MUNICIPAL DRAINAGE REPORT

FOR THE

REPAIR AND IMPROVEMENT

OF THE

WELLWOOD DRAIN

IN THE

TOWN OF TECUMSEH

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Ave. W. - Windsor ON N9A 5R9
Leamington: 18 Talbot St. W. - Leamington ON N8H 1M4
Chatham-Kent: 138 King St. W. Unit 102 - Chatham ON N7M 1E3

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May 8, 2019

REPAIR AND IMPROVEMENT OF THE WELLWOOD DRAIN
INDEX

ENTRY No.	TOPIC	PAGE
1.0	AUTHORIZATION	4
2.0	CURRENT DRAINAGE REPORT AND HISTORY	4
3.0	SITE MEETINGS	5
4.0	INSPECTION AND SURVEY	5
5.0	WATERSHED DESCRIPTION	6
6.0	EXISTING CONDITIONS	6
7.0	LANDOWNER REQUEST	9
8.0	DESIGN CONSIDERATIONS	9
9.0	RECOMMENDATIONS	10
10.0	DRAWINGS AND SPECIFICATIONS	14
11.0	ALLOWANCES	14
12.0	ESTIMATE OF COSTS	15
13.0	UTILITIES	21
14.0	ASSESSMENT	21
15.0	FUTURE MAINTENANCE	23
16.0	FISHERIES ISSUES/SPECIESW AT RISK.....	24
17.0	ENVIRONMENTAL IMPACT	25
18.0	GRANTS	25
19.0	ORDER OF PROCEDURE UNDER THE DRAINAGE ACT – SECTION 78 ...	26

ENTRY No. TOPIC PAGE

20.0 APPENDICES

APPENDIX 'A' – SCHEDULES OF ASSESSMENT

CONSTRUCTION ASSESSMENTS:

SCHEDULE A-1: SCHEDULE OF ASSESSMENT FOR CONSTRUCTION - DRAINAGE AREA 1…….. **29**

SCHEDULE A-2: SCHEDULE OF ASSESSMENT FOR CONSTRUCTION - DRAINAGE AREA 2…….. **30**

SCHEDULE A-3: SCHEDULE OF ASSESSMENT FOR CONSTRUCTION - DRAINAGE AREA 3…….. **31**

DRAIN MAINTENANCE ASSESSMENTS:

SCHEDULE B-1: SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE - WELLWOOD DRAIN - DRAINAGE AREA 1 …… **32**

SCHEDULE B-2: SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE - WELLWOOD DRAIN - DRAINAGE AREA 2 …… **33**

SCHEDULE B-3: SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE - WELLWOOD DRAIN - DRAINAGE AREA 3 …… **34**

CULVERT MAINTENANCE ASSESSMENTS:

SCHEDULE C-1: SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE OF CULVERTS - DRAINAGE AREA 1…… **35**

SCHEDULE C-2: SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE OF CULVERTS - DRAINAGE AREA 2…… **36**

SCHEDULE C-3: SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE OF CULVERTS - DRAINAGE AREA 3…….. **37**

APPENDIX 'B' – CONSTRUCTION SPECIFICATIONS

SPECIAL PROVISIONS …… **39**

GENERAL SPECIFICATION FOR OPEN DRAINS **…….** **48**

ENVIRONMENTAL PROTECTION SPECIAL PROVISIONS …… **56**

APPENDIX 'C' – ON-SITE MEETING RECORDS …… **59**

21.0 DRAWINGS – SHEETS 1 TO 10

May 8, 2019

Mayor and Municipal Council
Corporation of the Town of Tecumseh
917 Lesperance Road
Tecumseh, Ontario
N8N 1W9

Re: Repair and Improvement of the Wellwood Drain
Town of Tecumseh
Project No. 15-461

Mayor and Members of Council:

1.0 AUTHORIZATION

In accordance with your instructions, we have prepared the following report that provides for the repair and improvement of the Wellwood Drain.

The Town has issued instructions to carry out the necessary repair and improvements to this drain under the provisions of the Drainage Act. The Town asked at the on-site meeting, that the entire length of the drain be examined and repaired and improved as necessary. Our appointment and the works relating to repair and improvement of the drain are in accordance with Section 78 of the "Drainage Act, R.S.O. 1990, Chapter D.17". Accordingly, the firm of RC Spencer Associates Inc. has performed all of the necessary surveys, investigations, etc., and we report thereon as follows.

2.0 CURRENT DRAINAGE REPORT AND HISTORY

The most recent report for the Wellwood Drain was prepared by C. G. R. Armstrong and dated August 15th, 1964. It was adopted by Bylaw No. 1489 on September 21, 1964. That bylaw provided for the original construction of the Wellwood Drain and the installation of three access culverts in different locations along the drain. The 1964 report and bylaw governs the work that the Municipality has authority to carry out under maintenance and establishes current design gradeline for the bottom of the open drain.

Under the 1964 report, the following culverts were installed as a part of the Wellwood Drain:

a) Station 0-091 - A 6.1 m length of 375 mm diameter CSP was installed. This culvert was relocated possibly when the drain was relocated along Oldcastle Court. It now consists of 10.7 m of 500 mm diameter CSP from Stations 0-230.3 to 0-241.0 and is designated as Culvert No. 1 in this report.

b) Station 0+358 – A 6.1 m length of 300 mm diameter CSP was installed. This culvert is now the south part of Culvert No. 10 (Stations 0+358 to 0+420) which currently has a length of 62 m.

c) Stations 0+763.0 to 0+769.1 – A 6.1 m length of 450 mm diameter CSP was installed. This is Culvert No. 11 in this report

The 1964 report shows the Wellwood Drain to be an open ditch located along the east side of Oldcastle Road. The drain outlets into two drains, one being the Downing Drain in Lot 302 RP, Concession NTR S (North Talbot Road, South), and the other being the Washbrook Drain in Lot 302, Concession NTR N (North Talbot Road, North).

3.0 SITE MEETINGS

Two on-site meetings were held. Summaries for the on-site meetings are provided in Appendix 'C'.

4.0 INSPECTION AND SURVEY

Topographic survey data was gathered on the alignment of the entire length of the Wellwood Drain. The open channel was inspected, as well as, all of the culverts and lawn piping installed in the drain.

The 1964 report shows the Wellwood Drain as three separate sections of open drain along the east side of Oldcastle Road. The south end of the Wellwood Drain is specifically identified in the 1964 report as being 600 feet (183 m) south of the Downing Drain outlet. A portion of the Wellwood Drain located south of the Downing Drain has been realigned along the northeast side of the Oldcastle Court Cul-de-sac Road which was constructed sometime after the 1964 report. This section of drain now has a length of approximately 250 m and is still located on road property. The current drain extends southerly approximately as far as the drain that it replaced and serves the same watershed. The south limit of the existing open drain, as relocated, is located at Station 0-250.

We commenced our survey of the Wellwood Drain at the Downing Drain, where it crosses Oldcastle Road. The Downing Drain acts as an outlet for two portions of the Wellwood Drain. The Downing Drain location is referred as Station 0+000/0-000. The stations located north of the Downing Drain are referred to as "plus" chainages, measured in metres. The stations located south of the Downing Drain are referred to as "negative" chainage.

The "plus" chainage along the Wellwood Drain start at the Downing Drain (Station 0+000) and proceed upstream, northerly, to a high point in the drain at Station 0+356. The stationing continues northerly going downstream along the Wellwood Drain to an outlet into the Washbrook Drain, at Station 1+070. As part of the recommended work, the high point in the drain will be relocated to Station 0+335 to coincide with a property line.

The "negative" chainage along the Wellwood Drain start at the Downing Drain (Station 0-000) and proceed upstream, southerly, along the east side of Oldcastle Road and along the northeast side of Oldcastle Court Cul-de-sac Road, to the upstream limit of the Wellwood Drain at Station 0-250.

5.0 WATERSHED DESCRIPTION

The watershed area of the Wellwood Drain is irregular in shape and serves a drainage area of approximately 13.9 hectares (34.3 acres). The soil type within the watershed area is predominantly Brookston Clay. The topography of the watershed area is relatively flat and the bottom gradient of the drain varies between 0.08% to 0.40%.

6.0 EXISTING CONDITIONS

The existing current report for the Wellwood Drain is one dated August 14, 1964, and prepared by C. G. Russell Armstrong, P.Eng. Since then there have been more recent works carried out in this drain that were outside the provisions of the Drainage Act. New residential access culverts have been installed in the drain due to new residential development in the area. Although the bottom gradient of the drain is reasonably adequate throughout the length of the drain.

The properties served by Culverts No. 1, part of Culvert No. 10 and Culvert No. 11, referred to in this report were provided culverts under the 1964 report and are a part of the Wellwood Drain. Culvert No. 1 has been moved to a different location and replacement of the original culverts has taken place since 1964. We believe that the other culverts currently in the drain are private installations. They are presently not a part of the Wellwood Drain and the Town has no authority to work on them until such time as they are incorporated as part of the Wellwood Drain.

All of the access culverts and lawn piping were inspected during the course of our investigation. Specific structure numbers have been designated for ease of reference between the specification and drawings. The location, dimensions, condition and use of each structure are as follows:

Culvert No. 1: Joel Douglas Stafford (Roll No. 490-01406) – Station 0-230.3 to Station 0-241

From Station 0-230.3 to 0-241 South, a 10.7m length of 500mm (20”) diameter Corrugated Steel Pipe, without headwalls, provides access to this property. The culvert is in fair structural condition overall and has stable end slopes. The culvert provides sufficient hydraulic capacity and its invert elevation conforms to the design gradeline of the open drain. There is no requirement for immediate replacement.

Culvert No. 2: Downing Acres Inc. (Roll No. 490-01400) – Station 0-024 to Station 0-033.5

From Stations 0-014.5 to 0-024 South, a 9.5m length of 400mm (16”) diameter Corrugated Steel Pipe, without headwalls, provides access to this property. This culvert is in fair structural condition and has stable end slopes. Its invert elevation conforms to the design gradeline of the open drain. This culvert is slightly deficient in hydraulic capacity by current design standards and there is no need for immediate replacement. When the culvert is replaced in the future, it will be sized to have the capacity to accommodate the runoff from a 1 in 5 year design storm.

Culvert No. 3: R. & M. Fetherston (Roll No. 490-09102) – Station 0+004 to Station 0+087

From Stations 0+004 to 0+087, an 83m length of 450mm (18") diameter CSP with sloping rip-rap end treatment provides access to this property and also serves as lawn piping across the frontage of the house lot. This culvert is in fair structural condition, has quarried limestone rip rap end treatment and its invert elevation conforms to the design gradeline of the open drain. This culvert is slightly deficient in hydraulic capacity by current design standards and there is no need for immediate replacement. When the culvert is replaced in the future, it will be sized to have the capacity to accommodate the runoff from a 1 in 5 year design storm.

Culvert No. 4: T. & M. Zakrzewski (Roll No. 490-01415) – Station 0+102 to Station 0+115

From Stations 0+102 to 0+115, a 13m length of 450mm (18") diameter HDPE pipe (BOSS 2000) with sloping quarried limestone rip rap end treatment provides access to this property. This culvert is in very good structural condition, has stable end treatment and its invert elevation conforms to the design gradeline of the open drain. This culvert is slightly deficient in hydraulic capacity by current design standards and there is no need for immediate replacement. When the culvert is replaced in the future, it will be sized to have the capacity to accommodate the runoff from a 1 in 5 year design storm.

Culvert No. 5: J. & C. Salvatore (Roll No. 490-01403) – Station 0+133 to Station 0+143

From Stations 0+133 to 0+143, a 10m length of 375mm (15") diameter HDPE pipe (BOSS 2000) with sloping quarried limestone rip rap end treatment provides access to this property. This culvert is in very good structural condition, has stable end treatment and its invert elevation conforms to the design gradeline of the open drain. This culvert is slightly deficient in hydraulic capacity by current design standards and there is no need for immediate replacement. When the culvert is replaced in the future, it will be sized to have the capacity to accommodate the runoff from a 1 in 5 year design storm.

Culvert No. 6: Sabrina Amicone (Roll No. 490-01420) – Station 0+165 to Station 0+177

From Stations 0+165 to 0+177, a 12m length of 450mm (18") diameter Corrugated Steel Pipe with sloping quarried limestone rip rap end treatment provides access to this property. This culvert is in very good structural condition, has stable end treatment and its invert elevation conforms to the design gradeline of the open drain. The pipe provides a sufficient hydraulic capacity and does not need to be replaced at this time.

Culvert No. 7: Downing Acres Inc. (Roll No. 490-01400) – Station 0+205 to Station 0+214

From Stations 0+205 to 0+214, a 9m length of 450mm (18") diameter CSP with sloping quarried limestone rip rap end treatment provides access to this property. This culvert is in good structural condition, has stable end treatment and its invert elevation conforms to the design gradeline of the open drain. It is sufficient in hydraulic capacity and does not need to be replaced at this time.

Culvert No. 8: M. Abaldo & M. Taylor (Roll No. 490-09103) – Station 0+279 to Station 0+285.6

From Stations 0+279 to 0+285.6, a 6.7m length of 450mm (18") diameter Corrugated Steel Pipe with reinforced concrete endwalls provides access to this property. The invert of this culvert is presently well below grade, is partially obstructed and does not provide adequate drainage capacity. The culvert is in need of immediate replacement and the bottom of the open drain needs to be restored to grade. The reinforced concrete endwalls are sound and stable and can be modified and reused if possible. The driveable top width of the crossing is acceptable to the property owner. The width is suitable for a residential access crossing according to OPSD 301.020. The culvert will be replaced with a 6.7 m length of 450mm (18") diameter HDPE pipe. Additionally, earth grading has taken place to the drain channel to further disrupt the flow channel.

If the existing concrete end walls cannot be reused and replacement of the concrete headwalls is required, then the culvert will be replaced with an 11 m length of 450mm (18") diameter HDPE pipe and the culvert end treatment shall be restored with sloped quarried limestone rip rap erosion protection.

Culvert No. 9: Robert & Bobbi Burford (Roll No. 490-01410) – Station 0+302 to Station 0+310

From Stations 0+302 to 0+310 North, an 8m length of 400mm (16") diameter Corrugated Steel Pipe with poured concrete end walls provides access to this property. The invert elevation of this culvert conforms to the design gradeline of the open drain. Condition of the pipe is unknown due to poured concrete end treatment blocking the pipe openings and causing an obstruction to the flow of water. The endwalls are to be completely removed to allow maintenance or repair to the culvert. The existing culvert will be cleaned and inspected. If the structural condition of the culvert is adequate, the culvert end treatment on the south end of the culvert will be restored as a vertical sacked concrete headwall. A new lawn enclosure will be connected to the north end of the pipe.

If the culvert happens to be in deficient structural condition, we recommend that the culvert be replaced with an 11m length, 450mm (18") diameter HDPE pipe with a stiffness of 320 kPa and installed at 10% of the pipe diameter (45mm) below the new gradeline. Sloping quarried limestone rip rap end treatment will be installed on the south end of the access culvert.

Culvert 10: Perry Joseph & Jo Ann Burford (Roll No. 490-09106) – Sta. 0+358 to Sta. 0+420

From Stations 0+358 to 0+420, a 62m length of 400mm (16") diameter Corrugated Steel Pipe with a stacked broken concrete vertical endwall at its south end, provides access to this property and also serves as lawn piping across the frontage of the house lot. This culvert is in fair structural condition, has stable end slopes and is located at the correct elevation relative to the new gradeline for the drain. The culvert is sufficient in hydraulic capacity and does not need replacement. However, significant amounts of sediment accumulation has accumulated throughout the length of the pipe and a flushing and cleaning for the entire length is required. The end treatment on the south end of this culvert at Station 0+358 shall be removed and disposed of and a new section of lawn piping will be connected to the south end of this culvert.

Culvert 11: Richard & Robert McCarthy (Roll No. 490-09200): – Station 0+763 to Station 0+769

From Stations 0+763 to 0+769 North, a 6m length of 450mm (18") diameter Corrugated Steel Pipe, without headwalls, provides access to this property. This culvert is in fair structural condition and has stable end slopes. The culvert provides sufficient hydraulic capacity to accommodate a 5 year return period storm criterion and the its invert elevation conforms to the design gradeline of the open drain. There is no requirement for immediate replacement.

When the structural condition of the pipe becomes inadequate in the future or the width of the laneway is no longer adequate to accommodate the farm equipment that will use this access culvert, replacement of this culvert will be carried out as a work of future maintenance. A new pipe will be installed at that time, sized to accommodate a 5 year return period storm criterion. We recommend that the future replacement structure consist of 11m of 450mm (18") HDPE pipe with a minimum stiffness of 320kPa installed at 10% diameter embedment. Sloping quarried limestone rip rap end treatment will be installed on both ends.

7.0 LANDOWNER REQUESTS

The previous owner of 5384 Oldcastle Road, Donna Queen, submitted a request for improvement of the drain in 2015 under Section 78 of the Drainage Act. The existing culvert on this property has been installed too low and consequently has been causing drainage issues. The owner of the property has changed since the initial request for maintenance in 2015.

At the on-site meeting, the Town asked that the Engineer examine the entire length of the drain and recommend works for the repair and improvement of the entire length of the drain. The new course of the portion of the drain lying south of the Downing Drain requires incorporation as part of the drainage works to reflect current conditions.

At the 2nd on-site meeting on April 12th, 2017, a preliminary cost estimate of a drain enclosure was provided to the landowners in the drainage area. Upon review of the estimates, two owners of 5370 Oldcastle Road (Roll No. 490-09105) and 5394 Oldcastle Road (Roll No. 490-01420) requested that the entire length of the drain on their properties be enclosed.

In this report, the existing culverts that were installed privately in the Wellwood Drain without the report of an Engineer, are presently not a part of the drainage works. Under Section 18 of the Drainage Act, the Engineer must provide for the necessary construction or the repair and improvement of the access culverts in the drain and assess the costs accordingly. Incorporation of the existing culverts as part of the drainage works is appropriate. Section 18 provides that the access culverts be deemed a part of the drainage works for the purposes of future maintenance and repair of the drain. Technical standards for future replacement and assessment provisions for these culverts are included in this report.

8.0 DESIGN CONSIDERATIONS

The design and Construction Guidelines provided by the Ontario Ministry of Agriculture and Food (OMAF) recommends that residential or major agricultural access culverts or enclosures installed in open drains be designed to freely pass the peak runoff generated from a storm event having a frequency of occurrence of 1 in 5-10 years. We have applied a 5 year return period storm criterion for all culverts and enclosures being installed in the drain.

The design bottom elevations of the new culverts are set approximately 10% of the pipe diameter below the proposed gradeline. This embedment is requested by the Conservation Authority to enhance aquatic habitat.

9.0 RECOMMENDATIONS

Based on our review of the history, the information obtained during the site meetings, subsequent discussions with the landowners and the Town, a review of the survey data, and our detailed analyses and designs, we recommend that the Wellwood Drain be repaired and improved as described below.

We recommend that the contractor implement silt control measures near the outlets of each channel in Drainage Areas No. 1, 2 and 3 as defined on Page 1 of 10 of the Drawings. We recommend that any bank areas disturbed by the work be reseeded. Further, any lawn or grassed areas disturbed by the operation of equipment shall also be repaired to preconstruction conditions. We recommend that the contractor implement traffic control measures during construction.

The condition of the open drain through its length is such that minor repairs or improvements are required. We recommend that the entire length of the drain be brushed where necessary and excavated to the new proposed gradeline. We recommend that the drain consist of a bottom width of 1m and bank slopes of 2:1. The high point in the drain between Drainage Area 2 and Drainage Area 3 will be relocated from Station 0+356 to Station 0+335 to coincide with a property line.

The portion of the Wellwood Drain south of the Downing Drain has been realigned and relocated in part as a road construction project. We recommend that the new course be incorporated as part of the Wellwood Drain and that the portion of the Wellwood Drain that it replaced be formally abandoned.

We recommend that a cleaning and flushing be done for all the existing culverts that will remain in the drain. We have carried out a hydrological analysis of the watershed and a detailed hydraulic analysis and examination of each of the existing culverts in the drain. Our findings and the works recommended at each site are as follows:

Culvert No. 1: Joel Douglas Stafford (Roll No. 490-01406) – Station 0-230.3 to Station 0-241

We recommend that the existing 10.7m length of 500mm (20”) diameter Corrugated Steel Pipe be left in the drain. It will be flushed and cleaned of sediment at this time. When the structural condition of the pipe becomes inadequate in the future, the culvert and end treatment will be entirely removed from the drain. A new pipe shall be installed for replacement at that time and will be sized for a 5 year return period storm criterion with sloping quarried limestone rip rap end treatment. We recommend that the future replacement structure consist of 10m of 450mm (18”) HDPE plastic pipe with a minimum stiffness of 320kPa installed at 10% diameter embedment.

Culvert No. 2: Downing Acres Inc. (Roll No. 490-01400) – Station 0-024 to Station 0-033.5

We recommend that the existing 9.5m length of 400mm (16”) diameter Corrugated Steel Pipe be left in the drain. It will be flushed and cleaned of sediment at this time. When the structural condition of the pipe becomes inadequate in the future, the culvert and end treatment be

entirely removed from the drain. A new pipe will be installed for replacement at that time and will be sized for a 5 year return period storm criterion with sloping quarried limestone rip rap end treatment. We recommend that the future replacement structure consist of 9.5m of 525mm (21") HDPE pipe (320kPa) installed at a 10% diameter embedment depth.

Culvert No. 3: R. & M. Fetherston (Roll No. 490-09102) – Station 0+004 to Station 0+087

We recommend that the existing 83m length of 450mm (18") diameter Corrugated Steel Pipe be left in the drain. It will be flushed and cleaned of sediment at this time. When the structural condition of the pipe becomes inadequate in the future, the culvert and end treatment be entirely removed from the drain. A new pipe will be installed for replacement at that time and will be sized for a 5 year return period storm criterion with sloping quarried limestone rip rap end treatment. We recommend that the future replacement structure consist of 83m of 525mm (21") HDPE plastic pipe (320kPa) installed at a 10% diameter embedment depth.

Culvert No. 4: T. & M. Zakrzewski (Roll No. 490-01415) – Station 0+102 to Station 0+115

We recommend that the existing 13m length of 450mm (18") diameter BOSS 2000 be left in the drain. It will be flushed and cleaned of sediment at this time. When the structural condition of the pipe becomes inadequate in the future, the culvert and end treatment be entirely removed from the drain. A new pipe shall be installed for replacement at that time and will be sized for a 5 year return period storm criterion with sloping quarried limestone rip rap end treatment. We recommend that the future replacement structure consist of 13m of 525mm (21") HDPE plastic pipe (320kPa) installed at a 10% diameter embedment depth.

Culvert No. 5: J. & C. Salvatore (Roll No. 490-01403) – Station 0+133 to Station 0+143

We recommend that the existing 10m length of 375mm (15") diameter BOSS 2000 be left in the drain. It will be flushed and cleaned of sediment at this time. When the structural condition of the pipe becomes inadequate in the future, the culvert and end treatment be entirely removed from the drain. A new pipe shall be installed for replacement at that time and will be sized for a 5 year return period storm criterion with sloping quarried limestone rip rap end treatment. We recommend that the future replacement structure consist of 10m of 525mm (21") HDPE pipe (320kPa) installed at a 10% diameter embedment depth.

Culvert No. 6: Sabrina Amicone (Roll No. 490-01420) – Station 0+165 to Station 0+177

We recommend that the existing 12m length of 450mm (18") diameter Corrugated Steel Pipe be left in the drain and that it be extended at this time in order to enclose the drain. It will be flushed and cleaned of sediment at this time. At the landowner's request, we recommend that lawn piping be installed to enclose the remaining portions of the open drain within the property limits. This consists of 18.5m length of 450mm (18") diameter CSP north of the existing driveway culvert **(Station 0+146.5 to Station 0+165)** and 7.5m length of 450mm (18") diameter CSP south of the existing driveway from **(Station 0+177 to Station 0+184.5).** The existing end walls will be removed and new sloping rip-rap end treatment will be installed at both ends of the pipe structure at Stations 0+146.5 and Station 0+184.5 . When the structural condition of the pipe becomes inadequate in the future, the culvert and end treatment be entirely removed from the drain. A new pipe shall be installed for replacement at that time and shall be sized for a 5 year return period storm criterion with sloping quarried limestone rip

rap end treatment. It shall consist of 450mm diameter CSP or 450mm HDPE pipe. The total length of the lawn piping and access culvert will be 38m.

Culvert No. 7: Downing Acres Inc. (Roll No. 490-01400) – Station 0+205 to Station 0+214

We recommend that the existing 9m length of 450mm (18") diameter Corrugated Steel Pipe be left in the drain. It will be flushed and cleaned of sediment at this time. When the structural condition of the pipe becomes inadequate in the future, the culvert and end treatment be entirely removed from the drain. A new pipe shall be installed for replacement at that time and will be sized for a 5 year return period storm criterion with sloping quarried limestone rip rap end treatment. We recommend that the future replacement structure consist of 9m of 450mm (18") HDPE pipe (320kPa) installed at a 10% diameter embedment depth.

Culvert No. 8: M. Abaldo & M. Taylor (Roll No. 490-09103) – Station 0+279 to Station 0+285.6

We recommend that the existing 6.7m length of 450mm (18") diameter Corrugated Steel Pipe be removed from the drain and the materials be disposed of off-site. Care shall be taken to preserve and protect the existing concrete end walls in the process of removing the existing pipe material. We recommend the installation of a 6.7m length of 450mm (18") diameter HDPE culvert with a stiffness of 320 kPa at the proposed elevations. We recommend that the existing concrete endwalls be incorporated into the new culvert installation if possible. We recommend that the access driveway and the grassed areas disturbed by this work be fully restored.

If the existing concrete end walls cannot be reused and replacement of the concrete headwalls is required, then the culvert will be replaced with an 11 m length of 450mm (18") diameter HDPE pipe and the culvert end treatment shall be restored with sloped quarried limestone rip rap erosion protection. The cost of removing and disposing of the existing end walls, the cost of the additional 4.3 m of pipe, additional backfill material, additional installation costs and new rip-rap end treatment, will be tendered as a Provisional Item or Items in the tender documents, in the event that this additional work is required.

The cost of 6.7 m of new culvert and reusing the existing end walls is included in the estimate of costs and Special Benefit assessment for this culvert as shown in the report. If the existing end walls cannot be salvaged and reused, the Provisional Items of work shall be carried out. The actual cost for this Provisional Work will be assessed 100% against Roll No. 490-09103 as part of the Special Benefit assessment for this culvert. This assessment is in addition to the pro-rateable Special Benefit assessment made under this report for the replacement of the existing 6.7 m long access culvert and for salvaging and reusing of the existing concrete end walls.

Culvert No. 9: Robert & Bobbi Burford (Roll No. 490-01410) – Station 0+302 to Station 0+310

We recommend that the poured concrete end treatment be completely removed at the existing 8m length of 400mm (16") diameter Corrugated Steel Pipe. We recommend that the pipe be flushed, cleaned and inspected for structural condition after the removal of the end treatments. If the structural condition of the culvert is adequate, the culvert end treatment will be restored on the south end of the pipe as a vertical sacked concrete headwall.

If the culvert is found to be deficient in structural condition, we recommend that the culvert be replaced with an 11m length of 450mm (18") diameter HDPE pipe with a stiffness of 320 kPa and installed at 10% of the pipe diameter (45mm) below the new gradeline. Sloping quarried

limestone rip rap end treatment will be installed on the south end of the access culvert. The cost of removing and disposing of the existing culvert, the cost of the additional 3.0 m of pipe, additional backfill material, additional installation costs and the net difference in cost between the sacked concrete end wall and the rip-rap end treatment will be tendered as a Provisional Item or Items in the tender documents, in the event that this additional work is required.

The cost of removing the existing end treatment, flushing the existing 8 m long access culvert and a new sacked concrete end wall is included in the estimate of costs and the Special Benefit assessment for this culvert as shown in the report and assessment schedule but the cost of replacing the culvert pipe is not. If replacement of the pipe is found necessary, the Provisional Items of work shall be carried out. The actual cost for this Provisional Work will be assessed according to the future maintenance provisions of this report for this access culvert as set out under "Section 15.2" of this report. These assessments are in addition to the pro-rateable "Special Benefit" and "Outlet" assessments included in "Schedule A-2" for the removal of the concrete end treatment, flushing of the existing culvert and installation of a sacked concrete end wall.

Culvert 10: Perry Joseph & Jo Ann Burford (Roll No. 490-09106) – Sta. 0+358 to Sta. 0+420

We recommend that the existing 62m length of 400mm (16") diameter Corrugated Steel Pipe be left in the drain. It will be flushed and cleaned of sediment at this time. When the structural condition of the pipe becomes inadequate in the future, the culvert and end treatment be entirely removed from the drain. We recommend that the replacement structure consist of 62m of 450mm (18") HDPE pipe (320kPa) installed at a 10% diameter embedment depth. Sloping quarried limestone rip rap end treatment will be installed on the north end of the culvert.

Culvert 11: Richard & Robert McCarthy (Roll No. 490-09200): – Station 0+763 to Station 0+769

We recommend that the existing 6m length of 450mm (18") diameter Corrugated Steel Pipe be left in the drain. It will be flushed and cleaned of sediment at this time. embedment.

When the structural condition of the pipe becomes inadequate in the future or the width of the laneway is no longer adequate to accommodate the farm equipment that will use this access culvert, replacement of this culvert will be carried out as a work of future maintenance. We recommend that the future replacement structure consist of 11m of 450mm (18") HDPE pipe (320kPa) installed at a 10% diameter embedment depth. Sloping quarried limestone rip rap end treatment will be installed on both ends.

Lawn Piping - Judith Robson (Roll N. 490-09105) – Station 0+310 to Station 0+358

With the landowner's request to have the drain enclosed at the said property, we recommend that a 48m length of 400mm diameter corrugated steel pipe (CSP) be installed at the bottom of the drain on a clear stone bedding, with granular "B" and native backfill. A 600 mm x 600 mm concrete catch basin will be installed at Station 0+335. We recommend that the drain enclosure be graded to form a 150mm (6") deep swale, 3m wide.

10.0 DRAWINGS AND SPECIFICATIONS

As part of this report, we have attached design drawings for the proposed culvert. There is a set of ten drawings:

a) drawing showing the location of the Wellwood Drain and the approximate limits of the watershed for each of the three drainage areas;
b) drawing showing a profile for the proposed drain improvements;
c) four cross section drawings;
d) a drawing for the proposed drain enclosure at 5394 Oldcastle Rd;
e) drawings showing site plans and longitudinal sections with details and dimensions for the construction of Culvert No. 8;
f) a drawing for the proposed drain enclosure at 5370 Oldcastle Rd; and
g) a drawing showing site plan and sections for typical culvert details in case of future culvert replacements.

Also attached as **Appendix 'B'** are:

a) **'Special Provisions'** for the culvert construction which set out specifications and construction details for the various aspects of the required works to be conducted under this report;

b) **'General Specifications for Access Culvert Construction'**;

c) **'Environmental Protection Special Provisions'**.

Also attached as **Appendix 'C'** is an **'Endangered Species Act Review'** providing pertinent information.

Also attached as **Appendix 'D'** is a **'Correspondence Section'** providing copies of the appointment letter and other correspondence.

11.0 ALLOWANCES

From Station 0+400 to Station 1+070, the material excavated from the open drain shall be deposited and spread on the adjoining farmland and a damage allowance will be provided to the adjoining farmland. Throughout the remainder of the drain, all excavation of the drain will be done on the road side to prevent damage to properties and all excess materials will be hauled off-site. Since no crops are involved and full restoration will be carried out to lawn areas, no damages allowances will be provided to the residential properties. The working area designated in the specifications shall be provided by the landowners, in the future, for the purposes of future maintenance of the drain. The excavated material is to be disposed of as set out in the Special Provisions in the attached Appendix "B".

In accordance with Section 30 of the Drainage Act, we determined the amount to be paid to the owner of the agricultural property for damages to lands and crops (if any) occasioned by the operation of equipment and the disposal of material excavated from the drain. This amount is calculated at a rate of $1,980 per hectare ($800 per acre) and is shown in the following Schedule under the heading "Damages".

SCHEDULE OF ALLOWANCES

Roll No.	Con.	Lot or Part	Owner	Damages
490-09200	NTR	Pt Lot 302	Richard & Robert McCarthy	$ 1,080.00
			TOTAL -	$ 1,080.00

12.0 ESTIMATE OF COSTS

Our estimate of the total cost of the proposed work, including the cost of the engineer's report and all incidental expenses, is made up as follows:

DRAINAGE AREA 1 – STATION 0-000 TO STATION 0-250

CONSTRUCTION ITEMS – AREA 1

1. Open Drain Improvements

a)	Excavation of drain from Stations 0-000 to 0-250 to specified grade, including, brushing, hauling and disposing of the materials off-site. (Length of drain excavation approx. 250m)	**$**	**1,785.00**
b)	Seeding and mulching of drain banks and disturbed areas from Stations 0-000 to 0-250 (approx. 125 m^2)	**$**	**200.00**
c)	Supply all labour, equipment and materials to flush, clean and vacuum existing driveway culverts and lawn piping in the Wellwood Drain. (Culverts 1 and 2)	**$**	**500.00**

2. Miscellaneous Items

a)	Traffic Control During Construction	**$**	**1,500.00**
b)	Supply, install and maintain silt fence for duration of project	**$**	**330.00**
	SUB-TOTAL FOR CONSTRUCTION – AREA 1	**$**	**4,315.00**
	H.S.T. ON CONSTRUCTION COSTS (1.76%)	**$**	**76.00**
	TOTAL CONSTRUCTION COST – AREA 1	**$**	**4,391.00**

INCIDENTALS -AREA 1

Survey, report, estimate, specifications and drawings.	**$**	**5,350.00**
Contract Administration and Inspection.	**$**	**1,323.00**
Portion of ERCA Permit Fee.	**$**	**212.00**

Portion of Fee for "Species at Risk Mitigation Plan".	**$**	**117.00**
Contingency Allowance (if required).	**$**	**279.00**
SUB-TOTAL FOR INCIDENTALS – AREA 1	**$**	**7,281.00**
H.S.T. ON INCIDENTALS (1.76%)	**$**	**128.00**
TOTAL INCIDENTAL COSTS – AREA 1	**$**	**7,409.00**
TOTAL ESTIMATED COST FOR AREA 1	**$**	**11,800.00**

DRAINAGE AREA 2 – STATION 0+000 TO STATION 0+335

CONSTRUCTION ITEMS – AREA 2

1. Open Drain Improvements

a)	Excavation of drain from Stations 0+000 to 0+335 to specified grade, including, brushing, hauling and disposing of the materials off-site. (Length of drain excavation approx. 180m)	**$**	**1,300.00**
b)	Seeding and mulching of drain banks and disturbed areas from Stations 0+000 to 0+335 (approx. 170 m^2)	**$**	**270.00**
c)	Supply all labour, equipment and materials to flush, clean and vacuum existing driveway culverts and lawn piping in the Wellwood Drain. (Culverts No. 3, 4, 5, 6, 7 and 9)	**$**	**2,200.00**

2. Culvert No. 6 – Stations 0+146.5 to 0+184.5

a)	Supply to site a total of 26m of 450mm (18") diameter Corrugated Steel Pipe (CSP) with a minimum wall thickness of 2.0mm and corrugation profile of 68mm by 13mm. ***The downstream extension will be 18.5m long and the upstream extension will be 7.5m long.***	**$**	**2,520.00**
b)	Supply and install all 20-25mm clear stone material for pipe bedding, being approximately 7.5 tonnes.	**$**	**260.00**
c)	Supply and install all granular 'B' (Type II) bedding and backfill material for pipe installation, being approximately 14.5 tonnes.	**$**	**360.00**
d)	Supply and place all imported select earth backfill material for drain enclosure, being approximately 23m^3.	**$**	**230.00**
e)	Supply and place 100mm thick imported topsoil along the length of the new swale and disturbed areas as needed, being approximately 14m^3.	**$**	**140.00**

f)	Supply and place seeding and mulching to all topsoiled areas and disturbed areas, being approximately 145m^2.	**$**	**145.00**
g)	Supply labour and equipment to excavate for and install specified pipe including all drain excavation, compaction, disposal of surplus material and all drain bank and road restoration and bank seeding & mulching. Supply labour, equipment and materials to redirect all lateral tile drains that outlet into the open drain opposite the new culvert and outlet them into the open drain beyond the limits of the new culvert. Clean existing culvert (12m long).	**$**	**1,750.00**
h)	Supply and install a total of approximately 9.0 square metres (5.5 tonne) of quarried and graded erosion stone (150mm - 230mm) protection on the drain banks at both ends of culvert pipe, approximately 300mm in depth including all required excavation, disposal of surplus materials, and placement of Terrafix 270R or equal geotextile non-woven filter fabric.	**$**	**410.00**

3. <u>Culvert No. 8 – Station 0+279 to 0+285.6</u>

a)	Removal and disposal of existing 6.7m length of 450mm diameter CSP along with asphalt, granular backfill and other miscellaneous materials.	**$**	**1,500.00**
b)	Supply to site 6.7m of 450mm (18”) diameter High Density Polyethylene (HDPE) pipe with a minimum stiffness of 320 kPa.	**$**	**580.00**
c)	Supply and install all 20-25mm clear stone material for pipe bedding, being approximately 5.0 tonnes.	**$**	**180.00**
d)	Supply and install all granular ‘B’ (Type II) backfill material for pipe installation, being approximately 13 tonnes.	**$**	**325.00**
e)	Supply and install all granular ‘A’ material for road base, being approximately 12 tonnes.	**$**	**375.00**
f)	Supply labour and equipment to excavate for and install specified pipe including all drain excavation, compaction, disposal of surplus material and all drain bank and road restoration and bank seeding & mulching.	**$**	**800.00**
g)	Supply labour and equipment to salvage existing concrete headwalls by cutting opening to install proposed culvert, including brick and grout around pipe ends.	**$**	**1,000.00**
h)	Supply, place and compact Hot Mix Hot Laid Asphaltic Concrete to match existing asphalt driveway thickness. (HL3 Surface Course)	**$**	**350.00**

4.	**<u>Culvert No. 9: - Stations 0+302 to 0+310</u>**		
a)	Remove and dispose of existing poured concrete headwalls off-site.	**$**	**250.00**
b)	Supply and install a vertical sacked concrete end wall on the south end of the culvert pipe, including all required excavation, disposal of surplus materials, and placement of Terrafix 270R or equal geotextile non-woven filter fabric.	**$**	**450.00**
c)	Inspect structural condition of existing 400mm diameter CSP to determine whether a replacement of the culvert is required immediately. Drainage superintendent will make arrangements with the contractor for replacement.	**$**	**200.00**
5.	**<u>Lawn Piping - Roll No. 490-09105 – Stations 0+310 to 0+335</u>**		
a)	Supply to site 25m of 400mm (16") diameter Corrugated Steel Pipe (CSP) with a minimum wall thickness of 2.0mm and a corrugation profile of 68mm x 13mm.	**$**	**1,725.00**
b)	Supply and install all 20-25mm clear stone material for pipe bedding being approximately 7.5 tonnes.	**$**	**260.00**
c)	Supply and install all granular 'B' (Type II) backfill material to springline of pipe, being approximately 7 tonnes.	**$**	**175.00**
d)	Supply and place all imported select earth backfill material for drain enclosure, being approximately 8.0m^3.	**$**	**80.00**
e)	Supply and place 100mm thick imported topsoil along the length of the new swale and disturbed areas as needed, being approximately 7.5m^3.	**$**	**75.00**
f)	Supply and place seeding and mulching to all topsoiled areas and disturbed areas, being approximately 75m^2.	**$**	**150.00**
g)	Supply labour and equipment to excavate for and install specified pipe including all drain excavation, compaction and all drain bank and road restoration including seeding & mulching.	**$**	**1,950.00**
h)	Supply materials, labour and equipment to construct a precast concrete catch basin at Station 0+335.	**$**	**1,800.00**
6.	**<u>Miscellaneous Items</u>**		
a)	Supply, install and maintain silt fence for duration of project.	**$**	**330.00**
b)	Traffic Control during construction.	**$**	**1,500.00**
	SUB-TOTAL FOR CONSTRUCTION – AREA 2	**$**	**23,640.00**
	H.S.T. ON CONSTRUCTION COSTS (1.76%)	**$**	**416.00**
	TOTAL CONSTRUCTION COSTS – AREA 2	**$**	**24,056.00**

INCIDENTALS - AREA 2

Survey, report, estimate, specifications and drawings.	**$**	**12,450.00**
Contract Administration and Inspection.	**$**	**1,717.00**
Portion of ERCA Permit Fee.	**$**	**275.00**
Portion of Fee for "Species at Risk Mitigation Plan".	**$**	**152.00**
Contingency Allowance (if required)	**$**	**337.00**
SUB-TOTAL FOR INCIDENTALS – AREA 2	**$**	**14,931.00**
H.S.T. ON INCIDENTALS (1.76%)	**$**	**263.00**
TOTAL INCIDENTAL COSTS – AREA 2	**$**	**15,194.00**
TOTAL ESTIMATED COST FOR AREA 2	**$**	**39,250.00**

DRAINAGE AREA 3 – STATION 0+335 TO 1+070

CONSTRUCTION ITEMS – AREA 3

1.	**Open Drain Improvements**		
a)	Excavation of drain from Stations 0+335 to 1+070 to specified grade, including, brushing, hauling and disposing of the materials off-site or levelling the adjoining farmland. (Length of drain excavation approx. 667m)	**$**	**4,515.00**
b)	Seeding and mulching of drain banks and disturbed areas from Stations 0+335 to 1+070 North (approx. 205 m^2)	**$**	**330.00**
c)	Supply all labour, equipment and materials to flush, clean and vacuum existing driveway culverts and lawn piping in the Wellwood Drain. (Culverts 10 and 11)	**$**	**800.00**
2.	**Roll No. 490-09105 - Drain Enclosure – Stations 0+335 to 0+358**		
a)	Supply to site 23m of 400mm (16") diameter Corrugated Steel Pipe (CSP) with a minimum wall thickness of 2.0mm and a corrugation profile of 68mm x 13mm.	**$**	**1,585.00**
b)	Supply and install all 20-25mm clear stone material for pipe bedding being approximately 7.0 tonnes.	**$**	**245.00**
c)	Supply and install all granular 'B' (Type II) backfill material to springline of pipe, being approximately 6.5 tonnes.	**$**	**160.00**

d)	Supply and place all imported select earth backfill material for drain enclosure, being approximately 7m^3.	**$**	**70.00**
e)	Supply and place 100mm thick imported topsoil along the length of the new swale and disturbed areas as needed, being approx. 7m^3.	**$**	**70.00**
f)	Supply and place seeding and mulching to all topsoiled areas and disturbed areas, being approximately 69m^2.	**$**	**140.00**
g)	Supply labour and equipment to excavate for and install specified pipe including all drain excavation, compaction and all drain bank and road restoration including seeding & mulching	**$**	**1,800.00**
3.	**Miscellaneous Items**		
a)	Supply, install and maintain silt fence for duration of project.	**$**	**330.00**
b)	Traffic Control during construction.	**$**	**420.00**
	SUB-TOTAL FOR CONSTRUCTION – AREA 3	**$**	**10,465.00**
	H.S.T. ON CONSTRUCTION COSTS (1.76%)	**$**	**184.00**
	TOTAL CONSTRUCTION COSTS – AREA 3	**$**	**10,649.00**
	INCIDENTALS – AREA 3		
	Allowances under Section 30 (Damages)	**$**	**1,080.00**
	Survey, report, estimate, specifications and drawings.	**$**	**9,171.00**
	Contract Administration and Inspection.	**$**	**1,960.00**
	Portion of ERCA Permit Fee.	**$**	**313.00**
	Portion of Fee for “Species at Risk Mitigation Plan”.	**$**	**173.00**
	Contingency Allowance (if required)	**$**	**393.00**
	SUB-TOTAL FOR INCIDENTALS – AREA 3	**$**	**13,090.00**
	H.S.T. ON INCIDENTALS (1.76%)	**$**	**211.00**
	TOTAL INCIDENTAL COSTS – AREA 3	**$**	**13,301.00**
	TOTAL ESTIMATED COST FOR AREA 3	**$**	**23,950.00**
	GRAND TOTAL ESTIMATED PROJECT COST	**$**	**75,000.00**

The estimate provided in this report was prepared according to current materials and installation estimates as of the date of this report. From the time of filing of the report by the Engineer to the time of tendering the work, it is understood that the estimate of cost is subject to inflation. The rate of inflation shall be calculated using the Consumer Price Index applied to the cost of construction from the date of the report to the date of tendering.

13.0 UTILITIES

It may become necessary to temporarily or permanently relocate utilities that may conflict with the construction recommended under this report. In accordance with Section 26 of the Drainage Act, we assess any relocation cost against the public utility having jurisdiction. Under Section 69 of the Drainage Act, the public utility is at liberty to do the work with its own forces, but if it should not exercise this option within a reasonable length of time, the Town and/or engineer appointed will arrange to have this work completed and the costs will be charged to the appropriate public utility.

14.0 ASSESSMENT

Under the Drainage Act, assessments against individual properties are normally comprised of three (3) assessment components:

i. Benefit (*advantages relating to the betterment of lands, roads, buildings, or other structures resulting from the improvement to the drain).*
ii. Outlet Liability *(part of cost required to provide outlet for lands and roads).*
iii. Special Benefit *(additional work or feature that may not affect function of the drain).*

We have assessed the estimated costs against the affected lands and roads as listed in Schedule 'A-1, A-2, and A-3' under "Value of Special Benefit," "Value of Benefit" and "Value of Outlet." Schedule A-1 relates to the estimated cost of the work recommend in Drainage Area 1. Schedule A-2 relates to the estimated cost of the work recommend in Drainage Area 2. Schedule A-3 relates to the estimated cost of the work recommend in Drainage Area 3.

The Special Benefit assessments shown in Schedules 'A-2' and 'A-3' were derived as follows:

1. The cost of enclosing the open portion of the drain at Stations 0+146.5 to 0+184.5 (Culvert No. 6) including $102 of net GST, is estimated at $5,917. This estimated cost plus the engineering cost for preparing this report and overhead costs in the amount of $1,775 represents the total estimated cost of the drain enclosure in the amount of $7,692. This work involves an extension of an existing culvert and is assessed at 100% against the adjoining property (Roll No. 490-01420) as shown in Schedule 'A-2'.
2. The cost of replacing the residential culvert at Station 0+283 (Culvert No. 8) including $90 of net GST, is estimated at $5,200. This estimated cost plus the engineering cost for preparing this report and overhead costs in the amount of $1,560 represents the total estimated cost of the access culvert replacement in the amount of $6,760 as shown in Schedule 'A-2'. The replacement of this culvert is necessary due to the fact that it was installed well below the design gradeline of the open drain and caused an obstruction. The estimated cost of this work is assessed 100% against the adjoining property (Roll No. 490-09103) as a Special Benefit, as shown in Schedule 'A-2'.

The installation of the asphalt driveway surface across Culvert No. 8 is considered a non-pro-rateable item of work and must be tendered as separate item in the Form of Tender. The actual cost of this work shall be assessed as part of the Special Benefit assessment made against Roll No. 490-09103. The estimated cost of Culvert No. 8 ($5,200) less the estimated cost of the asphalt ($350) or $4,850 shall be inserted into Schedule A-2 in place of the Special Benefit assessment of $5,200 made against Roll No. 490-09103 prior to prorating the remainder of the cost of the project. The actual cost of the asphalt is to be added to the pro-rated assessment made against Roll No. 490-09103.

3. The cost of removal and disposal of concrete headwalls and other work at Station 0+305 (Culvert No. 9) including $16 of net GST, is estimated at $916. This estimated cost plus the engineering cost for preparing this report and overhead costs in the amount of $275 represents the total estimated cost of the works in the amount of $1,191. This access culvert is shared between Roll No. 490-09105 and Roll No. 490-01410. The Special Benefit is assessed against Roll No. 490-09105 and Roll No. 490-01410, in equal shares. Each share represents 30% of the estimated cost of the work or $357, as is shown in Schedule A-2. The remaining 40% of the cost ($477) is assessed as outlet liability against the lands and roads upstream of this culvert.

4. The cost of enclosing the drain from Stations 0+310 to 0+335 including $109 of net GST, is estimated at $6,324. This estimated cost plus the engineering cost for preparing this report and overhead costs in the amount of $1,897 represents the total estimated cost of this portion of the drain enclosure in the amount of $8,221.

   The cost of enclosing the drain from Stations 0+335 to 0+358 including $72 of net GST, is estimated at $4,142. This estimated cost plus the engineering cost for preparing this report and overhead costs in the amount of $1,243 represents the total estimated cost of this portion of the drain enclosure in the amount of $5,385.

   The cost of the two sections of drain enclosure is assessed at 93% against the adjoining property (Roll No. 490-09105) and 7% against the Town as owner of Oldcastle Road. The primary purpose of the drain enclosure is to benefit the adjoining private property. The enclosure will reduce the cost of future maintenance of the drain and provides a minor benefit to the road and the adjoining private lands for reduce future maintenance costs. The Special Benefit for the portion of the drain enclosure from Stations 0+310 to 0+335 is shown in Schedule 'A-2'. The Special Benefit for the portion of the drain enclosure from Stations 0+335 to 0+358 is shown in Schedule 'A-3'. The breakdown is as follows:

	Schedule A-2	Schedule A-3	Totals
Roll No. 490-09105	$ 7,646	$ 5,008	$ 12,654
Oldcastle Road	$ 575	$ 377	$ 950
Totals	$ 8,221	$ 5,385	$ 13,606

After assessing the part of the cost of the project that relates to the "Special Benefits", the remainder of the costs relating to the drainage improvements has been assessed as "Benefit" and "Outlet" against the lands and roads within each drainage area as shown in Schedules 'A-1', 'A-2' and 'A-3'.

When determining "Benefit" assessments, factors such as the advantages to any lands, roads, buildings or other structures resulting 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.

When determining "Outlet" assessments, factors such as area draining from each property, land use, impervious areas and other factors are considered. "Outlet" assessments are based upon the volume and rate of flow of the water artificially caused to flow into the drainage works from the lands and roads liable for such assessments.

We consider all of the items of work recommended in this report to be pro-rateable items except for the asphalt across Culvert No. 8. All other assessments are pro-rateable. However, should additional costs be incurred to deal with utilities and roads under Section 26 of the Drainage Act, those costs are non-pro-rateable. While there is one poured concrete endwall and two sacked concrete headwalls included with this project, we do not consider them to be decorative in nature but are recommended as an alternative to replacing and/or extending the existing culverts and installing sloped rip-rap end treatment, at this time. In the future, longer culverts will be installed with sloped rip-rap end treatment.

15.0 FUTURE MAINTENANCE

15.1 Future Maintenance (Open Drain)

We recommend that the future works of repair and maintenance on the Wellwood Drain be carried out by the Town and that the costs excluding the cost of maintaining the culverts in the drain be assessed against the affected lands and road in the Wellwood Drain watershed as "Benefit" and "Outlet" as shown in Schedules 'B-1, B-2 and B-3'. Schedule B-1 relates to the future maintenance costs incurred Drainage Area 1. Schedule B-2 relates to the future maintenance costs incurred Drainage Area 2. Schedule B-3 relates to the future maintenance costs incurred Drainage Area 3.

Future maintenance costs on each of the three Drainage Areas shall be kept separate and shall be levied pro rata on the affected lands and road that are located upstream of the future maintenance works using the appropriate Schedule. The total assessment in each schedule is based on an arbitrary $1,000 of future drain maintenance cost.

15.2 Future Maintenance (Access Crossings and Lawn Piping)

All of the access culverts, lawn enclosures and the farm culvert recommended or described in this report are a part of the Wellwood Drainage Scheme for the purposes of future maintenance of the drainage works. We recommend that the future works of repair and maintenance on the culverts be carried out by the Town and that the costs be assessed as described in the following paragraphs.

"Schedules C-1 to C-3" represent all of the lands and roads that drain through the most downstream culvert in Drainage Areas 1 to 3, respectively. Schedule C-1 applies to Culverts No. 1 and 2. Schedule C-2 applies to Culverts No. 3, 4, 5, 6, 7, 8 and 9. Schedule C-3 applies to Culverts No. 10 and 11. When calculating the outlet assessments for the cost of maintaining a particular culvert, only the properties or portions of properties that drain through the culvert

shall be assessed and the remainder of the properties shall be eliminated from the schedule prior to prorating the outlet assessments. The total Outlet assessments shown in "Schedule C-1", "Schedule C-2" and "Schedule C-3" are each based upon an arbitrary amount of $ 1,000.

Culverts No. 1 to 11 are access crossings and lawn enclosures. The cost of maintaining or replacing access culverts are assessed 60% against the adjoining property provided access by the crossing. The remaining 40% of the future maintenance cost for each access crossing is assessed as "Outlet" assessments only against the lands and roads upstream of each access crossing that drains through it. The Outlet assessments for each access crossing shall be prorated to the assessments that remain in "Schedule C-1 to C-3" after deleting the lands and roads, or parts thereof, that are located downstream of that particular access crossing. Lawn piping shall be assessed at 100% "Special Benefit" to the adjoining property owners. Since Culverts 3, 6 and 10 consist of an access culvert and lawn piping combined, the Special Benefit is calculated as a blended rate based upon a 60% rate for the estimated cost of the access culvert portion and a 100% rate for the estimated cost of the lawn piping portion.

Furthermore, all the above provisions for the future maintenance and improvement of these culvert shall remain as noted above until otherwise determined under the provisions of the 'Drainage Act RSP 1990 Chapter D. 17'.

The division between Special Benefit and Outlet assessment for the future maintenance of each access crossing shall be as follows:

Culvert No.	Type	Owner(s) Names	Owner(s) Roll Number	Special Benefit	Outlet
1	Primary	Joel Douglas Stafford	Roll No. 490-01406	60%	40%
2	Primary	Downing Acres Inc.	Roll No. 490-01400	60%	40%
3	Primary	Robert Fetherston	Roll No. 490-09102	94%	6%
4	Primary	Thomas Zakrzewski	Roll No. 490-01415	60%	40%
5	Primary	Johncarlo Salvatore	Roll No. 490-01403	60%	40%
6	Primary	Sabrina Amicone	Roll No. 490-01420	80%	20%
7	Primary	Downing Acres Inc.	Roll No. 490-01400	60%	40%
8	Primary	Michael Albado	Roll No. 490-09103	60%	40%
9	Shared	Robert Burford	Roll No. 490-01410	30%	40%
		Judith Robson	Roll No. 490-09105	30%	
9/10 Enclosure	Drain Enclosure between 9 & 10	Judith Robson	Roll No. 490-09105	93%	0%
		Oldcastle Road	N/A	7%	
10	Primary	Perry Joseph & Jo Ann Burford	Roll No. 490-09106	91%	9%
11	Primary	Richard McCarthy	Roll No. 490-09200	60%	40%

16.0 FISHERIES ISSUES/SPECIES AT RISK

The Federal Fisheries Act requires that no deleterious substances be introduced to fish habitat and that there be no net loss of fish habitat as a result of any undertaking. Any activities that may introduce deleterious substances or result in loss of fish habitat may require a permit from the Minister of Fisheries, Oceans and the Canadian Coast Guard. To reduce administration and time spent evaluating relatively simple projects that have easily predicted impacts that are

easily mitigated, the Department of Fisheries and Oceans Canada (DFO) has instituted a self-assessment process. This means that certain activities or activities within certain types of water bodies may be undertaken by the proponent without contacting DFO, provided that appropriate avoidance and mitigation measures are followed.

A self-assessment of the project has been completed. The DFO has a web page entitled "Project Activities and Water Bodies where review is not required". That web page allows for routine cleanout of drainage channels to be carried without DFO Review provided that cleanout occurs every 10 years or less, the work can be done in the dry and that no SARA-listed aquatic species are present. This describes the project being recommended in this report. However, there is also a section on that web page that requires that a DFO review be submitted if a waterbody such as a roadside ditch, agricultural drains or drainage ditches is connected to a waterbody that contains fish at any time during the year. In the past, DFO has indicated that a review by DFO is required for the type of project being recommended in this report.

The Wellwood Drain is a Class F drain and the work will be carried out in the dry. The Environmental Specifications attached to this report provides appropriate avoidance and mitigation measures for the Contractor to adhere to. The Town of Tecumseh has a detailed document entitled **"Species at Risk Mitigation Plan for Drainage Works"** and the Contractor will adhere to the requirements of that document.

17.0 ENVIRONMENTAL IMPACT

For most of its length, drain look like a relatively shallow roadside drain in front of residential properties. The existing west drain bank is mainly grass covered. The east bank in some areas is covered in light to medium brush. Should repair work proceed it may be necessary to remove the existing vegetation and brush to permit construction of the works. Any areas disturbed by construction would be restored with new grass vegetation or quarried rock erosion protection. Implementation of silt devices will be required for any construction work to ensure that silt and suspended debris are not carried into the downstream watercourse.

During our survey and examination of the drain we did not observe any fish or wildlife; however, the drain banks undoubtedly provide cover and habitat for small animals. Disturbance of portions of the drain banks will be unavoidable, but would be kept to a minimum. The bank disturbance would also be of a temporary nature. It is not anticipated that any significant degradation of the local natural environment would result from the proposed repair options.

18.0 GRANTS

In accordance with the provisions of Sections 85, 86 and 87 of the Drainage Act, a grant in the amount of 33–1/3 percent of the assessment eligible for a grant may be made in respect to the assessment made under this report upon privately owned lands used for agricultural purposes. The assessments levied against privately owned agricultural land must also satisfy all other eligibility criteria set out in the Agricultural Drainage Infrastructure Program policies. Some of the privately-owned lands are used for agricultural purposes and may be eligible under the A.D.I.P. policies. We are not aware of any lateral drains involved in this work that would not be eligible for a grant. The assessments made for the non-grantable items of this project are assessed entirely to non-agricultural properties and the road; and are not eligible for grant in any event. We recommend that application be made to the Ontario Ministry of Agriculture and

Food in accordance with Section 88 of the Drainage Act, for this grant, as well as for all other grants for which this work may be eligible.

We recommend that the two access culverts (Culverts No. 2 and 7) in the Wellwood Drain that serve Roll No. 490-01400, the Downing Acres Inc. property, be considered "Primary" or "Necessary" culverts required to access the property as the culverts are on two separate branches of the drain. As such, we consider that both culverts are eligible for grant as long as the other requirements of the ADIP policies are met. There is a third culvert on the Downing Drain that was used as a cattle crossing and is too narrow for farm vehicles. Also, it is a private culvert that is not a part of the Downing Drain for purposes of future maintenance by the Town. We consider the culvert in the Downing Drain to be a "Secondary" or "Convenience" culvert that is not eligible for grant.

A copy of the Agricultural Drainage Infrastructure Program Administrative Policies (ADIP Policies) are available on the OMAFRA web site.

19.0 ORDER OF PROCEDURE UNDER THE DRAINAGE ACT – SECTION 78

The following is the general order of procedure that is followed to repair and improve a municipal drainage system pursuant to Section 78 of the Drainage Act. As this is only a summary additional details may be obtained from the Town Clerk or Engineer.

a) Council determines that repair and improvements are required.

b) Council appoints an engineer.

c) Engineer conducts on site meeting.

d) Engineer conducts survey of the drain.

e) Engineer prepares drainage report and provides copy to the Town.

f) A Public Information meeting is held with the residents to discuss the report findings before finalizing the report and formally submitting it to the Town.

g) Council considers drainage report at a public meeting with the affected landowners.

h) At the meeting to consider the report, the Town Council may adopt the Drainage Report. If adopted the Town Clerk prepares a provisional by-law for the recommended work and sends copies of the by-law to affected parties and arranges a second meeting of Council for the Court of Revision.

i) The Court of Revision is held at a subsequent meeting with the affected landowners to discuss any disputes regarding assessment of cost to lands and roads.

j) Council passes by-law for construction of the work after statutory waiting periods and appeal periods expire.

k) Tenders are received by the Town to perform the recommended work and construction is carried out. Inspection of the construction work may be provided by the Town Drainage Superintendent or by an inspector assigned by the appointed Engineer from the consulting firm assigned to the project.

l) Upon completion of construction the Town Clerk will finalize all applicable costs and submit grant applications to the Ministry of Agriculture, Food and Rural Affairs, if applicable. Then, the clerk will then send a final net assessment to the affected landowners.

All of which is respectfully submitted.

RC SPENCER ASSOCIATES INC.

PREPARED BY:

D. R. McCready

Dennis R. McCready, B.A.Sc., P. Eng.

Appointed Engineer
May 8, 2019

LICENSED PROFESSIONAL ENGINEER
D. R. McCREADY
PROVINCE OF ONTARIO

REVIEWED BY:

Shane Lafontaine

Shane LaFontaine, M. Eng., P. Eng.

May 8, 2019

LICENSED PROFESSIONAL ENGINEER
S. M. LAFONTAINE
100206162
8 MAY/2019
PROVINCE OF ONTARIO

APPENDIX 'A'

SCHEDULES OF ASSESSMENT

FOR THE

REPAIR AND IMPROVEMENT

OF THE

WELLWOOD DRAIN

IN THE

TOWN OF TECUMSEH

COUNTY OF ESSEX

CONSTRUCTION SCHEDULE A-1
SCHEDULE OF ASSESSMENT FOR CONSTRUCTION
DRAINAGE AREA 1
WELLWOOD DRAIN
TOWN OF TECUMSEH

A) MUNICIPAL LANDS

ENTRY NO.	Description	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
1	Oldcastle Road	0.710	Town of Tecumseh	$ 1,846.00	$ 1,251.00	$ -	$ 3,097.00
2	Oldcastle Court	0.332	Town of Tecumseh	$ 1,097.00	$ 1,170.00	$ -	$ 2,267.00
	Total Affected Lands (Hectares)	1.042					
	Total Assessment on Municipal Lands			$ 2,943.00	$ 2,421.00	$ -	$ 5,364.00

B) PRIVATELY OWNED - NON-AGRICULTURAL LANDS (NOT GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
3	490-01406	NTR	Pt Lot 302 RP	0.286	Joel Douglas Stafford	$ 1,023.00	$ 514.00	$ -	$ 1,537.00
4	490-09001	NTR	Pt Lot 302 RP	0.217	Ministry of Transportation	$ 1,211.00	$ 137.00	$ -	$ 1,348.00
	Total Affected Lands (Hectares)			0.503					
	Total Assessment on Privately Owned Non-Agricultural Lands (Not Grantable)					$ 2,234.00	$ 651.00	$ -	$ 2,885.00

C) PRIVATELY OWNED - AGRICULTURAL LANDS (GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
5	490-01400	NTR	Pt Lot 302 RP	1.593	Downing Acres Inc	$ 3,083.00	$ 468.00	$ -	$ 3,551.00
	Total Affected Lands (Hectares)			1.593					
	Total Assessment on Privately Owned Agricultural Lands (Grantable)					$ 3,083.00	$ 468.00	$ -	$ 3,551.00

TOTAL ASSESSMENT FOR SCHEDULE A-1 (SECTIONS A, B & C)						$ 8,260.00	$ 3,540.00	$ -	$ 11,800.00

TOTAL LANDS AFFECTED (Ha)	
A) Municipal Lands	1.042
B) Non-Agricultural Lands	0.503
C) Agricultural Lands	1.593
Total Lands Affected:	3.138

NOTE: Assessment Values have been rounded to the nearest whole dollar for presentation purposes.

1 Hectare = 2.471 Acres

CONSTRUCTION SCHEDULE A-2
SCHEDULE OF ASSESSMENT FOR CONSTRUCTION
DRAINAGE AREA 2
WELLWOOD DRAIN
TOWN OF TECUMSEH

A) MUNICIPAL LANDS

ENTRY NO.	Description	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
1	Oldcastle Road	1.406	Town of Tecumseh	$ 4,579.00	$ 2,893.00	$ 575.00	$ 8,047.00
	Total Affected Lands (Hectares)	1.406					
	Total Assessment on Municipal Lands			$ 4,579.00	$ 2,893.00	$ 575.00	$ 8,047.00

B) PRIVATELY OWNED - NON-AGRICULTURAL LANDS (NOT GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
2	490-09105	NTR S	Pt Lot 302 RP	0.239	Judith L Robson	$ 541.00	$ 711.00	$ 8,003.00	$ 9,255.00
3	490-01410	NTR	Pt Lot 302 RP	0.183	Robert & Bobbi Ross Burford	$ 434.00	$ 295.00	$ 357.00	$ 1,086.00
4	490-09103	NTR	Pt Lot 302 RP	0.437	Michael Abaldo	$ 1,003.00	$ 432.00	$ 6,760.00	$ 8,195.00
5	490-01420	NTR	Pt Lot 302 RP	0.368	Sabrina Amicone	$ 788.00	$ 267.00	$ 7,692.00	$ 8,747.00
6	490-01403	NTR	Pt Lot 302 RP	0.289	Johncarlo & Charmaine Salvatore	$ 706.00	$ 179.00	$ -	$ 885.00
7	490-01415	NTR	Pt Lot 302 RP	0.289	Thomas & Magdalena Zakrzewski	$ 706.00	$ 131.00	$ -	$ 837.00
8	490-09102	NTR S	Pt Lot 302 RP	0.587	Robert Mann & Marianne Fetherston	$ 1,378.00	$ 96.00	$ -	$ 1,474.00
	Total Affected Lands (Hectares)			2.392					
	Total Assessment on Privately Owned Non-Agricultural Lands (Not Grantable)					$ 5,556.00	$ 2,111.00	$ 22,812.00	$ 30,479.00

C) PRIVATELY OWNED - AGRICULTURAL LANDS (GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
9	490-01400	NTR	Pt Lot 302 RP	0.215	Downing Acres Inc	$ 640.00	$ 84.00	$ -	$ 724.00
	Total Affected Lands (Hectares)			0.215					
	Total Assessment on Privately Owned Agricultural Lands (Grantable)					$ 640.00	$ 84.00	$ -	$ 724.00

TOTAL ASSESSMENT FOR SCHEDULE A-2 (SECTIONS A, B & C)	$ 10,775.00	$ 5,088.00	$ 23,387.00	$ 39,250.00

TOTAL LANDS AFFECTED (Ha)	
A) Municipal Lands	1.406
B) Non-Agricultural Lands	2.392
C) Agricultural Lands	0.215
Total Lands Affected:	4.013

NOTE: Assessment Values have been rounded to the nearest whole dollar for presentation purposes.

1 Hectare = 2.471 Acres

CONSTRUCTION SCHEDULE A-3
SCHEDULE OF ASSESSMENT FOR CONSTRUCTION
DRAINAGE AREA 3
WELLWOOD DRAIN
TOWN OF TECUMSEH

A) MUNICIPAL LANDS

ENTRY NO.	Description	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
1	Oldcastle Road	0.335	Town of Tecumseh	$ 3,551.00	$ 1,095.00	$ 377.00	$ 5,023.00
	Total Affected Lands (Hectares)	0.335					
	Total Assessment on Municipal Lands			$ 3,551.00	$ 1,095.00	$ 377.00	$ 5,023.00

B) PRIVATELY OWNED - NON-AGRICULTURAL LANDS (NOT GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
2	490-09105	NTR S	Pt Lot 302 RP	0.192	Judith L Robson	$ 280.00	$ 615.00	$ 5,008.00	$ 5,903.00
3	490-09106	NTR S	Pt Lot 302 RP	0.431	Jo Ann Marie & Perry Joseph Burford	$ 618.00	$ 945.00	$ -	$ 1,563.00
	Total Affected Lands (Hectares)			0.623					
	Total Assessment on Privately Owned Non-Agricultural Lands (Not Grantable)					$ 898.00	$ 1,560.00	$ 5,008.00	$ 7,466.00

C) PRIVATELY OWNED - AGRICULTURAL LANDS (GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
4	490-09200	NTR N	Pt Lot 302	6.070	Richard Trustee & Robert McCarthy	$ 8,551.00	$ 2,910.00	$ -	$ 11,461.00
	Total Affected Lands (Hectares)			6.070					
	Total Assessment on Privately Owned Agricultural Lands (Grantable)					$ 8,551.00	$ 2,910.00	$ -	$ 11,461.00

TOTAL ASSESSMENT FOR SCHEDULE A-3 (SECTIONS A, B & C)	$ 13,000.00	$ 5,565.00	$ 5,385.00	$ 23,950.00

TOTAL LANDS AFFECTED (Ha)	
A) Municipal Lands	0.335
B) Non-Agricultural Lands	0.623
C) Agricultural Lands	6.070
Total Lands Affected:	7.028

NOTE: Assessment Values have been rounded to the nearest whole dollar for presentation purposes.

1 Hectare = 2.471 Acres

MAINTENANCE SCHEDULE B-1
SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE OF THE WELLWOOD DRAIN
DRAINAGE AREA 1
WELLWOOD DRAIN
TOWN OF TECUMSEH

A) MUNICIPAL LANDS

ENTRY NO.	Description	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
1	Oldcastle Road	0.710	Town of Tecumseh	$ 156.00	$ 106.00	$ -	$ 262.00
2	Oldcastle Court	0.332	Town of Tecumseh	$ 93.00	$ 99.00	$ -	$ 192.00
	Total Affected Lands (Hectares)	1.042					
	Total Assessment on Municipal Lands			$ 249.00	$ 205.00	$ -	$ 454.00

B) PRIVATELY OWNED - NON-AGRICULTURAL LANDS (NOT GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
3	490-01406	NTR	Pt Lot 302 RP	0.286	Joel Douglas Stafford	$ 87.00	$ 44.00	$ -	$ 131.00
4	490-09001	NTR	Pt Lot 302 RP	0.217	Ministry of Transportation	$ 102.00	$ 12.00	$ -	$ 114.00
	Total Affected Lands (Hectares)			0.503					
	Total Assessment on Privately Owned Non-Agricultural Lands (Not Grantable)					$ 189.00	$ 56.00	$ -	$ 245.00

C) PRIVATELY OWNED - AGRICULTURAL LANDS (GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
5	490-01400	NTR	Pt Lot 302 RP	1.593	Downing Acres Inc	$ 262.00	$ 40.00	$ -	$ 302.00
	Total Affected Lands (Hectares)			1.593					
	Total Assessment on Privately Owned Agricultural Lands (Grantable)					$ 262.00	$ 40.00	$ -	$ 302.00

TOTAL ASSESSMENT FOR SCHEDULE B-1 (SECTIONS A, B & C)	$ 700.00	$ 301.00	$ -	$ 1,000.00

TOTAL LANDS AFFECTED (Ha)	
A) Municipal Lands	1.042
B) Non-Agricultural Lands	0.503
C) Agricultural Lands	1.593
Total Lands Affected:	3.138

NOTE: Assessment Values have been rounded to the nearest whole dollar for presentation purposes.

1 Hectare = 2.471 Acres

MAINTENANCE SCHEDULE B-2
SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE OF THE WELLWOOD DRAIN
DRAINAGE AREA 2
WELLWOOD DRAIN
TOWN OF TECUMSEH

A) MUNICIPAL LANDS

ENTRY NO.	Description	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
1	Oldcastle Road	1.406	Town of Tecumseh	$ 298.00	$ 180.00	$ -	$ 478.00
	Total Affected Lands (Hectares)	1.406					
	Total Assessment on Municipal Lands			$ 298.00	$ 180.00	$ -	$ 478.00

B) PRIVATELY OWNED - NON-AGRICULTURAL LANDS (NOT GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
2	490-09105	NTR S	Pt Lot 302 RP	0.239	Judith L Robson	$ 35.00	$ 24.00	$ -	$ 59.00
3	490-01410	NTR	Pt Lot 302 RP	0.183	Robert & Bobbi Ross Burford	$ 28.00	$ 19.00	$ -	$ 47.00
4	490-09103	NTR	Pt Lot 302 RP	0.437	Michael Abaldo	$ 65.00	$ 28.00	$ -	$ 93.00
5	490-01420	NTR	Pt Lot 302 RP	0.368	Sabrina Amicone	$ 51.00	$ 17.00	$ -	$ 68.00
6	490-01403	NTR	Pt Lot 302 RP	0.289	Johncarlo & Charmaine Salvatore	$ 46.00	$ 12.00	$ -	$ 58.00
7	490-01415	NTR	Pt Lot 302 RP	0.289	Thomas & Magdalena Zakrzewski	$ 46.00	$ 9.00	$ -	$ 55.00
8	490-09102	NTR S	Pt Lot 302 RP	0.587	Robert Mann & Marianne Fetherston	$ 89.00	$ 6.00	$ -	$ 95.00
	Total Affected Lands (Hectares)			2.392					
	Total Assessment on Privately Owned Non-Agricultural Lands (Not Grantable)					$ 360.00	$ 115.00	$ -	$ 475.00

C) PRIVATELY OWNED - AGRICULTURAL LANDS (GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
9	490-01400	NTR	Pt Lot 302 RP	0.215	Downing Acres Inc	$ 42.00	$ 5.00	$ -	$ 47.00
	Total Affected Lands (Hectares)			0.215					
	Total Assessment on Privately Owned Agricultural Lands (Grantable)					$ 42.00	$ 5.00	$ -	$ 47.00

TOTAL ASSESSMENT FOR SCHEDULE B-2 (SECTIONS A, B & C)	$ 700.00	$ 300.00	$ -	$ 1,000.00

TOTAL LANDS AFFECTED (Ha)	
A) Municipal Lands	1.406
B) Non-Agricultural Lands	2.392
C) Agricultural Lands	0.215
Total Lands Affected:	4.013

NOTE: Assessment Values have been rounded to the nearest whole dollar for presentation purposes.

1 Hectare = 2.471 Acres

MAINTENANCE SCHEDULE B-3
SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE OF THE WELLWOOD DRAIN
DRAINAGE AREA 3
WELLWOOD DRAIN
TOWN OF TECUMSEH

A) MUNICIPAL LANDS

ENTRY NO.	Description	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
1	Oldcastle Road	0.335	Town of Tecumseh	$ 192.00	$ 59.00	$ -	$ 251.00
	Total Affected Lands (Hectares)	0.335					
	Total Assessment on Municipal Lands			$ 192.00	$ 59.00	$ -	$ 251.00

B) PRIVATELY OWNED - NON-AGRICULTURAL LANDS (NOT GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
2	490-09105	NTR S	Pt Lot 302 RP	0.192	Judith L Robson	$ 15.00	$ 33.00	$ -	$ 48.00
3	490-09106	NTR S	Pt Lot 302 RP	0.431	Jo Ann Marie & Perry Joseph Burford	$ 33.00	$ 51.00	$ -	$ 84.00
	Total Affected Lands (Hectares)			0.623					
	Total Assessment on Privately Owned Non-Agricultural Lands (Not Grantable)					$ 48.00	$ 84.00	$ -	$ 132.00

C) PRIVATELY OWNED - AGRICULTURAL LANDS (GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
4	490-09200	NTR N	Pt Lot 302	6.070	Richard Trustee & Robert McCarthy	$ 460.00	$ 157.00	$ -	$ 617.00
	Total Affected Lands (Hectares)			6.070					
	Total Assessment on Privately Owned Agricultural Lands (Grantable)					$ 460.00	$ 157.00	$ -	$ 617.00

TOTAL ASSESSMENT FOR SCHEDULE B-3 (SECTIONS A, B & C)	$ 700.00	$ 300.00	$ -	$ 1,000.00

TOTAL LANDS AFFECTED (Ha)	
A) Municipal Lands	0.335
B) Non-Agricultural Lands	0.623
C) Agricultural Lands	6.070
Total Lands Affected:	7.028

NOTE: Assessment Values have been rounded to the nearest whole dollar for presentation purposes.

1 Hectare = 2.471 Acres

MAINTENANCE SCHEDULE C-1
SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE OF CULVERTS
DRAINAGE AREA 1
WELLWOOD DRAIN
TOWN OF TECUMSEH

A) MUNICIPAL LANDS

ENTRY NO.	Description	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
1	Oldcastle Road	0.710	Town of Tecumseh	$ -	$ 416.00	$ -	$ 416.00
2	Oldcastle Court	0.332	Town of Tecumseh	$ -	$ 195.00	$ -	$ 195.00
	Total Affected Lands (Hectares)	1.042					
	Total Assessment on Municipal Lands			$ -	$ 611.00	$ -	$ 611.00

B) PRIVATELY OWNED - NON-AGRICULTURAL LANDS (NOT GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
3	490-01406	NTR	Pt Lot 302 RP	0.286	Joel Douglas Stafford	$ -	$ 141.00	$ -	$ 141.00
4	490-09001	NTR	Pt Lot 302 RP	0.217	Ministry of Transportation	$ -	$ -	$ -	$ -
			Total Affected Lands (Hectares)	0.503					
			Total Assessment on Privately Owned Non-Agricultural Lands (Not Grantable)			$ -	$ 141.00	$ -	$ 141.00

C) PRIVATELY OWNED - AGRICULTURAL LANDS (GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
5	490-01400	NTR	Pt Lot 302 RP	1.593	Downing Acres Inc	$ -	$ 248.00	$ -	$ 248.00
			Total Affected Lands (Hectares)	1.593					
			Total Assessment on Privately Owned Agricultural Lands (Grantable)			$ -	$ 248.00	$ -	$ 248.00

TOTAL ASSESSMENT FOR SCHEDULE C-1 (SECTIONS A, B & C)						$ -	$ 1,000.00	$ -	$ 1,000.00

TOTAL LANDS AFFECTED (Ha)	
A) Municipal Lands	1.042
B) Non-Agricultural Lands	0.503
C) Agricultural Lands	1.593
Total Lands Affected:	3.138

NOTE: Assessment Values have been rounded to the nearest whole dollar for presentation purposes.

1 Hectare = 2.471 Acres

MAINTENANCE SCHEDULE C-2
SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE OF CULVERTS
DRAINAGE AREA 2
WELLWOOD DRAIN
TOWN OF TECUMSEH

A) MUNICIPAL LANDS

ENTRY NO.	Description	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
1	Oldcastle Road	1.406	Town of Tecumseh	$ -	$ 219.00	$ -	$ 219.00
	Total Affected Lands (Hectares)	1.406					
	Total Assessment on Municipal Lands			$ -	$ 219.00	$ -	$ 219.00

B) PRIVATELY OWNED - NON-AGRICULTURAL LANDS (NOT GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
2	490-09105	NTR S	Pt Lot 302 RP	0.239	Judith L Robson	$ -	$ 98.00	$ -	$ 98.00
3	490-01410	NTR	Pt Lot 302 RP	0.183	Robert & Bobbi Ross Burford	$ -	$ 82.00	$ -	$ 82.00
4	490-09103	NTR	Pt Lot 302 RP	0.437	Michael Abaldo	$ -	$ 140.00	$ -	$ 140.00
5	490-01420	NTR	Pt Lot 302 RP	0.368	Sabrina Amicone	$ -	$ 125.00	$ -	$ 125.00
6	490-01403	NTR	Pt Lot 302 RP	0.289	Johncarlo & Charmaine Salvatore	$ -	$ 109.00	$ -	$ 109.00
7	490-01415	NTR	Pt Lot 302 RP	0.289	Thomas & Magdalena Zakrzewski	$ -	$ 109.00	$ -	$ 109.00
8	490-09102	NTR S	Pt Lot 302 RP	0.587	Robert Mann & Marianne Fetherston	$ -	$ 86.00	$ -	$ 86.00
	Total Affected Lands (Hectares)			2.392					
	Total Assessment on Privately Owned Non-Agricultural Lands (Not Grantable)					$ -	$ 749.00	$ -	$ 749.00

C) PRIVATELY OWNED - AGRICULTURAL LANDS (GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
9	490-01400	NTR	Pt Lot 302 RP	0.215	Downing Acres Inc	$ -	$ 32.00	$ -	$ 32.00
	Total Affected Lands (Hectares)			0.215					
	Total Assessment on Privately Owned Agricultural Lands (Grantable)					$ -	$ 32.00	$ -	$ 32.00

TOTAL ASSESSMENT FOR SCHEDULE C-2 (SECTIONS A, B & C)	$ -	$ 1,000.00	$ -	$ 1,000.00

TOTAL LANDS AFFECTED (Ha)	
A) Municipal Lands	1.406
B) Non-Agricultural Lands	2.392
C) Agricultural Lands	0.215
Total Lands Affected:	4.013

NOTE: Assessment Values have been rounded to the nearest whole dollar for presentation purposes.

1 Hectare = 2.471 Acres

MAINTENANCE SCHEDULE C-3
SCHEDULE OF ASSESSMENT FOR FUTURE MAINTENANCE OF CULVERTS
DRAINAGE AREA 3
WELLWOOD DRAIN
TOWN OF TECUMSEH

A) MUNICIPAL LANDS

ENTRY NO.	Description	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
1	Oldcastle Road	0.335	Town of Tecumseh	$ -	$ 107.00	$ -	$ 107.00
	Total Affected Lands (Hectares)	0.335					
	Total Assessment on Municipal Lands			$ -	$ 107.00	$ -	$ 107.00

B) PRIVATELY OWNED - NON-AGRICULTURAL LANDS (NOT GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AREA AFFECTED (Hectares)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
2	490-09105	NTR S	Pt Lot 302 RP	0.192	Judith L Robson	$ -	$ 116.00	$ -	$ 116.00
3	490-09106	NTR S	Pt Lot 302 RP	0.431	Jo Ann Marie & Perry Joseph Burford	$ -	$ 186.00	$ -	$ 186.00
	Total Affected Lands (Hectares)			0.623					
	Total Assessment on Privately Owned Non-Agricultural Lands (Not Grantable)					$ -	$ 302.00	$ -	$ 302.00

C) PRIVATELY OWNED - AGRICULTURAL LANDS (GRANTABLE)

ENTRY NO.	TAX ROLL NO.	CON. OR PLAN NO.	LOT OR PART OF LOT	AFFECTED AREA (Ha)	OWNER	(SECTION 22) VALUE OF BENEFIT LIABILITY	(SECTION 23) VALUE OF OUTLET LIABILITY	(SECTION 24) VALUE OF SPECIAL BENEFIT	TOTAL ASSESSMENT
4	490-09200	NTR N	Pt Lot 302	6.070	Richard Trustee & Robert McCarthy	$ -	$ 591.00	$ -	$ 591.00
	Total Affected Lands (Hectares)			6.070					
	Total Assessment on Privately Owned Agricultural Lands (Grantable)					$ -	$ 591.00	$ -	$ 591.00

TOTAL ASSESSMENT FOR SCHEDULE C-3 (SECTIONS A, B & C)						$ -	$ 1,000.00	$ -	$ 1,000.00

TOTAL LANDS AFFECTED (Ha)	
A) Municipal Lands	0.335
B) Non-Agricultural Lands	0.623
C) Agricultural Lands	6.070
Total Lands Affected:	7.028

NOTE: Assessment Values have been rounded to the nearest whole dollar for presentation purposes.

1 Hectare = 2.471 Acres

APPENDIX 'B'

SPECIAL PROVISIONS AND SPECIFICATIONS

FOR THE

REPAIR AND IMPROVEMENT

OF THE

WELLWOOD DRAIN

IN THE

TOWN OF TECUMSEH

COUNTY OF ESSEX

SPECIAL PROVISIONS

May 8, 2019

1.0 GENERAL SPECIFICATIONS

The General Specifications and the Environmental Special Provisions attached hereto are part of Appendix 'B'. It forms part of this specification and is to be read with these specifications and the Drawings contained in the report. Where there is a difference between the requirements of the Special Provisions and the General Specifications, the Special Provisions shall take precedence. Any reference to the "Municipality" shall mean the "Town of Tecumseh".

2.0 REFERENCE STATIONS/CHAINAGE

The Wellwood Drain consists of three separate open drains with three separate watersheds. The three watersheds are denoted as Area 1, Area 2 and Area 3 on the drawings. Both positive and negative reference stations are shown on the drawings measured in metres. Station 0+000/0-000 is located where Area 1 and Area 2 of the Wellwood Drain outlet into the Downing Drain. The plus chainages proceed northerly along the drain to Station 1+070 where the portion of the drain in Area 3 outlets into the Washbrook Drain. Area 1 is measured with negative chainages starting at Station 0+000/0-000 at the Downing Drain and proceeding in a southerly direction to Station 0-250 at the head of the portion of the drain in Area 1.

3.0 DESCRIPTION OF WORK

a) Excavation of the drain from Stations 0+000 to 1+070 and from 0-000 to 0-250 to the new gradeline, including of the removal and disposal of all deleterious materials off site.

b) Culvert No. 6 at the property with Roll No. 490-01420 (Station 0+180). The work includes the installation of an 18.5m length, 450mm diameter CSP on the North side of the existing driveway and a 7.5m length, 450mm diameter CSP on the South Side of the existing driveway. The installation will include a clear stone bedding, Granular 'B' (Type II) backfill up to spring line and imported select native earth fill up to the appropriate grade. Top soil and seed to be placed and graded into swale.

c) The removal and reconstruction of Culvert No. 8 at Station 0+283 including granular bedding, backfill and driveway surface repair while salvaging the concrete headwalls and grouting pipe ends.

d) The removal of concrete headwalls at Culvert No. 9 (Station 0+307 North). The structural condition of the existing pipe is to be inspected after flushing and cleaning. If the culvert is in adequate structural condition, a vertical sacked concrete end wall will be constructed on the south end of the culvert.

If the pipe is found to be in poor condition and requires immediate replacement, the Drainage Superintendent or Engineer will make arrangements for the replacement of the pipe as set out in the drainage report.

e) Drain enclosure from Station 0+310 to Station 0+358 at the property with Roll No. 490-09105. The work includes the installation of 400 mm diameter CSP. A 150 mm deep swale to be constructed on top of the pipe and be directed towards a new catch basin installed at Station 0+335. The installation of the CSP will include a clear stone bedding, Granular 'B' (Type II) backfill up to spring line and imported select native earth fill up to the appropriate grade. Top soil and seed to be placed and graded into swale.

f) Flushing, cleaning, and vacuuming of all existing culverts and lawn piping in the Wellwood Drain.

g) Supply and place seeding and mulching of all disturbed areas (drain banks, lawns).

h) Silt control.

i) Traffic control.

4.0 ACCESS TO THE WORK

Access to the drain shall be from Oldcastle Road and Oldcastle Court Cul-de-sac Road. Through traffic must be maintained at all times along all municipal roads. All required traffic control is as per Section 8 in the General Specifications. The Contractor shall make his/her own arrangements for any additional access for his/her convenience and with the knowledge and approval of the Drainage Superintendent. All road areas and grass lawn areas disturbed shall be restored to original conditions at the Contractor's expense.

5.0 WORKING AREA

From Station 0+000 to Station 0+400 and from Station 0-000 to Station 0-250, the working area will be located on the road property and shall be designated in the field by the Drainage Superintendent in consultation with the Road Superintendent.

From Station 0+400 to Station 1+070, the working area will be located on the private lands (farmland) east of the Wellwood Drain. The designated working corridor shall have a maximum width of 8 m measured from the top of the finished east bank of the open drain.

Any damages to lands and/or roads from the Contractor's work shall be restored to pre-existing conditions at the Contractor's expense.

6.0 EXCAVATION AND DISPOSAL OF EXCAVATED MATERIAL

No excavated material shall be reused in the drain. All excavated material in the drain shall become the property of the contractor who shall load, haul and dispose of the excavated material off-site.

In all cases, the Contractor shall use the benchmarks to establish the proposed drain bottom grade. However, for convenience, the drawings provide the approximate depth from the existing drain bottom to the proposed grades. ***The Contractor shall not excavate deeper than the gradelines shown on the Drawings or cause sloughing of the banks.*** Should over-excavation or sloughing of the drain bank occur, the Contractor will **not** be permitted to repair with native material packed into place by the excavator and reshaped. Should over-excavation or sloughing occur, the Contractor will be required to have a bank repair detail engineered by a Professional Engineer (hired by the Contractor), to ensure long term stability of the bank is maintained. Such repairs shall be subject to approval by the Engineer and will be at no extra cost to the contract.

Seeding of the disturbed drain banks shall be completed immediately following drain construction and as specified in Section 9.

All excavation work shall be done in such a manner so that no unnecessary disturbance, damage or harm is caused to vegetation and trees except for that required by the specifications and that designated in the field by the Drainage Superintendent. Any unnecessary damage to trees or vegetation caused by the Contractors work shall be restored to the satisfaction of the Drainage Superintendent.

The Contractor shall exercise caution around existing tile outlet pipes and shall confirm with the property owners that all tiles have been located. The Contractor shall repair all damages caused by his operations to the satisfaction of the Drainage Superintendent.

7.0 CULVERT CONSTRUCTION

7.1 Location of Access Culverts

Culvert No. 6 serving the property with Roll No. 490-01420 is located at Station No. 0+180. The culvert extension shall be installed in accordance with the drawings attached to the engineer's report.

The reconstruction of the access culvert (Culvert No. 8) shall be installed as shown on the drawings attached to the engineer's report. The location of the culvert is at Station 0+283 or at the property with Roll No. 490-09103.

Culvert No. 9 is located at Station 0+307 or at the property with Roll No. 490-01410. The culvert is to be inspected to view the structural condition and life longevity of the pipe.

7.2 Reference specifications

Materials shall be as follows:

<u>Culvert No. 8 (Roll No. 490-09103)</u>

Culvert No. 8 shall consist of a 6.7m length, 450mm diameter HDPE pipe with a minimum stiffness of 320kPa.

The access culvert construction must conform to OPSS 421(Construction) and 1854 (Materials). New culvert shall be joined with one of the following options in OPSS 421.07.12.05. If a universal dimple coupler or any other coupler does not follow the contour of the flexible pipe sections to be joined, polyethylene gaskets shall then be installed at all joints when such couplers are used. Polyethylene gaskets shall be installed symmetrically about the pipe joint, between the coupler and the pipe, and shall be of sufficient length to equal the circumference of the pipe plus a minimum overlap of 300 mm.

Culvert No. 6 (Roll No. 490-01420)

Culvert No. 6 serving Roll No. 490-01420 shall consist of an 18.5m length, 450mm diameter CSP and a 7.5m length, 450mm diameter CSP with a wall thickness of 2.0mm and a corrugation profile of 68x13mm.

All CSP materials shall be aluminized (Type II) steel with rerolled ends. The culvert construction must conform to OPSS 421(Construction) and 1801(Materials). New culvert shall be joined with annular aluminized corrugated wide bolt and angle couplers (minimum of 8 corrugation overlap and 2.8mm wall thickness) and no single pipe less than 6.0m in length. All pipes connected with couplers shall abut to each other with no more than a 25mm gap between pipes prior to installation of the coupler.

Drain Enclosure – Stations 0+310 to 0+358 (Roll No. 490-09105)

The drain enclosure at Roll No. 490-09105 shall consist of 48 m of new 400 mm diameter corrugated steel pipe with a minimum metal thickness of 2.0 mm and a corrugation profile of 13mm x 68mm. New culvert shall be joined with annular aluminized corrugated wide bolt and angle couplers (minimum of 8 corrugation overlap and 2.8 mm wall thickness) and no single pipe less then 6.0 m in length. All pipes connected with couplers shall abut to each other with no more than a 25 mm gap between pipes prior to installation of the coupler.

The culvert construction must conform to OPSS.MUNI 421(Construction) and 1801 (Materials). All CSP materials shall be aluminized (Type II) steel with rerolled ends. The culvert construction must conform to OPSS 421(Construction) and 1801(Materials). New culvert shall be joined with annular aluminized corrugated wide bolt and angle couplers (minimum of 8 corrugation overlap and 2.8mm wall thickness) and no single pipe less than 6.0m in length. All pipes connected with couplers shall abut to each other with no more than a 25mm gap between pipes prior to installation of the coupler.

Bedding Below Pipe Invert

20-25mm clear stone conforming to OPSS Division 10.

Bedding and Backfill Material for Culvert No. 8

Granular ‘B’ (Type II) conforming to OPSS Division 10.

Bedding and Backfill Material for Drain Enclosure (Roll No. 490-09105)

20-25mm clear stone conforming to OPSS Division 10 and imported select earth or clay backfill material compacted to 95% Standard Proctor Density.

Driveway Surface (Culvert No. 8)

HL3 asphalt material matching the existing depth of the driveway surface conforming to OPSS 310 and OPSS 1150.

Erosion Stone for Sloping End Protection

All stone to be used for erosion protection shall be 125-250mm clear quarried rock or OPSS 1004, minimum 300mm thickness.

Topsoil

Topsoil conforming to OPSS, 100mm thickness.

Native Material

Select earth material, dry, free from broken concrete, steel, wood and deleterious substances.

Filter Fabric

"Non-Woven" geotextile filter fabric with a minimum strength equal to or greater than Terrafix 270R, Amoco 4546, Mirafi 140NC or approved equivalent.

7.3 Dry Culvert Installation

Suitable dykes shall be constructed in the drain so that the installation of the pipe can be accomplished in the dry. The drain bottom shall be cleaned, prepared, shaped and compacted to suit the new culvert configuration, as shown on the drawings. Granular materials shall be compacted to 100% of their maximum dry density.

7.4 Sloping Stone End Protection

Endwalls shall be constructed of quarry stone rip rap material, as shown on the Drawings. Each endwall shall extend from the invert of the new culvert to the top of the proposed lane. The endwalls shall be sloped to a minimum of 1 vertical to 1.5 horizontal unless stated otherwise with a filter fabric underlay surrounding the pipe and spanning across the entire width of the drain, wrapping around the drain banks to align with the ends of the new pipe culvert. The minimum thickness requirement of the erosion stone layer is 300mm with no portion of the filter fabric to be exposed to sunlight.

7.5 Sacked Concrete End Walls

A sacked concrete end wall shall be constructed on the south end of Culvert No. 9 at Stations 0+302. The work shall be carried out in accordance with the requirements of Section 23 of the General Specifications for Open Drains that is attached to this report.

7.6 Lateral Tile Drains

Should the Contractor encounter any lateral tiles within the proposed culvert limits as shown and also those not shown on the attached drawings, the Contractor shall re-route the outlet tile drain(s) in consultation with the Drainage Superintendent, as required, to accommodate the new culvert. **Tile drain outlets through the wall of the new culvert pipe will not be permitted.** All costs associated with re-routing lateral tile drains (if any) shall be at the Contractor's expense.

7.7 Asphalt Driveway Surface Restoration

Asphalt driveway surface shall be constructed with HL3 material and meet the depth of the existing asphalt surface.

Final restoration of the asphalt driveway surface must be restored to the approved surface following the completion of the access culvert reconstruction, as approved by and to the satisfaction of the Road Superintendent.

The Contractor shall saw-cut the asphalt driveway prior to removal of the existing culvert taking precautions not to undermine the adjoining pavement structure. The trench shall be sloped to provide safe access for the culvert works. The new asphalt shall be hot in place HL3 asphalt mix in one lift to match existing pavement depth and shall be rolled and compacted to a minimum 98% of the Marshall Density.

8.0 STONE EROSION PROTECTION (SEP)

The Contractor shall supply and install the required quantities of graded stone rip-rap erosion protection materials where specified at the driveway access culvert (Station 0+307). All stone to be used for erosion protection shall be 125 - 250 mm clear **quarried rock** or OPSS 1001 placed over a non-woven filter fabric Terrafix 270R or approved equivalent. **Concrete rip-rap will not be permitted.**

The minimum thickness requirement of the erosion stone layer is 300 mm with no portion of the filter fabric to be exposed. All work must be completed to the satisfaction of the Drainage Superintendent.

9.0 HYDRAULIC SEEDING OF DRAIN BANKS, ROADSIDE AREAS AND LAWN AREAS.

Hydraulic seeding and mulching shall be carried out in accordance with OPSS 804 as modified below, on the following areas:

- All existing grassed areas disturbed by the construction including lawns and roadside areas.
- All areas where the existing ditch is enclosed with culvert pipe and backfilled with native material and topsoil.
- All disturbed areas of the ditch banks and ditch bottom.

The surface to be seeded shall be loosened to a depth of 25 mm and shall be rendered uniformly loose for that 25 mm depth. The surface shall be predominantly fine and free from weeds and other unwanted vegetation. All other loose surface litter shall be removed and disposed of.

Hydraulic mulch shall consist of finely ground cellulose pulp derived from recycled newsprint and shall be dyed green. Its fiber consistency shall be approximately 60% fine fiber with the balance being paper particles, 40% of which shall be a diameter of 3 mm minimum and 6 mm maximum. Hydraulic mulch shall be applied at 2,000 kg of dry product per 10,000 m². Clean water shall be applied at 42,700 litres per 10,000 m².

Seeding and mulching shall be a one step process in which the seed, fertilizer and hydraulic mulch are applied simultaneously in a water slurry via the hydraulic seeder/mulcher. The materials shall be added to the supply tank while it is being loaded with water. The materials shall be thoroughly mixed into a homogeneous water slurry and shall be distributed uniformly over the prepared surface. The materials shall be measured by mass or by a mass-calibrated volume measurement, acceptable to the Drainage Superintendent.

The hydraulic seeder/mulcher shall be equipped with mechanical agitation equipment capable of mixing the materials into a homogenous state until applied. The discharge pumps and gun nozzles shall be capable of applying the material uniformly. The following seed mixtures are required:

a) <u>Lawn Areas and Roadside Areas</u>

The grass seed mixture shall be M.T.O. Standard Canada No. 1 lawn seed. The nurse crop shall be rye grain, Canada No. 1 seed. The application rates are:

M.T.O. Grass Seed Mix	100 kg
Nurse Crop Seed	60 kg

b) <u>Ditch Banks and Bottom</u>

Grass seed shall be Canada No. 1 grass seed mixture. The seed mixture shall be applied at a rate of 200 kg per 10,000 m². The mixture shall meet the requirements of a Waterway Slough Mixture as supplied by Growmark or approved equal, as follows:

Creeping Red Fescue	*20%*
Meadow Fescue	*30%*
Tall Fescue	*30%*
Timothy	*10%*
White Clover	*10%*

Bags shall bear the label of the supplier indicating the content by species, grade and mass. Other grass seed mixtures will be considered with approval of Engineer and Drainage Superintendent. Fertilizer shall be 8-32-16 applied at 350 kg per 10,000 m². It shall be in granular form, dry, free from lumps and in bags bearing the label of the manufacturer, indicating mass and analysis.

The hydraulic seeding shall be deemed "Completed by the Contractor" when the seed has established in all areas to the satisfaction of the Engineer. Re-seeding and/or other methods required to establish the grass will be given consideration to achieve the end result and the costs shall be incidental to the works.

10.0 SILT CONTROL

The contractor shall supply, install, maintain and remove a temporary water permeable filter fence (silt fence) to remove suspended particulars from the water passing through it. At the commencement of construction, the contractor shall install a silt fence across the outlet of the drain. The silt fence shall be constructed of a minimum 1.0 m wide geotextile securely fastened to steel posts. The geotextile shall be attached to the up-gradient side of the posts. Where required, wire or any other type of support may be constructed between the geotextile and the posts in order to improve the load carrying capacity of the silt fence. The geotextile may be a woven or a non-woven material that has a minimum tensile strength of 100 lbs., permittivity of at least 90 gal/min/ft^2 and an apparent opening size of US Sieve No. 30.

Steel posts of sufficient strength to support the silt fence shall be used. The maximum post spacing shall be approximately 2 m. Every effort must be made to ensure that the bottom edge of the silt fence is in continuous contact with the bottom of the channel.

The silt fence shall remain in place until the project is complete. The contractor shall maintain the silt fence until it is removed. Upon removal, the silt accumulation upstream of the fence shall also be removed. The cost of supply, installation, maintenance and removal of the silt fence shall be included in the Lump Sum price bid for this item.

11.0 ENDANGERED SPECIES ACT

All work must comply with the current version of the Ontario Endangered Species Act, 2007, S.O. 2007, c.6; O. Reg.230/08: (Species at Risk in Ontario); and O. Reg. 242/08: (General).

The Municipality shall obtain the most current Endangered Species information available from MNRF and other sources. A designated person employed by the Municipality will be responsible for reviewing habitat maps to determine if registration of prescribed activities or full review and approval by MNRF and other agencies is required.

Prior to the start of any construction activities, the Contractor shall meet with the Municipal Designate to obtain a copy of specific mitigation procedures for dealing with endangered species should they be encountered anytime during construction.

The Town's plans for MNRF/SARA mitigation procedures entitled **"Town of Tecumseh - Species at Risk Mitigation Plan for Drainage Works"** is available online at www.Tecumseh.ca and must be adhered to by the Contractor as part of the Contractor's bid prices for the required work and at no additional cost to the project.

GENERAL SPECIFICATION FOR OPEN DRAINS

(Revised 2016 11 25)

SECTION 1 - AGREEMENT AND GENERAL CONDITIONS

(1) Payment for the work shall be on a lump sum basis unless otherwise indicated. The Contractor agrees to enter into a formal contract with the Municipality upon acceptance of the tender. The General Conditions of the contract shall be those of the Stipulated Price Contract CCDC2-Engineers, 2008 or the most recent revision of this document. The form of agreement between Owner and Contractor shall be that of the previously stated document or a form of agreement specifically prepared by the Municipality for this purpose.

(2) All work shall be in first class condition, comply fully with the report, Special Provisions, General Specifications and the Drainage Act, and be carried out to the satisfaction and approval of the Drainage Superintendent for the Municipality. Upon completion of the project, the work will be inspected by the Engineer and the Drainage Superintendent. Any deficiencies noted during the final inspection shall be immediately rectified by the Contractor. Final inspection will be made by the Engineer within 20 days after the Drainage Superintendent has received notice in writing from the Contractor that the work is completed, or as soon thereafter as weather conditions permit.

(3) The Contractor shall complete all work on or before the date fixed at the time of tendering. The Contractor will be held liable for any damages or expenses occasioned by his/her failure to complete the work on time and for any expenses of inspection, superintending, re-tendering or re-surveying, due to their neglect or failure to carry out the work satisfactorily or in a timely manner. Any such expenses or damages may be deducted by the Drainage Superintendent from the amount of the contract or may be recovered by the Municipality from the Contractor and his sureties.

(4) The Contractor shall be required to submit to the Municipality a Certificate of Good Standing from the Workplace Safety and Insurance Board prior to the commencement of the work and the Contractor shall be required to submit to the Municipality a Certificate of Clearance for the project from the Workplace Safety and Insurance Board before final payment is made to the Contractor.

(5) The Contractor shall keep the work under his/her personal control, and shall not assign, transfer, or sublet any portion without first obtaining the written consent of the Municipality.

SECTION 2 - EXAMINATION OF SITE, PLANS AND SPECIFICATIONS

(1) Each tenderer must visit the site and review the plans and specifications before submitting his tender and must satisfy himself as to the extent of the work and local conditions to be met during the construction. He is not to claim at any time after submission of his tender that there was any misunderstanding of the terms and conditions of the contract relating to site conditions. The Contractor will be at liberty, before bidding, to examine any data in the possession of the Municipality or of the Engineer.

(2) The quantities shown or indicated on the drawings or in the report are estimates only and are for the sole purpose of indicating to the tenderers the general magnitude of the work. The tenderer is responsible for checking the quantities for accuracy prior to submitting his tender.

SECTION 3 - CONTRACTOR'S LIABILITY

(1) The Contractor, his/her agents and all workmen or persons under his control including sub-contractors, shall use due care that no person or property is injured and that no rights are infringed in the prosecution of the work. The Contractor shall be solely responsible for all damages, by whomsoever claimable, in respect to any injury to persons or property of whatever description and in respect of any infringement of any right, privilege or easement whatever, occasioned in the carrying on of the work, or by any neglect on the Contractor's part.

(2) The Contractor, shall indemnify and hold harmless the Municipality and the Engineer, their agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of or attributable to the Contractor's performance of the contract.

SECTION 4 – ONTARIO PROVINCIAL STANDARDS

(1) Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) shall apply and govern at all times unless otherwise amended or extended in these Specifications or on the Drawing. Access to the electronic version of the Ontario Provincial Standards is available online through the MTO website, free of charge to all users. To access the electronic standards on the Web go to http://www.mto.gov.on.ca/english/transrd/. Under the title Technical manuals is a link to the Ontario Provincial Standards. Users require Adobe Acrobat to view all pdf files.

SECTION 5 – APPROVALS, PERMITS AND NOTICES

(1) The construction of the works and all operations connected therewith are subject to the approval, inspection, by-laws and regulations of all Municipal, Provincial, Federal and other authorities having jurisdiction in respect to any matters embraced in this Contract. The Contractor shall obtain all approvals and permits and notify the affected authorities when carrying out work in the vicinity of any public utility, power, underground cables, railways, etc.

SECTION 6 – NOTIFICATION OF WORK

(1) Prior to commencing any work of installing any new bridge or removing any existing structures, the Contractor shall inform the Municipal Drainage Superintendent of his intent to commence work at least 48 hours prior to commencing any work. The Owner or Contractor shall endeavor to install and complete the new structure without delay once the work has commenced. If for any reason the work does not proceed continuously then the Owner or Contractor shall notify the Drainage Superintendent in advance of any backfilling operation or headwall construction so that he may schedule inspection of same.

SECTION 7 – CONSTRUCTION SAFETY

(1) The Contractor shall comply with all the requirements of the Occupational Health and Safety Act, 2013, and the regulations passed in connection therewith, as administered by the Ontario Ministry of Labour and all subsequent amendments of the said Act.

(2) The Contractor shall exercise all possible precaution against injury to persons or property resulting from his work. The Contractor shall leave no trenches, pits, holes or excavations uncovered, without providing sufficient protection at all times. The Contractor shall

install, erect and provide barricades, signs, traffic cones, flashers, lights, plates, warning and other devices, materials and personnel as may be required at his own expense in order to provide for the safe passage and control of traffic and to ensure public safety. All traffic control shall be in accordance with the latest standards of the Ministry of Transportation.

SECTION 8 – TRAFFIC CONTROL

(1) The Contractor shall not perform excavation operations from the travelled portion of the roadway nor close a road or reduce the width or number of traffic lanes available for traffic except as specified in the contract documents or approved by the Engineer.

(2) The Contractor will be required to control vehicular and pedestrian traffic along roads at all times and shall, at his/her own expense, provide for placing and maintaining such barricades, signs, flags, lights and flag persons as may be required to ensure public safety. The Contractor will be solely responsible for controlling traffic and shall appoint a representative to maintain the signs and warning lights at night, on weekends and holidays and at all other times that work is not in progress. The costs associated with provision of proper signage, barricades, lights and flag persons shall be considered incidental to the works to remove the old bridge and complete the new bridge installation.

(3) **During all phases of the project, adjoining public roadways shall remain open to through traffic with at least one lane being open to through traffic at all times.**

(4) All traffic control during construction shall be strictly in accordance with the **Occupational Health and Safety Act** and the current version of the **Ontario Traffic Manuals**. Access to the electronic version of the **Ontario Traffic Manual** is available online through the MTO website, free of charge to all users. To access the electronic standards on the Web go to http://www.mto.gov.on.ca/english/transrd/, click on "Library Catalogue", under the "Title", enter "Ontario Traffic Manual" as the search. Open the applicable "Manual(s)" by choosing the "Access Key", once open look for the "Attachment", click the PDF file. Users require Adobe Acrobat to view all PDF files.

(5) **Contractors are reminded of the requirements of the Occupational Health and Safety Act pertaining to Traffic Protection Plans for workers and Traffic Control Plan for Public Safety.**

SECTION 9 – GENERAL CO-ORDINATION

(1) The Contractor shall be responsible for the coordination between the working forces of other organizations and utility companies in connection with this work. The Contractor shall have no cause of action against the Municipality or the Engineer for delays based on the allegation that the site of the work was not made available to him by the Municipality or the Engineer by reason of the acts, omissions, misfeasance or non-feasance of other organizations or utility companies engaged in other work.

SECTION 10 – STATIONS AND BENCHMARKS

(1) Reference Stations measured in meters, are indicated on the drawings and represent stations along the course of the work. Stationing is shown along the profile at 25 m intervals numbered consecutively, 0+000, 0+025, 0+050, 0+075, etc. Where cut depths are shown on the profile, they represent the approximate depth, in meters, of the finished drain as measured from the surface of the ground to the design gradeline for the bottom of the open drain. Where excavation depths are shown on the profile, they represent the approximate depth, in meters, from the existing drain bottom down to the design gradeline for the bottom of the open drain.

(2) The Contractor will be held responsible during the progress of the work for the preservation of all reference stakes, bench marks and survey markers which fall within the limits of the work. The cost of replacing any bench mark or survey marker defaced or destroyed by the Contractor as a result of his work will be deducted from any monies due the Contractor.

SECTION 11 - ALIGNMENT

(1) Except where specified otherwise, the excavation will follow as nearly as possible the course of the existing drain with sloping and widening carried out on each bank as required to produce the specified cross-section. Wherever sharp or irregular bends occur, all sloping and widening is to be done on that side of the drain that will tend to reduce the curve and improve the alignment of the channel.

(2) Where one drain bank adjoins the travelled part of any roadway or laneway, all sloping and widening is to be done on that side of the drain farthest from the roadway unless otherwise directed by the Engineer.

(3) Where the drain bank adjoins an existing fence which is not specified for removal or relocation all required sloping and widening shall be carried out on that side of the drain farthest from the fence.

(4) Where a drain is to be moved off a road allowance and onto adjoining lands, the top edge of the nearest finished drain bank is to be not closer than 1 metre to the limit of the road allowance or top edge of the abandoned channel. The centreline of the new channel is to be as straight as possible even though this 1 metre dimension is exceeded in places.

(5) Where a new drain is constructed, its centre line will be as straight as possible and any changes in direction shall be in the form of smooth, regular bends.

(6) Where a new drain is to be constructed adjoining an existing fence line, the Contractor shall lay out a suitable centre line such that the top edge of the adjacent drain bank, at its widest point, will not be closer than 1 metre to the fence and the Contractor shall use this centre line to establish the drain location.

(7) The Contractor must lay out the proposed centre line in the field for approval by the Drainage Superintendent prior to construction.

SECTION 12 - PROFILE

(1) The excavation of the drain must be at least to the depth intended by the grade line shown on the Profile, which grade line is governed by the bench marks. The Profile shows, for the convenience of the Contractors and others, the approximate depth of excavation from the surface of the ground to the final invert of the channel in metres and decimals of a metre and also the approximate depth of excavation from the bottom of the existing channel to the final invert of the channel. Bench marks, which have been established along the course of the drain, shall govern the final elevation of the drain. The location and elevation of the bench marks are shown on the Drawings.

SECTION 13 - BOTTOM WIDTH AND SIDE SLOPES

(1) The bottom widths and the side slopes of the various sections of the finished drain are to be true to line and grade as shown on the Profile.

(2) Contractors will not be restricted to the exact dimensions specified but must excavate clear of the specified cross-sections and may excavate such additional depth or width as may be required to accommodate the use of suitable excavating equipment or to allow for minor sedimentation prior to final inspection provided that at no place are the side slopes of the excavation to be cut steeper than the slope specified on the Profile. The Contractor is not to excavate the drain bottom so much deeper than the grade line as to result in the formation of pockets in the drain bottom that will cause water to stand in pools along the drain. Should over-excavation of the drain bank occur, the Contractor will **not** be permitted to repair with native material packed into place by the excavator and reshaped. Should over-excavation occur, the Contractor will be required to have a bank repair detail engineered by a Professional Engineer (hired by the Contractor), to ensure long term stability of the bank is maintained. Such repairs shall be subject to approval by the Engineer and will be at no extra cost to the item.

SECTION 14 - OBSTRUCTIONS

(1) All brush, timber, logs, stumps, stones, or other obstructions encountered within the limits of the channel along the course of the drain are to be removed by the Contractor. Timber, logs and stumps are to be dealt with in the same manner as specified for brush and trees. Large stones and other similar materials are to be piled near the limit of the spread area so as not to interfere with the spreading of the excavated material. The disposal of this material shall be the owner's responsibility.

SECTION 15 - BRUSH AND TREES

(1) Brushing shall be carried out on the entire drain within the above identified sections of the drain where required and as specified herein. **All** brush and trees located within the drain side slopes shall be cut parallel to the side slopes, as close to the ground as practicable. Tree branches that overhang the drain shall be trimmed. Small branches and limbs are to be disposed of by the Contractor along with the other brush. Tree stumps, where removed to facilitate the drain excavation and reshaping of the drain banks, may be burned by the Contractor where permitted; otherwise, they shall be disposed of, off the site. All thorn trees shall be disposed of off-site.

(2) Where the existing bottom widths and side slopes of the drain are sufficient to permit the specified deepening of the drain without disturbing the existing banks above the present drain bottom, the Contractor will be required to cut the brush and trees on the sloping banks flush with the surface of the banks but he will not be required to remove their roots and stumps unless they will obviously create obstructions to the flow of water in the drain.

(3) Where it is necessary to widen the drain and excavate material from the sloping banks, all brush and trees within the limits of the channel and within 1 metre of the top of the drain banks and within the spread area are to be cut and those roots and stumps in the drain bottom and on the banks where the widening takes place shall be completely removed unless the Drainage Superintendent permits the Contractor to cut the roots and stumps flush with the surface of the finished banks.

(4) The Contractor shall make every effort to preserve mature trees which are beyond the drain side slopes, and the working corridors. If requested to do so by the Drainage Superintendent, the Contractor shall preserve certain mature trees within the designated working corridors.

(5) Where there is a fence adjoining the drain, he will be required to cut the brush in the fence line and on the side of the fence opposite the drain only if the excavating equipment will be operated from this side or excavated material is to be placed and levelled on this side.

(6) The Contractor shall cut off flush with the ground all brush and trees having a diameter of 150 mm or less from the disposal area. Should the Contractor find it necessary to remove trees having a diameter of 150 mm or larger from the disposal area in order to permit the efficient excavation of the drain or spreading of excavated material, he will be at liberty to do so only on permission of the Drainage Superintendent in charge of the work.

(7) All trees over 200 mm in diameter that are cut are to be trimmed of branches, and the trunks, along with branches over 200 mm in diameter, are to be cut up into log lengths and piled for the use of the adjoining owner unless the owner advises the Drainage Superintendent he does not want them, in which case they are to be disposed of by the Contractor along with the other brush. Small branches and limbs are to be disposed of by the Contractor along with the other brush. Tree stumps may be burned by the Contractor where permitted; otherwise, they shall be disposed of by him away from the site of the work.

(8) Following completion of the work, the Contractor is to trim up any broken or damaged limbs on trees which remain standing, disposing of the branches cut off along with other brush and leaving the trees in a neat and tidy condition.

(9) Brush and trees removed from the drain and banks thereof and from the disposal area are to be put into piles by the Contractor, in locations where they can be safely burned, and are to be burned by the Contractor after obtaining the necessary permits, as required. If, in the opinion of the Drainage Superintendent, any of the piles are too wet or green to be burned, he will so advise the Contractor who may then arrange, to the Drainage Superintendent's satisfaction, an agreement in writing, with the owners where the piles are located, for them to burn the material when dry enough. If a satisfactory agreement cannot be made, the Contractor to haul away the unburned materials to an approved dump site.

(10) Since the trees and brush that are cut off flush with the earth surface may sprout new growth later, it is strongly recommended that the Municipality make arrangements for spraying this new growth at the appropriate time so as to kill the trees and brush.

(11) Prior to and during the course of burning operations the Contractor shall comply with the guidelines prepared by the Air Quality Branch of the Ontario Ministry of the Environment and shall ensure that the Environmental Protection Act is not violated.

(12) In no case will brush or trees be buried in the spoil bank or within the excavated material.

(13) The Contractor will be required to brush rake the excavated material to remove brush and trees from the spoil if so instructed by the Drainage Superintendent.

(14) As part of this work, the Contractor shall remove any loose timber, logs, stumps, large stones or other debris from the drain bottom and from the side slopes. Timber, logs, stumps, large stones or other debris shall be disposed of off-site.

SECTION 16 – EXCAVATION OF DRAIN

(1) All excavated material shall be handled as specified in the following section. Materials deposited on the farmlands shall be within the working corridors, at least 2.0 m from the top of the drain bank, or as specified on the drawings. Upon allowing drying of excavated materials (if necessary) and as approved by the Drainage Superintendent, the Contractor shall level excavated materials as specified. Excavated material shall not be placed on dykes, in ditches, tiles or depressions intended to conduct water into the drain.

(2) Seeding of the disturbed drain banks shall be completed immediately following drain construction as specified in the Special Provisions.
(3) All excavation work shall be done in such a manner as to not harm any vegetation or trees, not identified in this report or by the Drainage Superintendent for clearing. Any damages to trees or vegetation caused by the Contractors work shall be rectified to the satisfaction of the Drainage Superintendent.
(4) The Contractor shall exercise caution around existing tile inlets and shall confirm with the property owners that all tiles have been located and tile ends repaired as specified.

SECTION 17 - DISPOSAL OF EXCAVATED MATERIAL

(1) Where a part of the drain is being relocated, the Contractor shall strip the topsoil from the alignment of the new course and stockpile it for re-use following the completion of the subsoil operations. Subsoil excavated from the new course is to be used first to fill the existing course which is to be abandoned. Where the Contractor can conveniently do so, he may deposit the material in the old course as he excavates it from the new course but where the distance separating the new course from the old course is too great to permit this the excavated material must be loaded onto trucks, hauled to the abandoned drain and placed in the old channel. The material shall be placed in the abandoned channel in layers no greater than 300 mm in thickness. Each layer shall be thoroughly compacted with the levelling equipment available at the site prior to the placement of the subsequent layers. The abandoned channel shall be filled to an elevation at least 300 mm higher than the adjacent natural ground elevation to allow for settlement. If insufficient material is available to fill the old course, the surface of the material shall be graded so as to eliminate any low areas that would collect water.
(2) Excess excavated material not required for the filling of an abandoned channel or material excavated from the drain under normal construction, repair, or improvement shall be deposited and spread on the immediately adjoining farm lands in the locations set out in the Special Specifications. The material shall be deposited and spread no closer than 2 metres from the top edge of the adjacent drain bank and at least 1 metre clear of all fences.
(3) Where the excavated material is deposited in bush land, it is to be spread and levelled in the form of a spoil bank over at least the full width of the strip that has been cleared to permit the passage of excavating equipment but in no case is the top surface to be left more than 600 mm above the natural ground level even though this may require additional clearing to produce a sufficient disposal area. On completion, the spoil bank is to be left so that it is smooth enough to drive an ordinary farm vehicle along it.
(4) Where the adjoining land is sufficiently clear to permit cultivation, the Contractor shall deposit the excavated material on the property and spread the material over a width that, after spreading, the excavated material will generally have a thickness of approximately 150 mm. The Contractor shall utilize a minimum spread width of 6 metres and a maximum spread width of 20 metres even though this results in a depth of material in excess of 150 mm. The material shall be thoroughly spread and levelled with suitable equipment and left in a condition which permits cultivation with ordinary farm equipment without causing undue hardship on farm machinery and personnel.
(5) After the excavated material has been spread and levelled, any stockpiled topsoil is to be spread over it to a depth of no more than 100 mm.
(6) No excavated material is to be placed on lawns or ornamental shrubbery but is to be deposited on either or both sides of the lawn on the farm lands immediately adjacent to the lawn.
(7) Excavated material or topsoil shall not be placed in ditches, tiles or depressions intended to conduct water into the drain.
(8) The material shall be sufficiently levelled to allow further working by agricultural implements.
(9) All stones and other debris removed from the drain, which may interfere with agricultural implements, shall be disposed of off-site.
(10) The Drainage Superintendent in charge will be the sole judge as to the proper disposal of material under the contract and this specification

SECTION 18 - FENCES

(1) Where it is necessary to remove any fences which parallel the course of the drain in order to permit the excavation of the drain or the disposal of excavated material the Contractor shall remove the fence. An allowance will be made to the owners of the properties to compensate them for damages to fences which are considered capable of restraining cattle. The Contractor shall notify the owner of his intentions to remove the fence at least 7 days prior to doing so. Any owner has the option to salvage his fencing materials but must do so sufficiently in advance of the Contractor's operations so as to cause no unnecessary delays to him. If the owner does not remove his fences, the Contractor shall carefully take down the fence and leave the materials neatly placed beyond the limit of the spread area for disposal or reconstruction by the owner. The owner will be responsible to construct and maintain any temporary fencing during the progress of the work. The landowners and not the Contractor will be responsible for the control of livestock in the adjoining field during the period of construction. Unless otherwise specified, the Contractor will not be required to reconstruct the fences following the completion of the work of excavation and levelling.
(2) No permanent fencing shall be constructed or reconstructed without the approval of the Drainage Superintendent. Any fences that are constructed or reconstructed along the course of the drain are to be kept at least 1 metre clear of the top edge of the adjacent drain bank.
(3) Where the Contractor finds it necessary to remove any fences which cross the drain, he shall remove the fencing materials in a careful, workmanlike manner. Unless otherwise directed the Contractor shall reconstruct the cross fences in as good a condition as the old material permits.

SECTION 19 - ROAD CROSSINGS

(1) Where the drain crosses the travelled part of a road through a bridge, the Contractor shall excavate the drain to its specified dimensions through the bridge opening, using care to avoid damaging it. If after the drain has been excavated at any bridge structure it appears to the Drainage Superintendent that repairs or replacement may be required, he shall so advise the Road Authority having jurisdiction over the particular bridge.
(2) Where a new bridge is required or where any underpinning, strengthening or repairs is rendered necessary by the work, it is to be carried out by the Road Authority at its own expense.

(3) Where the drain crosses the travelled part of a road through a pipe that does not have to be replaced or lowered, the Contractor shall clean the pipe to its full cross-sectional area using care to avoid damaging it.
(4) Where the existing pipe is of sufficient size and is in a good state of repair but requires to be lowered, the Contractor shall carefully remove it, clean it to its full cross-sectional area and replace it in the drain as specified herein.
(5) Where the existing pipe must be replaced, the Contractor shall carefully remove it from the drain, clean it to its full cross-sectional area, and leave it beside the drain for removal by the Road Authority. Unless otherwise instructed he shall install the new road culvert as supplied by the Road Authority. All backfill material shall be compacted granular material supplied by the Road Authority, unless otherwise specified.
(6) The Contractor shall notify the Road Authority having jurisdiction over the structure under construction at least 72 hours in advance of any construction activities.

SECTION 20 - FARM AND ACCESS CULVERTS

(1) Where a farm or access culvert or bridge does not have to be replaced or lowered, the Contractor shall clean it to its full cross-sectional area using care to avoid causing damage to it in the process.
(2) Where a pipe culvert is to be lowered, the Contractor shall carefully remove it, clean it to its full cross-sectional area and replace it in the drain with its invert set 10% of the pipe diameter below the grade line.
(3) Where a culvert is to be replaced, the Contractor shall carefully remove it from the drain, clean it to its full cross-sectional area and leave it on the drain bank. If the pipe was originally supplied and installed by the property owner, it shall be left for disposal by the owner. If the pipe was installed under the provisions of The Drainage Act, it shall be disposed of as directed by the Drainage Superintendent and any salvage value from the sale of the pipe shall be credited to the drain. Wooden or concrete farm or access bridges which must be removed from the drain shall be disposed of in the same manner.
(4) Where a pipe culvert is to be installed in the drain, all materials shall be supplied by the Drainage Superintendent as an expense to the drain. The Contractor shall install the pipe in the location directed by the Drainage Superintendent in accordance with the specifications governing the installation.
(5) Where a new culvert is to be installed, the owner may request the Drainage Superintendent to have it placed in a different location from the existing one and this will be permitted so long as the relocation does not result in an increase in the area draining through the culvert. Adequate notice of the change must be given to the Contractor. In no case may the existing culvert be left in the drain when it has been specified that it is to be removed.

SECTION 21 - FARM AND ACCESS PIPE CULVERT INSTALLATION

21.1 - Location and Elevation of Access Culvert or Farm Culvert

(1) In general, the new access or farm culvert shall be installed as shown on the drawings attached to the engineer's report. Prior to installation, the Contractor shall contact the Drainage Superintendent to confirm the exact location for the new culvert. The Drainage Superintendent, in consultation with the property owner, shall establish the exact location for the new culvert in the field.
(2) The invert (inside bottom) bottom of the pipe shall be set according to the elevations shown on the accompanying plans. For the purpose of construction the bench mark indicated on the accompanying plans shall be used to determine the elevation of the proposed enclosure.

21.2 Dry Culvert Installation

(1) Suitable dykes shall be constructed in the drain so that the installation of the pipe can be accomplished in the dry. The Contractor shall perform the excavation, placement of bedding, pipe and backfill in a dry condition and shall provide all required pumps and/or equipment to enable the work to proceed in the dry.

21.3 Pipe Installation

(1) The required pipe shall be set in the drain to the dimensions shown on the accompanying drawings and the Contractor shall carry out all required excavation to install the pipe and specified rip-rap end treatment. The drain bottom shall be cleaned, prepared, shaped and compacted to suit the new culvert configuration, as shown on the drawings. The Contractor shall excavate sufficient material from the drain banks and bottom to permit placement of the pipe and backfill material. The minimum trench width as shown on the drawings, shall be provided from the face of the pipe to the excavated trench wall along each bank to provide working room to compact the backfill material.
(2) The surface on which the culvert is to be laid shall be true to grade and alignment and shaped to accept the materials to be placed. The pipe shall be laid to the alignment and grade shown in the report but may not be placed on a bed containing frozen materials.
(3) The end protection to each end of the pipe structure shall be as specified in the Special Provisions and on the Drawings and in accordance with the following applicable specifications.
(4) All newly excavated portions of the drain bank shall be seeded.
(5) The Contractor shall dispose of all surplus excavated material at an approved disposal site at his expense.
(6) Rivetted corrugated steel pipe shall be laid with the inside circumferential laps pointing in the direction of the flow. The longitudinal laps shall be located in the upper half of the pipe.
(7) All helical corrugated steel pipe shall be supplied with re-rolled annular ends and shall be installed so that the helix angle is constant for the total length of the installation and each pipe section shall be installed next to the previous section such that the lock-seam forms a continuous helix.
(8) Corrugated steel pipe sections shall be joined together by means of plant fabricated couplers having a minimum wall thickness of 1.6 mm and a 10 c width. The couplers shall be installed to lap approximately equal portions of the pipe sections being connected, such that the corrugations or projections of the coupler properly engage the pipe corrugations.
(9) Where fabrication of structural plate structures by the Contractor is specified, they must be assembled in the trench or at the side of the excavation. If the assembled structure has to be moved to its final position, it shall be moved in such a manner that no damage or distortion is caused to the structure. The materials shall be assembled and handled in accordance with the manufacturer's specifications and directions.

(10) The whole of the work shall be done in a neat, thorough and workmanlike manner such that the alignment of the bridge pipe at each location meets the full satisfaction of the drainage superintendent.

21.4 Backfilling and Compaction

(1) Backfill and cover material on each side of the culvert pipe shall be carefully placed simultaneously on each side of the pipe so that damage to or movement of the pipe is avoided. At no time shall the levels on each side differ by more than the 300 mm uncompacted layer. Then, a 300mm thick layer of Granular 'A' material, O.P.S.S. Spec 1010 shall be constructed as a road base. All backfill materials shall be placed in layers not exceeding 300mm (12") in thickness, loose measurement. Each layer shall be thoroughly compacted in place to a Standard Proctor Density of 100% by means of mechanical compactors. The Contractor shall provide sufficient water to the granular material such that optimum compaction levels are achieved. The equipment used and method of compacting the backfill material shall be to the full satisfaction of the Drainage Superintendent.

SECTION 22 – LATERAL TILE DRAINS

(1) Should the Contractor encounter any lateral tiles within the proposed culvert limits as shown and also those not shown on the attached drawings, the Contractor shall re-route the outlet tile drain(s) in consultation with the Drainage Superintendent, as required, to accommodate the new culvert. **Tile drain outlets through the wall of the new culvert pipe will not be permitted.** All costs associated with re-routing lateral tile drains (if any) shall be at the Contractor's expense. Care must be taken in handling plastic drain pipe in cold weather to avoid causing damage.

(2) Plastic drain pipe shall be held in position on planned grade immediately after installation by careful placement of backfill material.

SECTION 22 – CULVERT END PROTECTION - SLOPING RIP-RAP

(1) Where specified, the Contractor shall install quarried rip-rap erosion protection materials on the slopes at both ends of the pipe. The backfill and quarried rip-rap protection over the ends of the pipe shall be sloped at 1.5 horizontal to 1 vertical or to a flatter slope specified on the drawings. All stone used for rip-rap culvert end protection shall be 125-225 mm clear quarried rock or OPSS.MUNI 1004 and be placed with a minimum thickness of 300mm thickness. Prior to placing rip-rap materials on the backfill materials, the Contractor shall lay a non-woven geotextile filter fabric equal to a "Terrafix 270R" or approved equal. The geotextile filter fabric shall extend from the bottom of the pipe to the top of each side slope of the drain and between both side slopes of the drain. No portion of the filter fabric shall remain exposed to sunlight. The Contractor shall take extreme care to not damage the geotextile filter fabric when placing the rip-rap on top of the filter fabric. The geotextile filter fabric and quarried stone shall be placed to the complete satisfaction of the Drainage Superintendent. **Concrete rip-rap or round stone will not be permitted.**

(2) Where a clay layer is specified beneath the Rip-Rap End Protection, it shall be a 500 mm thick layer of cohesive clay material that is dry select earth material free of topsoil, organic matter, broken concrete, steel, wood and deleterious substances. It shall be placed and shaped before the filter fabric layer is placed.

SECTION 23 - BAGGED CONCRETE HEADWALLS – SINGLE BAG THICKNESS

(1) Sacked concrete end walls that do not exceed 1.8 m in height shall be constructed of a single row of sacked concrete. The installation of the end wall shall be governed by the drawings. The end wall treatment shall extend to the same elevation as the finished travelled surface and fit to the top of bank elevation on both banks and in any event be a minimum of 300 mm above the crown of the pipe.

(2) Where specified and after the Contractor has set in place the new pipe and partially backfilled same, he shall install new concrete filled jute bag headwalls at each end of the pipe. When constructing the concrete jute bag headwalls, the Contractor shall place the bags so that the completed headwall will have a slope inward from the bottom of the pipe to the top of the finished headwall, the slope of the headwall shall be one unit horizontal to five units vertical.

(3) The Contractor shall completely backfill in behind the new concrete jute bag headwalls with granular material, Granular "B" per O.P.S.S. 1010, and the granular material shall be compacted in place with a Standard Proctor Density of 100%. The placing of the jute bag headwalls and the backfilling shall be performed in lifts simultaneously. The granular backfill shall be placed and compacted in lifts not to exceed 300mm (12") in thickness.

(4) The concrete jute bag headwalls shall be constructed by filling jute bags with concrete. All concrete used to fill the jute bags shall have a minimum compressive strength of 20 MPa in 28 days and shall be provided and placed only as a wet mix. Under no circumstances shall the concrete to be used for filling the jute bags be placed as a dry mix. The jute bags, before being filled with concrete, shall have a dimension of 460mm x 660mm (18" x 26"). The jute bags shall be filled with concrete so that when they are laid flat they will be approximately 100mm (4") thick, 300mm (12") to 380mm (15") wide and 460mm (18") long.

(5) The concrete jute bag headwall to be provided at the end of the pipe shall be of single bag wall construction or as specified otherwise. The concrete filled bags shall be laid so that the 460mm (18") dimension is parallel with the longitudinal length of the new pipe. The concrete filled bags shall be laid on a footing of plain concrete being 460mm (18") wide or as otherwise specified, extending for the full length of the wall, and from 0.3 metres (1.0') below the bottom of the corrugated pipe to the bottom of the culvert pipe. All concrete used for the footing shall have a minimum compressive strength of 20 MPa in 28 days.

(6) The completed jute bag headwalls shall be securely embedded a minimum of 0.50m (20") into the side slopes of the drain. At the road side of the bridge the Contractor shall flair outwards each headwall approximately 1.5m (5.0') as directed by the Drainage Superintendent.

(7) Upon completion of the jute bag headwall the Contractor shall cap the top row of concrete filled bags with a layer of plain concrete, 150mm (6") thick, and hand trowelled to obtain a pleasing appearance. The concrete cap shall be the same width as the bagged wall and excess concrete will not be allowed to be placed on the cap area. The concrete cap shall not overhang the bagged wall on the driveway side of the wall.

(8) The Contractor shall fill all voids between the concrete filled jute bags and the corrugated steel pipe with concrete, particular care being taken underneath the pipe haunches to fill all voids.

SECTION 24 – BAGGED CONCRETE HEADWALLS – DOUBLE BAG THICKNESS

(1) Sacked concrete end walls that exceed 1.8 m in height shall be constructed of double rows of sacked concrete.
(2) The concrete filled bags are to be laid so that the 460mm (18") dimension is perpendicular (at right angles) to the longitudinal length of the new pipe. Therefore, the long dimension of the bag will be visible when the headwall is complete.

SECTION 25 – GROUTED CONCRETE RIP-RAP WALL

(1) Where specified, the Contractor may construct a grouted concrete rip rap headwall. The specifications for the installation of a concrete filled jute bag headwall shall be followed with the exception that broken sections of concrete may be substituted for the jute bags. The concrete rip rap shall be approximately 460mm (18") square and 100mm (4") thick and shall have two flat parallel sides. The rip rap shall be fully mortared in place using a mixture composed of three parts of clean, sharp sand to one part of Portland Cement.

SECTION 26 – PRECAST CONCRETE HEADWALLS

(1) Where specified as an alternative, the Contractor may supply and install precast concrete headwalls. Said precast headwalls shall be a custom made product, manufactured by Underground Specialties (Windsor) or similar provider.
(2) The precast concrete headwall or precast blocks or modules shall be of the shape, size and dimensions shown on the drawings.
(3) Precast provider to provide stamped engineering drawing for precast headwall and Geotextile restrainers for approval.
(4) Excavation for the headwalls shall be in conformance with O.P.S.S. Section 902.
(5) The supply and placement of concrete shall be in conformance with O.P.S.S. Section 904. All concrete shall have a strength of 33 MPa after 28 days. All concrete shall be air entrained to an air content of 6% $\pm$ 1.5% by volume for 19mm maximum size of aggregate. Minimum cover for concrete shall be 40mm (1 ½").
(6) The supply and placement of reinforcing steel shall be in conformance with O.P.S.S. Section 905. The reinforcing steel shall be grade 400 and shall be of the size and type shown on the drawings.
(7) The Contractor shall place the precast headwall so that it is straight and plumb. The method of backfilling the side slope trenches shall be such that no voids remain under the haunches of the sloping concrete headwall. The Contractor's method of achieving this shall be approved prior to start of construction.
(8) The Contractor shall provide a sufficient opening in the headwalls so that when the headwalls are set and plumb the corrugated steel pipe may be inserted or adjusted to grade. The void between the corrugated steel pipe and opening in the headwall shall be fully mortared in place using a mixture composed of three parts of clean, sharp sand to one part of Portland Cement.
(9) After the corrugated steel pipe has been set and partially backfilled with Granular "B" per O.P.S.S. 1010 and compacted to 100% Standard Proctor Density, geotextile tie backs to the precast concrete headwalls in accordance to approved stamped headwall and restraining devices.

SECTION 27 - TILE OUTLET PIPES AND ROAD DRAINS

(1) Where existing tile outlet pipes of cast iron, asbestos cement, corrugated steel or other rigid material are encountered along the course of the drain, and where they will be removed or rendered useless by the work, the Contractor, as part of his work, shall reinstall the outlet pipes in the re-graded bank.
(2) Where, in the course of the grading operation tile drains having no outlet pipe are encountered or the existing outlet pipe is not suitable for re-installation, the Contractor shall install an outlet pipe manufactured for that purpose. The outlet pipe shall be one size larger than the diameter of the tile, 3 metres in length, and supplied by the Drainage Superintendent as an expense to the drain.
(3) All outlet pipes installed shall be at least 3 metres long and shall be embedded 2.5 metres into the bank of the drain and shall protrude 0.5 metres beyond its face. The outlet end shall be fitted with a removable wire rodent guard.
(4) Where a drain adjoining a road is relocated, the Drainage Superintendent shall arrange to have all existing private and road drains which cross beneath the road extended across the old course of the drain to the drain in its new location. The cost of all pipe materials to extend these drains together with the installation costs will be borne by the Road Authority having jurisdiction.

SECTION 28 – RIP-RAP EROSION PROTECTION

(1) The Contractor shall supply and install the required quantities of graded stone rip-rap erosion protection materials where specified All stone used for rip-rap culvert end protection shall be 125-225 mm clear quarried rock or OPSS.MUNI 1004 and be placed with a minimum thickness of 300mm thickness. Prior to placing rip-rap materials on the backfill materials, the Contractor shall lay a non-woven geotextile filter fabric equal to a "Terrafix 270R" or approved equal. No portion of the filter fabric shall remain exposed to sunlight. The Contractor shall take extreme care to not damage the geotextile filter fabric when placing the rip-rap on top of the filter fabric. The geotextile filter fabric and quarried stone shall be placed to the complete satisfaction of the Drainage Superintendent. **Concrete rip-rap or round stone will not be permitted.**

SECTION 29 – LOCATION OF STRUCTURES, ETC.

(1) The Contractor shall satisfy himself as to the exact location, nature and extent of any existing structure, utility or other object which he may encounter during the course of the work. The Contractor shall indemnify and save harmless the Municipality and the Engineer for any damages which he may cause or sustain during the progress of the work. He shall not hold the Municipality or the Engineer liable for any legal action arising out of any claims brought about by such damage caused by him.

SECTION 30 - LAWN RESTORATION

(1) Where the construction works cross a lawn, the Contractor shall take extreme care to avoid damaging the lawn, shrubs and trees encountered. Upon completion of the work, the Contractor shall completely restore the area by the placement and fine grading of topsoil and seeding or sodding the area as specified by the Engineer or Drainage Superintendent.

SECTION 31 – PROPERTY BARS AND SURVEY MONUMENTS

(1) The Contractor shall be responsible for marking and protecting all property bars and survey monuments during construction. All missing, disturbed or damaged property bars and survey monuments shall be replaced at the Contractor's expense, by an Ontario Land Surveyor.

SECTION 32 - CLEAN UP AND RESTORATION

(1) The Contractor shall leave the whole of the site of the work in a neat, thorough and workmanlike appearance to the full satisfaction of the Drainage Superintendent. He shall haul away any excess earth from the site. He shall haul to the site, at his own expense, sufficient earth to fill any depressions caused by his work. All debris and waste materials specified for disposal by others shall be left in a neat condition. All materials to be disposed of under this contract shall be removed by the Contractor and the site left in a neat and tidy condition. The site shall be left, as closely as possible, in the same condition it was in prior to the commencement of the work.

(2) As part of the work and upon completion, the Contractor shall remove and dispose of, off-site any loose timber, logs, stumps, large stones, rubber tires, cinder blocks or other debris from the drain bottom and from the side slopes. Where the construction works cross a lawn, the Contractor shall take extreme care to avoid damaging the lawn, shrubs and trees encountered. Upon completion of the work, the Contractor shall completely restore the area by the placement and fine grading of topsoil and seeding or sodding the area as specified by the Engineer or Drainage Superintendent.

SECTION 33 - UTILITIES, RAILWAYS, ETC.

(1) The Contractor shall note that overhead and underground utilities such as hydro, gas, telephone and water are not necessarily shown on the drawings. Before commencing work, the Contractor will investigate the location of any and all railways, utility lines, wires, pipes, poles, towers, cables, etc. which may interfere with the proposed work. He will take all necessary steps to avoid damaging these. The Contractor will be liable for any damage to utilities and should any damage result to them from his operations, he will be completely responsible for these damages and will save harmless the Municipality and the Engineer from any legal actions which may arise as a result of such damage.

(2) If permits are required to allow the work to be carried out on or adjacent to any utilities, pipelines, railways, etc., the Contractor shall obtain these at his own expense.

(3) All work on or adjacent to any utility, pipeline, railway, etc., is to be carried out in accordance with the requirements of the utility, pipeline, railway, or other, as the case may be, and its specifications for such work form part of this specification and apply.

(4) In accordance with Section 26 of the Drainage Act, if utilities are encountered during the installation of the drainage works that conflict with the work, the operating utility company shall relocate the utility at their own costs. The Contractor however will be responsible to co-ordinate these required relocations and their co-ordination work shall be considered incidental to the project.

SECTION 33 – DAMAGE TO TRAVELLED PORTION OF MUNICIPAL ROADS

(1) The Contractor shall be responsible for any damage caused by him to any portion of the municipal road system, especially to the travelled portion. When excavation work is being carried out and the excavation equipment is placed on the travelled portion of a road, the travelled portion shall be protected by having the excavation equipment placed on satisfactory timber planks or timber pads. If any parts of the travelled portion of the road are damaged by the Contractor, the Municipality shall have the right to have the necessary repair work done by its employees and the cost of all labour and materials used to carry out the repair work shall be deducted from the Contractor's contract and credited to the Municipality.

SECTION 34 – MAINTAINING FLOWS

(1) The Contractor shall maintain the flow of any drainage works encountered in the progress of the work at no expense to the Owner. The Contractor shall obtain written approval from the Engineer in charge to stop up any drain and if necessary provide pumping equipment, build necessary by-passes, etc. at no expense to the Owner.

SECTION 35 – MAINTENANCE

(1) The successful Tenderer shall guarantee the work for a period of one (1) year from the date of acceptance (as evidenced by the final inspection report), thereof from deficiencies that, in the opinion of the Engineer, were caused by faulty workmanship or materials. The successful Tenderer shall, at his/her own expense, make good and repair deficiencies and every part thereof, all to the satisfaction of the Engineer. Should the successful Tenderer for any cause, fail to do so, then the Municipality may do so and employ such other person or persons as the Engineer may deem proper to make such repairs or do such work, and the whole costs, charges and expense so incurred may be deducted from any amount due to the Tenderer or may be collected otherwise by the Municipality from the Tenderer. Nothing herein contained shall be construed as in any way restricting or limiting the liability of the Contractor under the appropriate laws under which the work is being done.

SECTION 36 - DRAINAGE SUPERINTENDENT

(1) Where the word "Drainage Superintendent" is used in this specification, it shall mean the person or persons appointed by the Council of the Municipality having jurisdiction, to superintend the work.

(2) The Drainage Superintendent will be permitted to make minor variations in the, work so long as these variations will result in either a more satisfactory drain or a more economical one. These variations, however, must not be such as to change the intent of the work performed nor are they to reduce the standard of quality.

SECTION 37 - SPECIAL PROVISIONS

(1) The Part of the Specifications headed "Special Provisions" which is attached hereto forms part of this Specification and is to be read with it. Where there is any difference between the requirements of this General Specification and those of the Special Provisions, the Special Provisions shall govern.

RC SPENCER ASSOCIATES INC.
Windsor, Leamington & Chatham, Ontario

ENVIRONMENTAL PROTECTION SPECIAL PROVISIONS

(Revised 2016 11 25)

SECTION 1 – GENERAL

(1) These Environmental Protection Special Provisions shall apply and form part of this Contract. All costs associated to confirming with these Special Provisions shall be included in the Tender prices bid.

SECTION 2 - FIRES

(1) Fires and burning of rubbish on site will be permitted only with special approval from the Municipality.

SECTION 3 - DISPOSAL OF WASTES

(1) The Contractor shall not bury rubbish and waste materials on site unless approved by the Engineer and all applicable approving authorities. The site shall be maintained free of accumulated waste and rubbish. All waste materials should be disposed of in a legal manner at a site approved by all local approving authorities and the Engineer.
(2) The Contractor shall not allow deleterious substances, waste or volatile materials such as mineral spirits, or paint thinner, to enter into waterways, storm or sanitary sewers.
(3) The disposal of dredge material where applicable shall be in accordance with the above.

SECTION 4 - POLLUTION CONTROL

(1) The Contractor shall maintain under this Contract temporary erosion, sediment and pollution control features installed.
(2) The Contractor shall control emissions from equipment and plant to local authority's emission requirements.
(3) The Contractor shall not cause excessive turbidity when performing in-water work. The Contractor shall not allow any debris, fill or other foreign matter to enter into the waterway. The Contractor shall remove from the waterway, all extraneous materials resulting from in-water work.
(4) The Contractor shall abide by local noise By-Laws for the duration of the Contract.
(5) Spills of deleterious substances into waterways and on land shall be immediately contained by the Contractor and the Contractor shall cleanup in accordance with Provincial regulatory requirements. All spills shall be reported to the Ontario Spills Action Centre (1-800-268-6060), local authorities having jurisdiction and the Engineer. To reduce the risk of fuel entering the waterway, refuelling of machinery must take place a safe distance from the waterway. The Contractor shall note that the Engineer or the Owner takes no responsibility for spills, this shall be the sole responsibility of the Contractor.

SECTION 5 - WHMIS

(1) The Contractor shall comply with the requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials and regarding labelling and the provision of material safety data sheets acceptable to Labour Canada.

SECTION 6 - DRAINAGE

(1) The Contractor shall not pump water containing suspended materials into waterways, sewers or drainage systems. The Contractor shall be solely responsible for the control, disposal or runoff of water containing suspended materials or other harmful substances in accordance with these specifications, and local authority requirements. The Contractor shall provide temporary drainage and pumping as necessary to keep excavations and the site free from water.
(2) The Contractor shall install and maintain sediment control devices as indicated on the Contract Drawing and as director by the Engineer.

SECTION 7 - PROTECTION OF VEGETATION

(1) The Contractor shall exercise the utmost caution to ensure that existing trees and plants on-site and on adjacent properties are not damaged or disturbed unless noted otherwise in the Removals Special Provisions of this Contract. The Contractor shall restrict tree removal to areas indicated on the Contract Drawings and/or designated on-site. No trees or shrubs shall be removed without the approval of the Engineer.

SECTION 8 - DUST CONTROL

(1) The Contractor will be solely responsible for controlling dust nuisance resulting from his operations, both on the site and within adjacent right-of-ways.
(2) Water and calcium chloride shall be applied to areas on or adjacent to the site as authorized by the Engineer as being necessary and unavoidable for the prevention of dust nuisance or hazard to the public. No payment will be made for dust control unless otherwise specified in the Special Provisions.

SECTION 9 - RESTRICTIONS FOR IN-WATER WORKS

(1) The Contractor shall only perform in-water works during times when conditions permit reasonable production rates to be achieved. The Contractor shall be required to adopt good housekeeping practices that minimize disturbance to the site and the adjacent waterway.
(2) The Contractor shall note that this Project is subject to approval from the Essex Region Conservation Authority and as such, any possible turbidity caused by the construction of shore protection works is of key importance.

(3) The Contractor shall minimize the turbidity (sedimentation) produced by any in-water works construction or operations. The Contractor will be ordered to cease operations if, in the opinion of the Engineer or authorities having jurisdiction, the in-water work is producing unacceptable amounts of turbidity in the waterway. Based on this, the Contractor shall either adjust his operation(s) to produce lower turbidity levels, wait for more favourable conditions before operations will be allowed to continue, or undertake approved mitigating measures (e.g. sediment control, etc.). All costs associated with the above will be the sole responsibility of the Contractor, and no claims for extras or delays will be considered.

SECTION 10 - FISH HABITAT

No work shall be undertaken when there is likelihood of adverse effects on fish spawning or fish habitat in downstream waters. The Contractor shall implement the following measures to avoid causing harm to fish and fish habitat:

10.1 - Site Selection

(1) Design and plan activities and works in the water body such that loss or disturbance to aquatic habitat is minimized and sensitive spawning habitats are avoided.
(2) Design and construct approaches to the water body such that they are perpendicular to the watercourse to minimize loss or disturbance to riparian vegetation.
(3) Undertake all instream activities in isolation of open or flowing water to maintain the natural flow of water downstream and avoid introducing sediment into the watercourse.

10.2 - Standard Practices

(1) Work will not be conducted at times when flows are elevated due to local rain events, storms or seasonal floods. Construct the work 'in the dry' and cut only trees necessary to do the work (no clear-cutting) and as specified in the Construction Specifications. All disturbed areas and all disturbed soils on both banks and within the channel, including spoil, must be stabilized immediately, and upon completion of work returned to a pre-disturbed state or better as soon as conditions allow.

10.3 - Timing Windows

(1) For spring spawning fish in southwestern Ontario, the timing window for construction, is July 15 to March 15. This covers all warmwater fish species, which is the type of fish that will be found in essentially all the small watercourses and drains in southwestern Ontario. Do not carry out in-water work and any work affecting fish or fish habitat outside of the timing window without prior authorization from the appropriate authorities for emergency situations affecting public safety.

10.4 - Contaminant and Spill Management

(1) Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, poured concrete, or other chemicals do not enter the watercourse. All activities should be controlled to prevent the entry of petroleum products, debris, rubble, concrete or other deleterious substances into the water.
(2) Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance and keep an emergency spill kit on site.
(3) Ensure that building material used in a watercourse has been handled and treated in a manner to prevent the release or leaching of substances into the water that may be deleterious to fish.

10.5 - Erosion and Sediment Control

(1) Develop and implement an 'Erosion and Sediment Control Plan' for the site that minimizes risk of sedimentation of the water body during all phases of the project. Erosion and sediment control measures should be maintained until all disturbed ground has been permanently stabilized, suspended sediment has resettled to the bed of the water body or settling basin, and runoff water is clear. The plan should, where applicable, include:

- Installation of effective erosion and sediment control measures before starting work to prevent sediment from entering the water body.
- Measures for managing water flowing into the site, as well as, water being pumped/diverted from the site such that sediment is filtered out prior to the water entering a water body. For example, pumping/diversion of water to a vegetation area, construction of a settling basin or other filtration system.
- Site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required (e.g., dredging, culvert work). To prevent sediment entry into the Drain, in the event of an unexpected rainfall, silt barriers and/or traps must be placed in the channel during the works and until the site has been stabilized. All sediment and erosion control measures are to be in accordance with related Ontario Provincial Standards. It is incumbent on the proponent and his/her contractors to ensure that sediment and erosion control measures are functioning properly and are maintained/upgraded as required.
- Measures for containing and stabilizing waste material (e.g., dredging spoils, construction waste and materials, uprooted or cut aquatic plants, accumulated debris) above the high water mark of nearby water bodies to prevent re-entry.
- Regular inspection and maintenance of erosion and sediment control measures and structures during the course of construction. Repairs to erosion and sediment control measures and structures if damage occurs. Sediment in the barriers/traps must be removed and stabilized on land to prevent entry of sediment into the water. Removal of non-biodegradable erosion and sediment control materials once the site is stabilized.

10.6 - Fish Protection

(1) Ensure that all in-water activities, or associated in-water structures, do not interfere with fish passage, constrict the channel width, or reduce flows.

(2) Retain a qualified professional to ensure applicable permits for relocating fish are obtained and to capture any fish trapped within an isolated/enclosed area at the work site and safely relocate them to an appropriate location in the same waters. Fish may need to be relocated again, should flooding occur on the site.

(3) Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself.

(4) Avoid using explosives in or near water. Use of explosives in or near water produces shock waves that can damage a fish's swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.

10.7 - Operation of Machinery

(1) Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species, and noxious weeds. Wash, refuel, and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.

(2) Whenever possible operate machinery on land above the high water mark, on ice, or from a floating barge in a manner that minimizes disturbance to the banks and bed of the water body.

(3) To cross a municipal drain or watercourse, use the existing crossing structures within the designated working corridors or construct temporary crossing structures approved by the Engineer. Fording will not be permitted unless approved by the Engineer and carried out by the Contractor according to the requirements determined by the Engineer.

10.8 - Culvert Work

(1) It is important to apply the relevant mitigation measures outlined above, to ensure that no deleterious materials reach fish habitat and that there are no detrimental impacts to physical fish habitat.

(2) Existing culverts may be repaired, replaced, and removed, and debris may be removed from them, without contacting DFO. Important things to consider are:

- the timing window, which will be July 15 to March 15 for almost 100% of projects;
- that fish passage must not be obstructed;
- that the channel cannot be realigned;
- that culverts are designed for a minimum embedment of 10% below grade;
- that new material placed below the high water mark must be properly stabilized and protected from erosion;
- that the channel must not be narrowed; and
- that work must be done when there is no flowing water.

(3) It is best to time work when stream flows are at a minimum, but contingency measures should be in place in the event that a heavy rain occurs. Coffer dams or other features should be used above the area of construction and water above it should be pumped into the stream channel downstream of the construction. If the initial dewatering strands fish, they should be captured and placed downstream in the wetted area. It may be necessary to get a permit from MNRF to move the fish.

SECTION 11 - ENDANGERED SPECIES ACT

(1) All work must comply with the current version of the Ontario Endangered Species Act, 2007, S.O. 2007, c.6; O. Reg.230/08: (Species at Risk in Ontario); and O. Reg. 242/08: (General).

(2) The Municipality shall obtain the most current Endangered Species information available from MNRF and other sources. A designated person employed by the Municipality will be responsible for reviewing habitat maps to determine if registration of prescribed activities or full review and approval by MNRF and other agencies is required.

(3) Prior to the start of any construction activities, the Contractor shall meet with the Municipal Designate to obtain a copy of specific mitigation procedures for dealing with endangered species should they be encountered anytime during construction.

APPENDIX 'C'

RECORD OF ON-SITE MEETINGS

FOR THE

WELLWOOD DRAIN

IN THE

TOWN OF TECUMSEH

COUNTY OF ESSEX

1ST ON-SITE MEETING

After reviewing the drainage information and the previous Engineer's reports on the drain, an on-site meeting was held on October 15, 2015 with the affected landowners, at 5390 Oldcastle Road.

In attendance were:	Representing:
• Lou Zarlenga, P.Eng.	RC Spencer Associates Inc.
• Amy Grenier, P. Eng.	RC Spencer Associates Inc.
• Sam Paglia	Town of Tecumseh
• Cheryl Curran	Town of Tecumseh
• Bob Moon	5445 Oldcastle Rd.
• George Johnston	5451 Oldcastle Rd.
• Perry Burford	5360 Oldcastle Rd.
• Judy Wellwood-Robson	5370 Oldcastle Rd.
• Donna Queen	5384 Oldcastle Rd.
• Wayne Mayor	3060 Hwy No. 3

The drainage superintendent, Sam Paglia, made introductions, announced the Engineer on Record and noted that the authorization to proceed with this project is provided under Section 78 of the Drainage Act, to repair, improve and extend the existing municipal drain to a sufficient outlet.

The Engineer on Record, Lou Zarlenga provided a brief history of the Drainage Act and summary of the procedures under Section 78 of the Drainage Act and described the affected drainage area and provided additional information as follows:

Purpose of Meeting:

1. The Town received a Request for Maintenance (from Donna Queen) under Section 78 of the Drainage Act.
2. Council, at their June 23, 2015 public meeting, appointed Lou Zarlenga, P.Eng. of RC Spencer Associates to examine the drainage area and prepare a Drainage Report for the Wellwood Drain.
3. The purpose of the site meeting held today is to review the drainage concerns and document landowner concerns for better understanding of the drainage issues.
4. Mr. Zarlenga will inspect the drain; confirm the drainage area; confirm the drainage outlet is sufficient to handle the stormwater run-off; and conduct a land survey on the existing drain.
5. An Engineer's Report will be completed and filed with the Town and circulated to the affected landowners. This report will detail the engineer's findings and the assessment schedule for the improvement works to be undertaken.
6. A "Meeting to Consider" the report will be scheduled with Council and the assessed landowners will be invited to attend and provide input into the technical aspects of the design.

7. Upon adoption of the report by Council, a Court of Revision is scheduled where landowners may raise concerns about their assessments
8. Following Court of Revision's decision, landowners have opportunity to appeal to the Tribunal. If none are received, Council can give third and final reading of the by-law.

Engineer's Report and General Discussion:

9. The most recent Engineer's Report was completed in 1964 by Russell Armstrong.
10. Land use and severances have taken place since this report has been completed.
11. Two outlets are identified in the Report: the Washbrook Drain and the Downing Drain.
12. Mr. Zarlenga asked if any of the meeting attendees had any issues with the existing drain outlets. No one raised concerns.
13. As part of the Engineer's Report, Mr. Zarlenga will confirm the outlets are able to handle the water from the Wellwood Drain
14. The most recent maintenance of the Downing Drain occurred in 1978. In 2009, the MTO previously maintained a portion of the Downing Drain near Highway 3 and subsequently the intersection was modified with a cul-de-sac which altered the drainage pattern at the previous intersection. This work was performed without a drainage report. By virtue of this report being adopted by Council the water-way surrounding the cul-de-sac will become a part of the Municipal Wellwood Drain in Area No. 1.
15. Mr. Zarlenga asked comments regarding the efficiency of the drain. Donna Queen stated that since road work was completed on Oldcastle Road, she has experienced flooding on her property.
16. Sam Paglia indicated that when he conducted a sight visit, he observed approximately 450mm (18") of sediment abutting Donna Queen's property.
17. Lou Zarlenga stated that Ms. Queen's culvert may have been installed too low or debris may be causing a backup. The reason for the inefficiency of the culvert will be determined when the survey is conducted.

Questions & Answers:

18. **Question:** **How will the 'high spot' in the drain be dealt with?**
    Answer: *A survey will be conducted which will verify the location of the high point in the drain. Currently, the drain outlets in the Washbrook Drain to the north and the Downing Drain to the south. The high point is in fact a natural occurrence and the gradeline takes this into consideration.*

19. **Question:** **What happens if work needs to be done on the drain as soon as possible to circumvent flooding or access failure?**
    Answer: *The Town's drainage superintendent should be contacted as soon as possible.*

20. **Question:** **Is a portion of the drain enclosed already?**
    Answer: *Yes. There are several culvert enclosures; the longest one is situated at 5360 Oldcastle Road.*

21. Question: **Is it possible to have the entire length of the Wellwood Drain enclosed? Would enclosing the drain lessen the likelihood of future drain problems?**

Answer: *Yes, the drain can be enclosed. The increased cost would be assessed to all affected landowners and roads.*
Yes, maintenance of an enclosed drain would be less.

22. Question: **Will the existing culvert located at 5360 Oldcastle Road be cleaned during the drain maintenance process?**

Answer: *This culvert will be cleaned by water flushing.*

23. Question: **Will there be future provisions for culvert replacement and design?**

Answer: *The culverts identified in this report will be maintained and replaced, however future designs may have to be reviewed.*

24. Question: **Is the access culvert to each property constructed differently depending on the land use?**

Answer: *Yes, a residential entrance is constructed with a 20 foot minimum length culvert; agricultural entrances would be a minimum of 30 feet long.*

25. Question: **Can you provide an estimated cost for the drain work to be done?**

Answer: *Yes, the final report will provide estimated costs.*

26. Question: **Why is the Wellwood Drain not considered a roadside ditch?**

Answer: *The Wellwood Drain is a municipal drain that was constructed pursuant to the Ontario Drainage Act. Roadside drains do not have this classification.*

Meeting adjourned at 10:15 a.m.

2ND ON-SITE MEETING

The 2nd on-site meeting was held on April 12, 2017 at 5:00 pm at 5390 Oldcastle Road, Town of Tecumseh. Further to the first onsite meeting of October 15, 2015, our office received in writing two requests from landowners assessed into the Wellwood Drain asking if estimates could be prepared to enclose portions of the Wellwood Drain situated in front of their properties on Oldcastle Road.

These requests were accommodated and preliminary estimates were prepared for these two landowners. This situation is very common when the drainage works are situated in an urban setting.

A summary of the second onsite meeting comments is listed below:

In Attendance:	**Representing:**
Lou Zarlenga, P.Eng.	RC Spencer Associates
Marvel Hormiz	RC Spencer Associates
Sam Paglia, P.Eng.	Town of Tecumseh
Johncarlo Salvator	5404 Oldcastle Road
Sabrina Amicone	5394 Oldcastle Road
Judy Wellwood – Robson	5370 Oldcastle Road
Mike Abaldo	5384 Oldcastle Road
Thomas Zakrzewski	5414 Oldcastle Road
P. Burford	5360 Oldcastle Road
J. Burford	5360 Oldcastle Road

The drainage superintendent, Mr. Sam Paglia, made introductions, announced the Engineer on Record and noted that under Section 78 of the Drainage Act, a report must be completed by an Engineer for the repair, improvement and extension of the drain to a sufficient outlet. Mr. Paglia also explained the procedures under section 78 of the Drainage Act.

Lou Zarlenga:

- The initial scope of work was to repair and improve the drain, which includes cleaning and deepening of the drain if necessary. The cost of work would be assessed to affected landowners situated within the drainage area. Preliminary cost estimates for culvert installation were provided to the residents. Comments from residents were received requesting cost estimates for the enclosure of the drain on their properties. The purpose of the meeting was to discuss any further drain enclosures, the estimates for the drain enclosures and decide if the landowners would prefer this option.

- Mr. Zarlenga briefly described the procedures under section 78 of the Drainage Act. He also noted that certain assessments to agricultural properties may be eligible to receive a 33.33% grant on the portion of the assessment relating to the eligible portions of the work.

Questions & Answers:

1. **Question:** **Do we have to apply for the grant?**
   Answer: *No, the Town applies for the grant on your behalf. Once the bylaw is passed for the report, the grant application for the improvement or construction of a municipal drain must be claimed within one year after the work is complete. Grant applications are submitted to OMAFRA (Ontario Ministry of Agriculture, Food and Rural Affairs) and are subject to the requirements of the Agricultural Drainage Infrastructure Program (ADIP Policies) of the Ministry.*

2. **Question:** **Can we perform our own culvert work?**
   Answer: *No. Since this is a municipal drain, it is under Town jurisdiction and any work that is done to the drain must be authorised by the Town. In most cases, the Town prepares tenders for the work. The tenders are provided to experienced drainage contractors. Small repairs would be referred to a local contractor to perform.*

3. **Question:** **Are the costs in this table fully assessed to the corresponding owners?**
   Answer: Yes, they are and these assessments are provided in the various schedules of assessment contained in the final report.

4. **Question:** **What are the benefits of having the drain enclosed?**
   Answer: The benefit can be the aesthetic look to your property. Providing drain enclosures in urban areas is very common, providing an esthetically pleasing appearance. The pipes quite likely will need to be flushed out every few years.

5. **Question:** **Are the culverts corrugated or smooth walled?**
   Answer: HDPE (High Density Polyethylene) pipe material has a smooth walled interior. Corrugated Steel Pipe (CSP) has a corrugated interior.

6. **Question:** **Why are we getting charged for catch basins? We already have our drain enclosed and have catch basins.**
   Answer: Catch basins or Manholes will need to be installed at every two properties to allow for proper surface drainage and will also act as a maintenance access if the pipes need to be flushed out. Homeowners will also be able to connect tiles or storm and roof drain connections to the catch basins.

7. **Question:** **I do not want to enforce any fees on anybody else on the drain. If I decide to go with the enclosure, will it have any effect on anybody else?**
   Answer: If you decide to enclose the drain at your property, it will have no effect on anybody else in the watershed. The initial pipe installation is totally paid by you, however future maintenance costs are shared.

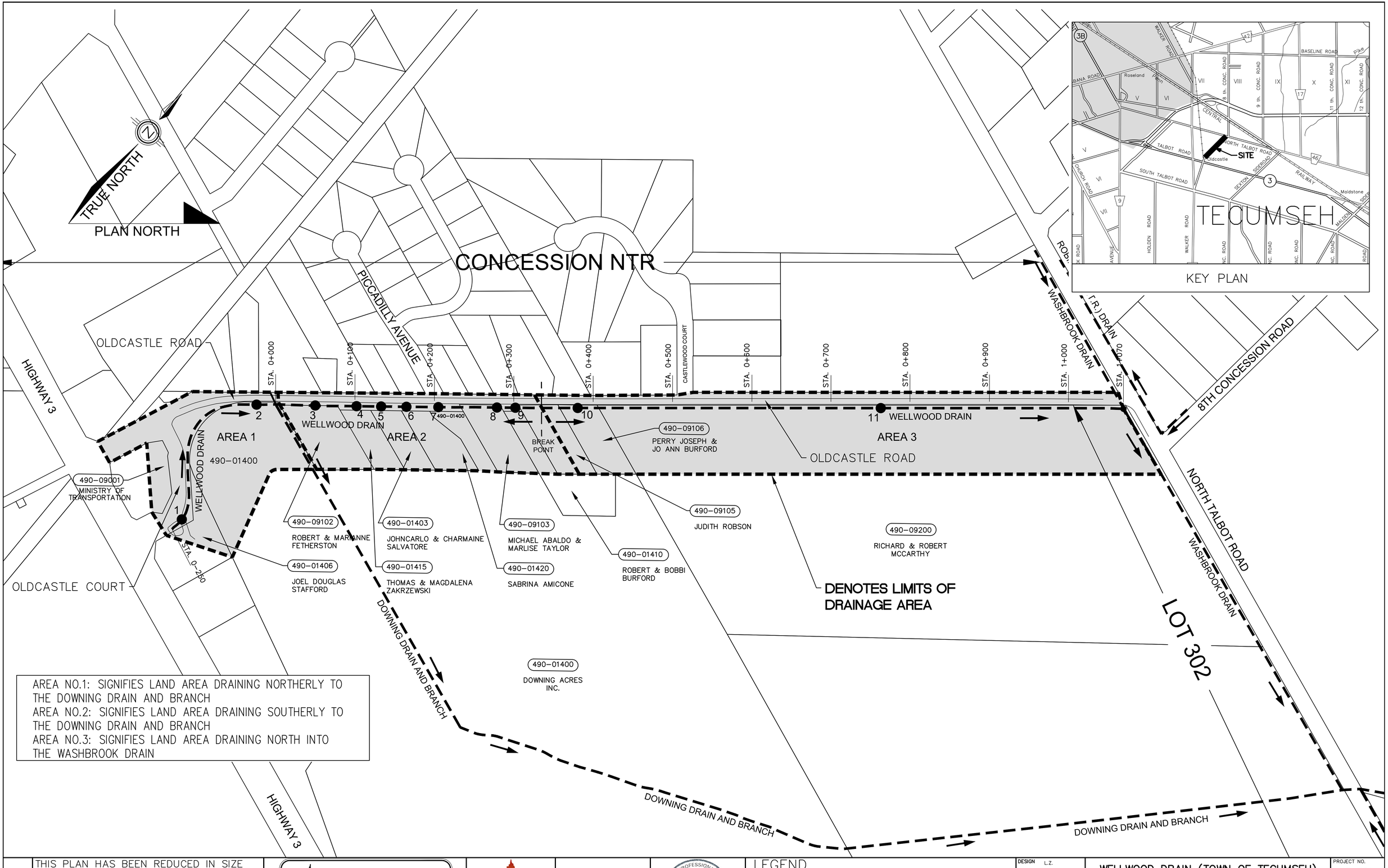
8. **Question:** **I have connections going out into the drain. What will happen to them if I decide to enclose the drain?**
   Answer: Any tiles or storm connections outletting into the drain will be connected to the pipe or preferably a catch basin.

9. **Question:** **When do we need to decide whether or not we want to enclose the drain?**
   Answer: As soon as possible so that we will be able to finalize the report.

10. **Question:** **I would like to know how much it is going to cost for a simple cleaning of the drain so I can compare the costs.**
    Answer: Contact the Town's drainage superintendent as they are aware of current costs and you can discuss.

The Town drainage superintendent, Mr. Sam Paglia, noted that all affected landowners will receive a copy of the final drainage report and ultimately this document will be used to prepare a tender document for advertising the project to contractors and ultimately used to construct the recommended works. However, during the tender stage the final bids from contractors may be higher than estimated by the Engineer. If tenders come in and are greater than 133% of the Engineer's estimate, a meeting of Council and the ratepayers must be called to discuss the matter and at this time Council will decide whether proceed, retender or not proceed with the project.

The second on site meeting was adjourned at 6:30pm



AREA NO.1: SIGNIFIES LAND AREA DRAINING NORTHERLY TO THE DOWNING DRAIN AND BRANCH
AREA NO.2: SIGNIFIES LAND AREA DRAINING SOUTHERLY TO THE DOWNING DRAIN AND BRANCH
AREA NO.3: SIGNIFIES LAND AREA DRAINING NORTH INTO THE WASHBROOK DRAIN

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Professional Engineers Ontario

LICENSED PROFESSIONAL ENGINEER D. R. McCREADY MAY 8, 2019 PROVINCE OF ONTARIO

LEGEND
- DENOTES DRAINAGE LIMIT
- DENOTES DRAIN FLOW
- 10 DENOTES CULVERT LOCATION

DESIGN	L.Z.
CHECKED	D.M.
DRAWN	M.H.
CHECKED	D.M.
DATE	MAY 8, 2019
SCALE	1 : 2000

WELLWOOD DRAIN (TOWN OF TECUMSEH)

DRAINAGE AREA PLAN

PROJECT NO. 15-461
SHEET NO. 1
OF 10

0–241 — SOUTH END OF 500mm DIA. C.S.P. 10.7m LONG, NO HEADWALLS

0–024 — SOUTH END OF 400mm DIA. C.S.P. 9.5m LONG, NO HEADWALLS

0+000 — START OF DOWNING DRAIN
0+004 — SOUTH END OF 450mmø C.S.P. 83m LONG, NO HEADWALLS

0+061 — S.P.C.B. AT MUN. 5426

0+102 — SOUTH END OF 450mm DIA. BOSS 2000 13m LONG, RIP RAP HEADWALLS

0+133 — SOUTH END OF 375mm DIA. BOSS 2000 10m LONG, RIP RAP HEADWALLS

0+165 — SOUTH END OF 450mm DIA. C.S.P. 12m LONG, NO HEADWALLS
450mm DIA. C.S.P. TO BE INSTALLED FOR DRAIN ENCLOSURE
FOR SABRINA AMICONE

0+205 — SOUTH END OF 450mm DIA. C.S.P. 9m LONG, RIP RAP HEADWALLS

0+279 — SOUTH END OF EX. 450mm DIA. C.S.P. 6.7m LONG, CONCRETE HEADWALLS TO BE REPLACED WITH 450mm DIA. HDPE BOSS 2000

0+302 — SOUTH END OF 400mm DIA. C.S.P. 8m LONG, CONCRETE HEADWALLS

0+335 — NEW STANDARD 600X600mm CATCHBASIN (TOP ELEV=190.800)

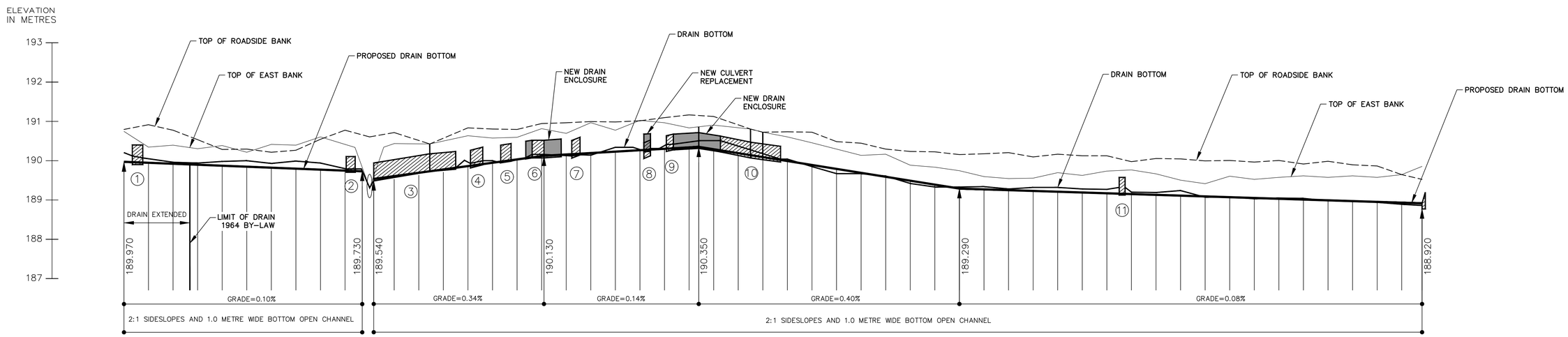
0+358 — SOUTH END OF 400mm DIA. C.S.P. 62m LONG, BLOCK HEADWALL

0+387 — S.P.C.B. AT MUN. 5360
0+400 — S.P.C.B. AT MUN. 5360

0+420 — NORTH END OF 400mm DIA. C.S.P. 62m LONG, NO HEADWALL

0+763 — SOUTH END OF 450mm DIA. C.S.P. 6m LONG, NO HEADWALLS

1+171 — EXISTING DITCH INLET CATCH BASIN OUTLET TO WASHBROOK DRAIN



DRAIN STATIONS (IN METRES)	0–250	–25	0–200	–82.9 –75	–50	–25	0–100	–75	–50	–25	–7	0+000 4	25	50	75	0+100	25	50	75 77	0+200	25	50	75	0+300	25 35	50	75	0+400	25	50	75	0+500	25	50	75	0+600	25	50	75	0+700	25	50	75	0+800	25	50	75	0+900	25	50	75	1+000	25	50	70
DEPTH OF CUT (m)	0.235	0.105	0.040	0.045	0.110	0.155	0.110	0.190	0.170	0.050						0.120	0.070						0.110	0.015	0.080	0.135	0.220				0.050				0.020			0.040	0.070	0.030	0.090	0.110	0.090	0.100	0.050	0.060	0.130		0.010			0.020	0.030					
EXISTING PROPERTY SIDE TOP OF BANK	190.750	190.340	190.390	190.310	190.390	190.220	190.420	190.400	190.600	190.500			190.440	FILLED IN	FILLED IN	190.630	190.580	190.590	190.840	190.700	190.820	190.780	190.880	190.800	190.860	190.920	FILLED IN	FILLED IN	190.600	190.460	190.300	190.140	190.170	189.880	189.830	189.740	189.600	189.540	189.550	189.690	189.620	189.740	189.770	189.670	189.510	189.420	189.610	189.530	189.570	189.610	189.580	189.610	189.580	189.550	189.530
EXISTING BOTTOM OF DRAIN (METRES)	190.210	190.050	189.960	189.940	189.980	190.000	189.930	189.990	189.940	189.790	189.310	FILLED IN	FILLED IN	FILLED IN	189.930	190.000	190.020	FILLED IN	190.130	190.140	190.340	190.280	190.390	190.480	190.510	FILLED IN	FILLED IN	190.040	189.850	189.670	189.670	189.610	189.420	189.330	189.330	189.340	189.280	189.320	189.320	189.280	189.270	189.200	189.190	189.240	189.070	189.080	189.030	189.050	189.040	188.980	188.980	188.940	188.890	188.860

⑨ – DENOTES CULVERT NUMBER

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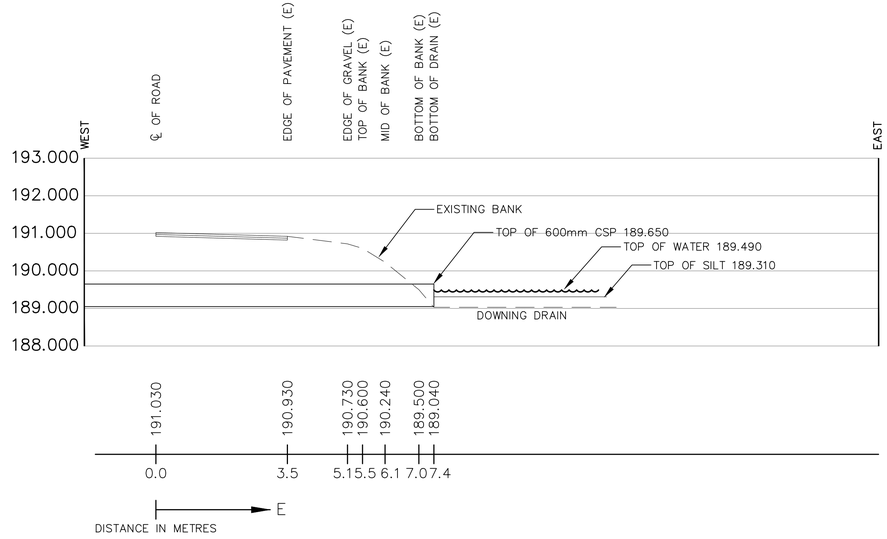
LICENSED PROFESSIONAL ENGINEER
D. R. McCREADY
MAY 8, 2019
PROVINCE OF ONTARIO

DESIGN	L.Z.
CHECKED	D.M.
DRAWN	M.H.
CHECKED	D.M.
DATE	MAY 8, 2019
SCALE	V=1 : 100 H=1 : 2000

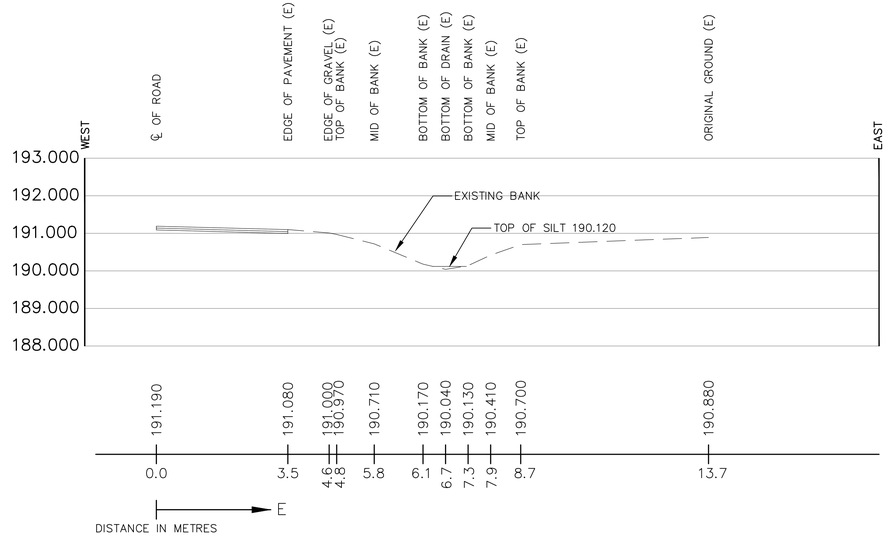
WELLWOOD DRAIN (TOWN OF TECUMSEH)

PROFILE

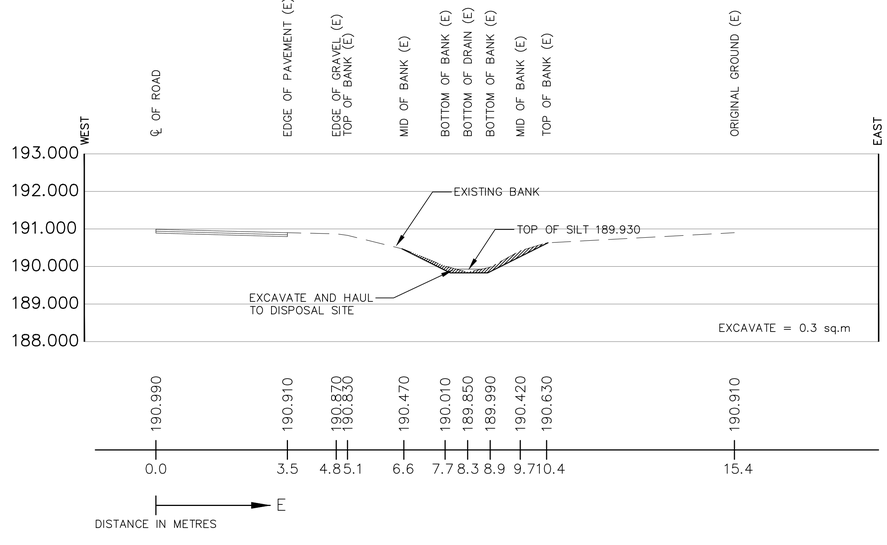
PROJECT NO. 15–461
SHEET NO. 2
OF 10



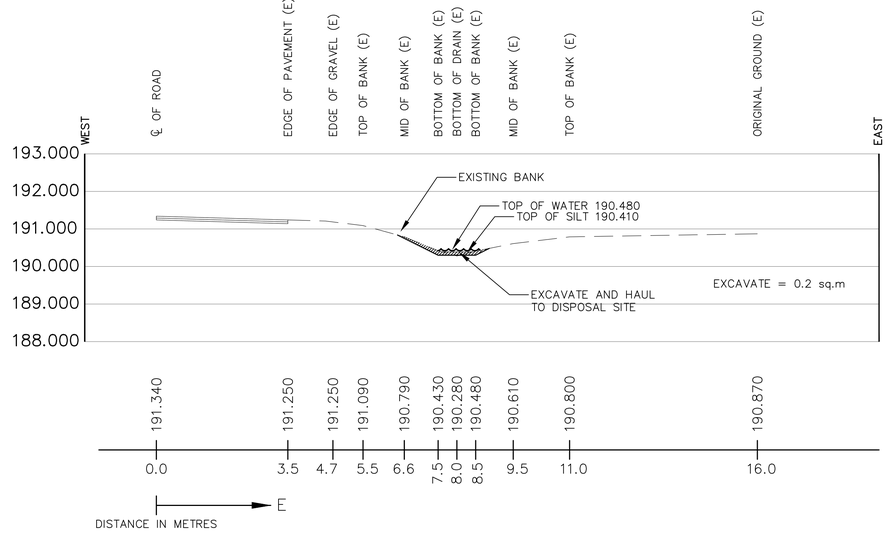
STA. 0+000 (CROSS SECTION AT DOWNING DRAIN)



STA. 0+200 NORTH



STA. 0+100 NORTH



STA. 0+300 NORTH

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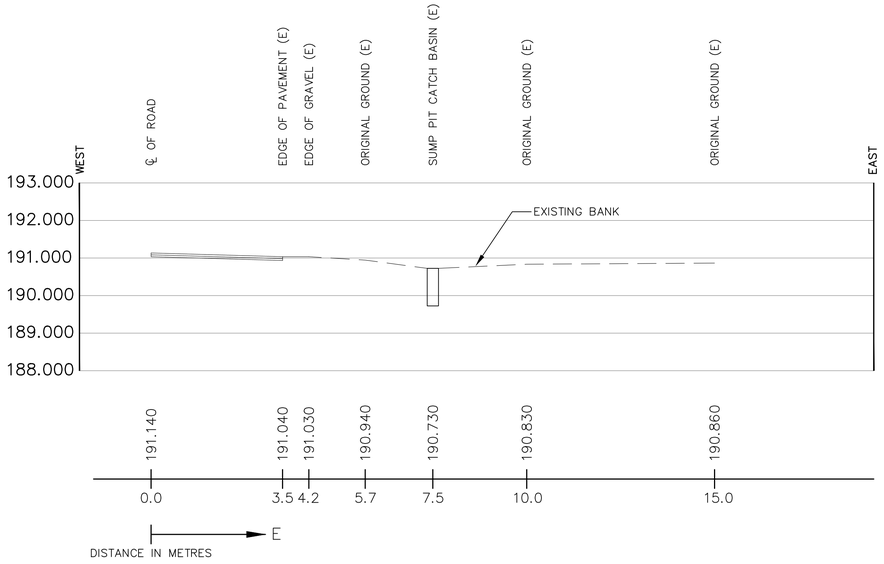
LICENSED PROFESSIONAL ENGINEER
D. R. McCREADY
PROVINCE OF ONTARIO
MAY 8,2019

DESIGN	L.Z.
CHECKED	D.M.
DRAWN	M.H.
CHECKED	D.M.
DATE	MAY 8, 2019
SCALE	1 : 75

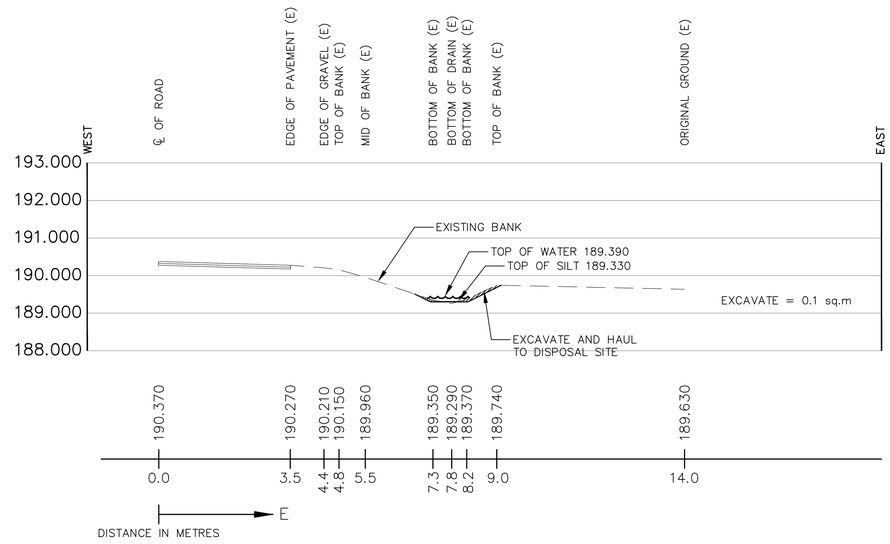
WELLWOOD DRAIN (TOWN OF TECUMSEH)

CROSS-SECTIONS (STA 0+000 TO 0+300)

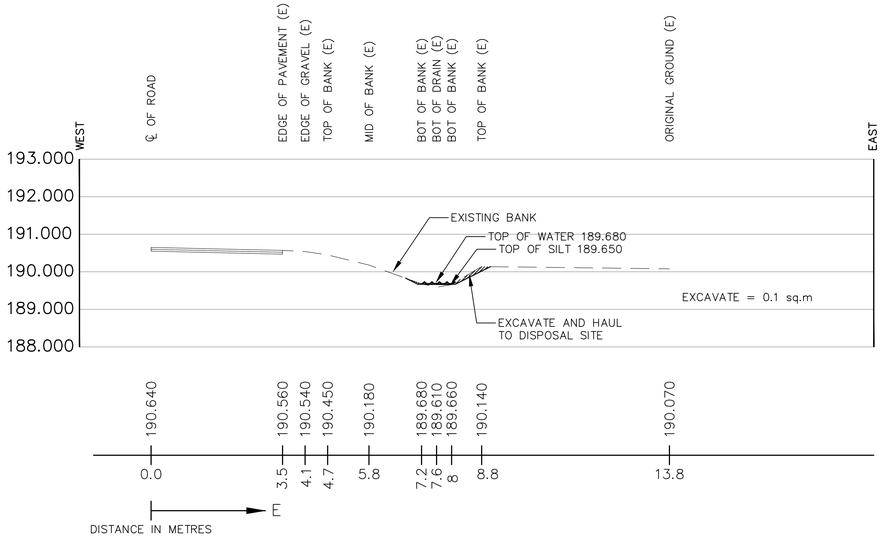
PROJECT NO. 15-461
SHEET NO. 3
OF 10



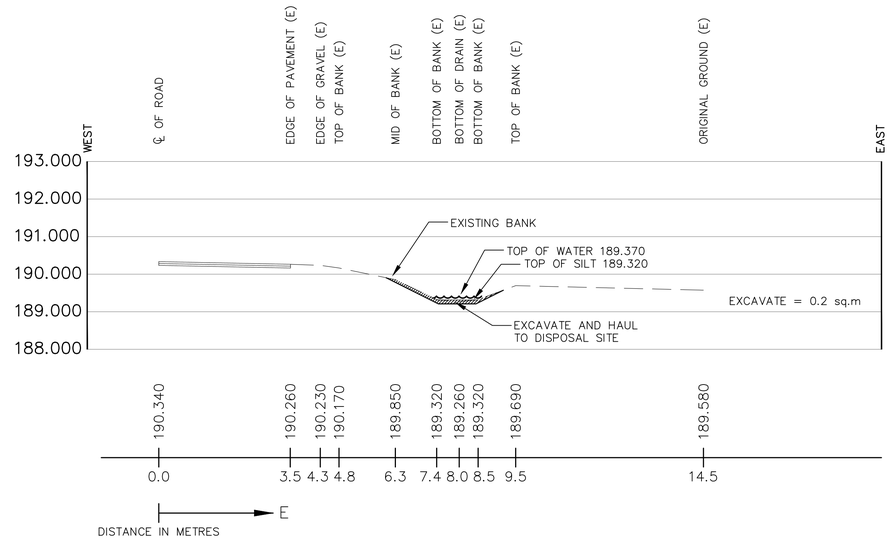
STA. 0+400 NORTH



STA. 0+600 NORTH



STA. 0+500 NORTH



STA. 0+700 NORTH

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LICENSED PROFESSIONAL ENGINEER
D. R. McCREADY
MAY 8, 2019
PROVINCE OF ONTARIO

DESIGN	L.Z.
CHECKED	D.M.
DRAWN	M.H.
CHECKED	D.M.
DATE	MAY 8, 2019
SCALE	1 : 100

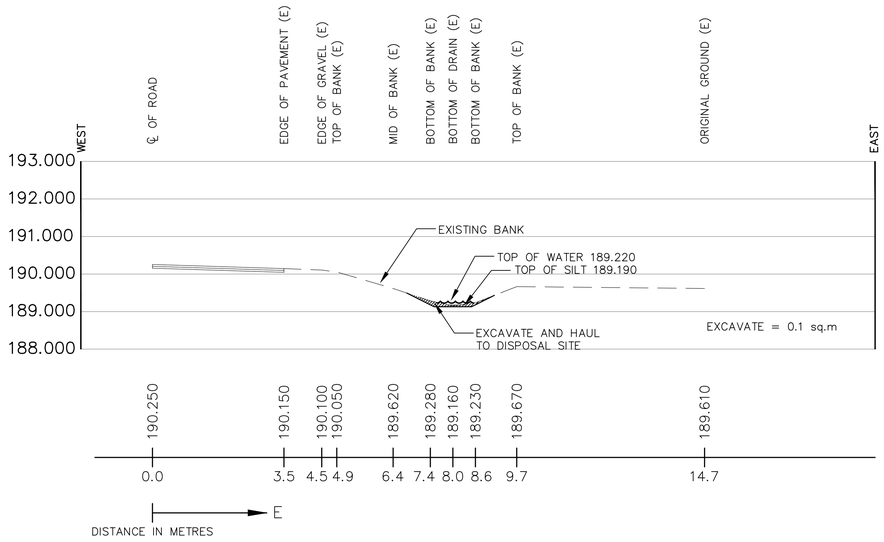
WELLWOOD DRAIN (TOWN OF TECUMSEH)

CROSS-SECTIONS (STA 0+400 TO 0+700)

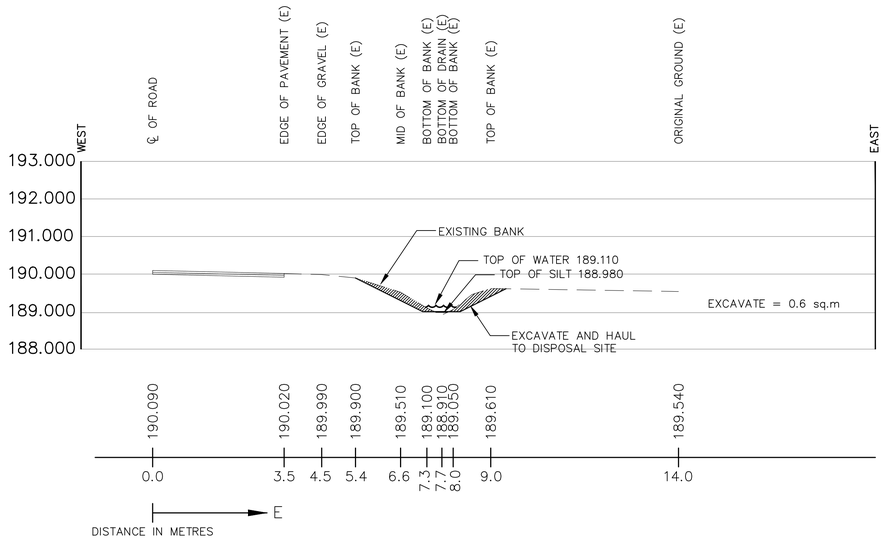
PROJECT NO. 15-461

SHEET NO. 4

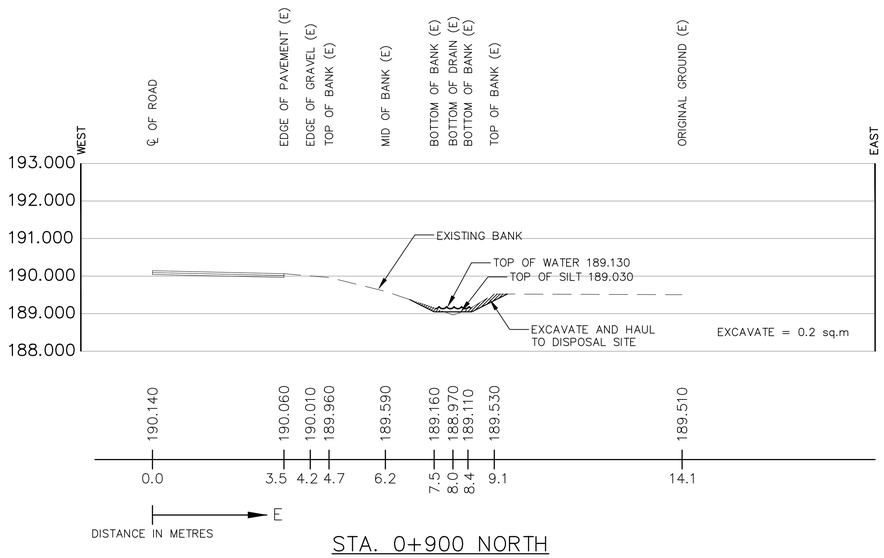
OF 10



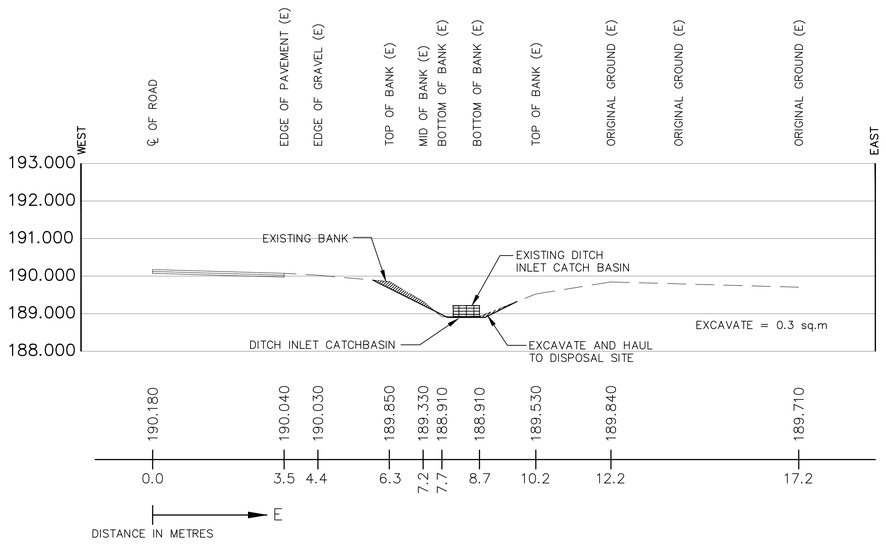
STA. 0+800 NORTH



STA. 1+000 NORTH



STA. 0+900 NORTH



STA. 1+070 NORTH (END OF DRAIN)

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D. R. McCREADY
PROVINCE OF ONTARIO
MAY 8, 2019

DESIGN	L.Z.
CHECKED	D.M.
DRAWN	M.H.
CHECKED	D.M.
DATE	MAY 8, 2019
SCALE	1 : 100

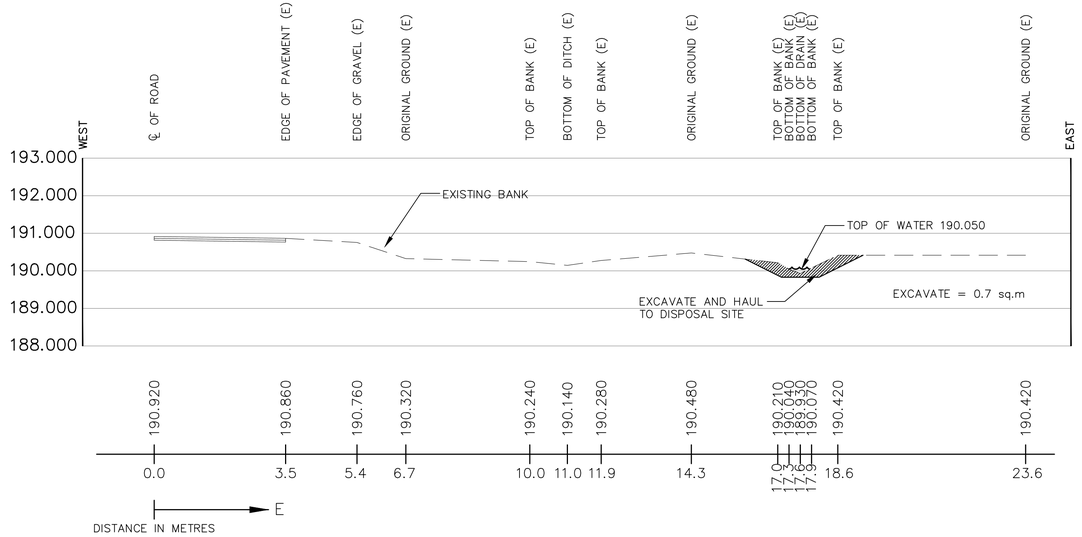
WELLWOOD DRAIN (TOWN OF TECUMSEH)

CROSS-SECTIONS (STA 0+800 TO 1+070)

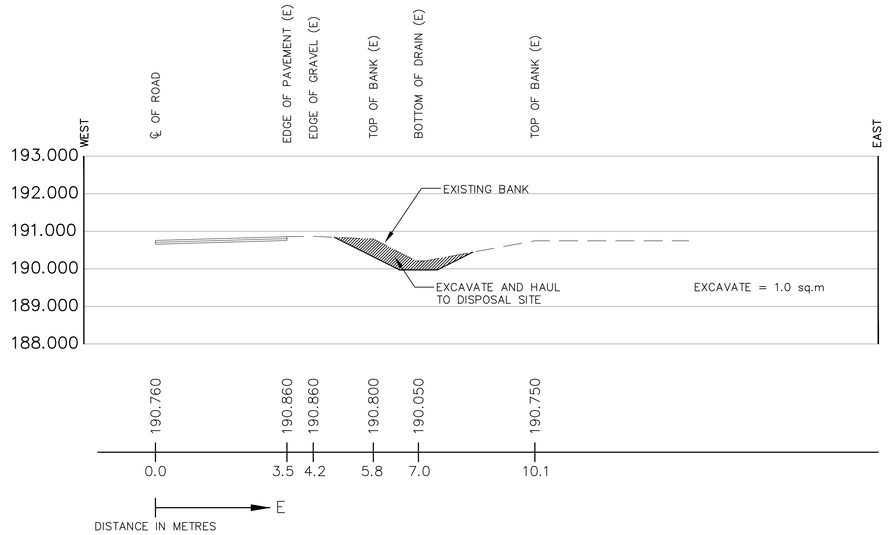
PROJECT NO. 15-461

SHEET NO. 5

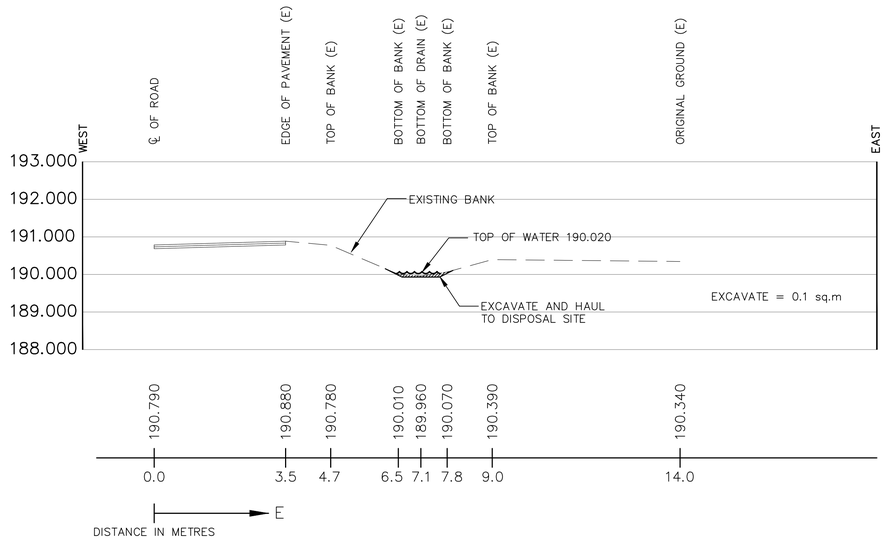
OF 10



STA. 0–100 SOUTH (CORNER OF OLDCASTLE RD AND OLDCASTLE CRT)



STA. 0–250 SOUTH (END OF DRAIN)



STA. 0–200 SOUTH

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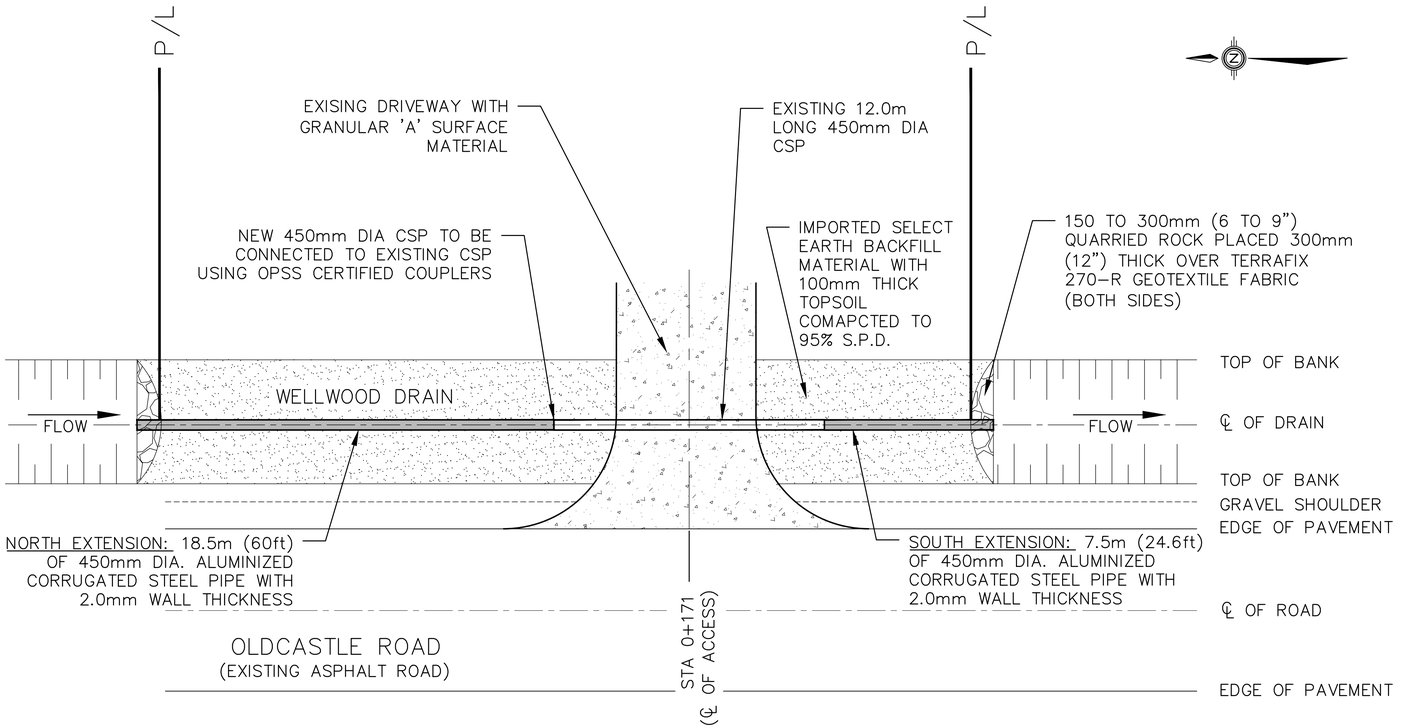
LICENSED PROFESSIONAL ENGINEER
D. R. McCREADY
PROVINCE OF ONTARIO
MAY 8, 2019

DESIGN	L.Z.
CHECKED	D.M.
DRAWN	M.H.
CHECKED	D.M.
DATE	MAY 8, 2019
SCALE	1 : 100

WELLWOOD DRAIN (TOWN OF TECUMSEH)

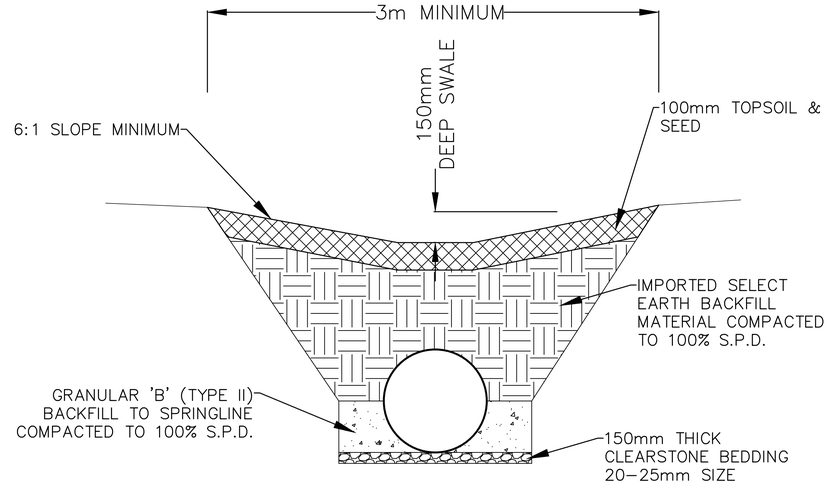
CROSS–SECTIONS (STA 0–100 TO 0–250)

PROJECT NO. 15–461
SHEET NO. 6
OF 10



CULVERT #6 – PLAN DETAIL (ROLL NO. 490–01420)

SCALE= 1:125



SWALE DETAIL (TYPICAL)

NOT TO SCALE

DESCRIPTION	BRIDGE NO. 6 (N) EXTENSION
BRIDGE LOCATION (STA)	0+177 TO 0+195.5
INVERT ELEV. U/S END (m)	190.100
INVERT ELEV. D/S END (m)	190.070
CULVERT MATERIAL	CSP HEL–COR
WALL THICKNESS	2.0mm
CORRUGATION PROFILE	68x13mm (2.7x0.5")
CULVERT LENGTHS	18.5m (60.7 ft)
CULVERT ENDWALL TYPE	RIP–RAP

DESCRIPTION	BRIDGE NO. 6 (S) EXTENSION
BRIDGE LOCATION (STA)	0+157.5 TO 0+165
INVERT ELEV. U/S END (m)	190.070
INVERT ELEV. D/S END (m)	190.040
CULVERT MATERIAL	CSP HEL–COR
WALL THICKNESS	2.0mm
CORRUGATION PROFILE	68x13mm (2.7x0.5")
CULVERT LENGTHS	7.5m (24.6 ft)
CULVERT ENDWALL TYPE	RIP–RAP

BENCHMARK DESCRIPTION	ELEVATION
TOP OF NUT ON FIRE HYDRANT AT MUN NO. 5389 OLDCASTLE ROAD	191.944

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Professional Engineers Ontario

TECUMSEH OM

LICENSED PROFESSIONAL ENGINEER D. R. McCREADY PROVINCE OF ONTARIO MAY 8, 2019

DESIGN	L.Z.
CHECKED	D.M.
DRAWN	M.H.
CHECKED	D.M.
DATE	MAY 8, 2019
SCALE	AS SHOWN

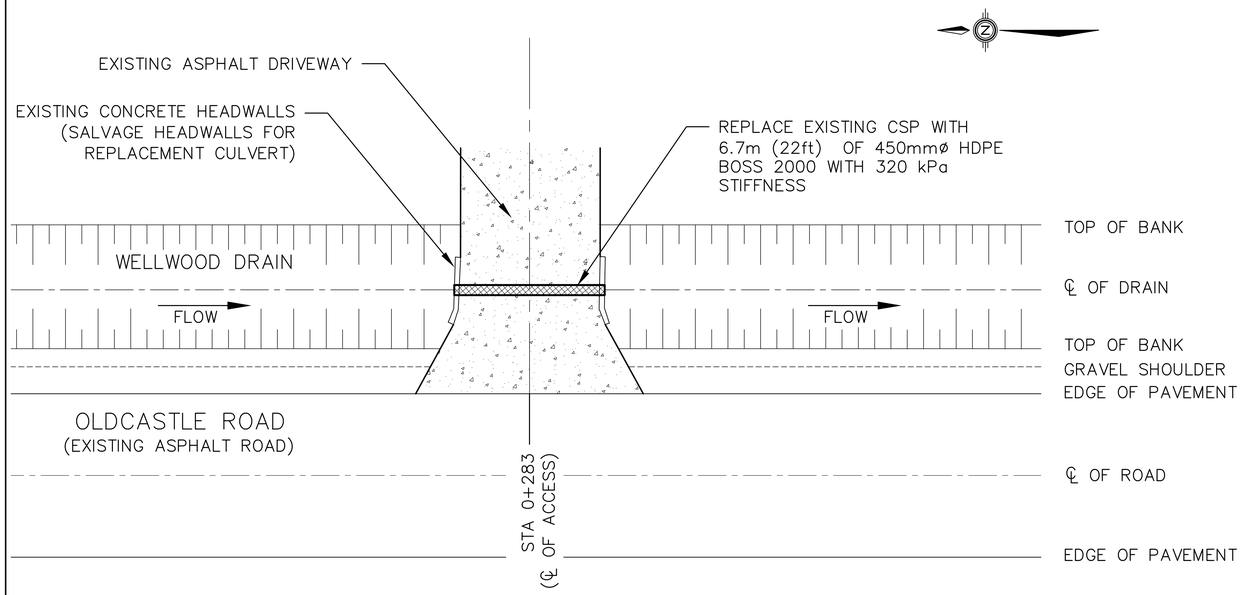
WELLWOOD DRAIN (TOWN OF TECUMSEH)

DRAIN ENCLOSURE (5394 OLDCASTLE ROAD)

PROJECT NO. 15–461

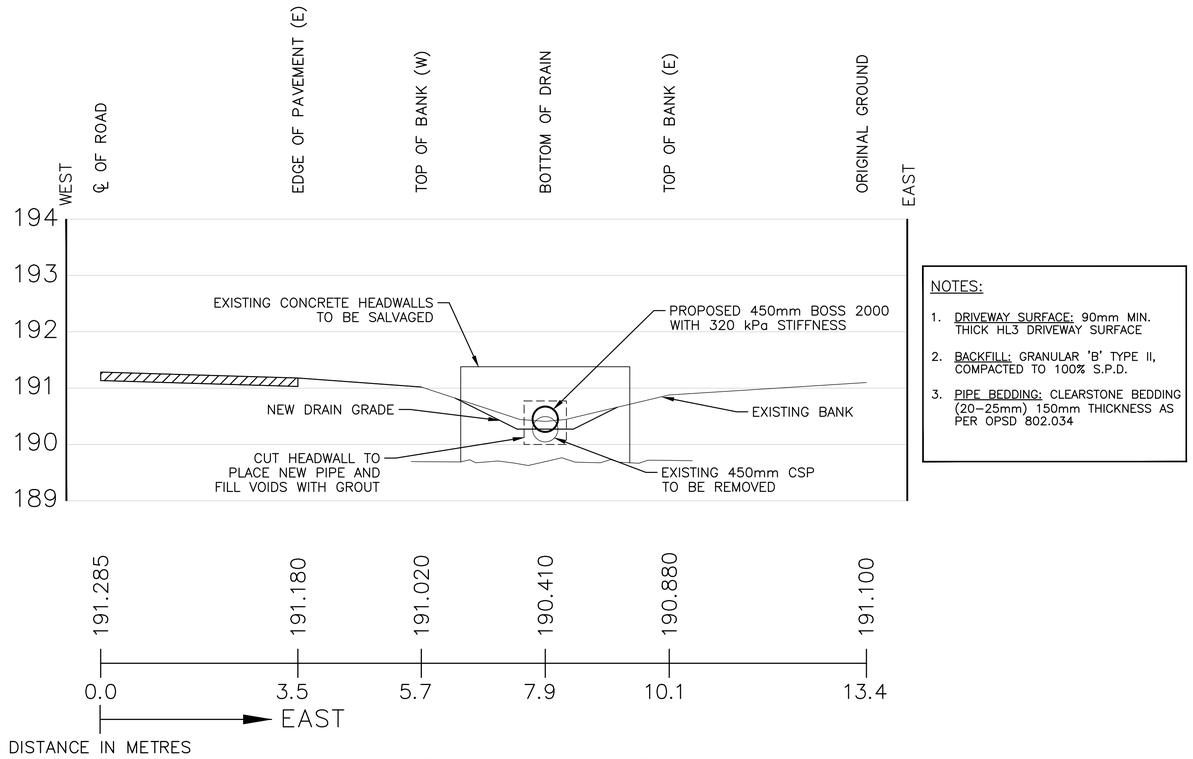
SHEET NO. 7

OF 10



CULVERT # 8 – PLAN DETAIL

SCALE: 1:125

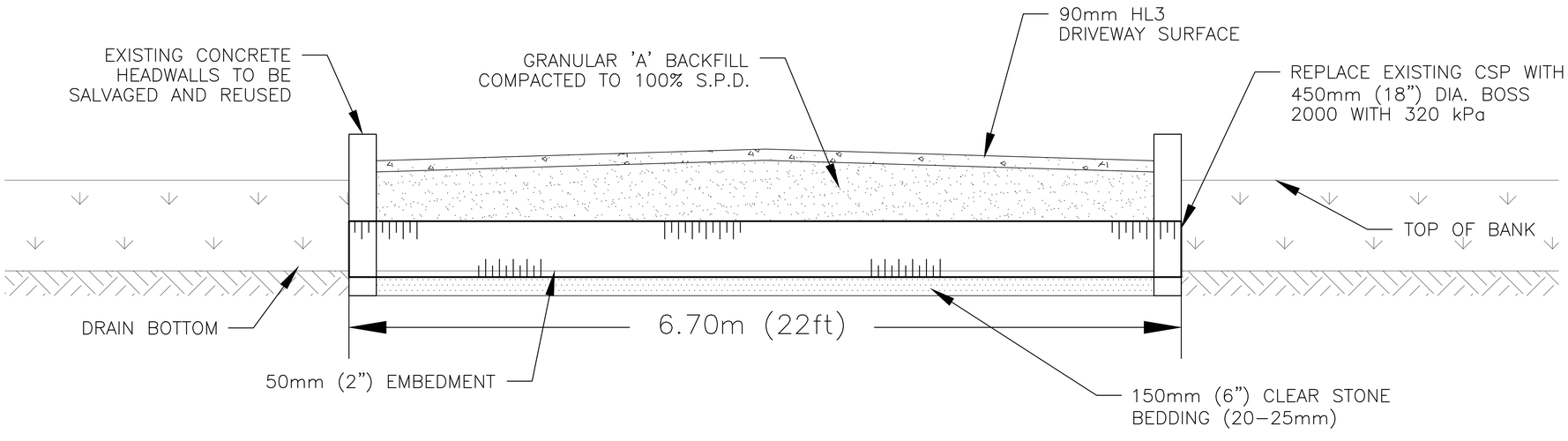


NOTES:

1. DRIVEWAY SURFACE: 90mm MIN. THICK HL3 DRIVEWAY SURFACE
2. BACKFILL: GRANULAR 'B' TYPE II, COMPACTED TO 100% S.P.D.
3. PIPE BEDDING: CLEARSTONE BEDDING (20–25mm) 150mm THICKNESS AS PER OPSD 802.034

CULVERT # 8 – LONGITUDINAL SECTION

SCALE: 1:50



CULVERT # 8 – LONGITUDINAL SECTION

SCALE: 1:20

DESCRIPTION	BRIDGE NO. 8
BRIDGE LOCATION (STA)	0+283
INVERT ELEV. U/S END (m)	190.230
INVERT ELEV. D/S END (m)	190.220
CULVERT MATERIAL	HDPE BOSS 2000
CULVERT STIFFNESS	320 kPa
CULVERT SIZE	450mm DIA.
CULVERT LENGTH	6.7m (20 ft)
CULVERT ENDWALL TYPE	CONCRETE

BENCHMARK DESCRIPTION	ELEVATION
TOP OF NUT ON FIRE HYDRANT AT MUN NO. 5389 OLDCASTLE ROAD	191.944

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D. R. McCREADY
MAY 8, 2019
PROVINCE OF ONTARIO

DESIGN	L.Z.
CHECKED	D.M.
DRAWN	M.H.
CHECKED	D.M.
DATE	MAY 8, 2019
SCALE	AS SHOWN

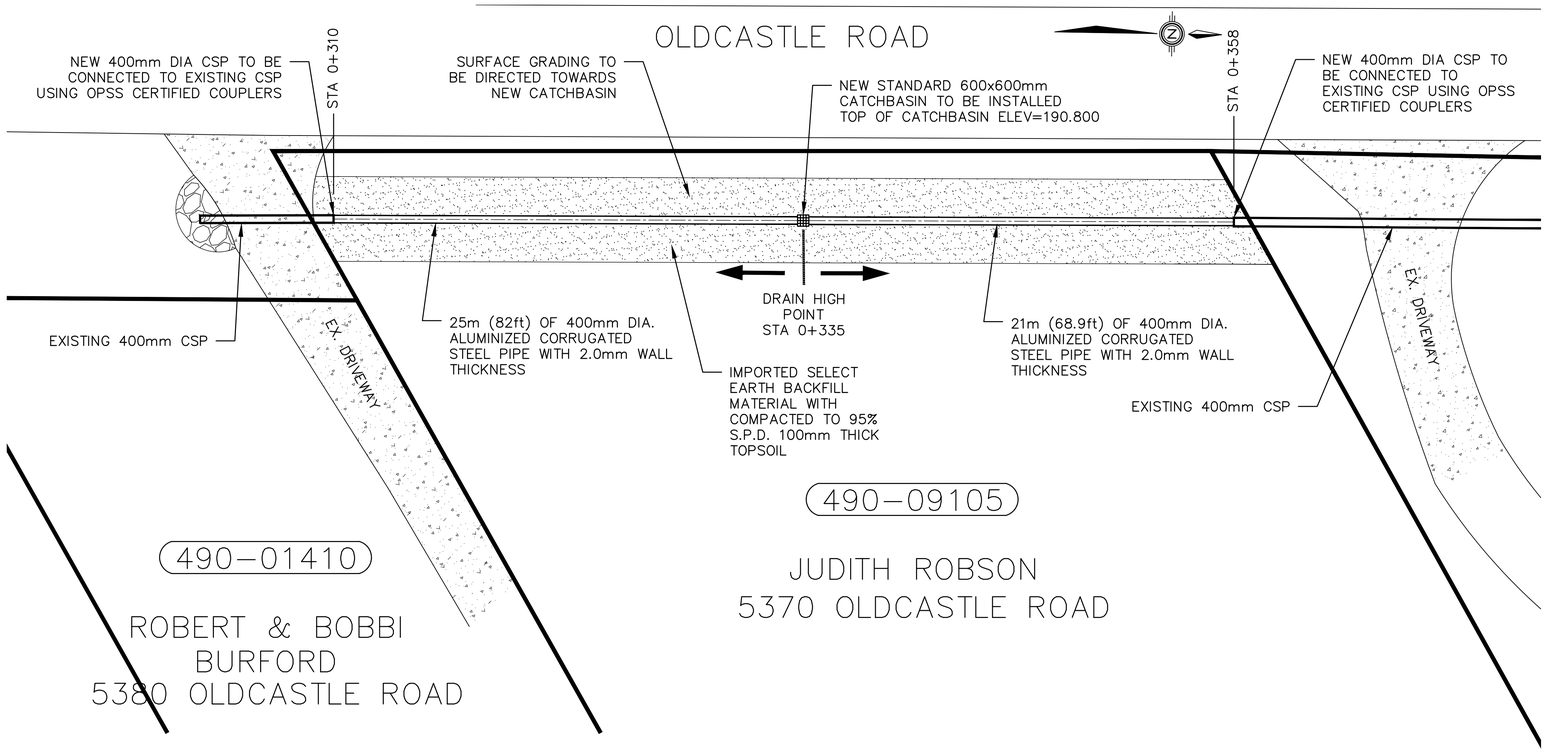
WELLWOOD DRAIN (TOWN OF TECUMSEH)

CULVERT NO. 8 DETAILS (5384 OLDCASTLE ROAD)

PROJECT NO. 15–461

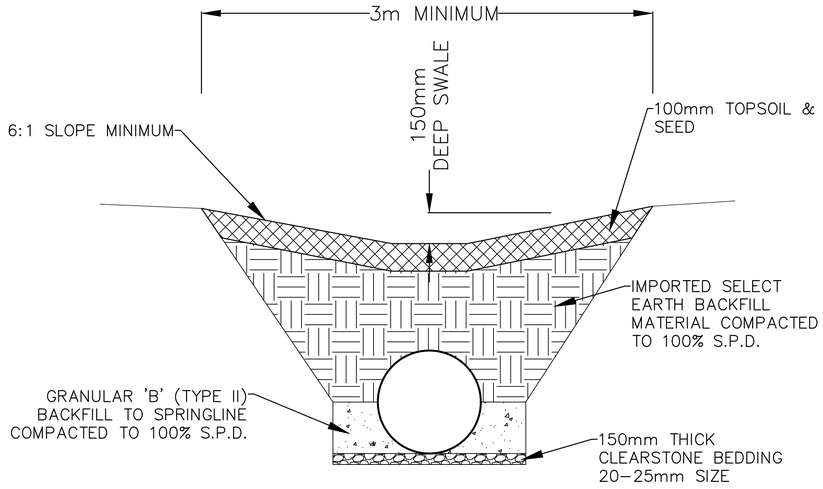
SHEET NO. 8

OF 10



PLAN VIEW DRAIN ENCLOSURE

SCALE: 1:150



SWALE DETAIL (TYPICAL)

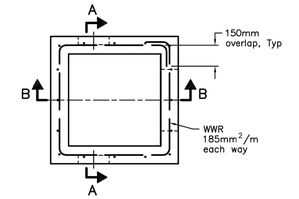
NOT TO SCALE

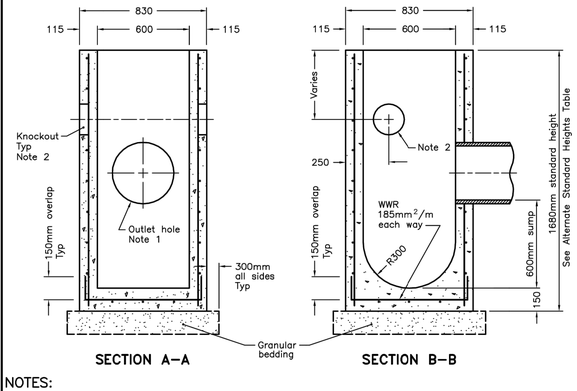
DESCRIPTION	JUDITH ROBSON DRAIN ENCLOSURE
BRIDGE LOCATION (STA)	0+310 TO 0+335
INVERT ELEV. U/S END (m)	190.310
INVERT ELEV. D/S END (m)	190.275
CULVERT MATERIAL	CSP HEL-COR
WALL THICKNESS	2.0mm
CORRUGATION PROFILE	68x13mm (2.7x0.5")
CULVERT LENGTHS	25m (82 ft)
CULVERT ENDWALL TYPE	N/A

DESCRIPTION	JUDITH ROBSON DRAIN ENCLOSURE
BRIDGE LOCATION (STA)	0+335 TO 0+358
INVERT ELEV. U/S END (m)	190.310
INVERT ELEV. D/S END (m)	190.225
CULVERT MATERIAL	CSP HEL-COR
WALL THICKNESS	2.0mm
CORRUGATION PROFILE	68x13mm (2.7x0.5")
CULVERT LENGTHS	22.5m (73.8 ft)
CULVERT ENDWALL TYPE	N/A

BENCHMARK DESCRIPTION	ELEVATION
TOP OF NUT ON FIRE HYDRANT AT MUN NO. 5389 OLDCASTLE ROAD	191.944

ALTERNATE STANDARD HEIGHTS	
ALTERNATIVE	DIMENSION
A	1980
B	1830
C	1520
D	1380





NOTES:

1 Outlet hole size 525mm diameter maximum, location as required.
2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
A Centre reinforcing in base slab and walls ±20mm.
B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
D Pipe support shall be according to OPSD 708.020.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3
PRECAST CONCRETE CATCH BASIN 600x600mm		OPSD 705.010

THIS PLAN HAS BEEN REDUCED IN SIZE FOR PRESENTATION PURPOSES AND THEREFORE IT IS NOT TO THE SCALES INDICATED. A FULL SIZE SET OF DRAWINGS IS AVAILABLE FOR REVIEW AT THE TOWN OFFICE

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 261 Shepherd St. E.- Windsor, ON N8X 2K6
Leamington: 18 Talbot St. W.- Leamington, ON N8H 1M4
Chatham: 138 King St. W. Unit 102- Chatham, ON N7M 1E3
Professional Engineers Ontario

LICENSED PROFESSIONAL ENGINEER D. R. McCREADY PROVINCE OF ONTARIO MAY 8, 2019

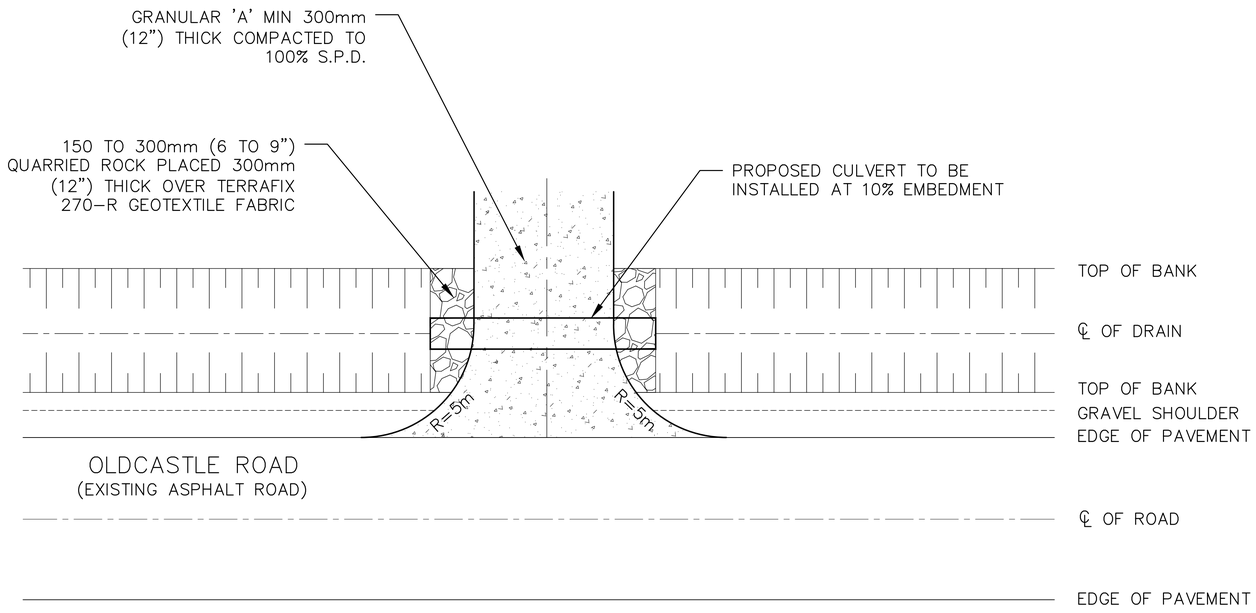
DESIGN	L.Z.
CHECKED	D.M.
DRAWN	M.H.
CHECKED	D.M.
DATE	MAY 8, 2019
SCALE	AS SHOWN

WELLWOOD DRAIN (TOWN OF TECUMSEH)

DRAIN ENCLOSURE
5370 OLDCASTLE ROAD

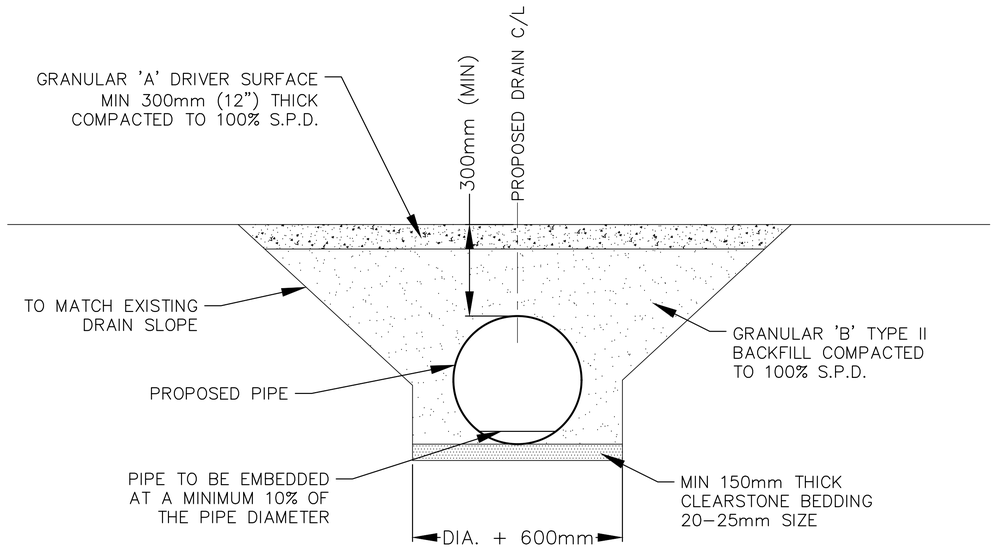
PROJECT NO. 15-461

SHEET NO. 9 OF 10



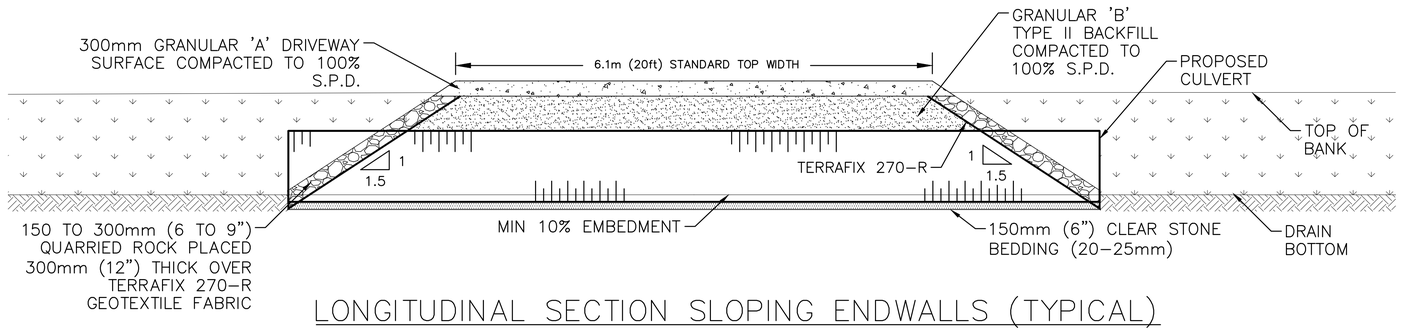
PLAN DETAIL SLOPING ENDWALLS (TYPICAL)

NOT TO SCALE



CROSS SECTION DETAIL (TYPICAL)

NOT TO SCALE



LONGITUDINAL SECTION SLOPING ENDWALLS (TYPICAL)

NOT TO SCALE

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D. R. McCREADY
PROVINCE OF ONTARIO
MAY 8,2019

DESIGN	L.Z.
CHECKED	D.M.
DRAWN	M.H.
CHECKED	D.M.
DATE	MAY 8, 2019
SCALE	AS SHOWN

WELLWOOD DRAIN (TOWN OF TECUMSEH)

CULVERT DETAILS (TYPICAL)

PROJECT NO. 15-461

SHEET NO. 10 OF 10