



Municipality of Middlesex Centre

Komoka Drainage Works, Union Avenue Branch

GMBP File: 519019

July 2021





July 28, 2021
Our File: 519019

Mayor and Members of Council
The Municipality of Middlesex Centre

Re: Komoka Drainage Works, Union Avenue Branch

Mayor DeViet and Members of Council:

We are pleased to present our report on the "Komoka Drainage Works, Union Avenue Branch" serving parts of Lots 4 to 6, Concession 3 to 4 in the Municipality of Middlesex Centre, former Township of Lobo, County of Middlesex.

Authority to prepare this report was obtained by a resolution of Middlesex Centre Council as stated in a May 14, 2019 letter from Dan Anderson, Drainage Superintendent, to appoint GM BluePlan Engineering Limited (GMBP) to prepare an Engineer's Report.

In accordance with your instructions pursuant to a request received by Council under Section 78 of the Drainage Act, R.S.O. 1990, for the request for drainage works improvements, GM BluePlan has held an on-site meeting, undertaken a field survey and prepared for Council's consideration the following Drainage Report, Plan, Profiles and Specifications for this work to be completed on the Komoka Drainage Works, Union Avenue Branch.

We trust that the information contained within will be satisfactory. If there are any questions or concerns please do not hesitate to contact us.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED
Per:

A handwritten signature in blue ink, appearing to read 'Brad Bunke'.

Brad Bunke, P.Eng.
Encl.

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KOMOKA DRAINAGE WORKS, UNION AVENUE BRANCH**THE MUNICIPALITY OF MIDDLESEX CENTRE****JULY 2021****GMBP FILE: 519019**

1. INTRODUCTION

At the request of property owners in the Municipality of Middlesex Centre, Council has appointed GM BluePlan Engineering Limited (GMBP) under Section 78 of the Drainage Act to investigate improvements to be made to the Komoka Drainage Works, Union Avenue Branch (KDW-UAB). The existing drain consists of approximately 170m of closed pipe, approximately 165m of swale adjacent to the closed pipe and approximately 110m of open drain including road culverts across Union Avenue and Komoka Road.

The owner and properties represented on the request are:

Marcus Bergsten	For Pt. Lot 5 Plan 570	Concession 3	Roll No. 020-298-78
Mark Muscutt	For Pt. Lot 5 Plan 570	Concession 3	Roll No. 020-298-81
Kenneth and Katherine Yeo	For Pt. Lot 5 Plan 570	Concession 3	Roll No. 020-298-79
Kelly Chandler	For Pt. Lot 5 Plan 570	Concession 3	Roll No. 020-298-80
Dennis Smith and Chaya Dhinsa	For Pt. Lot 5 Plan 570	Concession 3	Roll No. 020-298-82
John Emin	For Pt. Lot 5 Plan 570	Concession 3	Roll No. 020-298-83
Colin McDonald	For Pt. Lot 5 Plan 113C	Concession 3	Roll No. 020-213

Based on site observations and previous drainage reports, thirty-nine properties have been determined as within the drainage area of the KDW-UAB which includes parts of Lots 4 to 6, Concession 3 to 4 (former Lobo Township), as well as Komoka Road, Melrose Drive and Union Avenue.

2. HISTORY

The Municipality of Middlesex Centre has provided background municipal drain maps and reports.

The Komoka Drainage Works was originally adopted under the Drainage Act through a report prepared by A.M. Spriet, P.Eng. dated March 29, 1974. The report provided for Drain No. 1, Drain No. 2 and Drain No. 3 of the Komoka Drainage Works to serve the developed areas (at the time of the report) in the Village of Komoka. Under this report, Drain No. 1 consisted of approximately 579m of 250mm to 525mm diameter concrete pipe with an outlet into a pond in the Municipal gravel pit, Drain No. 2 consisted of approximately 2,148m of 250mm to 825mm diameter concrete pipe and 1,300m of open drain with an outlet into the Crow Creek Drain (Waters Arnold Municipal Drain), and Drain No. 3 consisted of approximately 2,201m of 250mm to 1200mm diameter concrete pipe and 762m of open drain with an outlet into the Crow Creek Drain (Waters Arnold Municipal Drain). Drain No. 3 replaced a portion of the downstream extent of the Frank Drain.

The KDW-UAB was constructed through a report prepared by M.P. DeVos, P.Eng. dated October 10, 2006 (revised by Tribunal March 6, 2007). The report provided for the construction of approximately 170m of 450mm to 750mm diameter concrete and PVC pipe, approximately 165m of swale adjacent to the pipe and approximately 110m of open drain, including CSP road culverts across Union Avenue and Komoka Road. The KDW-UAB provided an outlet for the Komoka Station Park Development (development) stormwater management system in part of Lot 5 Concession 3, as well as an

outlet for upstream lands in parts of Lots 4 to 6, Concession 3 to 4 to flow through the development. The KDW-UAB outlets to the Komoka Drainage Works, Drain No. 3, with overflow using the Frank Drain as an outlet.

3. PROCEEDINGS UNDER THE DRAINAGE ACT

The Drainage Act is a vehicle by which a drainage scheme can be constructed and the cost raised by local special assessment. That is, the cost is assessed in varying proportions to lands within the watershed, as a one-time charge over and above any taxes paid. Maintenance of the drain is likewise charged to the watershed, often in the same proportions as the original construction.

The Act has evolved over many years and attempts have been made to balance the rights of the individual against the benefits of the construction of drains that involve more than one property. The Act recognizes that perfect agreement is not possible in every case and provides a number of proceedings that give owners and others the opportunity to influence the outcome.

This Report is one of those proceedings. To aid in the understanding of the process listed below in chronological order are typical proceedings with the notation "Completed" beside those which have been completed. This listing is a summary of many but not all parts of the Drainage Act and applies to the ordinary course of events. Further proceedings are available, and for these the Drainage Act should be consulted directly.

1. Submission of a Request. *Completed.*
2. Notification of the Project to the Upper Thames River Conservation Authority (UTRCA). *Completed.*
3. Engineer appointed. *Completed.*
4. On-site meeting. *Completed.*
5. Preparation of Report. *Completed.*
6. Report considered by Council and a By-Law is adopted.
7. Court of Revision convened to consider and deal with appeals on assessment if necessary.
8. Appeal is available from the decisions of the Court of Revision and on other matters to the Ontario Drainage Tribunal.
9. Disposition of appeals by the Tribunal, or if none, final passage of the By-Law, which establishes the drain in law and authorizes construction.
10. Construction of Municipal Drain improvements.
11. Levying and collecting of assessments.

4. ON-SITE MEETING

In accordance with Section 9(1) of the Drainage Act, R.S.O. 1990 an on-site meeting was held on July 4, 2019. The meeting was scheduled to take place at 9:00 am on Union Avenue approximately 20m east of Komoka Road. Persons recorded to be in attendance were:

Brad Bunke, P.Eng.	GM BluePlan Engineering Limited (GMBP)
Brendan Shapton	GM BluePlan Engineering Limited (GMBP)
Dan Anderson	Municipality of Middlesex Centre (MC)

Karen Winfield	Upper Thames River Conservation Authority (UTRCA)
Cari Ramsey	Upper Thames River Conservation Authority (UTRCA)
Andy Noorenberghe	S Pt. Lot 4 Concession 4 (020-357)
Bob McAuley representing Schlegel Poultry Inc.	S Pt. Lot 6 Concession 4 (020-354)
Paul McDermontt	Pt. Lot 5 Concession 3 (020-213-04)
David & Jacqueline Elder	S Pt. Lot 4 Concession 4 (020-358)
Walter & Lori Ferguson	Pt. Lot 5 Concession 3 (020-213-01)
Jane Campbell representing Carol Campbell & Campbell Hillview Farm Corp.	Pt. Lot 5 Concession 3 (020-231-02) N Pt. Lot 5 Concession 3 (020-231-01)
Lenora Fournie; also representing Campbell Hillview Farm Corp.	Pt. Lot 5 Concession 3 (020-231-03) N Pt. Lot 5 Concession 3 (020-231-01)
Michael Grasby	Pt. Lot 5 Concession 3 (020-213-06)
Joseph Carter	Pt. Lot 5 Concession 3 (020-213-03)
Mark & Janice Mishriky	N Pt. Lot 4 Concession 3 (020-341) N Pt. Lot 4 Concession 3 (020-232)
Marcus Bergsten & Heidi McColl	Pt. Lot 5 Concession 3 (020-298-78)
Walter Ferguson	Pt. Lot 5 Concession 3 (020-231-01)
Dennis Smith	Pt. Lot 5 Concession 3 (020-298-82)
Adam Stallaert	Pt. Lot 5 Concession 3 (020-230-01)
Ken & Katherine Yeo	Pt. Lot 5 Concession 3 (020-298-79)
Kelly Chandler & Jennifer Jackson	Pt. Lot 5 Concession 3 (020-298-80)
Mark Muscutt	Pt. Lot 5 Concession 3 (020-298-81)

A handout was distributed which described the procedures under the Drainage Act, steps already taken by Council in appointing an Engineer, a map of the relevant part of the watershed, and results of the investigation to date.

Landowners provided the following pertinent comments and observations:

Andy Noorenberghe stated that any improvements on the drain would have to extend to his property for him to benefit. He also stated that he has no drainage concerns on his property.

Bob McAuley (on behalf of Schlegel Poultry Inc.) stated that their property is the high point and everything flows downhill. He also stated that there are no improvements required for their property at this time.

Paul McDermott stated that he is concerned that the drain is being addressed today when he believes it should have been addressed in 2006. He also stated that the volume of water has increased coming across the railway and that he believes, other than changes in farming practices, there has been no change upstream of the railway.

David & Jacqueline Elder inquired if the previous engineering companies are responsible for existing conditions and if they will be approached for this project. They noted that the water table fluctuates in Komoka. They also stated that they have no drainage concerns, other than cost concerns including for themselves and upstream farms.

Walter & Lori Ferguson stated that they have no drainage issues. They also stated that the work will be a large cost for something that does not affect them.

Jane Campbell stated that they planted 6,000 trees and grasses (on the north side of the railway) which assists in catching silts and that if they were to ever till the grassed area it will flood people out downstream. She stated that in 2006 she said to not develop that land as it will flood and that the houses and drain should never have been built. She also stated that in 2006 the drain changed the direction of water to direct it to the drain. Ms. Campbell noted that there is a 2007 tribunal report for this drain. She stated that she believes the previous engineering companies and developer should be at this meeting. She also stated that landowners are frustrated with the Municipality on this project and that landowners will not pay any money for these improvements. She also stated that the roadside ditches on Melrose Drive have changed and are contributing more water. Ms. Campbell concluded by stating that she believes that no improvements are needed.

Lenora Fournie stated that she was against the land being developed. She stated that her uncle previously owned the development land and never cropped it because of erosion. She inquired why Melrose Drive was ditched recently. She also stated that she will not pay an assessment on the project and there has only been damage to her property since the development. She agreed with Ms. Campbell and she believes no improvements are needed.

Michael Grasby stated that he believes no improvements are needed. He stated that he has lived there since 1981, the ground is sandy soil and has never had water issues before development. He also stated that after they started building, water was ponding on the yards and the water pressure caused his basement floor to crack. Mr. Grasby stated that there are no issues now and the water is flowing through the drain and that at this point there is no reason for any change to the drain. He also stated that once they develop the property with the Frank Drain, he believes the water backing up will be worse.

Joseph Carter stated that he has lived there for 4 years and that there is a creek flowing through the backyard which has heavier flow in the fall and spring. He stated that the land is dry and drains quite well. He also stated he has no drainage issues.

Janice (and Mark) Mishriky stated that there is a natural wetland at the railway tracks and she would like to maintain it. She stated that there is grass and forest on her property and she plans on preserving these as well. She also stated that she believes the wetland and forests need to be maintained to mitigate flooding. Ms. Mishriky stated that they are not cropping some land and 5 years ago they planted 30 acres with trees. She stated that she believes no improvements are needed.

Marcus Bergsten & Heidi McColl stated that they see a lot of water coming through the drain by the house and that they were told the swale only fills up in a 100-year storm. They stated that their house is high up compared to others and that their sump pump runs often. They also stated that they spend time keeping the ditch clean, including cleaning catch basins, removing brush, logs, overgrown weeds, and when the Municipality completes maintenance it does not look as nice. They stated that erosion occurs in the drain and they fill it in. They also stated that water will stay in the drain for weeks during the spring. They stated that the downstream field which is planned for development is always wet.

Walter Ferguson stated that he wants to leave things alone and wants to keep some water on his property. He stated that they planted trees along the ditch on their property to keep erosion down and they love the ditch. He also stated that he is not interested in costs and any costs should go back to the people who designed the development. Mr. Ferguson stated that he has no other concerns.

Dennis Smith stated that he is concerned with the water flow through the swale since they built their house. He stated that when they were sold the property the sales pitch was only a small amount of water would be in the swale. He also stated that the swale flows after a heavy rain, not just in spring and fall, and that water goes through the swale fast enough to sweep away a young child and that he understands the 100-year storm does not include snow thaw and melt. Mr. Smith stated that he believes the drain was designed poorly in 2006, that 80-90% of the water goes through the

swale and the grate at the upstream catch basin is never cleaned. He stated that his sump pump runs every day and that the drain is a safety issue to himself and other homeowners. He also stated that upstream farmers have a history of different fixes for water issues that are easy for them but have impacts on properties downstream, and that he does believe a fix to the problem is going across the road (Komoka Road). Mr. Smith stated that the drawings from UTRCA have water right at the back of the property and that he does not have faith in the previous engineering drawings. He stated that the swale affects insurance for his house, and that he believes the only solution is to pipe the water.

Adam Stallaert stated that he has lived at the property for 33 years and has never had a water problem. He stated that as a child the development property was full of water in the spring. He also stated that the pond on Pt. Lot 5 Concession 3 (Roll No. 020-213) fills up and if the swale is blocked, the water comes onto his property and floods his shed, and he would like this addressed.

Ken & Katherine Yeo stated that the water is worse in the last 5 years and have similar comments to Dennis Smith and Marcus Bergsten. They stated that they are concerned with the volume of water in the swale and that the swale is constantly running water. They also stated that water is at the top of the swale at the fence and fence boards have rotted out which they have replaced. They stated that the water going downstream goes in both directions (Komoka Drain No. 3 and Frank Drain) and that once the new development is built across Komoka Road they believe it is going to get worse. They also stated that it would be good if the flow could be underground and straight across the road (Komoka Road), with a pipe to handle every rain event.

Kelly Chandler (& Jennifer Jackson) stated that their house is for sale and cannot sell the house with a crack in the foundation and no back yard. He stated that the water table has risen and his sump pump runs all the time. Mr. Chandler stated that there is a river going between the houses and water goes into the basement window. He stated that he has the same problems as Dennis Smith and Marcus Bergsten. He stated that with a developer wanting to develop the downstream land (west of Komoka Road), they could pay to fix the issues, and that no permits could be issued until the developer pays.

Mark Muscutt stated that he is looking for a solution that will not affect the day to day use of his yard. He stated that he spoke to a lawyer who said the swale should only flood under a 1 in 100 year storm. He also stated that he believes the fence is designed incorrectly. Mr. Muscutt stated that the developer changed the flow swale direction on his developer lot (Pt. Lot 5 Concession 3 – Roll No. 020-298-85) to go to the swale. He stated that there is a tree in the middle of the ditch downstream and inquired why this hadn't been addressed. He also stated that he believes the solution is to put a square culvert across the swale. He also stated that the landowners shouldn't have to pay to fix this problem.

Karen Winfield stated that UTRCA is reviewing the developer's (west of Komoka Road) functional service report. She stated that they provide comments to the Municipality but do not approve the development. She also stated that there are no watercourses or wetland on the proposed development. She stated that UTRCA can provide comments on the link between the two projects.

In concluding the on-site meeting, it was the consensus of the landowner group that GMBP would review and provide a series of drainage improvement options along with associated cost estimates for consideration by the affected parties.

5. DESIGN AND TECHNICAL MEMO PREPARATION

Following the on-site meeting, work was undertaken to complete a series of improvement options for the KDW-UAB which included background review, hydraulic analysis, preparing draft design drawings, preliminary estimates of cost and project assessments. This work was summarized within a Technical Memo to be used as a basis for discussion at the forthcoming design review meeting.

6. DESIGN REVIEW MEETING AND LANDOWNER INFORMATION PACKAGE

A design review meeting was held on October 20, 2020 to review and discuss the potential improvement options with landowners prior to finalizing the report. As the properties which back onto the KDW-UAB are the most impacted by the improvement options, in combination with the COVID-19 gathering restrictions at the time, only the landowners whose properties back onto the KDW-UAB were invited to attend. The meeting was scheduled to take place at 2:00pm at the Coldstream Community Centre at 10227 Ilderton Road, Ilderton, Ontario. Persons in attendance were:

Brad Bunke	GM BluePlan Engineering Limited (GMBP)
Brendan Shapton	GM BluePlan Engineering Limited (GMBP)
Dan Anderson	Municipality of Middlesex Centre (MC)
Rob Cascaden	Municipality of Middlesex Centre (MC)
Russell Angeles	Pt. Lot 5 Concession 3 (020-298-80)
Mark Muscutt	Pt. Lot 5 Concession 3 (020-298-81)
Dennis Smith	Pt. Lot 5 Concession 3 (020-298-82)
Heather Loedige	Pt. Lot 5 Concession 3 (020-298-84)

A handout was distributed which described the procedures under the Drainage Act and steps already taken to date. Brad Bunke, P.Eng., from GMBP reviewed the project history to date, steps taken to reach this stage of the project, and presented draft design, draft cost estimates and draft assessments for five improvement options for the KDW-UAB.

The five improvement options presented at the meeting generally included;

- Option No. 1 – Do Nothing (maintain existing conditions)
- Option No. 2 – Drain Maintenance
- Option No. 3 – Improvements to the Closed (pipe) System
- Option No. 4 – Improvements to the Open (swale) System
- Option No. 5 – Enclosure of the Open System

Each of the options were then reviewed in detail with landowners providing the following pertinent comments:

Mark Muscutt stated that he has owned the property since 2008 and expressed concern with the original construction – including that the stone beneath the swale was not installed and styrofoam insulation was not installed above the 600mm diameter pipe. He continued in additionally stating that his home is within a no build zone and that he felt water within the swale twice per year is okay, but five to six times per year is too frequent.

Heather Loedige and Dennis Smith both similarly remarked that their homes may be built too close to the drain based on the UTRCA flood mapping. Mr. Smith stated that if the (upstream) catch basin was lower, the catch basin would be the first point of entry for the water, not the swale. He stated that debris accumulation is an issue and when he cleans the debris off the catch basin grate, more water enters the catch basin.

Concluding the meeting, Brad Bunke reiterated that landowner feedback on the drainage improvement options presented today would be appreciated and is being requested prior to finalizing the report. Understanding that several landowners with property backing onto the drain were not in attendance at this meeting, Mr. Bunke additionally stated that GMBP would prepare and distribute an information package to landowners in an effort to solicit additional feedback and preferred scope of work moving forward with the report. Mr. Smith volunteered to assist with the distribution of this package.

An information package was assembled including a copy of the design review meeting presentation and a cover letter explaining the feedback being requested as well as next steps in the process. This package was distributed on October 30, 2020 to the same landowners previously invited to the design review meeting with a request that feedback be provided to GMBP by December 1, 2020.

Two of the seven landowners receiving this package provided comments. These received comments are summarized below.

Heather Loedige stated that she believes the roadside ditch downstream of Union Avenue requires a cleanout and that yard waste has been placed in the ditch. She noted that it appears the CSP beneath Union Avenue has settled. She

stated that she would be in favour of improvement Option No. 2 (maintenance to the swale and review potential improvements to the upstream catch basin).

John Emin and Vanessa Hachez (Pt. Lot 5 Concession 3; Roll No. 020-298-83) stated they are leaning towards favouring improvement Option No. 2 (maintenance to the swale and potential improvements to the upstream catch basin).

7. FINDINGS

Based on the information obtained at the on-site meeting and the design review meeting, we understand that the residential landowners are concerned with the volume, velocity, depth and frequency of water in the swale during rain events. We also understand that the existing KDW-UAB was designed to convey water in the closed pipe prior to the swale. We have made an examination of the drainage area and determined that if these properties are provided with an improved upstream catch basin location, elevation and inlet size, water can be better directed to the closed pipe of the KDW-UAB.

Based on site observations, localized high points are present within the swale bottom. As part of the work, these localized high points should be excavated to improve grades within the swale.

These catch basin modifications and localized excavation work proposed within the swale are in-line with Option No.2 – Drain Maintenance. This report has proceeded on this basis.

8. BASIS FOR DESIGN

It is reported by landowners that the upstream catch basin is not the primary location where water first enters the KDW-UAB due to its location and elevation. Therefore, GMBP has selected to improve the location, elevation and inlet size of the upstream catch basin. The intent is to have water directed to the catch basin and into the piped system at a greater frequency by providing an improved position/elevation and a greater hydraulic opening to capture water originating from upstream lands.

It is important to understand that these modifications are not to provide for an increase in overall system capacity, but to better direct water to the closed pipe portion of the KDW-UAB. The capacity of the KDW-UAB remains as outlined in the Engineer's Report prepared by M.P. DeVos, P.Eng. dated October 10, 2006 (revised by Tribunal March 6, 2007).

The excavation of the localized high points within the swale are minor in scope and should be considered as maintenance. This work will therefore not result in any tangible increase in the overall system design capacity.

9. ENVIRONMENTAL CONSIDERATIONS

This Drain will be subject to the review of the UTRCA, the Department of Fisheries and Oceans (DFO), and consideration under the Species-at-Risk Act.

The proposed work is located within the UTRCA regulated areas. A copy of this report will be sent to UTRCA with a view to obtaining approval for construction.

The ultimate outlet for the KDW-UAB is Komoka Drainage Works, Drain No. 3 located approximately 1.3 km downstream. GMBP has reviewed the available DFO mapping tools for aquatic species listed under SARA. Based on this mapping, there is no indication of extirpated, endangered or threatened aquatic species, special concern aquatic species or critical habitat for extirpated, endangered or threatened aquatic species in the project area or open drain of the Komoka Drainage Works, Drain No. 3. Based on this mapping, the Komoka Drainage Works, Drain No. 3 is a DFO Class F drain. As no work is proposed at the open drain of the Komoka Drainage Works, Drain No. 3 and the proposed work is on a swale and closed drain of the KDW-UAB located on existing residential lands, review by DFO should not be required.

As a preventative measure to mitigate risks to migratory birds protected under the Migratory Birds Convention Act, 1994, no tree, vegetation or brush removal and associated work shall occur between March 15th and August 31st (inclusive) of any given year, unless approved by a qualified biologist.

Although the exact views of these agencies cannot be known in advance, the environmental impacts are thought to be slight. This project is anticipated to have no permanent adverse impact on any species, as it intends to continue land use in the watershed as residential lands.

10. RECOMMENDATIONS FOR THE KOMOKA DRAINAGE WORKS, UNION AVENUE BRANCH

It is our recommendation that:

1. The existing portion of the KDW-UAB from the catch basin at Sta. 1+007 to the manhole at Sta. 1+019 be replaced along the route shown on the drawings. The KDW-UAB replacement shall consist of approximately 12m of twin 375mm diameter HDPE pipe.
2. One (1) 600mm x 2700mm new ditch inlet catch basin be installed at Sta. 1+007 as shown on the drawings to serve as an inlet for surface water and provide maintenance access. The ditch inlet catch basin will be complete with rock protection on geotextile to control erosion.
3. The existing manhole at Sta. 1+019 remain. The twin 375mm diameter HDPE pipe shall be connected to the existing manhole, complete with any reducers, fittings, adaptors, cement parging and finishing required for the connection.
4. A total of approximately 66m of swale be excavated to remove localized high points as maintenance. The excavated material shall be removed and disposed of off-site.

The drawings included with the Report show the extent of the work, land affected, profile of the tile and other details of the work. The plan shown on Drawing No. 1 – Komoka Drainage Works, Union Avenue Branch Plan gives the area considered to be in the drainage area of the work proposed.

During construction, contingencies may arise and will be dealt with as determined by the Engineer and included as part of construction. There will be no special assessments for contingencies. Common contingencies are clear stone bedding, tile connections and extra effort to deal with poor soil conditions.

11. WORKING AREA

The working area for construction purposes shall be a width of 9m located within the swale. The working area for maintenance purpose for shall be in accordance with the report prepared by M.P. DeVos, P.Eng. dated October 10, 2006 (revised by Tribunal March 6, 2007). The working area for construction and maintenance is summarized in the table below.

Table 1 – Working Area for Construction

Drain Stations	Working Width Measured From	Construction Working Width (m)
Sta. 1+000 to Sta. 1+113	North fence	9m to the South
Sta. 1+113 to Sta. 1+125	East top of bank	9m to the West
Sta. 1+125 to Sta. 1+156	East retaining wall	9m to the West

Access to the working area shall be from Komoka Road and Union Avenue. Each Landowner on whose property the drainage work is to be constructed shall designate access to and from the working area at the time of construction or upon failure to do so, the Engineer or Drainage Superintendent, as the case may be, shall designate access. The existing retaining walls, fences, sheds, gardens, armour stone, patios and any other obstructions within or adjacent to the working area shall be removed, salvaged, reinstalled and protected, and not damaged or disturbed by the Contractor as outlined in the special provisions.

12. WATERSHED CHARACTERISTICS

The Drainage Area comprises approximately 113.55 hectares. Land use within the watershed is primarily agricultural and land use within the working area is primarily residential.

Specific land uses within the watershed are as follows:

Agricultural	- 98.07 ha
Roadway	- 5.94 ha
Railway	- 1.49 ha
Residential	- 7.97 ha
Bush	- 0.08 ha

13. ALLOWANCES

Various allowances are considered part of a Municipal Drain. The Drainage Act provides in Sections 29 to 33 that the Engineer is to allow in money for the value of several items, as follows:

a) Section 29 – Right-of-Way

The Drainage Engineer is to provide for an allowance to be paid to the landowner whose land is proposed to be used for construction of the new drainage system. While the lands used for the Drain are still legally owned by the landowner on title, the Drainage Act creates a “Statutory Easement” which allows for future access for maintenance and repair purposes. The Act requires the landowner to be compensated for the value of the land.

We understand that as per the October 10, 2006 (revised by Tribunal March 6, 2007) report prepared by M.P. DeVos, P.Eng., landowners have previously been provided an allowance for Right-of-Way. Therefore, no Right-of-Way allowance has been provided as part of this report.

b) Section 30 - Damages

The Drainage Engineer is to provide for an allowance to be paid to the landowner of land that may be damaged during construction. Typically, this section refers to agricultural crops, however, it also applies to lawns, ornamental trees and fences.

As all lawn areas are to be restored with topsoil and seed, there are no areas with crops along this portion of the KDW-UAB, retaining walls, fences, sheds, gardens, armour stone and patios will be reinstalled, protected, and not damaged, and any disturbed areas are to be restored to pre-construction conditions, no damage allowances are proposed to be provided.

No damage allowance is to be provided for the removal of any vegetation or obstructions within the Right-Of-Way for future drain improvement, repair or maintenance.

c) Section 31 – Allowance for Existing Drains

As no existing private drains are incorporated as part of this project, no allowance for existing drains is considered appropriate.

d) Section 32 – Allowance for Damage Due to Insufficient Outlet

As sufficient outlet has been confirmed, there is no allowance for insufficient outlet.

e) Section 33 – Allowance for loss of Access

As crossings are provided at each property where crossings were originally provided, no loss of access allowance is considered appropriate.

GMBP has determined that there are no allowances for the KDW-UAB as part of this project.

14. ASSESSMENTS

Section 21 of the Drainage Act requires that the Engineer “*shall assess for benefit, outlet liability and injuring liability, and shall insert in an assessment schedule, in separate columns, the sums assessed for each opposite each parcel of land and road liable therefore.*” On this project, Benefit, Outlet liability and Special Benefit assessments are involved.

Assessment for Benefit is described in **Section 22** of the Act, which states “*Lands, roads, buildings, utilities or other structures that are increased in value or are more easily maintained as a result of the construction, improvement, maintenance or repair of a drainage works may be assessed for benefit.*” As defined in the Act, Benefits to landowners can include higher market value for the property, improved appearance or better control of surface or subsurface water, or any other advantages relating to the betterment of lands, roads, buildings or structures.

Assessment for Outlet Liability is described in **Section 23(1)** of the Act which states “*Lands and roads that use a drainage works as an outlet, or for which, when the drainage works is constructed or improved, an improved outlet is provided either directly or indirectly through the medium of any other drainage works or of a swale, ravine, creek or watercourse, may be assessed for outlet liability.*” Outlet liability is the part of the cost of the works that is required to provide such outlet or improved outlet.

As the excavation of the swale is intended to improve grades, the swale improvements are assessed as per the maintenance assessment in the KDW-UAB report prepared by M.P. DeVos, P.Eng. dated October 10, 2006 (revised by Tribunal March 6, 2007). Under this report 90% of the work is assessed as benefit against the adjacent properties, with the remaining 10% assessed as outlet against upstream lands. Additionally, the benefit assessment for the Komoka Road right-of-way is assessed 60% to Komoka Road and 40% to Union Avenue.

Outlet liability for all roads were calculated using the methodology outlined in “*Outlet Liability Assessment Factors for Highway Rights of Way*”, as published by the Ontario Ministry of Transportation. It was determined that 40% of the right-of-way was developed and that the adjacent soil runoff coefficient (‘C’ factor) was 0.4. As a result the roadways were assigned an Equivalent Area factor of 2.0.

Assessment for Special Benefit is described in **Section 24** of the Act and is defined as any additional work or feature included in the construction, repair or improvement of a drainage works that has no effect on the functioning of the drainage works.

As the drainage improvements to the closed drain are at the request of the residential landowners in part to better direct water to the closed portion of the KDW-UAB, and there is no change in the overall system capacity of the KDW-UAB, the full cost of drainage improvements to the closed drain including new pipe and catch basin are assessed to the adjacent residential landowners as a special benefit under Section 24.

Assessments were determined using a modified “Todgham” method, a method of assessment that is recognized to be a fair and equitable way of dividing costs between the benefitting landowners. This methodology involves assigning Equivalent Area Factors to various types of property which reflect their runoff potential, using Agricultural lands as a base (Ag factor = 1.0). The cost of the drain is divided into logical sections, each property is assigned to a section, and benefit and outlet assessments are determined on a property by property basis, starting at the outlet and working towards the topmost property.

There is no injuring liability assessment on this drain. No property is considered to have riparian rights insofar as assessment is concerned.

Assessments on agricultural lands may be eligible for a one third provincial grant. Neither the availability nor the amount of the grant can be determined in advance.

Should the project not proceed by reason of withdrawal from the petition, costs to date are payable by the petitioners prorated to the assessments contained herein. There is no grant should this happen.

15. COST ESTIMATE

The cost of this Municipal Drain improvement is estimated as **\$131,000** and is raised by assessment from properties within the watershed. A Schedule of Estimated Assessments can be found in **Appendix A**.

GMBP estimates the cost of the KDW-UAB as follows:

COST ESTIMATE - Komoka Drainage Works, Union Avenue Branch Municipality of Middlesex Centre		
Allowances	\$	-
Drain Construction		
Environmental Protection Measures	\$	3,000
Clearing and grubbing, complete	\$	400
Supply 24m of 375mm diameter HDPE pipe	\$	1,600
Install 12m of twin 375mm diameter HDPE	\$	1,700
Supply and install granular 'A' bedding and backfill for HDPE pipe (approx. 65 tonnes)	\$	1,300
Supply and install rigid high density foam insulation	\$	1,600
Supply and install 1 - 2700mm x 600mm ditch inlet catch basin complete with birdcage grate	\$	6,500
Supply and install rock protection (10m ²)	\$	1,000
Salvage existing 1500mm diameter maintenance hole and connect HDPE pipes	\$	3,000
Restore existing swale including seeding and removal of material		
Excavation of swale including removal of material	\$	4,000
Restoration including toposil and seed	\$	6,000
Remove, salvage and re-install rock protection on geotextile filter material	\$	3,000
Remove, salvage and re-install 19mm clear stone infiltration trench complete with geotextile filter material (PROVISIONAL)	\$	1,200
Remove salvage, re-install and protect retaining wall, fences, sheds, gardens, armour stone, patios, etc.	\$	5,000
Allowance for 19mm clear crushed stone	\$	2,400
Contingency Fund at approx. 20% of construction	\$	8,300
Total Estimated Drain Construction Cost	\$	50,000
Non-Construction Costs		
On Site Meeting, Survey, Plan, Profile, and Report	\$	68,000
Tendering, Construction Review, Contract Administration and Grant Application	\$	7,000
Carrying Costs (est. @ 3% for 1 year) & Net HST (1.76%)	\$	6,000
Total Non-Construction Costs	\$	81,000
TOTAL ESTIMATED COST	\$	131,000

*The above costs are estimates only. The final costs of engineering and administration cannot be determined until construction is completed. The above costs also do not include costs to defend the drainage report should appeals be filed with the Court of Revision, Drainage Tribunal and/or Drainage Referee as the extent of the work required cannot be determined. Should additional costs be incurred, unless directed otherwise, the costs would be assessed in pro rata fashion as per the Schedule of Assessments.

16. MAINTENANCE

As per section 74 of the Act, after construction of the improvements the KDW-UAB as described in this Report shall be maintained by Middlesex Centre at the expense of the upstream lands and roads assessed, in the proportions set out in the By-Law which adopts this Report. Any future maintenance or repair costs shall be distributed pro rata in accordance with the KDW-UAB report prepared M.P. DeVos, P.Eng. dated October 10, 2006 (revised by Tribunal March 6, 2007).

Landowners should take note that there is responsibility for landowners to not damage or block flow in the Municipal Drain. Section 80(1) of the Drainage Act states;

"When a drainage works becomes obstructed by a dam, low bridge, fence, washing out of a private drain, or other obstruction, for which the owner or occupant of the land adjoining the drainage works is responsible, so that the free flow of the water is impeded thereby, the persons owning or occupying the land shall, upon reasonable notice sent by the council of the local municipality whose duty it is to maintain and repair the drainage works or by a drainage superintendent appointed by the council, remove such obstruction and, if it is not so removed within the time specified in the notice, the council or the drainage superintendent shall forthwith cause it to be removed, and the cost thereof is payable to the municipality by the owner or occupant of the land."

Any additional costs for future drain maintenance required for or due to the prescience or required removal of trees, vegetation, retaining walls, fences, sheds, gardens, armour stone, patios and any other obstructions within the Right-Of-Way shall be fully assessed to the adjacent landowner.

Any landowners, who have questions as to their rights and responsibilities under the Drainage Act, should contact the Middlesex Centre Drainage Superintendent who can provide additional information and answer any questions that landowners may have.

Regular inspection of the drainage system should be undertaken by the Middlesex Centre Drainage Superintendent. Landowners can assist with the inspection by making regular inspections of the drain as it crosses their property, clearing debris from the drain and culverts if possible, and reporting any problems or concerns to the Drainage Superintendent who can inspect and take any necessary actions.

All of which is respectfully submitted.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED
Per:



Brad Bunke, P.Eng.



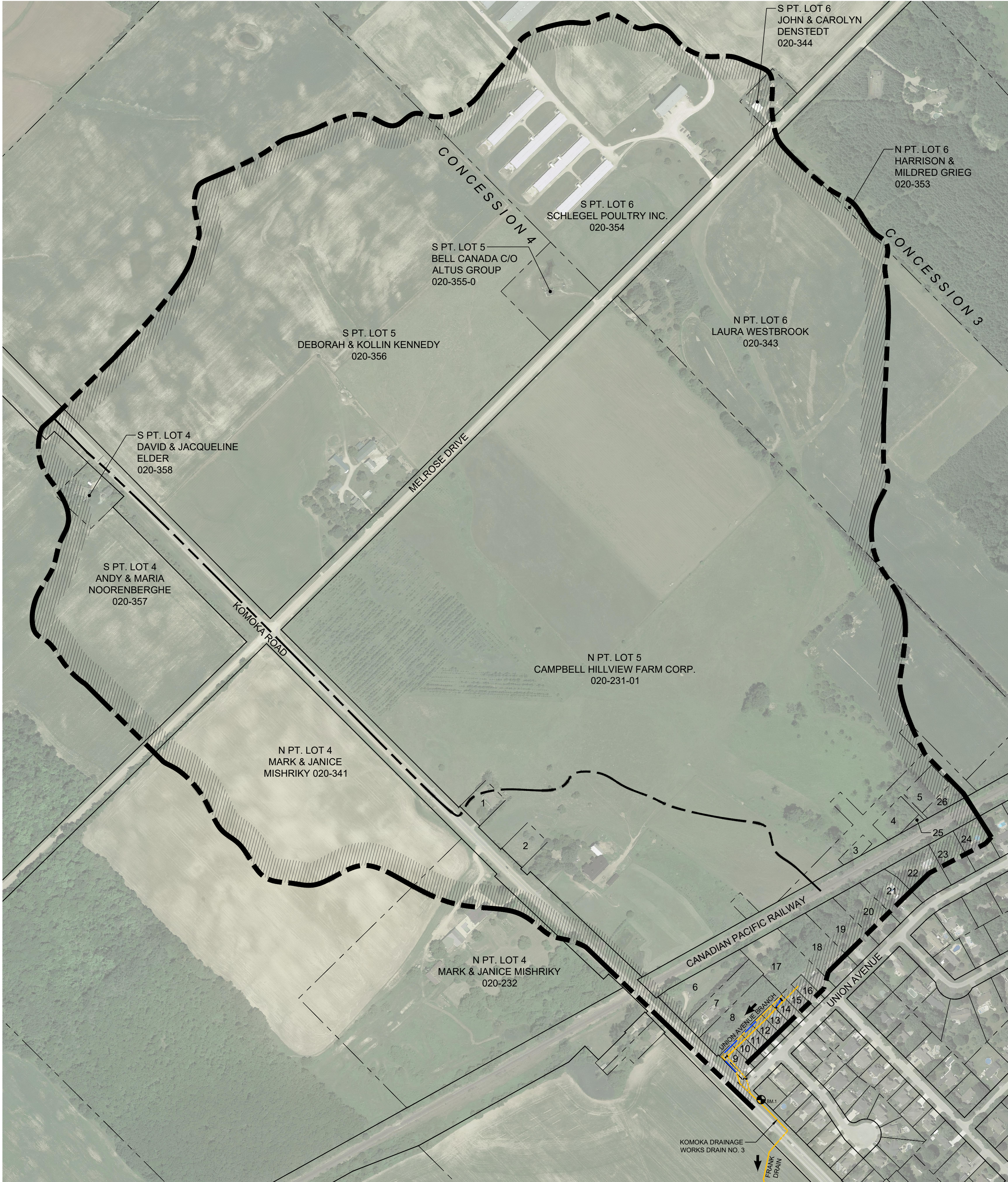
Disclaimer: This report is intended for the sole use of The Middlesex Centre for the purposes as expressed in the report. Any use of or reliance upon this report by third parties is at the expressed responsibility of the third party. GM BluePlan Engineering is not responsible for any damages suffered by any third party as a result of decisions or actions made based upon the information contained in this report.

Appendix A
Schedule of Estimated Assessments for Construction

Schedule of Estimated Assessments Prepared by GM BluePlan Engineering Limited July 2021 Komoka Drainage Works, Union Avenue Branch													
Roll No.	Conc	Lot	Owner	Affected Area		Adjusted Area		Benefit (sect. 22)	Outlet (sect. 23)	Section 24/26	TOTAL ASSESSMENT	Allowances	NET ASSESSMENT ¹
				ac.	ha.	ac.	ha.						
Lands													
020-354	4	S Pt. 6	Schlegel Poultry Inc.	21.84	8.84	21.84	8.84	\$ -	\$ 100	\$ -	\$ 100	\$ -	\$ 100
020-355-01	4	S Pt. 5	Bell Canada c/o Altus Group	2.00	0.81	2.00	0.81	\$ -	\$ 10	\$ -	\$ 10	\$ -	\$ 10
020-356	4	S Pt. 5	Deborah & Kollin Kennedy	59.01	23.88	59.01	23.88	\$ -	\$ 285	\$ -	\$ 285	\$ -	\$ 285
020-358	4	S Pt. 4	David & Jacqueline Elder	9.49	3.84	14.23	5.76	\$ -	\$ 65	\$ -	\$ 65	\$ -	\$ 65
020-357	4	S Pt. 4	Andy & Maria Noorenberghe	11.59	4.69	11.59	4.69	\$ -	\$ 50	\$ -	\$ 50	\$ -	\$ 50
020-341	3	N Pt. 4	Mark & Janice Mishriky	16.31	6.60	16.31	6.60	\$ -	\$ 75	\$ -	\$ 75	\$ -	\$ 75
020-232	3	N Pt. 4	Mark & Janice Mishriky	1.83	0.74	1.83	0.74	\$ -	\$ 10	\$ -	\$ 10	\$ -	\$ 10
020-231-01	3	N Pt. 5	Campbell Hillview Farm Corp.	102.15	41.34	102.15	41.34	\$ -	\$ 495	\$ -	\$ 495	\$ -	\$ 495
020-231-02	3	Pt. 5	Carol Campbell	0.44	0.18	0.67	0.27	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
020-231-03	3	Pt. 5	Lenora Fournie	0.43	0.17	0.64	0.26	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
020-343	3	N Pt. 6	Laura Westbrook	25.55	10.34	25.55	10.34	\$ -	\$ 120	\$ -	\$ 120	\$ -	\$ 120
020-231	3	Pt. 5	Michael Woods & Kim Guest	1.01	0.41	1.51	0.61	\$ -	\$ 10	\$ -	\$ 10	\$ -	\$ 10
020-230-01	3	Pt. 5	Adam & Jessica Stallaert	0.81	0.33	1.21	0.49	\$ -	\$ 10	\$ -	\$ 10	\$ -	\$ 10
020-230	3	Pt. 5	Phillip Ferreira	1.02	0.41	1.53	0.62	\$ -	\$ 10	\$ -	\$ 10	\$ -	\$ 10
020-298-78	3	Pt. 5	Marcus Bergsten & Heidi McColl	0.17	0.07	0.27	0.11	\$ 1,405	\$ 5	\$ 17,760	\$ 19,170	\$ -	\$ 19,170
020-298-79	3	Pt. 5	Angela Edds	0.15	0.06	0.22	0.09	\$ 1,405	\$ 5	\$ 17,760	\$ 19,170	\$ -	\$ 19,170
020-298-80	3	Pt. 5	Natalie & Russell Angeles	0.15	0.06	0.22	0.09	\$ 1,405	\$ 5	\$ 17,760	\$ 19,170	\$ -	\$ 19,170
020-298-81	3	Pt. 5	Mark & Kelly Muscutt	0.15	0.06	0.22	0.09	\$ 1,405	\$ 5	\$ 17,760	\$ 19,170	\$ -	\$ 19,170
020-298-82	3	Pt. 5	Dennis Smith & Chaya Dhinsa	0.15	0.06	0.22	0.09	\$ 1,405	\$ 5	\$ 17,760	\$ 19,170	\$ -	\$ 19,170
020-298-83	3	Pt. 5	John Emin & Vanessa Hachez	0.15	0.06	0.22	0.09	\$ 1,405	\$ 5	\$ 17,760	\$ 19,170	\$ -	\$ 19,170
020-298-84	3	Pt. 5	Heather Loedige	0.15	0.06	0.22	0.09	\$ 700	\$ 5	\$ 8,870	\$ 9,575	\$ -	\$ 9,575
020-298-85	3	Pt. 5	Vincent Zoccano	0.15	0.06	0.22	0.09	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
020-213	3	Pt. 5	Colin & Leisa McDonald	1.16	0.47	1.75	0.71	\$ -	\$ 10	\$ -	\$ 10	\$ -	\$ 10
020-213-01	3	Pt. 5	Walter & Lori Ferguson	0.82	0.33	1.24	0.50	\$ -	\$ 10	\$ -	\$ 10	\$ -	\$ 10
020-213-02	3	Pt. 5	Ross & Marion Monck	0.69	0.28	1.04	0.42	\$ -	\$ 10	\$ -	\$ 10	\$ -	\$ 10
020-213-03	3	Pt. 5	Joseph & Loraine Carter	0.59	0.24	0.89	0.36	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
020-213-04	3	Pt. 5	Paul McDermott & Judy Ashton	0.47	0.19	0.72	0.29	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
020-213-05	3	Pt. 5	Donald & Jane Murray	0.52	0.21	0.79	0.32	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
020-213-06	3	Pt. 5	Michael & Katherine Grasby	0.30	0.12	0.44	0.18	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
020-213-07	3	Pt. 5	Marcella & Gregory Alcock	0.32	0.13	0.49	0.20	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
050-162	3	Pt. 5	Canadian Pacific Railway	3.68	1.49	5.54	2.24	\$ -	\$ 30	\$ -	\$ 30	\$ -	\$ 30
020-231-96	3	N Pt. Lot 5	Fred Van Der Ploeg Construction Ltd.	0.05	0.02	0.05	0.02	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
020-231-94	3	N Pt. Lot 5	Fred Van Der Ploeg Construction Ltd.	0.23	0.09	0.22	0.09	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
020-353	3	N Pt. 6	Harrison & Mildred Grieg	0.20	0.08	0.10	0.04	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
020-344	4	S Pt. 6	John & Carolyn Denstedt	0.42	0.17	0.64	0.26	\$ -	\$ 5	\$ -	\$ 5	\$ -	\$ 5
000-000	3	Pt. 5	Municipality of Middlesex Centre	1.78	0.72	1.78	0.72	\$ -	\$ 10	\$ -	\$ 10	\$ -	\$ 10
Total Estimated Assessment - Lands				265.91	107.61	277.59	112.34	\$ 9,130	\$ 1,405	\$ 115,430	\$ 125,965	\$ -	\$ 125,965
Roads													
		Komoka Road	County of Middlesex	9.09	3.68	18.19	7.36	\$ 2,930	\$ 95	\$ -	\$ 3,025	\$ -	\$ 3,025
		Melrose Drive	Municipality of Middlesex Centre	5.58	2.26	11.17	4.52	\$ -	\$ 60	\$ -	\$ 60	\$ -	\$ 60
		Union Avenue	Municipality of Middlesex Centre	-	-	-	-	\$ 1,950	\$ -	\$ -	\$ 1,950	\$ -	\$ 1,950
Total Estimated Assessment - Roads				14.68	5.94	29.36	11.88	\$ 4,880	\$ 155	\$ -	\$ 5,035	\$ -	\$ 5,035
TOTAL ESTIMATED ASSESSMENTS				280.59	113.55	306.95	124.22	\$ 14,010	\$ 1,560	\$ 115,430	\$ 131,000	\$ -	\$ 131,000

¹Agricultural lands may be eligible for a one third provincial grant. Neither the availability nor the amount of the grant can be determined in advance

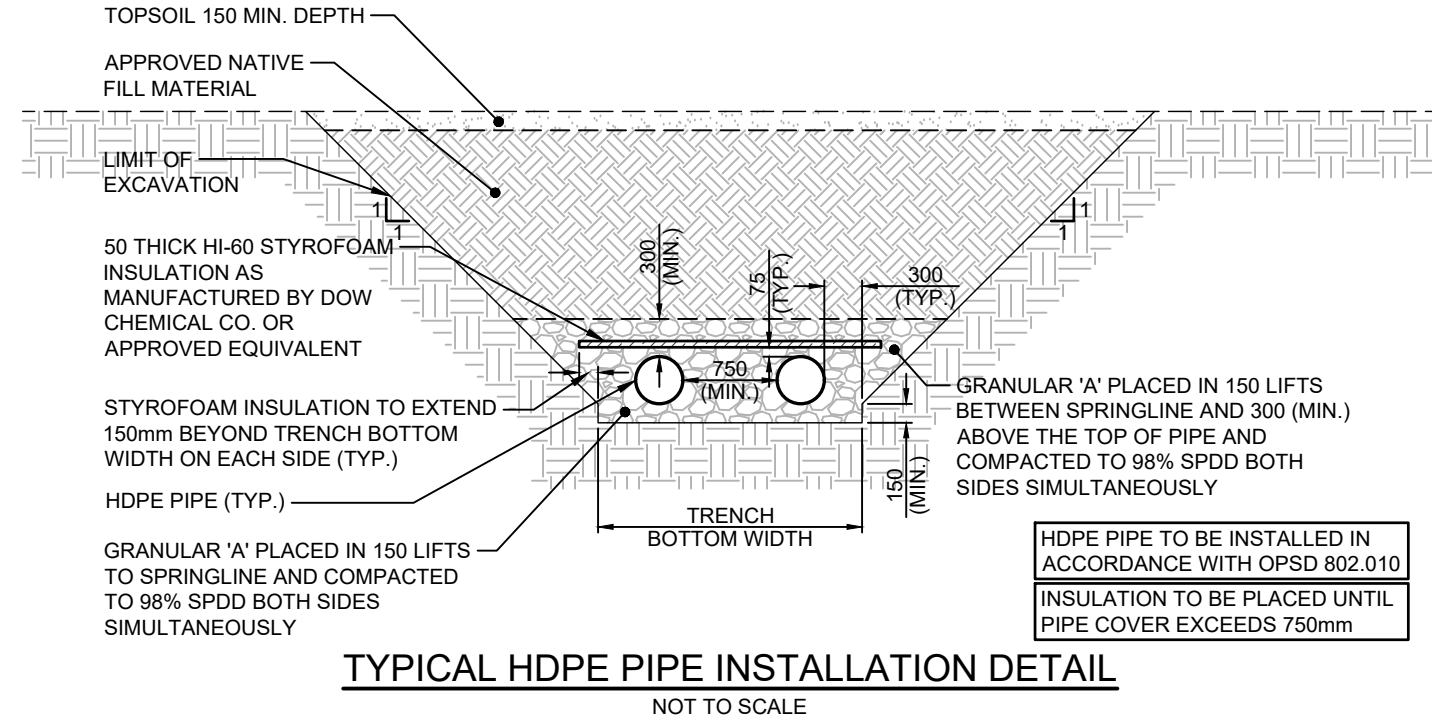
Appendix B Drawings



ENVIRONMENTAL PROTECTION NOTES :

1. THE CONTRACTOR IS TO CONTROL THE PLACEMENT OF STABILIZATION WORKS TO MINIMIZE EROSION AND SEDIMENT TRAVEL IMPACTS DOWNSTREAM.
2. GEOTEXTILE FABRIC SHALL BE INDUSTRIAL POLYPROPYLENE.
3. INSTALLATION OF SILT FENCE SHALL CONFORM TO OPSD 219.110.
4. INSPECTION OF SILT FENCE SHALL BE CONDUCTED DAILY, REPAIRS TO THE FENCE MUST BE COMPLETED IMMEDIATELY AND ANY SECTION OF THE FENCE WHICH DECOMPOSES BEFORE THE END OF ITS EXPECTED USE SHALL BE REPLACED IMMEDIATELY.
5. SEDIMENT TRAPPED IN THE FILTER SHOULD BE REMOVED FOLLOWING EACH STORM AND WHEN THESE DEPOSITS REACH $\frac{1}{2}$ THE HEIGHT OF THE BARRIER.
6. PERFORM WORK IN NO/Low FLOW CONDITIONS TO MINIMIZE SEDIMENT MOVEMENT AND EROSION.
7. ALL WORK SHOULD BE HALTED IF A FORECAST OF SIGNIFICANT RAINFALL IS EXPECTED.
8. PLACE BRUSH, DEBRIS AND SEDIMENT IN SUCH A LOCATION AS TO MINIMIZE ENTRY INTO THE CHANNEL.
9. LIMIT SOIL MOVEMENT AND EROSION; USE APPROPRIATE CONTROL MEASURES BEFORE WORK BEGINS AND INSPECT AND MAINTAIN THOSE MEASURES REGULARLY UNTIL ALL DISTURBED AREAS ARE STABILIZED.
10. ANY AREAS OF DISTURBED OR BARE SOIL AROUND THE DRAIN SHOULD BE SEEDED WITH NATIVE, NON-INVASIVE HERBACEOUS MATERIAL WHILE THE GROUND IS MOIST AND CONDITIONS ARE APPROPRIATE FOR GERMINATION.

NUMBER	LOT	CONC.	PLAN	LAND OWNER	ROLL NUMBER
1	PL LOT 5	3	-	CAROL CAMPBELL	020-231-02
2	PL LOT 5	3	-	LENORA FOURNIE	020-231-03
3	N PL LOT 5	3	113	CAMPBELL HILLVIEW FARM CORP.	020-231-01
4	N PL LOT 5	3	113	CAMPBELL HILLVIEW FARM CORP.	020-231-01
5	N PL LOT 5	3	113	CAMPBELL HILLVIEW FARM CORP.	020-231-01
6	PL LOT 5	3	113	MICHAEL WOODS & KIM GUESTS	020-231
7	PL LOT 5	3	113	ADAM & JESSICA STALLAERT	020-230-01
8	PL LOT 5	3	113, 33	PHILIP FERREIRA	020-230
9	PL LOT 5	3	570	MARCUS BERGSTEN & HEIDI MCCOLL	020-298-78
10	PL LOT 5	3	570	ANGELA EDDIS	020-298-79
11	PL LOT 5	3	570	NATALIE & RUSSELL ANGELES	020-298-80
12	PL LOT 5	3	570	MARK & KELLY MUSCUTT	020-298-81
13	PL LOT 5	3	570	DENNIS SMITH & CHAYA DHINSA	020-298-82
14	PL LOT 5	3	570	JOHN EMIN & VANESSA HACHEZ	020-298-83
15	PL LOT 5	3	570	HEATHER LOEDIGE	020-298-84
16	PL LOT 5	3	570	VINCENT ZOCCANO	020-298-85
17	PL LOT 5	3	113C	COLIN & LISA McDONALD	020-213
18	PL LOT 5	3	981, 113C	WALTER & LORI FERGUSON	020-213-01
19	PL LOT 5	3	981, 113C	ROSS & MARION MONCK	020-213-02
20	PL LOT 5	3	981, 113C	JOSEPH & LORAIN CARTER	020-213-03
21	PL LOT 5	3	981, 113C	PAUL McDERMOTT & JUDY ASHTON	020-213-04
22	PL LOT 5	3	981	DONALD & JANE MURRAY	020-213-05
23	PL LOT 5	3	981	MICHAEL & KATHERINE GRASBY	020-213-06
24	PL LOT 5	3	981	MARCELLA & GREGORY ALCOCK	020-213-07
25	PL LOT 5	3	981	FRED VAN DER PLOEG CONSTRUCTION LTD	020-231-96
26	PL LOT 5	3	981	FRED VAN DER PLOEG CONSTRUCTION LTD	020-231-94



1. CONTRACTOR IS TO OBTAIN UTILITY LOCATES PRIOR TO CONSTRUCTION.
2. CONTRACTOR IS TO CONNECT EXISTING TILES DURING CONSTRUCTION.
3. DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

NOMENCLATURE:	
APPROX. C/W	APPROXIMATE COMPLETE WITH
CB	CATCHBASIN
CONC.	CONCRETE
C	CENTER LINE
CSP	CORRUGATED STEEL PIPE
Ø	DIAMETER
DICB	DITCH INLET CATCHBASIN
ELEV.	ELEVATION
EX	EXISTING
INV.	INVERT
MIN.	MINIMUM
PL	PROPERTY LINE
R	RADIUS
RYCB	REAR YARD CATCHBASIN
STA.	STATION
TYP.	TYPICAL

LEGEND:	
	WATERSHED BOUNDARY
	R.O.W. LIMITS
	PROPERTY LINE
	EX. OPEN DRAIN
	EX. CLOSED DRAIN
	PR. CLOSED DRAIN
	PR. OPEN DRAIN
	DIRECTION OF DRAIN FLOW
	BENCHMARK LOCATION
	EX. CATCHBASIN
	EX. MANHOLE
	PR. DITCH INLET CATCHBASIN

BENCH MARKS :
BM 1 - ELEV = 242.893m
NAIL IN HP, HP EAST OF KOMOKA ROAD,
1st HP SOUTH OF UNION AVE.

THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.
BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO THEM.



4.	2021/07/28	ENGINEER'S REPORT	B.B.
3.	2020/08/21	REVIEW BY MUNICIPALITY	B.B.
2.	2020/06/19	REVIEW BY MUNICIPALITY	B.B.
1.	2019/07/04	ON-SITE MEETING	B.B.
NO.	DATE	REVISION DESCRIPTION	CHKD

BluePlan
ENGINEERING

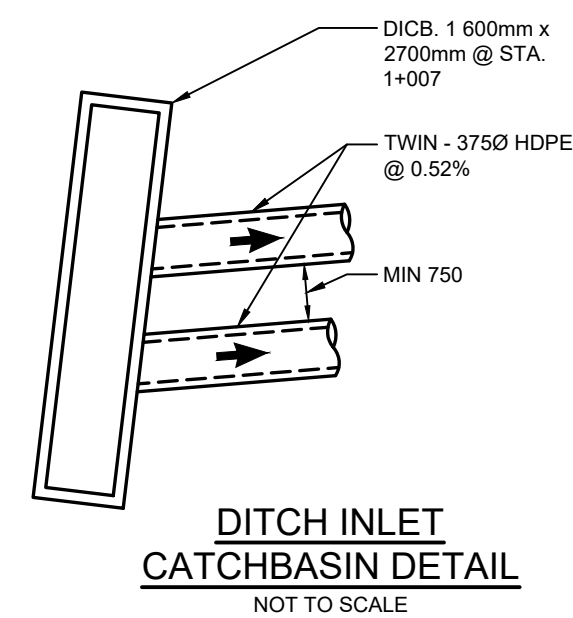
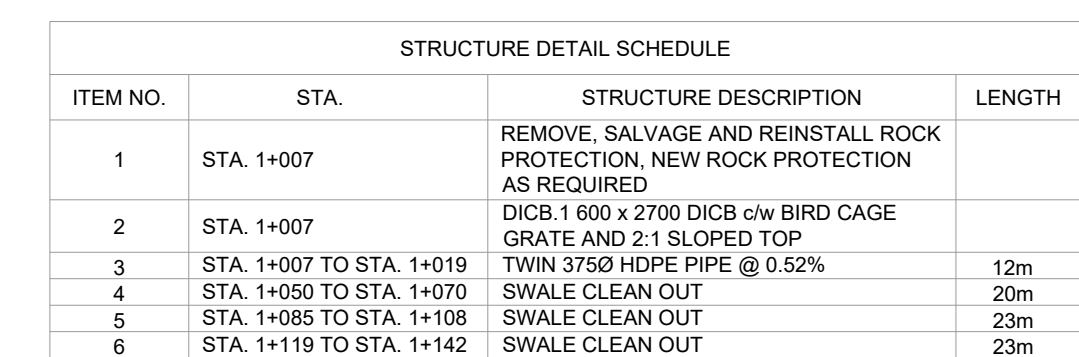
GUELPH | OWEN SOUND | LISTOWEL | KITCHENER | LONDON | HAMILTON | GTA
235 NORTH CENTRE ROAD, UNIT 103, LONDON, ON N5X 4E7
TEL 519-672-5603 www.gripblueplan.ca

KOMOKA DRAINAGE WORKS -
UNION AVENUE BRANCH

MUNICIPALITY OF
MIDDLESEX CENTRE

PLAN

DRAWN BY : B.V.	APPROVED BY : B.B.	PROJECT NO. : 519019	DRAWING NO. : 1
DESIGNED BY : B.S.	DATE : JUNE 2020	SCALE : 1:3000	



- | | |
|---------------|--|
| 1. | CONTRACTOR IS TO OBTAIN UTILITY LOCATES PRIOR TO CONSTRUCTION. |
| 2. | CONTRACTOR IS TO CONNECT EXISTING TILES DURING CONSTRUCTION. |
| 3. | DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. |
| NOMENCLATURE: | |
| APPROX. | APPROXIMATE |
| CB | COMPLETE WITH |
| CATCHBASIN | CATCHBASIN |
| CONC. | CONCRETE |
| Ø | CENTER LINE |
| CSP | CORRUGATED STEEL PIPE |
| Ø | DIAMETER |
| DICB | DITCH INLET CATCHBASIN |
| ELEV. | ELEVATION |
| EXIST. | EXISTING |
| INVERT | INVERT |
| MIN. | MINIMUM |
| R | PROPERTY LINE |
| RADIUS | RADIUS |
| RYCBB | REAR YARD CATCHBASIN |
| STATION | STATION |
| TYP. | TYPICAL |

-
- LEGEND:**
- | | |
|-------------------------|---|
| | WATERSHED BOUNDARY |
| | R.O.W. LIMITS |
| | PROPERTY LINE |
| | EX. FENCE |
| | EX. OPEN DRAIN |
| | EX. CLOSED DRAIN |
| | PR. CLOSED DRAIN |
| | PR. OPEN DRAIN |
| | DIRECTION OF DRAIN FLOW |
| | EX. STRUCTURE - PROFILE |
| | PR. STRUCTURE - PROFILE |
| | EX. CATCHBASIN - PLAN |
| | EX. MANHOLE - PLAN |
| | PR. DITCH INLET CATCHBASIN - PLAN |
| | EX. DECK / STRUCTURE |
| | EX. ROCK PROTECTION |
| | EX. CLEAR STONE WRAPPED IN FILTER CLOTH |
| | PR. ROCK PROTECTION |
| EXISTING GRADE | PROPOSED GRADE |
| PROFILE BAND GRADE TAGS | |

- BENCH MARKS :
BM.1 - ELEV. = 242.893m
NAIL IN HP, HP EAST OF KOMOKA ROAD,
1st HP SOUTH OF UNION AVE.

- THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND ABOVE GROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED.
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4.	2021/07/28	ENGINEER'S REPORT	B.B.
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1.	2019/07/04	ON-SITE MEETING	B.B.
NO.	DATE	REVISION DESCRIPTION	CHKD



KOMOKA DRAINAGE WORKS - UNION AVENUE BRANCH
MUNICIPALITY OF MIDDLESEX CENTRE

PROFILE, SECTIONS AND DETAILS

DRAWN BY : B.V.	APPROVED BY : B.B.	PROJECT NO. : 519019	DRAWING NO. : 2
DESIGNED BY : B.S.	DATE : JUNE 2020	SCALE : AS NOTED	

Appendix C

Special Provisions

**Special Provisions (Non-Tender Items)
For The Construction Of The
Komoka Drainage Works, Union Avenue Branch
The Municipality of Middlesex Centre**

1. STANDARD SPECIFICATIONS

Where reference is made to OPSS or OPSD, the Contractor shall refer to the latest revision of the Ontario Provincial Standard Specifications and the Ontario Provincial Standard Drawings. Where reference is made to OPSS, it shall be assumed to refer to OPSS.MUNI wherever equivalent municipal specifications exist. These specifications and drawings may not be bound within this document. They are available on-line from the Ontario Ministry of Transportation.

All work to be undertaken shall comply with the latest version of OPSS and OPSD, unless superceded by the Special Provisions included herein.

Where in the Specifications the word "Corporation", "Municipality" or "Owner" occurs it shall mean the "Corporation of the Middlesex Centre".

Where in the Specifications the word "Engineer" occurs it shall mean "GM BluePlan Engineering Limited".

2. SALES TAXES

Harmonized Sales Tax (H.S.T.)

The Total Tender Price shall include an allowance for H.S.T., calculated as 13% of the cost of the works as itemized in the Schedule of Unit Prices in the Form of Tender.

This allowance is simply an estimate of the amount of H.S.T. to be paid to the Contractor.

The Engineer will determine the appropriate amount of H.S.T. to be paid on each progress payment and on the final payment, and this amount may be more or less than the "allowance" included in the Total Tender Price.

3. LASER ALIGNMENT

The Contractor shall use a laser beam or equivalent line and grade control methods for laying all drain tile to maintain the on grade and alignment shown on the plans. Batter boards or any other means will not be acceptable. Tile drains shall be laid to a grade not more than +/- 25mm from the alignment as shown on the plans. Tile drains with a vertical variation of greater than 25mm may be rejected by the Engineer, and in that event the Contractor will be required to take up and re-lay those sections of tile drain at their expense.

4. TRENCHES TO BE CLOSED

No trench may be left open at the end of each day unless authorized by the Engineer. Any trench that is to be left open shall be completely fenced off with steel construction fencing. All fencing shall be at the Contractor's expense. If the Contractor neglects to fence a trench, the Engineer shall have the right to have this work done by others and charged to the Contractor.

5. ROAD SIGNS

The Contractor, at his/her own expense, shall carefully remove and satisfactorily replace Municipal Road Signs which must be removed in order to carry out the contract. Where traffic control signs, such as Stop Signs, have to be temporarily or permanently relocated, they shall be immediately reset either temporarily or permanently, as conditions dictate. All temporarily relocated signs shall be permanently reset as soon as site conditions permit. Where replacements are necessary, new signs shall conform to Middlesex Centre Development Standards.

6. DAMAGE TO TREES

A penalty of \$1,000.00 will be levied against the Contractor to be deducted from monies payable under this Contract for each and every tree destroyed or damaged due to the Contractor's carelessness or negligence and which is not designated in the Contract for removal. As to what constitutes the carelessness or negligence on the part of the Contractor, the Engineer's decision shall be final.

7. COORDINATION MEETINGS

The Contractor shall attend such meetings with the Owner, Engineer, landowners and Utility Company Authorities (as necessary) as may be required by the Engineer to co-ordinate services affected by this Contract.

8. DISPOSAL OF SURPLUS OR UNSUITABLE EXCAVATED MATERIAL

All earth material excavated in carrying out the work of the various tender items included in this Contract and which is unsuitable for, or which is surplus to, the requirements for backfill shall be disposed of off-site. Excess material excavated from this site is anticipated not to meet MECP Table 1 criteria. The excess material may be disposed of at a site arranged by the contractor upon receipt of a sign-off by the property owner. The property owner must be aware and must acknowledge that the fill might not pass MECP Table 1 criteria.

All concrete, large boulders and other "solid" materials are to be loaded and hauled separately from the other earth and granular materials and disposed of at an MECP approved site obtained by the Contractor at no cost to the Owner.

The Contractor shall be responsible for complying with O.Reg. 406/19 including, but not limited to, information provided to truck drivers carrying excess soil and planning for environmentally safe transportation. All excess soil and earth material shall be managed, handled and disposed of in accordance with O.Reg. 406/19.

9. COMPACTION

This Contract contains no separate tender item for compaction equipment as may be required to compact the earth or granular materials whether used for embankment construction, base courses, bedding, or backfill.

The Contract prices for the materials to be placed or the work to be carried out shall include full compensation for supplying and operating such compaction equipment as the Contractor may require and for compacting the materials to the specified density.

When it is impractical with the larger types of compaction equipment to obtain the required degree of compaction in areas where working space is limited, the Contractor shall provide and use mechanical hand compaction equipment in order to achieve the specified density.

Granular materials used as bedding shall be compacted to a density of 98% of the maximum dry density, granular backfill or base courses shall be compacted to a density of 100% of the maximum dry density. All other earth materials shall be compacted to a density of 95% of the maximum dry density.

When field tests indicate that the required degree of compaction cannot be obtained with the equipment in use or the procedure being followed, the Contractor's operations shall be halted until the Engineer is satisfied that the Contractor has made such modifications, in his/her equipment and procedure, which will produce the required results.

10. NATURAL GAS CONSTRUCTION SPECIFICATIONS

Where the Contractor is working near natural gas mains the work shall be carried out in accordance with the requirements and specifications of the Gas Company having control over such mains.

11. UTILITY POLE LINES

Where utility poles may have to be supported, the Contractor shall make arrangements with the hydro authority to do this work. There shall be no charge to the Contractor for this work.

12. UTILITIES AND PIPE CROSSINGS

The location and depth of underground utilities shown on the Contract Drawings are based on information received by the Engineer. The position of all pole lines, conduits, watermains, sewers and other underground and over ground utilities and structures is not necessarily shown on the Contract Drawings and where shown, the accuracy of the position of such utilities and structures is not guaranteed. It is the Contractor's responsibility before starting any work to contact the Municipal Authorities or Utility Companies for further information in regard to the exact location of these utilities and to take such other precautions as necessary to safeguard the utilities from damage.

Where pipes and other utilities are encountered in the excavation, these shall be maintained and supported by the Contractor to minimize damage done to them. Prior to backfilling, the Contractor shall submit to the Engineer, for his/her approval, details of the proposed method of support of such pipes and utilities and no backfilling may take place prior to the Engineer's review of such details. Approval by the Engineer of any such details will in no way relieve the Contractor from his/her responsibility to avoid any damage where possible.

13. DAMAGE BY VEHICLES AND OTHER EQUIPMENT

If at any time, in the opinion of the Engineer, damage is being or is likely to be done to any highway or any improvement thereon, other than such portions as are part of the work, by the Contractor's vehicles or other equipment, whether licensed or unlicensed, the Contractor shall, on the direction of the Engineer and at the Contractor's own expense make changes in or substitutions for such vehicles or other equipment or shall alter loading or shall in some other manner remove the cause of such damage to the satisfaction of the Engineer. Where such damage has occurred, the Contractor shall make repairs satisfactory to the Owner or, where the Owner has found it necessary to make the repairs, make payment to the Owner of the cost of repairs carried out by the Owner.

14. SURVEY BARS AND MONUMENTS

The Contractor shall be responsible for replacing all survey bars which are bent, moved, removed, due to carelessness but will not be responsible for survey bars that have to be removed for construction. The contractor shall provide a list of all damaged and removed survey bars to the Engineer.

15. MAINTENANCE OF ROAD

The Contractor shall at all times and at his/her own expense, maintain safely and adequately, all private entrance facilities throughout the length of the Contract.

16. IMPERIAL CONVERSION OF METRIC SPECIFICATIONS

The Standard Specifications governing this work are in metric units. For the purpose of this Contract it is assumed that the metric units shall be hard converted to Imperial units, wherever necessary.

17. CONSTRUCTION HOURS

The Contractor will be allowed to work from 7:00 a.m. to 7:00 p.m., Monday to Friday. Additional hours may be permitted under certain circumstances if approved by the Engineer.

18. MAINTENANCE OF FLOWS

The contractor shall be responsible to maintain all drainage flows during construction. No extra payment will be made for pumping, hauling or disposing of any drainage flow or removing any granular material that enters the drainage system through manhole or catch basin frame adjustments. The contractor will be responsible for maintaining and directing storm water flows during construction so that flooding of private property and silt migration or washouts do not occur. The contractor shall be responsible to pay for any damages caused by storm water flooding due to, or as a result of, construction activities during the duration of this project.

**Special Provisions
For The Construction Of The
Komoka Drainage Works, Union Avenue Branch
The Municipality of Middlesex Centre**

SPECIFICATIONS

The Special Provisions, along with the "*Specifications for the Construction of Municipal Drainage Works*" attached hereto, shall apply to and govern the construction of the "*Komoka Drainage Works, Union Avenue Branch*".

PLAN AND REPORT

The Plan and Profile and the Engineer's Report on the proposed Drainage Works shall be a part of this Specification.

EXTENT OF WORK

General

1. All standard Detailed Drawings are attached to these Specifications.
2. The Contractor shall coordinate a pre-construction meeting with the Owners and Engineer prior to construction. This meeting is not required to be held immediately before construction begins and can be held in advance of construction. The Contractor shall provide at least two weeks notice prior to the pre-construction meeting. No work will be undertaken by the Contractor in advance of this meeting unless otherwise authorized by the Engineer in writing.
3. The Contractor shall notify the Owners and the Engineer forty-eight (48) hours prior to construction.
4. The Contractor shall verify the location of the new tile drains with the Engineer and the landowners prior to construction.
5. The working area for construction purposes shall be a width of 9m located within the swale. The working area for maintenance purpose for shall be in accordance with the report prepared by M.P. DeVos, P.Eng. dated October 10, 2006 (revised by Tribunal March 6, 2007). The working area for construction and maintenance purposes is summarized in the table below.

Table 1 – Working Area for Construction

Drain Stations	Working Width Measured From	Construction Working Width (m)
Sta. 1+000 to Sta. 1+113	North fence	9m to the South
Sta. 1+113 to Sta. 1+125	East top of bank	9m to the West
Sta. 1+125 to Sta. 1+156	East retaining wall	9m to the West

Access to the working area shall be from Komoka Road and Union Avenue. Each Landowner on whose property the drainage work is to be constructed shall designate access to and from the working area at the time of construction or upon failure to do so, the Engineer or Drainage Superintendent, as the case may be, shall designate access. The existing retaining walls, fences, sheds, gardens, armour stone, patios and any other obstructions within or adjacent to the working area shall be removed, salvaged, reinstalled and protected, and not damaged or disturbed by the Contractor as outlined in the special provisions.

6. All utilities shall be located and uncovered in the affected areas by the Contractor prior to construction.
7. The Contractor shall supply all materials unless otherwise stated at the time of tendering.
8. All standard catch basins shall be precast concrete catch basins as per OPSD. Knockouts shall be provided in the catch basins.

9. The catch basin grate elevations shall be set to the satisfaction of the Engineer.
10. Stone rip-rap protection and geo-textile material (Terrafix 270R or approved equivalent) shall be placed around all catch basins as part of this contract.
11. All catch basin grates shall be fastened to the new catch basins.
12. The Contractor shall supply all necessary materials to complete the connections of any existing drains to the new drain.
13. All CSP pipe shall be minimum 2.0mm (14 gauge) with a 68mm x 13mm corrugation profile, and galvanized.
14. All HDPE pipe shall be CSA rated 320kPa with bell and spigot complete with water-tight gasket joints (CSA B182.8 Type 1). Pipe shall be double wall smooth interior, Boss2000 or approved equivalent.
15. Material change across pipe connections shall be connected by sealing all around with 150mm of concrete or wrapping with a 600mm wide strip of Terrafix 270R filter cloth, or approved equivalent.
16. All clear stone shall be 19mm Type I as per OPSS.MUNI 1004.
17. All rip rap stone shall be R50 quarry stone (150mm to 300mm diameter) and placed to a depth of 400mm, unless otherwise specified, as per OPSS.MUNI 1004.
18. The Contractor shall be responsible for all trench settlement.
19. The Contractor shall supply and install catch basin markers beside all catch basins.
20. All concrete tile shall meet the requirements of ASTM C412-15. Minimum three-edge bearing crushing strength for all tile to meet or exceed 2000D unless otherwise noted.
21. The Contractor shall strip the topsoil centered on the drain before installing the HDPE pipe and excavating the swale. The width of topsoil stripping shall be at the Contractor's discretion, but all operations shall be constrained to the working width as previously denoted in the report. In locations where they may be deep cuts or excessive soil generation, the Contractor may apply to the Engineer to strip wider than the working width. The Engineer shall have the right to permit or deny this request. Topsoil shall be kept separate from subsoil as much as possible. The topsoil shall be later spread over the backfilled trench.
22. The Contractor shall, where directed, remove either by excavation or by crushing, any existing tile drains, inlets and/or catch basins encountered that are no longer required for the drainage system. Removal of existing tile drains and associated drainage works shall be considered part of the work and there will be no extra payment for removal of existing drainage infrastructure.
23. The Contractor shall grade the road ditches to the new catch basins. The disturbed areas within the road Right-Of-Way shall be top soiled and seeded.
24. Contractor shall maintain the following minimum cover for all tile placed:
 - 600mm minimum cover for all HDPE pipe, unless noted otherwise
25. The Contractor shall clean up the site and leave it in a neat and tidy condition.
26. The tender shall be based upon unit prices and shall be as detailed on the tender form.
27. Nothing in these Specifications shall be construed as requiring less than a complete and satisfactory job in accordance with the obvious intent of the Drawings and Specifications.

28. All work shall be done to the satisfaction of the Engineer.
29. In accordance with Section A.25 of the General Specifications, the Contractor shall be responsible for all faulty materials or workmanship which appears within a one year period from the date of the Engineer's final Payment Certificate. An amount equal to 3% of the final contract price shall be retained for the maintenance period. Any part of the money retained may be used to make good any deficiencies after five (5) working days' notice being given to the Contractor. This notice may be either in writing or by telephone.
30. Unless approved by a qualified biologist, no vegetation and brush clearing, and associated work shall occur between March 15 and August 31 (inclusive) of any year.
31. All work shall conform and comply with the requirements of the permit issued by and best practices of the Maitland Valley Conservation Authority, Ministry of the Environment, Conservation and Parks and Department of Fisheries and Oceans.
32. All work shall conform and comply with the following environmental mitigation measures:

In-Water Works

- The duration of in-water works should be minimized or spread out to lower the risk of sedimentation issues.
- An emergency spill kit should always be on-site in the event of a spill. All workers should be properly trained on site procedures and the use of an emergency spill kit.
- Ensure that all machinery used near water bodies arrives on site clean and is checked for fluid leaks prior to any construction activities.
- Re-fueling and maintenance of construction equipment should be done at a minimum of 30m away from any body of water and on an impervious surface to minimize the risk of harmful substances entering the water and soil.
- Operate machinery on land.
- Sediment and erosion control measures will be installed where appropriate before construction occurs to minimize the risk of sedimentation of local water systems. Sediment and erosion control measures should be installed according to the Guide for Erosion and Sediment Control for Urban Construction Sites (OMNR, 2006) and applicable standards in the Ontario Provincial Standard Specification/Ontario Provincial Standard Drawings (OPSS/OPSD).
- Sediment and erosion control measures should be inspected and maintained during construction activities near water.
- Any disturbed ground near water will be re-vegetated as soon as possible.
- Any excavated material that is to be stockpiled near water should be placed above the high water mark to reduce sedimentation risk.

Riparian Re-Vegetation and Stabilization

- Clearing of riparian vegetation should be kept to a minimum. Use existing trails and clearings when possible.
- Immediately stabilize shoreline areas and banks after construction activities near water to reduce the risk of sedimentation.
- Re-vegetation should be done with native species suitable for the environment.

Drain Construction Work

- Minimize vegetation removal on sloped or hilled areas to reduce the impacts.
- Ensure that the grading for the site remains unaltered during and post construction of the drain.
- Minimize the disturbance to the land and avoid grading any areas containing significant land features.

CLOSED AND SWALE WORK

C-1 *Environmental Protection Measures*

Payment for this item shall be lump sum. Payment shall include all labour, equipment and material necessary for protection of the environment, including but not limited to costs to supply, install, maintain and remove heavy duty silt fence and all other arrangements to ensure debris, silt sediment, deleterious substances, and any other material is contained and does not enter the watercourse. Payment shall also include all labour, equipment and material necessary to maintain dry conditions within the limits of construction and to maintain flows through the closed drain and swale throughout construction, including but not limited to costs to supply, install, maintain and remove coffer dams, dewatering pumps, by-pass pipe and all other dewatering arrangements.

Protection measures shall include, but not be limited to, heavy duty silt fence at the extent of the work at approximately Sta. 1+138 as shown on the Contract drawings, silt fences around stockpiled earth and topsoil, pump discharges onto grass flats and straw bale check dams, sediment traps or discharge setting basins. Protection measures shall also include, but not be limited to, dewatering measures to maintain dry conditions within the limits of construction and to maintain flows through the closed drain and swale throughout construction. Such measures shall be in accordance with the details provided herein. Any discharges of water into the roadside ditch shall be free of any silt or other deleterious material. Pumping discharges onto grass flats, straw bale check dams, sediment traps or discharge setting basins shall be used as a means to ensure that this objective is met. Payment shall also include for the removal and disposal of all deleterious substances off-site at an approved location arranged by the Contractor.

Prior to commencing work, the Contractor shall submit to the Engineer for review an environmental management plan complete with diagrams and written procedures. The work shall conform and comply with the requirements of the permits issued by and best practices of UTRCA, DFO and MECP.

Heavy-duty silt fence shall be installed as per OPSD 219.130 and to the approval of the Engineer. Silt fence shall be inspected by the Contractor periodically at regular intervals and after every rainfall event, and maintained as necessary and as directed by the Engineer, at no additional cost. The Contractor shall remove any accumulated sediment at regular intervals or as directed by the Engineer. The Contractor shall remove any sediment control devices and accumulated sediment after completion of the project and once the new drain has stabilized, but only upon the authority of the Engineer or Drainage Superintendent.

C-2 *Clearing, Grubbing and Disposal of Trees, Shrubs and Stumps, Complete*

The Contractor is to obtain utility locates prior to construction.

The Contractor is to clear, grub and remove brush, trees, branches and vegetation in swale and working area to facilitate construction and access for construction. This item shall apply only to those trees, shrubs, brush, bushes, stumps and windfalls designated for removal as required for construction and access for construction. This item shall include disposal of trees, brush and branches off-site at a location arranged for by the Contractor.

Clearing required for this work shall be accordance with Section A.6 of the Construction Specifications. This includes removing all tree stumps in the cleared area as close as practically possible to the ground and chemically treated to prevent regrowth. This applies to all areas of the construction and access for construction. No work for this item shall commence until authorization in writing by the Engineer.

Payment for this item shall lump sum and includes all labour, materials and equipment required to clear, grub and remove brush, trees, branches and vegetation, including disposal off-site at a location arranged for by the Contractor.

C-3 *HDPE Pipe by Excavator*

The Contractor is to obtain utility locates prior to construction.

Supply and install 24m of 375mm (15") diameter HDPE pipe by excavator. Pipe shall be Boss2000 non-perforated dual wall smooth interior HDPE pipe, with bell and spigot complete with water-tight gasket joints (CSA B182.8 Type 1), as supplied by Armttec or approved equivalent. The excavation shall be as per OPSD 802.030. The pipe shall be installed to the specifications indicated on the Contract drawings, and shall include all site restoration.

Pipe installed in a field shall be installed as follows:

- Bedding – Shall be granular 'A' with a minimum thickness of 150mm placed in maximum 150mm lifts and compacted to 98% SPMDD. The Contractor shall ensure that bedding is properly placed and compacted under the haunches of the pipe.
- Haunching – From bedding to the springline of the pipe shall be granular 'A' placed in maximum 150mm lifts and compacted simultaneously both sides of the pipe to 98% SPMDD.
- Initial backfill – From the springline of the pipe to a minimum of 300mm above the top of the pipe shall be granular 'A' placed in maximum 150mm lifts and compacted simultaneously both sides of the pipe to 98% SPMDD.
- Final Backfill – From initial backfill to topsoil shall be approved granular material (native if available) free of any large stones, clumps, etc. placed in maximum 300mm lifts and compacted uniformly to 95% SPMDD. Final backfill shall be placed, graded and leveled in a manner to not damage or displace the pipe.

Refer to Contract drawings for Pipe Bedding Detail.

Supply, placement, grading and compaction of the granular 'A' shall be as per Item C-4 below.

Extra will not be paid for stoney conditions while installing the HDPE pipe unless boulders are encountered larger than can be lifted by the excavator. Extra will not be paid for poor soil conditions due to trees, tree trunks or tree roots.

Payment for be per metre of HDPE pipe supplied and installed and all labour, equipment and materials necessary to excavate and shape the trench, supply and place the granular 'A', lay and connect the pipe, backfill the trench, and includes topsoil stripping and replacement, and restoration.

Material change across pipe connections shall be connected by sealing all around with 150mm of concrete or wrapping with a 600mm wide strip of Terrafix 270R filter cloth, or approved equivalent.

The Contractor shall take care to keep rutting and damage to trees to a minimum.

C-4 Granular 'A'

Supply and install granular 'A' for bedding, backfill or envelope. Where not already specified in the contract, location for installation shall be designated by the Engineer.

Payment for this item shall include all labour, equipment and material necessary to supply, place, grade, and compact all granular 'A' at locations shown on the Contract Drawings or as directed by the Engineer.

Payment for this item shall be for each tonne of granular 'A' delivered, placed on site, installed and compacted, confirmed by copies of aggregate supply tickets signed by the Contractor and obtained from the aggregate supplier.

C-5 Rigid high density foam insulation

Supply and install high density foam insulation as shown on the Contract drawings where the HDPE pipe is installed with less than 0.75m cover. Insulation shall be 50mm thick HI-60 styrofoam insulation as manufactured by Dow Chemical Co. or approved equivalent. Width of insulation shall be as shown on the Contract Drawings.

Payment shall be per metre of insulation supplied and installed and includes all labour, material and equipment for the supply and installation of the insulation.

C-6 Ditch inlet catch basin

Contractor is to obtain utility locates prior to construction.

Supply and install one (1) – 2700mm x 600mm ditch inlet catch basin complete with birdcage grate and 600mm sump as per OPSD 705.030. Ditch inlets shall have a 2:1 sloped top and heavy duty galvanized steel grate (minimum bar diameter 15mm, maximum spacing 75mm) of the “birdcage” type set so that the top of the back of the ditch inlet is approximately flush with the surrounding ground.

All catch basins shall be set on a 200mm thick layer of compacted granular ‘A’ or 19mm drainage stone. Granular ‘A’ or 19mm drainage stone shall be included in the price of the catch basin and there shall be no extra payment for supply and placement.

For the purposes of this report, top of concrete shall be equivalent to the lowest point that surface water can enter the structure.

All necessary minor grading and contouring to convey water to the catch basin is included. The approximate top of concrete elevation has been shown on the detailed plans; however the Contractor shall confirm the surface elevations prior to ordering or placing any catch basins. All catch basins shall include at least one 150mm riser section.

Securely fasten the grate to the structure with two galvanized bolts. All pipes connected to the catch basin shall be suitably grouted with concrete, and all grouted connections shall be completely wrapped with geotextile. Further, geotextile shall be placed over all the joints between sections of the box for the entire perimeter of the box. Connections shall be in accordance with Section C.9 of the Construction Specifications.

Payment under this item shall be per each catch basin and includes all labour, equipment and materials necessary to supply and install the catch basin with birdcage grate, excavate and shape the trench, supply and place the granular ‘A’ or clear stone, backfill the trench, connect pipe to catch basin, minor grading and contouring, and includes topsoil stripping and replacement, and restoration.

C-7 Rip rap

Supply and install approximately 10m² of rock protection at the ditch inlet catch basin and as designated by the Engineer. Rock protection shall be 150mm to 500mm diameter (as per OPSS.MUNI 1004) or as approved by the Engineer on a filter mat base (Terrafix 270R or approved equivalent), machine placed to produce a smooth locked surfaced. All rock protection and geotextile shall be installed as shown on the drawings accompanying the Report, and in accordance with OPSD 810.020.

Payment for rock protection shall be per square metre of rock protection supplied and installed and shall include all labour, equipment and materials to supply and install the rock protection on filter mat base.

C-8 Connect to existing manhole and salvage existing manhole

Payment for this item shall be lump sum and include all labour, equipment and materials necessary to connect the HDPE pipes to the existing manhole at approximately Sta. 1+018, including breaking / coring where required and any reducers, fittings, adaptors, cement parging and finishing required for the connections, as shown on the Contract drawings. The breaking / coring shall be completed to place the HDPE pipe at the elevations specified on the Contract drawings.

The lump sum price for this item shall include all excavation, dewatering, backfill, support for pipes entering and leaving the manhole (per OPSD 708.020), breaking/coring into the existing manhole to create a watertight connection including any reducers, fittings, adapters, cement parging and finishing, and whatever measures are necessary to not disturb or damage the existing manhole and utilities. All pipes connected to the manhole shall be suitably grouted with concrete, and all grouted connections shall be completely wrapped with geotextile. Connections shall be in accordance with Section C.9 of the Construction Specifications.

This item shall include whatever is necessary to salvage and protect and to not disturb or damage the existing manhole. This item shall include the cost of repairs or relocation of the manhole steps, as required due to the connections. This item shall include all restoration of the manhole after the connection of the HDPE pipes, including geotextile being placed over all the manhole joints between sections for the entire perimeter of the box and all necessary grading and contouring. All damage and disturbance to the existing manhole shall be repaired at the Contractor's expense.

C-9 *Excavation of swale*

The Contractor is to obtain utility locates prior to construction.

The Contractor shall use a hydraulic excavator to re-grade the swale from approximately Sta. 1+050 to Sta. 1+070, Sta. 1+085 to Sta. 1+108 and Sta. 1+119 to Sta. 1+142 to the proposed grade and depth as shown on the Contract drawings. Re-grading of the open drain required for this work shall be in accordance with Section B – Open Drains of the Construction Specifications.

The excavated material shall be removed and disposed of properly off-site. The Contractor must be aware that the excavated material may not pass MECP Table 1 criteria. The Contractor shall be responsible for complying with O.Reg. 406/19 including, but not limited to, information provided to truck drivers carrying excess soil. All excess soil and earth material shall be managed, handled and disposed of in accordance with O.Reg. 406/19.

All excess soil shall be deposited at a local waste transfer facility or directly at a waste disposal site.

The topsoil is to be stripped from the swale as required, and temporarily stockpiled prior to construction. Topsoil may be re-used from the existing lands provided it is screened to remove any unwanted material such as stones, clumps of sod, sticks, etc. All areas to be topsoiled shall be fine graded to the required lines and grades, allowing for a minimum depth of 150mm of topsoil. The surface shall be free of all vegetation and other debris and free of stones which would not be covered by the depth of topsoil specified and shall be loose to a depth of 25mm at the time of placing topsoil. The Contractor shall perform such mowing, raking and picking up of debris and such discing, harrowing or other mean of scarification as may be necessary to comply with this requirement and shall dispose of all debris off-site. All excess native topsoil (beyond cover requirements, if applicable) shall be spread and leveled as directed by the Engineer.

The Contractor shall uniformly spread native topsoil to a depth of not less than 150mm over the excavated open drain, and other areas disturbed by construction. All clods or lumps shall be pulverized and any roots, stones over 50mm in diameter, or foreign matter shall be raked up and removed as directed prior to placement of grass seed.

The re-graded open drain and other areas disturbed by construction shall have application of an approved grass seed mixture to the standard described in Item C-10.

The price shall include whatever measures are necessary to not disturb, damage or break the existing pipes, manhole, catch basins and any other component of the drain. All existing pipe, manhole, catch basins and any other component of the drain disturbed, broken or damaged shall be repaired at the Contractor's expense.

Payment will be per metre of swale excavated and includes all labour, equipment and material to excavate the swale including removal and disposal of excavated material.

C-10 Restoration of swale and other areas

The Contractor shall restore the swale and any other area disturbed by construction, including areas used for access, to pre-construction conditions.

The Contractor shall uniformly spread native topsoil to a depth of not less than 150mm over the swale and other areas disturbed by construction. All clods or lumps shall be pulverized and any roots, stones over 50mm in diameter, or foreign matter shall be raked up and removed as directed prior to placement of grass seed. The top soil shall be from the top soil stripped and temporarily stockpiled prior to construction in accordance with the general special provision.

The Contractor shall complete all necessary grading and contouring to convey water to the catch basins and swale.

The swale and other areas disturbed by construction shall have an application of an approved grass seed mixture and fertilizer as specified below, or approved equivalent, and in accordance with Section B.12 of the Construction Specifications. The fresh, clean and new crop seed shall meet the requirements of the Seed Act for Canada No. 1 seed and composed of the following varieties:

- 12% Coated Birdsfoot Trefoil
- 20% Double Cut Red Clover
- 26% Creeping Red Fescue
- 10% Annual Ryegrass
- 25% Kentucky Bluegrass
- 7% White Clover

A nursery crop of mixed grain or winter rye or wheat will also be used at a rate of 60 kg per hectare. Grass seed shall be applied a rate of 130 kg/ha, and 8-32-16 fertilizer shall be applied at the rate of 350 kg per hectare.

Payment shall be lump sum for all restoration, including topsoil and grass seed and includes all labour, material and equipment to restore the swale and any other areas disturbed by construction, including areas for access, to pre-construction conditions.

C-11 Remove, salvage and reinstall existing rock protection

Payment for this item shall be for all labour, equipment and material necessary to remove, salvage and reinstall on geotextile filter cloth (Terrafix 270R or approved equivalent) the existing rock protection on the swale as per the locations shown on the Contract Drawings or as designated by the Engineer. Rock protection through the swale shall be placed so that the top surface of the rock protection is at the approximate elevation of the bottom of the existing swale. Rock protection reinstallation shall be to the satisfaction of the Engineer.

If not enough rock protection is available on site the contractor shall supply and install additional rock protection under Item C-7.

Payment for this item shall be lump sum and include all labour, equipment and materials to remove, salvage and reinstall the rock protection on a filter mat base to the satisfaction of the Engineer.

C-12 Remove, salvage and reinstall existing clear stone infiltration trench (PROVISIONAL)

Payment for this item shall be for all labour, equipment and material necessary to remove, salvage and reinstall the existing infiltration trench within and adjacent to the swale, as required for construction and as designated by the Engineer. The infiltration trench shall be lined with geotextile fabric, Terrafix 270R or approved equal. The geotextile fabric shall be folded over the top of the trench (minimum 300mm) overlap in both longitudinal and transverse directions. Excess material shall be removed and disposed of off-site at locations arranged by the Contractor.

If not enough clear crushed stone is available on site the contractor shall supply and install additional clear crushed stone under Item C-14.

Payment for this item shall be per linear metre along the swale of clear stone infiltration trench removed, salvaged and reinstalled and include all labour, equipment and materials to remove, salvage and reinstall the clear crushed stone infiltration trench including geotextile fabric to the satisfaction of the Engineer.

C-13 *Remove, salvage, reinstall and protect existing obstructions*

The Contractor shall remove, salvage, reinstall and protect the existing retaining walls, fences, sheds, gardens, armour stone, patios and any other obstructions within or adjacent to the working area to facilitate construction and access for construction. The price shall also include whatever measures are necessary to not disturb or damage the existing retaining walls, fences, sheds, gardens, armour stone, patios and any other obstructions within or adjacent to the working area to facilitate construction and access for construction.

Payment for this item shall be lump sum and include all labour, material and equipment to remove, salvage, reinstall and protect, and not damage or disturb the existing retaining walls, fences, sheds, gardens, armour stone, patios and any other obstructions. Any damages or disturbance incurred during construction shall be repair at the Contractor's expense.

C-14 *19mm clear crushed stone (PROVISIONAL)*

Supply and install 19mm diameter clear crushed stone for bedding or envelope, including wrapping the clear crushed stone in geotextile fabric, Terrafix 270R or approved equal, where required. Where not already specified in the contract, location for installation shall be designated by the Engineer.

Payment will be for the actual quantity, in tonnes, installed. Payment shall include wrapping the clear crushed stone in geotextile fabric, Terrafix 270R or approved equal, where required as designated by the Engineer.

Appendix D

Construction Specifications

SPECIFICATIONS
for the
CONSTRUCTION
of
MUNICIPAL DRAINAGE WORKS

Revised July 2020

SPECIFICATIONS FOR THE CONSTRUCTION OF MUNICIPAL DRAINAGE WORKS

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SPECIFICATIONS FOR THE CONSTRUCTION OF MUNICIPAL DRAINAGE WORKS

SECTION A - GENERAL

A.1 BENCH MARKS

Bench Marks are set along the course of the work as shown on the accompanying Plan and Profile. Attention is drawn to Section 13 (2) of the Drainage Act regarding liability for interference with Bench Marks.

A.2 STAKES

Where requested, stakes may be set throughout the course of the work and at all fences or as shown on the accompanying Plan and Profile. The Contractor shall be held liable for the cost of replacing any stakes destroyed during the course of construction and the drainage area shall be liable for the cost of replacing stakes destroyed before commencement of construction.

A.3 LINE

Open drains shall run in straight lines throughout each course except that at intersections of courses it shall run on a curve of at least 15m radius. The centre line of existing open drain shall in general be the centre line of the finished work but the straight lines of the drain shall be staked by the Contractor at least one complete course ahead of the digging, and all sloping and widening necessary shall be done in such a manner as to make the finished work uniform.

The Contractor shall exercise care not to disturb any existing tile drain or drains which parallel the course of the new drain, particularly where the new and existing tile act together to provide the necessary capacity. Where any such existing drain is disturbed or damaged, the Contractor shall perform all necessary correction or repair at his expense. The Engineer will designate the general location of the tile drain, but the landowners may indicate the exact location if approval is given by the Engineer.

The Contractor shall verify the location of the new tile drain with the Engineer, Drainage Superintendent and the landowners before proceeding with the work.

A.4 PROFILE

The drain is to be excavated to regular grade lines as shown on the Profile. These grade lines are governed entirely by the bench marks and show the bottom of the finished drain. In the case of tile drains, the grade line is that of the invert of the tile. The Profile shows, for the convenience of the Contractor and others, the approximate depths from the surface of the ground, but the bench marks must govern the construction. Open drains shall be brought to an even grade in the bottom so that water will not stand therein, except in special cases such as sediment traps.

The drain shall be constructed with a uniform grade in accordance with the Profile Drawing. A variation of 25mm from the proposed Profile shall be sufficient to require the Contractor to remedy this discrepancy.

A.5 ERRORS OR OMISSIONS

The Contractor shall satisfy themselves before the commencement of any part of the work of the meaning of all stakes and marks, and any errors or omissions they may find in Plans, Profiles or Specifications shall not relieve the responsibility of completing the work in accordance with the evident intention of such Plans, Profiles and Specifications. The Contractor shall report any such errors or omissions to the Engineer for correction before the work is commenced.

A.6 CLEARING

(a) General

Brush, timber, logs, stumps, stones or any obstruction in the course of the work, and any brush along the banks thereof shall be removed to a sufficient distance to be clear of the excavated material or to the width as shown on the Profile.

Where included, the Special Provisions and the Engineering Plans lay out the amount of the work of clearing through bush and treed areas for both open and closed drains.

All brush and trees removed from the drain and banks thereof must be piled to the satisfaction of the Engineer for burning or disposal by the Owner.

Any deviation during construction will require the written authorization of the Engineer or the Drainage Superintendent in charge of the work. Other deviation will only be by Special Specification applicable to and governing certain aspects of special situations.

The Contractor will be permitted to cut standing timber along the banks of the drain to the extent that may, in the opinion of the Engineer, be reasonably necessary for the operation of the excavation equipment.

The quality of workmanship shall be equal to the best in the industry and the Contractor shall be held liable for all damages incurred due to carelessness, negligence or failure to adhere to this Specification.

(b) Open Work

Clearing shall be 15m on the spoil side as designated on the Profile unless specified otherwise in the Special Provisions. All overhanging limbs and any dead or dying trees liable to fall into the drain on the opposite side shall be cut and removed. Care shall be exercised to prevent the scraping or barking of trees outside of the clearing area.

All trees 150mm in diameter, 450mm above the ground, must be cut, trimmed and stacked in log lengths in a location accessible to the Owner. These trees shall be cut sufficiently close to the ground in the cleared area that the spoil can be leveled over them.

No brush or trees are to be left inside the slopes of the drain whether they come within the limits of the excavation or not.

Under no circumstances shall the cleared material be pushed or deposited in any way in the uncleared area so as to impede the passage through the bush or to do damage to the uncleared bush. All remaining trees, bush and trimmed limbs shall be cleared with suitable equipment and temporarily placed on the edge of the cleared area remote from the drain. After the spoil has been spread and leveled, the cleared material is to be placed in piles along the centre of the cleared area free from dirt for disposal by landowners or others. The piles of brush shall be a minimum of 60m apart. For the clearing of willows, the Contractor shall use the equipment necessary to uproot and stack the bush in piles free from dirt for disposal by others.

(c) Closed Work

Clearing width shall be as provided for in the Special Provisions.

In the normal case where the course of the drain is to be included in cultivated lands in the near future, all stumps shall be removed, and the land leveled for the full width of the clearing.

Where the course of the drain is through low, wet or swampy land and clearing prior to tile installation is impractical, then with special written permission ONLY can the tile be laid before clearing. For drainage purposes, the clearing shall be postponed until ground and weather conditions permit working within the area adjacent to the tile.

Where the course of the drain is not to be included in cultivated lands, all stumps shall be removed and the land leveled for 6m on each side of the installed tile. All stumps in the remaining cleared area shall be cut as close as is practically possible to the ground and chemically treated to prevent regrowth.

After the tiles have been laid, heavy machinery shall not be driven over it if there is any possibility of disturbing or damaging the tile.

Care shall be taken to prevent the scraping or barking of trees outside the cleared area.

All trees 150mm in diameter, 450mm above the ground shall be cut, trimmed and stacked in log lengths, in a location accessible to the Owner.

The cleared material shall not be pushed or deposited in the uncleared area in any manner so as to impede the passage through the bush or to do damage to the uncleared bush. All trees, bush and trimmed limbs remaining shall be cleared with suitable equipment and placed in piles free from dirt at intervals of 60m for disposal by other methods.

Willows shall be cleared using the necessary equipment to uproot and stack the bush in piles free from dirt for disposal by others.

A.7 FENCES

The Contractor will be permitted to remove fences to the extent necessary to enable the Contractor to construct the drain and dispose of any excess material. Any such fences must be carefully handled so as to cause no unnecessary damage and shall be replaced by the Contractor in as good condition as found. Fences shall be properly stretched and fastened. The Contractor shall supply all wire and/or material necessary to properly reconstruct any fences. The Contractor shall not leave any fence open when they are not at work in the immediate vicinity. Replacing of the fences shall be to the satisfaction of the Engineer, or the Drainage Superintendent appointed to be in charge of the work.

A.8 TRIBUTARY OUTLETS

During the construction of an open drain, the Contractor shall guard against damaging outlets of any tributary drains and during the construction of a tile drain the Contractor shall connect all tributary tile drains to the main tile as work progresses and before backfilling the new drain. Attention is drawn to Article B.11 and Article C.5 of these Specifications. The Contractor will be held liable for damage caused by negligence or carelessness, on the part of their self, their workers or subcontractors.

A.9 ALTERATIONS

The Engineer may make minor changes in the work as it progresses. An amount proportionate to the amount contained in the Tender or as Tendered in the Schedule of Unit Prices shall be added to or deducted from the contract price to cover such changes. No changes will be made unless ordered by the Engineer or the Drainage Superintendent in charge of the works.

A.10 SPECIAL CONDITIONS

If the Contractor should encounter any unusual soil conditions of any sort which may not have been known to the Engineer, and where not provided for by these Plans and Specifications and which would make necessary

alterations to the Plans and Specifications in order that the work be completed in a satisfactory and workmanlike manner, the Contractor shall immediately notify the Engineer who will make the necessary alterations.

Failure of the Contractor to so notify the Engineer shall not relieve the Contractor of the responsibility of fully completing the work to the satisfaction of the Engineer and shall make the Contractor ineligible to receive any extra compensation made necessary by the alteration.

A.11 PERMITS, NOTICES, LAWS AND RULES

The Contractor shall apply and pay for all permits, licenses or approvals required for performance of the work (but this shall not include the obtaining of permanent easement or rights of servitude). The Contractor shall give all necessary notices and pay all associated fees required by law and comply with all laws, rules and regulations relating to the work and to the preservation of the public's health and safety.

A.12 HIGHWAYS, RAILWAYS, UTILITIES

The Contractor shall perform the work affecting any lands of any Road Authority, Railway, Telephone, Pipeline Company or Public Utility in accordance with the Specifications or permit requirements of such Authority, Company or Utility, as though said Specifications were hereto attached.

Notices Required

(a) Highways

Before any construction may take place on the right-of-way of any highway, forty-eight (48) hours notice in writing, exclusive of Saturdays, Sundays and Holidays, must be given to the appropriate District Engineer of the Ministry of Transportation of Ontario, or the Road Superintendent of the local Road Authority as the case may be.

(b) Railways

Before any construction may take place on the property of any Railway, a minimum of forty-eight (48) hours notice in writing, exclusive of Saturdays, Sundays and Holidays, must be given to the Area Engineer of the Railway Company.

Where a pipe is to be installed under Railway tracks by open cutting, a minimum of seventy-two (72) hours notice in writing, exclusive of Saturdays, Sundays and Holidays, must be given to the Area Engineer of the Railway Company.

A.13 CONTRACTOR'S LIABILITY INSURANCE

The Contractor shall protect their self and indemnify and save the Owner harmless from any and all claims which may arise from the Contractor's operations under the Contract where bodily injury, death, or property damage is caused and for this purpose shall, without restricting the generality of the foregoing, maintain an insurance acceptable to the Owner, and subject to the limits and conditions under the Articles of Agreement of the tender, per occurrence for bodily injury, death, and damage to property including loss of use thereof. The Contractor will be solely liable for all injuries and/or accidents to workers, and/or the public, and/or livestock, and/or property and for any expenses or damages created by fences being left open or improperly closed, insufficient guarding and lighting or bad workmanship at places where a drain runs along or across a road allowance or any negligence in completing the work.

The Contractor shall furnish evidence of compliance with all requirements of the Workplace Safety and Insurance Act including payments due there under.

Prior to the commencement of any work hereunder, the Contractor shall file with the Owner a copy of each insurance policy and certificate required. All such insurance shall be maintained until final completion of the work including the making good of faulty work or materials; except that coverage of completed operations liability in any event by maintained for one (1) year from the date of final payment certificate by the Engineer.

A.14 SUB-CONTRACTORS

The Contractor shall not sublet the whole or part of this Contract without the written approval of the Engineer, which approval shall not be unreasonably withheld.

A.15 STANDING CROPS AND LIVESTOCK

The Contractor shall not be held responsible for damages to standing crops within the "working space" as defined in the report or in the access to and from such "working areas" such access having been defined by the owner of the property if the Contractor notifies the owner thereof in writing at least two (2) days prior to commencement of the work on that portion. Similarly, the Contractor constructing a tile drain shall not be held responsible for damages or injury to livestock occasioned by leaving trenches open for inspection by the Engineer if they notify the owner in writing at least two (2) days prior to commencement of the work on that portion. But the Contractor will be held liable for such damages or injury if the backfilling of such trenches is delayed more than seven (7) days after acceptance by the Engineer.

When notified as outlined above, the owner of the property on which the drain is located shall be responsible for the protection of all livestock on said property during construction and shall also be liable for any damages caused by such livestock.

A.16 SURPLUS GRAVEL

If as a result of any work, gravel or crushed stone is required and not all the gravel or crushed stone is used in the construction or the works, the Contractor shall haul away such surplus gravel or stone.

A.17 OPEN CUT ROAD CROSSINGS

All road crossings may be made with an open cut unless otherwise specified. The exact location of the crossings shall be verified and approved by the Road Authority or the Engineer. A 150mm depth of Granular 'A', compacted to 98% SPD, shall be placed as a base for each pipe crossing. The pipe shall be backfilled with granular material for the width of the travelled portion plus 1,200mm on either side. The material shall be placed in lifts not exceeding 150mm in depth and shall be thoroughly compacted with an approved type mechanical vibrating compactor. The top 150mm of the roadway backfill shall consist of crushed granular material meeting the OPSS for Granular Base Course Class 'A' (Granular 'A') material.

The Contractor shall be responsible, however, for subsequent uneven joints in the pavement due to settling of the backfill. The Contractor shall arrange with the Road Authority to keep the crossing in repair if unable to do such personally. All road crossings shall meet the approval of the Road Authority. When doing work on or across any public road, care must be taken to protect the travelling public. The Contractor is required to erect and maintain, until the completion of the work, all signs, barricades, and lights necessary to indicate or warn the travelling public that the work is being undertaken, all in compliance with the Ontario Traffic Manual Book 7.

The excavated material from road right-of-way shall be removed and disposed of at an approval disposal site.

If the Engineer deems a gravel road to have been damaged by the construction of a drain either across or along the said road, the Engineer may direct the Contractor to supply and place sufficient crushed granular material on the roadway to restore it to a safe and passable condition at the Contractors expense.

A.18 LANEWAYS

All pipes crossing laneways shall be backfilled with material that is clean, free of foreign material or frozen particles and readily tamped or compacted in place unless otherwise specified. Laneway culverts on open ditch projects shall be backfilled with material that also is not easily erodible. All backfill material shall be thoroughly compacted as directed by the Engineer.

All pipe culverts located under laneways shall be backfilled with granular material to a minimum of 900mm beyond each side of the culvert. 150mm of granular 'A' shall be placed under the culvert as a base. Granular material shall be placed simultaneously on each side of the culvert in 150 mm layers and compacted to a ninety-eight per cent (98%) Standard Proctor maximum dry density. All culverts are to be assembled according to the Manufacturers Specifications. Culverts to have a minimum of 600mm of cover over the pipe unless otherwise noted on the Drawings.

The backfill over culverts and subsurface pipes at all existing laneways that have granular surfaces on open ditch and closed drainage projects shall be surfaced with a minimum of 300mm of pit run granular material and 150mm of Granular 'A' material. All backfill shall be thoroughly compacted as directed by the Engineer. All granular material shall be placed to the full width of the travelled portion.

Any settling of backfilled material shall be repaired by or at the expense of the Contractor during the warranty period of the project as soon as required. Any existing bituminous pavement on laneways shall be placed to its original condition by the Contractor.

A.19 REMOVALS

Unless otherwise specified, the cost of removing existing catchbasins, junction boxes, tile (any size), outlets, farm bridge/culverts, and other such structures that are no longer required for the proposed drainage works and are encounter during construction are consider part of the Contract price.

A.20 FINAL INSPECTION

Final inspection will be made by the Engineer within ten (10) days after they have received notice in writing from the Contractor that the work is completed or as soon thereafter as weather conditions permit.

If, after receiving notice from the Contractor that the work has been completed, the Engineer or Drainage Superintendent in charge of the work finds items uncompleted which entail a further inspection of the whole or part of the work, the cost of such further inspection may be charged against the Contractor.

All the work included in the Contract must, at the time of final inspection, have the full dimensions and cross-sections called for in the Plans and Specifications.

A.21 COMPLETION OF WORK

The work may commence immediately after the Contractor is notified of the acceptance of the Tender or at a later date as specified in the contract documents, when weather and ground conditions are suitable.

The work must proceed in such a manner as to ensure its completion at the earliest possible date consistent with the first class quality work and within the time limit set out in the Tender or the Contract Documents.

A.22 NOTICE OF COMMENCEMENT OF WORK

The Contractor shall give the Engineer and the Drainage Superintendent a minimum of seventy-two (72) hours advance notice before commencement of work on any municipal drain.

If the Contractor leaves the job site for a period of time after initiation of work, they shall give the Engineer and Drainage Superintendent a minimum of forty-eight (48) hours advance notice prior to returning to the job.

If any work is commenced without such advance notice, the Contractor shall be fully responsible for all such work undertaken prior to such notification and shall make good any works or materials used judged to be inadequate or constructed in a manner that may have been subject to alteration if made known to the Engineer prior to commencement of construction.

A.23 FIELD MEETINGS

At the Engineers discretion, a field meeting with the Contractor or representative, the Engineer and with those others that the Engineer deems to be affected, shall be held after notification of commencement of work has been given and prior to commencement of, or during construction.

A.24 SUPERVISION

The Contractor shall provide site supervisors and/or forepersons as required and assume all responsibility for control and direction of the work in accordance with the OPS General Conditions of Contract.

A.25 MAINTENANCE OR FAULTY WORKMANSHIP

The Contractor shall repair and make good any damages or faults in the drain that may appear within one (1) year after its completion (as evident by the final payment certificate) as the result of the imperfect or defective work done or materials furnished if certified by the Engineer as being due to one or both of these causes; but nothing herein contained shall be construed as in any way restricting or limiting the liability of the Contractor under the laws of the Country, Province or Locality in which the work is being done. Neither the final payment certificate nor payment there under, nor any provision in the Contract Documents shall relieve the Contractor from responsibility.

A.26 DRAINAGE SUPERINTENDENT

Where a Drainage Superintendent is appointed by the Municipality, the Drainage Superintendent may act as the Engineer's representative, if so directed by the Engineer. The Drainage Superintendent shall have the power to direct the execution of the work and to make any necessary minor adjustments.

SECTION B - OPEN DRAINS

B.1 BOTTOM WIDTH AND SIDE SLOPES

The drain shall have the full specified bottom width at the grade line at the time of final inspection. Both sides of an open drain are to be sloped as shown on the accompanying Profile. Bottom widths will vary with the size of the drain. Where the width of the bottom of the existing ditch is sufficient to permit the desired width, depth and back slopes for the new ditch to be constructed without disturbing the existing banks, such banks shall be left as is, subject to clearing required as described in Section B.9 "Obstructions". Sides of the drain shall be smooth and have a uniform slope from top to bottom.

B.2 EXCAVATED MATERIAL

Excavated material shall be deposited on one or both sides of the drain as directed by the Engineer. In general, the material shall be placed on the low side of the drain or opposite trees and fences. The Contractor shall contact all landowners before proceeding with the work to verify the location to place and level the excavated material.

A clear berm or margin of at least 2.0m shall be left between the top edge of the ditch and the leveled spoil. In no case shall the side of the spoil bank nearest the ditch have a slope greater than 1.5m to 1m.

Any large stones or boulders which exceed 500mm in diameter shall be buried adjacent to the ditch and at a depth so as to not interfere with farm machinery.

Where it is necessary to straighten any bends or irregularities in the alignment of the ditch or to relocate any portion or all of an existing ditch, the excavated material from the new cut shall be used for backfilling the original ditch. Regardless of the distance between the new ditch and the old ditch, no extra compensation will be allowed for this work and it must be included in the Contractor's price for the open work.

B.3 SPREADING AND LEVELLING

The spoil shall be deposited, spread and leveled up to a maximum depth of 200mm and be left so that the land on which it lies may be cultivated with adjacent lands by use of ordinary farm machinery. If the Contractor obtains a statement in writing, signed by the owner of the lands affected that they do not wish the spoil to be leveled, the Engineer may release the Contractor from obligation in that regard. Disposal of the material shall be to the satisfaction of the Engineer. Through timbered land the excavated material may be spread to a maximum depth of 600mm unless otherwise noted on the Plans governing the work. The Contractor is not required to remove stones and boulders from the excavated material unless called for in the Special Provisions.

B.4 FILLING OLD CHANNEL

At every new cut, the excavated material shall be used to fill the abandoned channel unless otherwise directed by the Engineer. Fill shall be placed to 300mm below finished ground surface.

Where the on-site soil available is of insufficient quantity or quality to fill the abandoned channel, new soil shall be imported from an approved source. The imported soil shall be of the quality necessary to support agricultural operations and shall meet the most current Table 1 standards for Agricultural Use under the "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*" as published by the Ontario Ministry of the Environment and Climate Change. All imported soil will be subject to the approval of the receiving landowner. Fill soil placed to fill in abandoned channels shall be compacted to 95% SPMDD or as otherwise directed by the Engineer.

Abandoned channels shall be finished with a 300mm layer of topsoil of the quality necessary to support agricultural operations, and subject to the approval of the Engineer and the receiving landowner.

B.5 INLETS FOR SURFACE WATER

Inlets shall be left in the leveled spoil on each property but not over 90m apart, or as shown on the Plan or Profile. No excavated material is to be left in or any damage done to any ditches, depressions, furrows, pipes, or tiles intended to conduct water into or across the open drain.

B.6 EXCAVATION AT BRIDGE SITES

The Contractor shall be required to excavate the drain to full depths and as nearly as possible to the full widths and slopes at the sites of all bridges. Bridges of a permanent character are not to be unnecessarily disturbed. The excavation at these bridges being made, if necessary, by hand or by other suitable means.

Excavation under culverts and bridges is to conform to the grades, bottom widths and side slopes specified. The Contractor shall be held liable for any damage to any structure caused by carelessness, neglect or over-excavation. The Contractor shall immediately notify the Engineer if it should become apparent that the excavation of the drain to the grades shown on the Plan will in any way endanger any culvert or bridge and the Contractor shall discontinue work on the drain until the Engineer instructs them to proceed.

B.7 FARM BRIDGES AND FARM CULVERTS

All farm bridges hereafter constructed or reconstructed, in order not to be regarded as obstruction, shall have minimum openings equal to the cross-section area recommended in the Report or of clear width equal to twice the specified bottom width of the drain. If required, it shall be the responsibility of the landowner to arrange for the supply, delivery and installation of a culvert of the recommended size. This work shall not form part of the Contract.

If a landowner at the time of construction has furnished a suitable culvert at the site, the Contractor shall install it as part of the work at the landowner's expense, with the invert 150mm below the grade of the drain, and with a suitable earth backfill such that a crossing with normal farm machinery can be made. Final grading, shaping or rip rapping of backfill shall be the responsibility of the landowner(s) involved. A minimum of 500mm cover shall be placed over each culvert.

Where it is necessary to remove a temporary farm bridge in order to perform the necessary excavation, the material from the bridge shall be carefully handled and left at the side of the drain for the use of the owner.

B.8 RIP RAP PROTECTION FOR CULVERTS

Where rip rap protection is called for at either or both ends of a new culvert such rip rap shall be heavy field stone or quarry stone rip rap protection with geotextile filter material (Terrafix 270R filter cloth or approved equivalent).

The Contractor shall be responsible for any defects or damages that may develop in the rip rap or the earth behind the rip rap that the Engineer deems to have been fully or partially caused by the faulty workmanship of the materials for a period of one (1) year from the time of the final payment certificate.

B.9 OBSTRUCTIONS

All brush, bushes, fallen timber and debris shall be removed from the banks and slopes of the drain to such a distance on each side to eliminate any interference with the spreading of the spoil bank. Grubbing shall include the removal and disposal of all stumps to the satisfaction of the Engineer. The slopes shall be cleared whether or not they are directly affected by the excavation. The roots shall be left in the banks if no bank excavation is required as part of the new channel excavation. Any trees necessarily removed are to be brushed and left for the landowner. In wooded or heavily overgrown areas, the brush, limbs, etc. may be pushed into piles back out of the way. All dead trees alongside the drain that impede the performance of the drain shall be removed prior to excavation and

put in piles, unless directed otherwise by the Engineer. All brush, limbs, debris, etc. shall be put into pile for disposal by the landowner.

B.10 ROADS

Where an open drain is being removed from the road allowance, it must be reconstructed wholly on the adjacent land with a minimum berm width of 1,200mm on the roadway side of the ditch, unless otherwise noted on the Drawings. The excavated material shall be used to fill the existing open ditch and any excess excavated material shall be placed and leveled on the adjacent farm land. Any work done on the road allowance with respect to excavation, disposal of materials, installation of culverts, cleaning under bridges, etc., shall be to the satisfaction of the Road Authority. Any pipe culvert laid under the traveled portion of the road allowance shall be constructed as per Section A.17.

All excavated excess material from the construction of a road culvert or cleanout through culverts on any road allowance shall be trucked away for disposal. Any culverts suitable for salvage shall become the property of the landowner, if the landowner wishes to retain same, otherwise the Contractor be responsible for the disposal of the culvert to the satisfaction of the Engineer.

B.11 TILE OUTLETS IN EXISTING DITCHES

All tile outlets in existing ditches shall be noted by the Contractor prior to excavation. The Contractor shall contact all landowners and ask them to mark all their tile outlets which enter the ditch. Any tile drain outlets that were marked and are subsequently damaged by the Contractor shall be repaired by the Contractor at their expense. If any ditch bank is altered due to the construction at the tile outlet, the Contractor shall replace the altered outlet.

In general, if the existing outlet is tile only, the new outlet shall consist of undamaged lengths of tile. If the existing outlet is a metal pipe with or without a rodent grate, such outlet shall either be relocated to adjust to the new banks or shall be replaced if damaged. If any outlet becomes plugged as a result of construction, the Contractor shall be obliged to free such outlet of impediments. Where stone or concrete rip rap protection exists at any existing outlet, such protection shall be moved as necessary to protect the outlet after reconstruction of the ditch. Where any damage results to tile leading to and upstream of the outlet as a consequence of construction, the Engineer may direct the Contractor to repair such tile and shall determine fair compensation to be paid to the Contractor for performing the work.

B.12 GRASS SEED AND FERTILIZER

The ditch slopes where disturbed shall be seeded using an approved seed mixture. The grass seed and fertilizer shall be applied the same day as the excavation of the open ditch. Grass seed shall only be applied between April 15th and November 15th, unless otherwise directed by the Engineer.

Grass seed shall be fresh, clean and new crop seed, meeting the requirements of OPSS 804 for Standard Roadside Mix.

Grass seed shall be applied at the rate of 170kg/ha (150lbs/acre) and the fertilizer shall be applied at the rate of 365kg/ha (325lbs/acre), or as directed otherwise. Fertilizer shall be 8-32-16 (N-P-K).

B.13 EQUIPMENT

An approved hydraulic excavator shall be used to carry out the excavation of the open ditch unless otherwise directed by the Engineer.

B.14 COMPLETION

At the time of completion and final inspection, all work in the Contract shall have the full dimensions and cross-sections specified without any allowance for caving of banks or sediment in the ditch bottom.

SECTION C - TILE DRAINS

C.1 TILE QUALITY

All tile installed under these Specifications shall be sound and of first quality and shall meet all ASTM Specifications as set out in Designation C412-15 for Concrete Tile. Tile shall be approved by the Engineer before being incorporated into the work and the Engineer shall have the right to order such tests as deemed necessary to be made upon the tile, including that of testing by an independent testing laboratory. The costs of all such tests shall be borne by the Contractor and may be deducted from monies due to the Contractor under this Contract.

C.2 LINE

New tile drains shall be constructed at an offset from and parallel to any existing ditch or defined watercourse in order that fresh backfill will not be endangered by the flow of surface water. Where any existing tile drains are to remain, the Contractor shall exercise care not to disturb any existing tile drains which follow the same course as the new drain. Where any such existing drain is disturbed or damaged, the Contractor shall perform the necessary correction or repair at their expense.

The Contractor shall verify the location of the new tile drain with the Engineer, Drainage Superintendent and the landowner before proceeding with the work.

C.3 TILE LAYING

All tile shall be laid carefully on a rounded, smooth solid bottom with all joints aligned both vertically and horizontally. All tile being laid in a straight line shall be placed together as tightly as possible with the maximum space between successive tiles not exceeding 6mm. All tile being laid on a curve shall be fitted with a maximum space between successive tiles not exceeding 6mm at any point on the circumference. Any tile joint exceeding this tolerance shall be covered with wire mesh and sealed **all around** with concrete not less than 150mm thick. The grades and location of the tile shall be as specified on the Plan and Profile. No deviation shall be permitted without the written permission of the Engineer with the exception of that stated in Section A.4 of these Specifications. The maximum trench width at the top of the tile shall not be greater than the outside diameter of the tile plus 600mm. The trench shall not be opened up for a distance greater than 60m in advance of the tile laying. All dirt, foreign material and obstructions shall be removed from inside the tile before laying. Where corrugated metal or plastic pipe is used, the joints between the pipe and the field tile shall be sealed with concrete not less than 150mm all around. When construction is stopped for the day, the open ends of all tile drains shall be completely closed to prevent entry by animals or unnecessary water.

The sides of the tile are to be supported by partial filling of the trench prior to inspection by the Engineer. The remainder of the excavated material shall be used to restore and maintain the natural surface of the ground. No tile shall be backfilled until inspected by the Drainage Superintendent or Engineer unless directed otherwise by the Engineer. The tile shall be backfilled such that a sufficient mound of backfill is placed over the disturbed area. The Contractor's Tender Price shall include the cost of stripping the topsoil, bulldozing of the subsoil to the depth required and subsequent replacement of subsoil and topsoil.

C.4 LOWERING OF SURFACE GRADES

If necessary, the Contractor shall strip back and stockpile the topsoil, and strip the subsoil in order that the tiling machine may trench to the correct depths. After the tile is installed, the trench shall be backfilled, subsoil replaced, and the topsoil shall be spread over the disturbed area. The Contractor's Tender Price shall include the cost of stripping the topsoil, bulldozing of the subsoil to the depth required and subsequent replacement of subsoil and topsoil.

C.5 TRIBUTARY DRAINS

Any tributary tile encountered in the course of the drain is to be carefully taken up by the Contractor and placed clear of the excavated earth. If the tributary drains encountered are clean or reasonably clean, they shall be connected into the new drain. Tributary tile drain connections into the new drain shall be made using high density polyethylene agricultural drain tubing installed on and backfilled with 19mm clear crushed stone. All tile drain connections into the new drain shall be cored hole with an InsertaTee or a manufactured "tee".

Where the existing drains are full of sediment, the decision to connect or not to connect the new drain shall be left to the Engineer. The Contractor shall be paid for each tributary drain connection as outlined in the Form of Tender and Articles of Agreement.

The Contractor shall be responsible for all tributary tile connections for a period of one (1) year after the issuance of the final payment certificate by the Engineer. After construction, any missed tile connections required to be made into the new drain shall be paid at the same rate as defined in the Form of Tender and Agreement. The Contractor will have the option to make any subsequent tile connections or have the Municipality make the required connections and have the cost of which deducted from the holdback.

Where the Contractor is required by the Engineer to hook up an existing tile which is not encountered in the course of the drain, the cost of such work shall constitute an extra and the basis for payment shall be determined by the Engineer subject to the provision of Section A.20 "Completion of Work".

C.6 CONNECTIONS

All tile encountered shall be connected into the main drain or a catch basin. Tile connections may be made by using the same size of concrete field tile or one size larger of standard corrugated plastic drainage tubing. Connections are included as part of the Contract. The Unit Price shall include the supply and installation of up to 3m of tile in order that the connection will be sloped at not greater than 3m horizontal to 1m vertical. All tile connections will be made in the upper 1/3 of the circumference of the main tile. Connection at the main shall be "earth tight" to the satisfaction of the Engineer. **All connections shall be left uncovered for inspection** by the Engineer.

Any open ends of tile left by making the connections shall be securely plugged with concrete.

C.7 BACKFILLING

All tile shall be left open, as the laying of tile progresses, until after inspection. After laying and prior to inspection, partial filling (blinding) is to be made at the sides of the tile and compacted sufficiently to maintain the alignment. The upper 1/3 of the tile shall be left uncovered until after inspection by the Engineer or Drainage Superintendent in charge of the works. Where conditions indicate that damage may occur, arrangements shall be made for daily or continuous inspection by the Engineer or Drainage Superintendent. The Engineer or the Drainage Superintendent in charge of the work reserves the right to demand that all or any part of the works be uncovered to allow for adequate inspection and the Contractor shall supply, at their own expense, all equipment and labour to do the said work.

After the work is inspected by the Engineer or Drainage Superintendent in charge of the work, the remainder of the excavated material shall be used to restore and maintain the natural surface of the ground. Stones having any dimensions larger than 150mm shall not be used for backfill material within 300mm of the tile.

C.8 OUTLET PROTECTION

The protection at the outlet of a tile drain shall be a length of corrugated metal or plastic pipe, as specified, fitted with a rodent-proof grate. The grate shall be hinged at the top to permit the exit of foreign material from the tile. The pipe shall be protected with rip rap protection consisting of quarry stone or heavy field stone and geotextile

filter material in a manner satisfactory to the Engineer. The rip rap shall extend from the bottom of the trench to the original ground surface and for a distance of at least 4m from the end of the outlet pipe unless otherwise specified on the Drawings. The protection shall extend to the top of the backfilled trench and below the pipe to 400mm under the streambed and also extend 600mm into undisturbed soil on either side of the backfilled trench unless otherwise specified on the Drawings.

Where the outlet occurs at the end of an open ditch, the above rip rap protection will extend all around the end of the ditch and to a point 800mm downstream on either side unless otherwise specified on the Drawings. Where heavy overflow is likely to occur, sufficient additional rip rap and filter material shall be placed as directed by the Engineer to prevent the water cutting around the protection. A concrete structure may be required to protect against heavy overflow if so indicated on the Drawings. The corrugated outlet pipe shall have a hinged metal grate on the outlet end to prevent the entry of small animals. Maximum spacing between bars shall be 50mm.

C.9 CATCH BASINS

All catch basins shall be approved reinforced precast units having inside dimensions as noted on the drawings with a 600mm sump. The sides shall be a minimum of 115mm thick, and the bottom shall have a minimum thickness of 150mm. The elevation of the top of the catch basin shall be as set by the Engineer at the time of construction. All necessary grading to convey water to the catch basin shall be included as part of the Contract.

All tile and pipe entering a catch basin shall be sealed all around with 15 MPa concrete which shall extend a minimum of 150mm beyond the **OUTSIDE WALL** of the catch basin. The **INSIDE WALL** of the catch basin shall be formed and the void around all tile and pipe entering a catch basin shall be completely filled with concrete to form a smooth flush surface.

If there are no existing drains to be connected to the catch basin at the top end of the drain, a plugged tile shall be placed in the upstream wall, with the same diameter and at the same elevation as the outlet tile.

Offset catch basins shall be offset with tile in the size specified on the drawings. All offsets shall enter into the main tile at a maximum angle of 45 degrees downstream with a maximum grade of 0.50%. The connection into the main tile shall be fitted and sealed all around with a minimum of 150mm of 15 MPa concrete. It shall be the responsibility of the Contractor to supply and install all tile required for the construction of the offset. Payment shall be made for the actual quantity installed, as measured at the time of construction, in accordance with the Unit Prices. **All** offsets shall be left open for inspection by the Engineer.

All blind inlets shall be constructed with 19mm clean, crushed stone placed to a minimum depth of 150mm over the top of the tile between the stations as specified in the Special Provisions.

C.11 BRUSH, TREES, DEBRIS, ETC.

The Contractor is to include the removal of all excavation of whatever nature, disposal of material, removal and cutting of all brush, supplying of all labour and completing the whole work in accordance with the Plan, Profile and Specifications. Any trees necessarily removed are to be brushed and left for the Owner of the property on which they are found. All brush, limbs, etc. are to be put in piles by the Contractor and left for disposal by the landowner. No additional payment will be made for brushing of scattered trees where required by the Engineer.

Where, in the opinion of the Engineer, the drain or proposed location of the drain is heavily overgrown with small trees and brush, the Contractor may use a bulldozer or other such equipment to clear a maximum width of 20m. The resulting debris shall be placed where directed by the Engineer and/or the landowner(s) and left for disposal by the landowner(s). Where roots may interfere with the new drain, all such roots shall be grubbed and placed in a pile convenient for disposal by the landowner. No additional payment will be made for such work.

C.12 POOR SOIL CONDITIONS

The Contractor shall immediately contact the Engineer or Drainage Superintendent if poor soil conditions are encountered. The Engineer or Drainage Superintendent may direct the Contractor to construct a temporary open drain to lower the water table or to lay the tile on a crushed stone mat, or to take such action as may be necessary. The basis of payment for such work shall be determined by the Engineer or Drainage Superintendent.

C.13 ROCKS

The Contractor shall immediately contact the Engineer or Drainage Superintendent if boulders of sufficient size and number are encountered such that the Contractor cannot continue trenching with a tiling machine. The Engineer or Drainage Superintendent may direct the Contractor to use some other method of excavating to install the drain. The basis of payment for this work shall be determined by the Engineer or Drainage Superintendent.

If only scattered large stone or boulder are removed on any project, the Contractor shall either excavate a hole to bury same adjacent to the drain, or they shall haul the same to a nearby bush or fence line, or other convenient location as approved by the landowner(s).

C.14 BROKEN OR DAMAGED TILE

The Contractor shall either bury or remove all damaged tile. NO tile shall be left on the ground for the landowner(s).

C.15 FILLING IN EXISTING DITCHES

The Contractor shall backfill the ditch sufficiently for traversing by farm machinery. If sufficient material is not available from the old spoil banks to fill in the existing ditch, the topsoil shall be stripped and the subsoil shall be bulldozed into the ditch and the topsoil shall then be spread over the backfilled waterway.

C.16 CONSTRUCTION OF GRASSED SWALES/WATERWAYS

Where the Contractor is required to construct a grassed swale/waterway, the existing waterway shall be filled in, regarded, shaped and a seed bed prepared prior to applying the grass seed and fertilizer. The grass seed shall be fresh, clean and new crop seed, meeting the requirements of "Lowland Mix" as per OPS 804.

Grass seed shall be applied at the rate of 170kg/ha (150lbs/acre) and the fertilizer shall be applied at the rate of 350kg/ha (300lbs/acre), or as directed otherwise. Fertilizer shall be 8-32-16 (N-P-K).

C.18 TILE CROSSING ROADWAYS BY OPEN CUT

- (a) Unless otherwise specified, the Municipality will supply no labour, equipment or materials for the construction of any road crossing.
- (b) The excavated material removed from the right-of-way shall be removed and disposed of off the site by the Contractor. No excavated material shall be spread on the right-of-way without written consent of the Engineer.
- (c) The backfill material for the excavation on the right-of-way, shall be in accordance with A.17 "Road Crossings".
- (d) The Contractor shall apply calcium chloride at the rate of 1 kg/m³ to the finished surface for the entire width of the excavation covered in this section.

- (e) The excavated material from the trench may be replaced in the trench in the case of covered drains. This material shall be compacted by hand tamping in layers not exceeding 300mm. The finished work shall be left in a clean and orderly condition, flush with or slightly higher than the adjacent ground, and seeded with a good quality grass seed mixture to the requirements of the Engineer.
- (f) The type, location on the right-of-way and the elevation of the top of catch basins, inlets and junction boxes on the right-of-way shall be as required by the Engineer.
- (g)
 - (i) The Contractor shall give the Road Authority such notice as it may require before the Contractor commences any work on the right-of-way of any road. A copy of the notice shall at the same time be sent to the Engineer.
 - (ii) The Contractor shall be responsible for maintaining the road crossing until the work has been approved by the Engineer and shall be responsible for any deficiencies arising from their work for the period of guaranteed maintenance.
- (h) If at all possible, the Contractor shall keep the road open to traffic at all times. The Contractor shall provide suitable warning signs and/or flagpersons to satisfy all requirements for safety and to notify motorists of work on the road ahead. If it is necessary to close the road to through traffic, the Contractor shall provide for and adequately sign the detour road as per the Ontario Traffic Manual Book 7.

C.19 RECOMMENDED PRACTICE FOR CONSTRUCTION OF SUBSURFACE DRAINAGE SYSTEMS

The latest version of The Drainage Guide for Ontario, as published by OMAFRA, shall be the guide to all methods and materials to be used in the construction of tile drains except where superseded by other Specification of the Contract.