

**DRAINAGE REPORT  
FOR THE**

**RELOCATION OF THE  
RUSH DRAIN**

**FORMER TOWNSHIP OF COLCHESTER NORTH  
NOW IN TOWN OF ESSEX**



**8 JANUARY 2021**  
**TIM R. OLIVER, P.ENG.**  
FILE No. 19-1023

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Corporation of the Town of Essex  
33 Talbot Street South  
Essex, Ontario  
N8M 1A8



**Drainage Report for the  
RELOCATION OF THE  
RUSH DRAIN  
Former Township of Colchester North  
Now in the Town of Essex**

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Mayor and Council:

**Instructions**

The Municipality received a request from the new owners of the Essex Town Centre Development for the relocation of the Rush Drain. The works are being undertaken as part of a future residential development within part Lots 284 & 285, South Talbot Road (STR) Concession, in the former Township of Colchester North, now in the Town of Essex. Council accepted the request under Section 78 of the Drainage Act and on 13<sup>th</sup> December 2018 appointed Dillon Consulting Limited to prepare a report.

**Watershed Description**

For the purpose of this report and accompanying drawings, the plan north direction is defined as being perpendicular to the King's Highway No. 3, with the said highway having an east-west alignment. The Rush Drain commences at the junction between Maidstone Avenue West and the Canadian Southern Railway and continues southerly as a closed drain across Allen Avenue to the southerly limit of the existing industrial properties. From there the Rush Drain continues as an open drain flowing in a southerly direction along the line between Lots 284 & 285 Concession STR to South Talbot Road allowance before turning east and then south again to align with and outlet into the 14<sup>th</sup> Concession East Drain.

For the purpose of future drainage assessments, we have divided the watershed area into block areas labelled Blocks 'A', 'B', 'C' and 'D' on the drawings appended to this report. The lands included within the Rush Drain watershed include a mix of existing residential and industrial land, denoted herein as Block 'A' having an area of approximately 45.12 hectares (111.5 acres).

The lower lands included within the Rush Drain watershed south of Block 'A' and lying west of the Cypher Systems Group Greenway corridor and to the north of South Talbot Road are slated for future residential and highway commercial development, being denoted herein as Block 'B' and Block 'C' respectively.

Block 'B' having an area of approximately 33.55 hectares (82.9 acres) presently divided up among nineteen (19) individual parcels with roll number identifiers listed below:

- Roll Number 210-01070 – Essex Town Centre Ltd.
- Roll Number 210-01020 – Essex Town Centre Ltd.
- Roll Number 210-00800 – Essex Town Centre Ltd.

- Roll Number 210-00820 – Essex Town Centre Ltd.
- Roll Number 210-00840 – Essex Town Centre Ltd.
- Roll Number 210-00880 – Essex Town Centre Ltd.
- Roll Number 210-00920 – Essex Town Centre Ltd.
- Roll Number 210-00960 – Essex Town Centre Ltd.
- Roll Number 210-01400 – Essex Town Centre Ltd.
- Roll Number 210-01300 – Essex Town Centre Ltd.
- Roll Number 210-01290 – Essex Town Centre Ltd.
- Roll Number 210-01250 – Essex Town Centre Ltd.
- Roll Number 210-01210 – Essex Town Centre Ltd.
- Roll Number 210-01160 – Essex Town Centre Ltd.
- Roll Number 210-01090 – Essex Town Centre Ltd.
- Roll Number 210-01500 – Essex Town Centre Ltd.
- Roll Number 210-01120 – Essex Town Centre Ltd.
- Roll Number 210-01350 – Essex Town Centre Ltd.
- Roll Number 210-01380 – Essex Town Centre Ltd.

Block 'C' having an area of approximately 6.47 hectares (16.0 acres) presently divided up among two (2) individual parcels with roll number identifiers listed below:

- Roll Number 210-50000 – 1954990 Ontario Inc.
- Roll Number 210-50200 – CL Benninger Equipment (1995) Ltd.

In the interim, these lands are used for agricultural purposes, specifically cash crop farming.

The King's Highway No. 3 and South Talbot Road allowance presently do not drain into the Rush Drain, however the said lands do have direct outlet into the 14<sup>th</sup> Concession East Drain and its associated branch drain which runs westerly along the north side of highway. Future improvements include the widening of the King's Highway No. 3 to four (4) lanes and the completion of South Talbot Road between Maidstone Avenue West and Victoria Road. Once relocated, the Rush Drain will provide drainage for a portion of these roadways totalling approximately 5.41 hectares (13.4 acres).

The Rush Drain also provides outlet for the Cypher Systems Greenway lands and beyond to the east including Sadler's pond and the north-westerly portion of the Viscount Estates, as denoted herein as Block 'D'. The Block 'D' having an area of approximately 8.71 hectares (21.5 acres).

The overall watershed area for the Rush Drain is approximately 102.20 hectares (252.6 acres) including Blocks 'A' to 'D' as well as future drainage from South Talbot Road and King's Highway No. 3. Most of the land parcels within the Rush Drain watershed are systematically drained through urban storm sewer systems, roadside swales and agricultural drainage tiles. There is little topographic relief. From the Ontario Soil Survey, the principle surficial soil in the study area is Brookston Clay and is characterized as a very slow draining soil type.

### **Drain History**

The recent history of Engineers' reports for the Rush Drain follows:

- **8 March 2006 by N.J. Peralta Engineering Ltd.:** The recommended work included the relocation of the open portion of the Rush Drain and the abandonment

of the existing Rush Drain and Branch. The purpose of the drain relocation was to accommodate the request from the previous owner of the Essex Town Centre development (Block 'B') in 2006. The by-law for the report was passed, however only partial works were completed including the filling in of the Rush Drain Branch that was located along the northerly portion of the South Talbot Road allowance and extending from the Rush Drain easterly to the Cypher Systems Group Greenway corridor. Development plans were put on hold and the owner(s) of the said lands elected to sell the property thereafter. Subsequently, a private drainage ditch was constructed across the said development lands to pick up the drainage for part of the Greenway corridor that previously used the Rush Branch Drain as an outlet. Around the same time, maintenance work was performed to clean out the Rush Drain, 14<sup>th</sup> Concession East Drain Branch and a part of the 14<sup>th</sup> Concession East Drain to Pinkerton Road and beyond to the line between Lots 14 & 15, Concession 14.

- **29 November 1979 by LaFontaine, Cowie, Burratto and Associates Ltd.:** The report recommended enclosing the upper portion of the Rush Drain beginning from the Canadian Southern Railway along the south side of Maidstone Avenue West and extending through the Allen Avenue industrial subdivision, a total length of approximately 235 metres. The enclosed portion of drain consists of a 2060 mm span x 1520 mm rise arch pipe.
- **29 January 1965 by C.G.R. Armstrong, P.Eng.:** The recommended work included the repair and improvement of the Rush Drain and Branch, complete with brushing and cleaning. This report also included downstream cleanout works on the 14<sup>th</sup> Concession East Drain and 14<sup>th</sup> Concession East Drain Branch (previously known as the Munch Drain).

#### Meeting with Landowners

The first meeting was held at the Town of Essex Municipal Building on 26<sup>th</sup> March 2019. A record of the meeting is provided in Schedule 'A', which is appended hereto. There was representation from the Town of Essex, the landowner of Block 'C' lands, the Essex Region Conservation Authority and Dillon Consulting Limited.

#### Meetings with Ministry of Transportation

Subsequent meetings were held between the Town of Essex and the Ministry of Transportation Ontario on February 6, 2020 and April 29, 2020. The purpose of these meetings were to introduce and further discuss the proposed alignment of the relocated Rush Drain within the King's Highway No. 3 corridor. Dillon Consulting prepared some plans and cross sections for the Town to share with the Ministry representatives at their meeting of February 6, 2020. The Ministry was receptive to the drain relocation design provided the following conditions could be met as follows:

- Pre and post development flow calculations on the new Rush Drain show no increase in water elevations during the 1 in 100 year storm event and that a minimum 1 m freeboard is maintained below the travelled highway surface.
- A cost comparison between locating the Rush Drain to the south side of South Talbot Road versus the north side of South Talbot Road confirms there are substantial cost savings with locating the drain onto the King's Highway No. 3 corridor. Given the required width for the Rush Drain to be an open channel, there is insufficient room to locate the drain entirely within the South Talbot Road



allowance without having to shift the roadway to the most northerly limit which then conflicts with the existing overhead hydro transmission line pole locations, fire hydrants and also leaves no available space for a future multi-use trail or the future gas main on the road allowance.

Shifting the road entirely to the south limit of the road allowance and locating the drain to the north side would require costly utility relocations including the existing overhead hydro transmission line, watermain, and the future placement of a gas main that would need to acquire an easement on private future commercial lands adjacent to South Talbot Road. Alternatively, to construct an enclosed drain requiring less space than an open drain would not be an option. This is primarily due to the loss of fish habitat which is not acceptable to ERCA or DFO, as well as limiting the hydraulic capacity and creating a maintenance concern for the cleaning a long culvert with minimal gradient available.

- A cost comparison between locating the Rush Drain on lands north of South Talbot Road allowance versus lands on the King's Highway No. 3 corridor confirms there are substantial cost savings with locating the drain onto the King's Highway No. 3 corridor. For the drain to be located beyond the north limit of South Talbot Road allowance would require acquisition of lands for the drain. The costs of the land acquisition would be significant given its designated used for highway commercial development. In addition, the said lands would require driveway access bridges over the drain to South Talbot Road. With the relocation of the entire drain width onto the King's Highway No. 3 lands at its northerly limit, there is sufficient room to ensure the drain does not encroach into the required 13.5 m wide clear zone for the new widened highway. Prior the highway widening and its location being shifted more southerly than the current location, the requirement for a guide rail is the only additional cost.

On March 11, 2020 the Ministry of Transportation provided comments on the plans and sections illustrating the relocated Rush Drain within the King's Highway No. 3 corridor. A comment summary is enclosed within Schedule 'A' herein. In response, a re-submission of updated plans and cross sections were submitted by Dillon Consulting to the MTO on April 9, 2020 by formal letter. A copy of this correspondence has also been included within Schedule 'A' herein. Two options (Options No. 1 and No. 2) were proposed as part of the April 9, 2020 correspondence.

On April 28, 2020, Ministry representatives indicated their preference would be for Option No. 2. A copy of the email correspondence was received on April 28, 2020 and confirming same has been included within Schedule 'A' herein. Option No. 2 provides an increased offset distance from the Rush Drain to the nearest westbound lane of the future widened highway ranging between 14.2 m and 18.7 m. This satisfies the Ministry to have the relocated drain located entirely outside of the 13.5 m wide clear zone. The Town of Essex by similar correspondence on the same day instructed Dillon to proceed with the preparation of the drainage report including the Rush Drain relocation within the highway corridor as per Option No. 2.

Further to this response, the Town of Essex, MTO and Dillon held a virtual meeting on April 29, 2020 and there was further discussion pertaining to the Rush Drain relocation. This included the MTO's request for Dillon to provide updated cross sections as this realignment is a change from the current contract design for King's Highway No. 3. The drainage report drawings will detail the design and contain plan view and cross section drawings that would be used for the construction of the relocated Rush Drain. The MTO

requested that sections be provided at every 25 m intervals. The Town of Essex and Dillon confirmed that the MTO will be provided with a copy of the drainage report when it's completed for their review.

### Survey and Existing Conditions

Our survey of the existing Rush Drain alignment and the surrounding lands it traverses (Blocks 'B' and 'C') was completed in March 2019 including the No-Name Drain that serves as a tributary to the Rush Drain. We also surveyed the adjacent drainage ditches within the Cypher Systems Group Greenway corridor and the Rush Drain outlet condition continuing south of the King's Highway No. into the 14<sup>th</sup> Concession East Drain downstream to Pinkerton Road.

### Rush Drain

Our survey of the existing Rush Drain open portion that was abandoned in 2006 had revealed numerous sediment bars and drain bank erosion. Due to the lower land elevation abutting part of the drain, the channel is relatively shallow and unable to convey the upstream drainage flows without the over spilling and flooding of the surrounding lands. The upstream part of the Rush Drain is enclosed with a 2060 mm x 1520 mm pipe arch culvert, approximately 235 m in length. It continues to have municipal drain status and was not abandoned in 2006, however is presently without a legal outlet.

Most of the open drain channel is free and clear of brush with sparse weedy vegetation on the drain banks providing little stability. We also observed a significant amount of standing water within the lower part of the Rush Drain near its outlet at the King's Highway No. 3 culvert. This is mostly attributed to the significant sediment accumulation throughout the highway culvert that requires cleaning.

### 14<sup>th</sup> Concession East Drain

Our survey revealed some sediment build up within the upper part of the 14<sup>th</sup> Concession East Drain that would require cleaning. The drain was last cleaned in 2016 and there is only minimal brushing work required. The available drain bottom gradient between Pinkerton Road and the King's Highway No. 3 when considering the depth through existing culverts is 0.03%.

The design gradient established in the previous 1965 Armstrong report for the 14<sup>th</sup> Concession Drain East was 0.05%, however in terms of the drain's performance, with a slightly deeper drain at a reduced grade, there is no measurable loss in drain capacity. The reason being that for most cases, the existing culvert crossings limit the drain's capacity. With the additional drain depth, a lower tail water condition for each culvert exists and this results in a slight increase in capacity for each culvert. The reduction of flow velocity with a lesser 0.03% drain gradient is negligible, and no increase in sedimentation is expected.

### No-Name Drain

The No-Name Drain has no drain by-law on record with the Town of Essex and therefore is presumed to be a private drain having no municipal drain status. The said drain flows are from east to west starting at the Cypher Systems Group Greenway and continuing along the rear property limit of the Allen Avenue industrial properties to the original Rush Drain. The No-Name Drain picks up drainage from the existing industrial lots on the south side of Allen Avenue, part of the Cypher Systems Group Greenway corridor ditches including drainage from the northwest portion of the Viscount Estates and the Sadler's Pond property.

With the proposed relocation of the Rush Drain and filling in the abandoned Rush Drain, the No-Name Drain no longer has an outlet and would require regrading in the opposite direction from west to east to direct the drainage from the industrial lands to the realigned Rush Drain. Alternatively, consideration has been given to partially fill in the No-Name and provide existing drainage connections for each of the industrial properties to extend across to the new relocated Rush Drain. We believe this to be more practical and the filling in of the No-Name Drain would improve accessibility through a future drain maintenance corridor along the rear of the existing industrial properties. The access corridor would be a part of the new realigned Rush Drain allowing the municipality (Town of Essex) access for both future maintenance of the drain and the industrial lot drainage connections.

The drainage from a portion of the Cypher Systems Group Greenway corridor, the northwest portion of Viscount Estates and Sadler's Pond would be intercepted by the new realigned Rush Drain situated along the greenway. The area represented by the said lands is approximately 11.65 hectares (28.8 acres). Given that the No-Name Drain currently has no known legal status, these lands are better served with a new outlet directly into the re-aligned Rush Drain. This is made possible by the two existing culverts that cross the greenway corridor at the north and the south ends of the re-aligned Rush Drain portion along the greenway corridor.

#### Cypher Systems Group Greenway

The Cypher Systems Group Greenway drainage presently has no legal outlet into a municipal drain. The lands are currently owned and maintained by the Essex Region Conservation Foundation and include a public trail existing since 2010. There are two existing culverts that cross the trail. The northerly culvert is aligned with and outlets to the No-Name Drain which provides drainage for the trail as well as Sadler's Pond and the northwest portion of the Viscount Estates trailer park. The southerly culvert is located at the South Talbot Road allowance. Its previous outlet was the Rush Drain Branch until it was abandoned as part of the 2006 N.J. Peralta Engineering report recommendations for the Rush Drain improvements. The Rush Drain Branch was then subsequently filled in.

A temporary drainage outlet for the south end of the greenway corridor was provided through an existing private open drain located near the southerly limit of the Essex Town Centre Development lands (denoted as Block 'B' on the drawings) which extends westerly over to the Rush Drain. Once this open portion of the Rush Drain, which had been previously recommended for abandonment, is replaced with the new relocated Rush Drain within the greenway corridor, the private open drain will remain for collecting surface water runoff from the Block 'B' lands and directing it into the relocated Rush Drain.

There exists a 3 m wide asphalt surfaced public trail on the Cypher Systems Group Greenway that is situated a minimum 1.5 metres away from the existing west side ditch. The new relocated Rush Drain essentially takes the place of this west side ditch and will continue to maintain the minimum 1.5 m wide buffer away from the edge of the trail. There is a significant overgrowth of brush and sucker growth type smaller trees occupying the existing ditch that will require clearing as part of the relocated Rush Drain construction. Within this buffer zone, some new tree and shrub plantings has been considered to re-establish some cover and shade for the drain as well as to provide habitat and restore the naturalization of the trail enhancing the aesthetic features. The Essex Region Conservation Authority should be consulted concerning the preferred type of tree and shrub species.

#### Overhead Hydro Transmission Line

An existing overhead hydro pole transmission line, owned and operated by Hydro One

Networks Inc. extends from Maidstone Avenue southerly along the east side of the covered portion of the Rush Drain and then heads easterly following the northerly limit of the Block 'B' lands and continuing across the greenway corridor, the southerly limit of the Sadler's pond property and beyond. Its alignment is approximately 0.5 m south of the northern property limit of the Block 'B' lands and will be directly adjacent to the future Rush Drain.

With the future development on Block 'B', a new road allowance (Bear Street) will border the northerly property limit. The width of the road allowance was designed to be 22.86 m (75') and is larger than the standard 20 m (66') wide road allowance. The wider road allowance was designed to accommodate the relocated Rush Drain as well as a new location for the hydro pole line inside a 2.8 m (9.2') wide grass boulevard between the Rush Drain and the future residential street.

Provision has been made to maintain a minimum 1.8 m clearance between the new line of hydro poles and the Rush Drain. Coordination with Hydro One Networks Inc. will be required to relocate the hydro transmission line in order to facilitate the relocated drainage works, the future construction of Bear Street and the noise barrier fence being located between the new pole line and the drain. The hydro transmission line location would be approximately 10.1 m (33.1') further south from its present alignment. Access to the relocated hydro transmission line would be available from the municipally owned lands of the future Bear Street, Bell Avenue and the storm water pond access road. In accordance with Section 26 of the Drainage Act, the increased costs to the drainage works would constitute all costs associated with the relocation of the existing public utility that is assessable against Hydro One Networks Inc. having jurisdiction over the transmission line.

#### **King's Highway No. 3 Widening and South Talbot Road Construction**

Over a 3 year time period (2021 – 2023) the Ministry of Transportation Ontario is committed to the widening of King's Highway No. 3 (Essex By-pass) to four lanes and extending eastward from the previous work in 2009 which ended approximately 670 m to the east of Maidstone Avenue West (County Road No. 8). In addition to the highway widening, there are plans in the Spring of 2021 to first complete the South Talbot Road extension eastward and join up with existing road previously completed at the North Malden Road entrance leading into Viscount Estates. The original portion of South Talbot Road going east of Maidstone Avenue West was constructed in 2006 for an approximate 400 m long distance. After completion of this future road extension, South Talbot Road will link Maidstone Avenue West to Victoria Avenue.

The South Talbot Road portion alongside the existing commercial properties has an existing ditch on the south side that drains westward. Drainage from this ditch is first directed into an existing storm water management pond that is located beyond the westerly portion of South Talbot Road near Maidstone Avenue. The pond has a controlled outlet discharging into the 14<sup>th</sup> Concession East Drain Branch. The easterly portion of South Talbot Road that is alongside future commercial properties has been designed, as part of the future highway improvements, and the existing drainage swale is being redirected into the relocated Rush Drain.

#### **Design Considerations**

As per the requirements for the Rush Drain relocation as set out by both the Town of Essex and the Essex Region Conservation Authority concerning the future Essex Town Centre residential development (Block 'B' lands), we have designed the new drain taking into account the application of storm water management for this development. We have considered the controlled discharge that has been designed for the future storm water



detention pond's pumping station to outlet into the relocated Rush Drain and have confirmed this will have no adverse impacts to the surrounding lands both upstream and downstream of the said development.

The following design criteria has been applied as noted below:

- An existing conditions model was completed using PCSWMM computer hydrologic modelling software to assess flow and hydraulic grade line conditions in the existing Rush Drain and associated drainage systems entering the drain. Inflow hydrographs from flow entering the Rush Drain, No-Name Drain and the Cypher Systems Group Greenway drainage ditches were made available by the Town of Essex through Stantec Inc., who is presently undertaking a storm water study for a larger part of the Town of Essex including the lands where the Essex Town Centre Development is located. The downstream extents of the PCSWMM model is the 14<sup>th</sup> Concession East Drain at Pinkerton Road. Associated drainage areas of the 14<sup>th</sup> Concession East Drain Branch up to this limit were also included in the model. The 1 in 100 year design storm was used in the analysis based on a 4 hour duration and 15 minute peak intensity of approximately 144 mm/hr and a total volume of 81.5 mm for the upstream watershed.
- The proposed conditions model was developed to simulate the hydraulic conditions of the relocated Rush Drain during the 1 in 100 year design storm to determine the required minimum drain cross section sizes to maintain water surface elevations at or below existing conditions for both the upstream and downstream ends of the Rush Drain. The recommended drain cross section sizes were determined based on the ultimate full developed condition of the Essex Town Centre development which accounts for the maximum controlled discharge rate that would be pumped from the storm water detention pond into the relocated Rush Drain for the new development. This controlled discharge rate is 160 L/s and was based on the allowable release rate using a 1 in 2 year design storm with a 24 hour duration and using the SCS Type II rainfall distribution which is most suitable for rural watersheds. Municipal drains like the Rush Drain and the 14<sup>th</sup> Concession East Drain have design capacity to serve rural watersheds with a typical 1 in 2 year storm conveyance.
- The storm water management pond for the Essex Town Centre development was designed to provide an oversized storage volume to account for the urban stress test due to climate change as defined within the Windsor/Essex Region Storm water Management Standards Manual (ERCA, 2018). This represents a higher intensity storm for this region beyond the 1 in 100 year design storm with a 24 hour rainfall distribution yielding an additional 42 mm depth of rainfall for a total of 150 mm. The overland surface flows within the development are designed to limit flooding of roadways to not exceed 0.3 m depth and are to be routed entirely to the storm water management pond to be temporarily stored and released at the 1 in 2 year design storm pre-development rate. The net effect of this oversized pond will be an attenuation of the peak drainage flows within the relocated Rush Drain as well as the downstream receiving drain being the 14<sup>th</sup> Concession East Drain. This accounts for larger storm events up to the 1 in 100 year frequency. With regular drain maintenance, these downstream drains will provide sufficient outlet.

Similar to the Essex Town Centre future residential lands, the relocated Rush Drain is designed to account for drainage at a pre-development flow rate from the future commercial lands, denoted herein as Block 'C', and representing a total of approximately 6.47 Ha (16.0 acres). It would be the responsibility of the owner(s) of the said future



commercial lands to address on-site storm water management requirements including all the necessary approvals associated thereof.

### **Recommendations**

#### **Rush Drain Relocation for Block 'B' & Block 'C' Lands**

We recommend the relocation of the outlet for the Rush Drain that was previously abandoned and extends across the Block 'B' and Block 'C' lands measuring approximately 765 m in length. Once the relocated drain is constructed, including the full grass seeding of the channel, the original Rush Drain can be filled in across the said properties.

The new open portion of the Rush Drain would commence from the enclosed upper portion of the drain turning eastward and extending to the Cypher Systems Group Greenway corridor. From there the Rush Drain would continue southward along the west side of the existing pedestrian trail and remaining entirely within the greenway corridor. Once across the South Talbot Road allowance, the Rush Drain would turn to the west along the northern portion of King's Highway No. 3 corridor to its outlet through the existing highway culvert as part of the 14<sup>th</sup> Concession East Drain. The total length of relocated drain is approximately 1,445 m and would consist of a trapezoidal channel with a larger cross section and depth compared to the abandoned Rush Drain.

The new relocated Rush Drain is to be constructed off line and a grass cover established over the channel prior to connecting to and receiving the drain flows from the upstream enclosed portion of the Rush Drain. As for the other contributing flows from the No-Name Drain, the Cypher Systems Group greenway corridor, Viscount Estates, Sadler's Pond, South Talbot Road and King's Highway No. 3, drainage will be accommodated during construction of the relocated Rush Drain. A portion of the excavated materials that is sufficient in volume to completely fill in the abandoned Rush Drain alignment which traverses both the Block 'B' and Block 'C' lands shall be temporarily stockpiled along the east side of the said drain in a windrow until such time that the relocated Rush Drain has been fully vegetated and ready to be connected and receive upstream drainage flows. Thereafter, the abandoned Rush Drain shall be filled in across both the Block 'B' and Block 'C' lands. The temporary stockpiled materials along the abandoned Rush Drain shall be placed no closer than 2 m from the edge of the drain and openings provided within the stockpiled windrow to ensure surface drainage is maintained for the vacant Block 'B' lands.

A portion of the Rush Drain excavated materials that is sufficient in volume to partially fill in the No-Name Drain shall be stockpiled for this purpose. Despite the filling in of the above noted drains, there will remain a significant amount of excess excavated materials from the Rush Drain construction that shall remain on the Block 'B' lands and shall be stockpiled in the locations as directed by the owner or the owner's engineer for use in the future development of these lands.

The upper enclosed portion of the Rush Drain shall remain in place continuing through the Allen Avenue industrial lands northerly to Maidstone Avenue West to the Canada Southern Railway lands.

#### **Rush Drain (Station 0+000 to Station 0+134)**

Starting from the downstream end, the relocated Rush Drain requires the extension of the King's Highway No. 3 culvert (Bridge No. 1) by a 2.5 m length before the start of the new open drain channel that continues easterly for approximately 131.5 metres and parallel to the northerly limits of the highway corridor. From Station 0+002.5 to Station 0+134, the relocated drain is designed to have a bottom width of 2.5 m, 2:1 (H:V) side slopes, and

0.03% gradient. It is oversized to ensure that the 1 in 100 year storm flows are conveyed below full bank conditions and that the resulting water surface elevation is below the travelled highway surface providing a minimum 1 m freeboard to satisfy the Ministry of Transportation Ontario's highway design requirements. The location of the Rush Drain will be entirely beyond the minimum 13.5 m wide clear zone measured from the northern edge of the future westbound lanes of the widened highway. The existing drainage areas for the King's Highway No. 3 and South Talbot Road shall be directed into this drain segment.

Additional works associated with this new drain segment include provisions for a steel guiderail to be located 0.5 m south of the south drain bank for the relocated Rush Drain from Station 0+000 easterly along the same alignment. If the Rush Drain is constructed prior to the widening and shifting of the King's Highway No. 3 further south, the guiderail will be situated approximately 5 metres away from the north edge of the present highway. The guiderail if it were to remain in place after the highway widening is completed would remain outside of the 13.5 m clear zone and address avoiding any safety hazard or structure being erected inside the clear zone.

Should construction of the South Talbot Road extension linking Maidstone Avenue West to Victoria Avenue be initiated before the Rush Drain relocation, the road would be crossing the abandoned Rush Drain at its outlet and requires a new culvert as a temporary measure. We recommend a 30 m long, 1800 mm diameter concrete pipe culvert with sloping stone end treatment. This culvert is designed to convey a 10 year storm peak flows as the minimum design standard for a local road. The Ministry of Transportation Ontario would be responsible for the temporary culvert placement and may elect to install a larger culvert, if necessary, to meet their highway drainage standards.

In the event that the Rush Drain relocation was completed prior to the South Talbot Road extension, there would be no requirement for a temporary culvert across the road. This relocated off line Rush Drain segment from Station 0+000 to Station 0+134 would receive drainage flows directly from King's Highway No. 3, South Talbot Road and the Block 'C' lands. With the relocation of the Rush Drain, the Block 'C' lands still require an outlet for which the abandoned Rush Drain presently provides. However, when South Talbot Road is constructed, there would be the requirement for a culvert. The size of this culvert would be considerably smaller than the temporary culvert being required under South Talbot Road in the event that the relocated Rush Drain was completed prior to construction of the road.

#### Rush Drain (Station 0+134 to Station 0+171.5)

The relocated Rush Drain turns northward to cross South Talbot Road and follows the west side of the Cypher Systems Group Greenway. Since the new location of the Rush Drain will be situated on the south side of South Talbot Road within the limits of the King's Highway No. 3, a new road culvert will be required in the future. We have recommended a 36 m long, 2400 mm span by 1200 mm rise precast concrete box culvert (denoted herein as Bridge No. 2) to facilitate the future construction of South Talbot Road. The culvert is designed to ensure that the 1 in 100 year storm flows are conveyed without exceeding the full bank conditions and preventing any increase in the backwater elevation extending to the upper end of the drain. The new bridge alignment will be diagonally across the road following same north-south direction as the relocated Rush Drain.

There will be the necessary lowering of an existing 200 mm diameter water main to pass below the drain and the future road culvert and providing a minimum 0.5 m clearance. The existing underground Bell Canada telephone cables will cross over the new culvert in two locations within both the South Talbot Road allowance and King's Highway No. 3 corridor.

The Bell utility would otherwise require relocation below the drain if the road culvert was not installed prior to or at the same time as the construction of the relocated Rush Drain. Care shall be taken not to damage the cables during installation of the new culvert.

In the vicinity of the existing water main location, there is also an existing 450 mm diameter sanitary sewer, however it is approximately 2.5 metres below the new culvert and does not pose an elevation conflict with the new culvert. The existing sanitary sewer maintenance hole structures are in close proximity to the new culvert. Care shall be taken not to disturb these structures during installation of the new culvert.

There is also an existing culvert crossing of the greenway corridor that we have recommended be abandoned and replaced with a new culvert to be located further north and outside of the South Talbot Road allowance. The original outlet for this existing culvert was the Rush Drain Branch, however it was previously abandoned and filled in. The new culvert outlet shall be into the relocated Rush Drain on the upstream side of Bridge No. 2.

Should the South Talbot Road extension, as part of the Ministry of Transportation Ontario's project to widen the King's Highway No. 3 precede the Rush Drain relocation, the Ministry will be responsible for all costs associated with this crossing.

#### Rush Drain (Station 0+171.5 to Station 0+925)

The north-south portion of the relocated Rush Drain shall occupy the lands of the Cypher Systems Greenway situated entirely within and parallel to the westerly limit of the corridor. From Station 0+171.5 to Station 0+925, the Rush Drain has been designed to have a bottom width of 1.7 m, 1.5:1 (H:V) side slopes and 0.03% gradient. It is oversized to ensure that the 1 in 100 year storm flows are conveyed without exceeding the full bank conditions and preventing any increase in the backwater elevation extending to the upper end of the drain.

With the presence of an existing asphalt pedestrian trail, the relocated Rush Drain has also been designed to maintain the minimum 1.5 m separation continuously between the existing west side ditch and the westerly edge of the trail. For the most part, the pedestrian trail is straight and very close to being parallel to the existing west side ditch and greenway corridor alignment. The exception is between Station 0+266 and Station 0+416 for the new relocated Rush Drain where the trail shifts to the west and there would be only a 0.5 m clearance from the trail. To establish a minimum 1.5 m separation, we have recommended the westerly bank be constructed at 1:1 side slopes and lined with gabion stone erosion protection. The easterly drain bank will remain at 1.5:1 side slope and seeded to grass.

Alongside the Greenway corridor the drainage from the east side is received by the relocated Rush Drain via two separate culverts crossings under the pedestrian trail. The west side ditch within the greenway corridor, the northwest portion of the Viscount Estates residential area and Sadler's Pond use the existing 600 mm diameter culvert that is aligned with the No-Name Drain at the north end of the relocated Rush Drain. We recommend a new north culvert consisting of a 15 m long, 600 mm diameter high density polyethylene (HDPE) pipe to align with the new Rush Drain and abandonment of the existing culvert. The new culvert shall be considered a part of the Rush Drain drainage works while the existing culvert will remain the responsibility of the owner of the greenway corridor.

The existing east side ditch within the greenway corridor uses the existing 750 mm diameter culvert that is aligned with South Talbot Road allowance at the south end of the relocated Rush Drain. We recommend a new south culvert consisting of a 9 m long, 750 mm diameter high density polyethylene (HDPE) pipe to outlet into the new Rush Drain upstream of Bridge No. 2 and abandonment of the existing culvert. The existing culvert is



completely filled in with sediment. Rather than removing the culvert, we recommend the ends of the pipe be capped and sealed with non-shrink concrete grout. The new culvert shall be considered a part of the Rush Drain drainage works while the existing culvert will remain the responsibility of the owner of the greenway corridor.

There is also a private east-west ditch traversing the Block 'B' lands and is located near its southerly limit that cross connects between the greenway corridor ditch and the abandoned Rush Drain to the west. With the future filling in of the abandoned Rush Drain, the new outlet for this private east-west ditch will be the relocated Rush Drain. We have recommended a new 600 mm diameter high density polyethylene pipe outlet where the ditch enters the new relocated Rush Drain at Station 0+374 complete with a backwater gate.

We have also recommended a new drain crossing (denoted herein as Bridge No. 3) over the relocated Rush Drain to connect the greenway pedestrian trail to the Block 'B' lands and future Essex Town Centre residential development. The location of the crossing (Station 0+705) is near the southerly limit of the future storm water detention pond and will serve primarily as a pedestrian access link between the future residential area and the greenway corridor. It will also serve a secondary function for future drain maintenance where the access corridor would switch from the west side of the drain on the storm water pond property to the greenway corridor lands on the east side of the drain and continuing southward to South Talbot Road. The bridge shall comprise of a 15 m long, 2500 mm x 1830 mm corrugated steel pipe arch with sloping stone endwalls providing a minimum 6 m wide top width. The culvert is designed to ensure that the 1 in 100 year storm flows are conveyed without exceeding the full bank conditions and preventing any increase in the backwater elevation extending to the upper end of the drain.

#### Rush Drain (Station 0+925 to Station 1+445)

The relocated Rush Drain turns westward to follow along the northerly limit of the Block 'B' lands continuing upstream and returning to the enclosed upper part of the Rush Drain. Gabion stone erosion protection has been recommended on the drain bends and in the vicinity of existing hydro poles that are close to the drain bank within a 0.5 metre clearance. The hydro poles are part of an existing hydro transmission line that will require future relocation to facilitate both the Rush Drain relocation and the future Essex Town Centre Development on the Block 'B' lands. Should the hydro poles be removed prior to the drain relocation, the erosion protection measures, as noted herein, would not be required.

From Station 0+925 to Station 1+445, the relocated drain is designed to have a bottom width of 3.0 m, 1.5:1 (H:V) side slopes, and 0.13% gradient. It is oversized to ensure that the 1 in 100 year storm flows are conveyed below full bank conditions. This section of drain will also receive the new drainage outlets being recommended for the existing Allen Ave industrial lots that back on to the No-Name Drain as the said private drain will no longer have an outlet into the abandoned Rush Drain that will be filled in as part of the works recommended herein. The recommended work for these new drainage outlets is further explained below under the section titled "No-Name Drain (Station 0+000B to Station 0+538B)".

We have also recommended a new drain crossing (denoted herein as Bridge No. 4) over the relocated Rush Drain for the future Bell Avenue road allowance. The bridge shall comprise of a 20 m long, 2400 mm span x 1200 mm rise pre-cast concrete box culvert with sloping stone endwalls. There will be the required future extension of the existing 250 mm diameter water main on Bell Avenue to cross and deflect under the new culvert and provide a minimum 0.5 m clearance.

#### 14<sup>th</sup> Concession East Drain (Station 0+000A to Station 0+593A)

We recommend a bottom cleaning of the 14<sup>th</sup> Concession East Drain starting from the downstream side of the Pinkerton Road and continuing upstream to the north side of King's Highway No. 3. The work shall include excavation and levelling of drain spoils onto adjacent agricultural lands to the west within the designated working corridor as well as the cleaning of three (3) existing bridges located within this reach of drain. The bottom shall be maintained at a minimum 1 m width and the 1.5:1 side slopes to remain undisturbed.

Within the limits of available depth at these bridges, we have recommended a modified design gradient for the 14<sup>th</sup> Concession East Drain reducing it from 0.05% to 0.03% in order for the Rush Drain outlet at the King's Highway No. 3 crossing to be lowered by approximately 0.12 m. This extra depth compensates for any capacity loss with a reduced grade, and furthermore permits the relocated Rush Drain to be designed of sufficient size and gradient to convey the upstream drainage flows without any adverse impacts to upstream or downstream properties.

The Ministry of Transportation Ontario intends to extend the southerly end of the existing highway culvert (denoted herein as Bridge No. 1) as part of the future widening of King's Highway No. 3 and expansion of the highway corridor. The extension of the existing 3000 mm span x 1500 mm rise concrete culvert by approximately 33.5 m will be completed as part of the future highway improvements. With a deeper drain resulting from the grade change downstream, the resulting increase in flow rate compensates for the minor hydraulic losses associated with increased culvert length. The existing highway culvert is of adequate size and poses no restriction to the Rush Drain upstream flows. We have also recommended stone erosion protection at the existing drain bend location near the south limit of the King's Highway No. 3 corridor. The drain bend is situated within the same vicinity as the downstream end of the extended highway culvert.

#### No-Name Drain (Station 0+000B to Station 0+538B)

We have recommended the No-Name Drain be partially filled in and re-graded such that each industrial lot has at least one new rear yard catch basin to collect surface drainage. The drainage flows are discharged via outlet pipes directly into the relocated Rush Drain complete with stone erosion protection on the pipe ends. Where existing storm drain connections exist from the industrial properties, we have recommended they be connected to the rear yard catch basins. Sediment control measures to be implemented around the catch basins and the filled area of the No-Name Drain to receive a top soil layer to be fine graded and seeded to grass.

The new rear yard catch basins and lead pipes shall form part of the drainage works for the Rush Drain in order to maintain drainage for the existing industrial properties. We recommend a 4.5 m wide access corridor along the north side of the relocated drain Rush Drain, of which a 4 m width is available across the rear limit of the existing industrial properties continuing up to the existing fences where they are present. The purpose of the corridor is not only for the construction of the individual drain connections, catch basins, associated infilling and grading works, it will further provide a future maintenance corridor for the Rush Drain with the access to the corridor being available from Bell Avenue.

#### Allowances (Relocated Rush Drain)

In accordance with Section 29 of the Drainage Act, we have made a determination of the amount to be paid for lands used or taken for the purpose of relocating the Rush Drain



including areas used for both the construction and future maintenance corridors. For affected lands which are presently occupied by the abandoned Rush Drain, we have not provided a land allowance since the said lands occupied by the abandoned drain when filled in become re-usable and are no longer encumbered. Schedule 'B-1' herein shows the distribution of these allowances in a total amount of \$14,000.00.

In accordance with Section 30 of the Drainage Act, we determined the amount to be paid to the owners for damages to lands and crops (if any) occasioned by the operation of equipment and the disposal of material excavated from the drain. For affected lands which are presently occupied by the abandoned Rush Drain, we have not provided a damage allowance since the said lands occupied by the abandoned drain when filled in become re-usable and are no longer encumbered. For non-agricultural lands which may be disturbed during the drain excavation works, we have recommended the restoration to original or better than original conditions in lieu of providing a damage allowance.

#### **Allowances (14<sup>th</sup> Concession East Drain)**

In accordance with Section 30 of the Drainage Act, we have made a determination of the amount to be paid to the owners for damages to lands and crops (if any) occasioned by the operation of equipment and the disposal of material excavated from the drain. For non-agricultural lands which may be disturbed during the drain excavation works, we have recommended the restoration to original or better than original conditions in lieu of providing a damage allowance. The allowance for damage costs is calculated at a rate of \$3,707 per hectare, (\$1,500 per acre). Schedule 'B-2' herein shows the distribution of these allowances in a total amount of \$2,000.00.

#### **Cost Estimate (Rush Drain)**

We have estimated the costs of the recommended drainage improvements to the Rush Drain, as outlined below:

<b>Item</b>	<b>Description</b>	<b>Amount</b>
	<b><u>RUSH DRAIN</u></b>	
1.	Tree and brush removal within the Cypher Systems Group Greenway corridor specifically the west side of the pedestrian trail including the existing ditch. The work shall also include the removal of tree stumps to permit construction of the new drain and the disposal of all trees, brush and stumps by burning on-site or removal off-site as required to accommodate the drainage works.	\$40,000.00
2.	Fencing and Guiderail works, as follows:	
	a) Remove existing wire fence along north limit of King's Highway No. 3 corridor where required to gain access for construction and to re-instate fence as per OPSD 971.101 & OPSD 971.103 drawing details.	\$5,000.00

Item	Description	Amount
	b) Supply and installation of a steel guiderail (OPSD 912.125) and Type M20 steel posts (OPSD 912.127) complete with a flared extruder terminal at the east end (overall guiderail length approximately 150 metres) meeting the Ministry of Transportation Ontario design standards and highway safety requirements.	\$60,000.00
3.	Strip and place topsoil as follows:	
	a) From Station 0+925 to Station 1+440 strip topsoil (minimum 150 mm depth) across a minimum 10 m width over the proposed drain location and temporarily stockpile separately within the designated working corridors. Upon completion of excavation, spread a thin layer of salvaged topsoil a minimum 25 mm thickness over the drain banks of the new drain from Station 0+000 to Station 1+440 and fine grade.	\$25,000.00
4.	Excavation, trucking, filling and compaction of excavated materials, as follows:	
	a) Excavation of new Rush Drain from Station 0+000 to Station 1+440, totalling approximately 1,440 lineal metres of drain and approximately 11,200 m <sup>3</sup> of material including trucking to temporary stockpile area on site of (Block 'B' lands) as directed by the property owner.	\$80,000.00
	b) <b>(Future Work)</b> Excavation of new Rush Drain from Station 1+440 to Station 1+445, totalling approximately 5 lineal metres of drain and approximately 50 m <sup>3</sup> of material including trucking to temporary stockpile area on site of (Block 'B' lands) as directed by the property owner. <u>Note:</u> Work shall be completed once the relocated Rush Drain is a fully established grass lined channel.	\$1,000.00
	c) <b>(Future Work)</b> Remove all vegetation and organic debris from the existing drain slopes from the abandoned Rush Drain on the Block 'B' lands prior to infilling. Fill existing drain (approximately 3,000 m <sup>3</sup> ) including trucking, filling and compaction of material in 250 mm lifts. Compaction to a minimum of 95% standard proctor density. Any excess materials to be stockpiled on site in location specified by property owner. <u>Note:</u> Work shall be completed once the relocated Rush Drain is a fully established grass lined channel and connected to upstream Rush Drain portion between Station 1+440 and Station 1+445.	\$30,000.00

Item	Description	Amount
	d) <b>(Future Work)</b> Remove all vegetation and organic debris from the existing drain slopes from the abandoned Rush Drain on the Block 'C' lands prior to infilling. Fill existing drain (approximately 1,200 m <sup>3</sup> ) including trucking, filling and compaction of material in 250 mm lifts. Compaction to a minimum of 95% standard proctor density. Any excess materials to be stockpiled on site in location specified by property owner. <b>Note:</b> Work shall be completed once the relocated Rush Drain is a fully established grass lined channel and connected to upstream Rush Drain portion between Station 1+440 and Station 1+445.	\$12,000.00
5.	Seeding of new drain banks as follows:	
	a) Supply and placement of bonded fibre matrix hydro-seed on new drain banks from Station 0+000 to Station 1+440 (approximately 15,000 m <sup>2</sup> ).	\$50,000.00
6.	Supply and plant new trees (red cedar or other as specified by ERCA) @ minimum 9 m spacing along west side of Greenway pedestrian trail from Station 0+180 to Station 0+898 providing a minimum 1 m clearance from trail edge (approx. 80 trees). Between the trees, supply and plant shrubs (Black Chokeberry or Winterberry Holly or other as specified by ERCA) @ minimum 3 m spacing providing a minimum of 1 m clearance from trail edge (approx. 160 shrubs). Work shall include watering, fertilizer and staking where required.	\$20,000.00
7.	Pedestrian trail drainage works, as follows:	
	a) <u>Station 0+176 (Cypher Systems Group Greenway) –</u> Supply and install 750 mm diameter HDPE pipe, 9 m long culvert under trail including heavy duty steel flap gate, clear stone bedding (approximately 10 tonnes), compacted full Granular 'B' backfill (approximately 55 tonnes) Granular 'A' subgrade (approximately 5 tonnes) and asphalt restoration of pedestrian trail (approximately 2 tonnes) and sloped stone end walls with filter fabric underlay (approximately 40 m <sup>2</sup> ). The work shall also include the capping and sealing of the existing culvert ends with non-shrink concrete grout. <b>Note: Contractor to hydrovac excavate &amp; daylight existing Cogeco fibre line prior to installation.</b>	\$7,500.00


Item	Description	Amount
	b) <u>Station 0+907 (Cypher Systems Group Greenway) –</u> Supply and install 600 mm diameter HDPE pipe, 15 m long for outlet of under trail including heavy duty steel flap gate, clear stone bedding (approximately 10 tonnes), compacted full Granular 'B' backfill (approximately 70 tonnes), Granular 'A' subgrade (approximately 5 tonnes) and asphalt surface for trail (approximately 2 tonnes). The work shall also include excavation and re-grading of south side ditch on upstream end of culvert and sloped stone erosion protection (approximately 100m <sup>2</sup> ). <b>Note: Contractor to hydrovac excavate &amp; daylight existing Cogeco fibre line prior to installation.</b>	\$15,000.00
8.	Supply and install stone erosion protection (minimum 300 mm thickness) on drain banks complete with filter fabric underlay at the following locations:	
	a) Station 0+000 - Supply and install 150 m <sup>2</sup> (300 mm thick) of stone erosion protection (SEP) including new filter fabric underlay on drain banks.	\$9,000.00
	b) Station 0+226 to Station 0+416 - Supply and install 560 m <sup>2</sup> (300 mm thick) of stone erosion protection (SEP) including new filter fabric underlay on west drain bank.	\$33,600.00
	c) Station 0+898 to Station 0+925 - Supply and install 350 m <sup>2</sup> (300 mm thick) of stone erosion protection (SEP) including new filter fabric underlay on drain banks.	\$21,000.00
	d) Station 0+925 to Station 1+443 - Supply and install 130 m <sup>2</sup> (300 mm thick) of stone erosion protection (SEP) at hydro pole locations (13 @ 10 m <sup>2</sup> each) including new filter fabric underlay on drain banks.	\$7,800.00
	e) Station 1+440 to Station 1+449 - Supply and install 120 m <sup>2</sup> (300 mm thick) of stone erosion protection (SEP) including new filter fabric underlay on drain banks.	\$7,200.00
9.	<u>Lateral private ditch outlet Station 0+374 -</u> Supply and install 600 mm diameter HDPE outlet pipe 6 m long, complete with heavy duty flap gate. The work shall also include stone erosion protection on inlet end of pipe (approximately 5 m <sup>2</sup> ).	\$2,500.00
10.	Trail access to Block 'B' lands, as follows:	

Item	Description	Amount
	a) <u>Bridge No. 3– ( Station 0+705)</u> Supply and installation of a new 2500 mm x 1830 mm aluminized corrugated steel pipe arch (CSPA), 15.0 m long with 3.5 mm thickness (see specifications) complete with clear stone bedding up to springline of pipe complete with filter fabric overlay (approximately 60 tonnes), clean native backfill material above (approximately 70 m <sup>3</sup> ), Granular 'A' driveway material (approximately 30 tonnes) and sloping stone end walls c/w filter fabric underlay (approximately 60 m <sup>2</sup> ) providing a minimum 6.0 m (20 ft.) top width.	\$30,000.00
11.	<u>Station 0+005 to Station 0+013 Rock flow check dam</u> – Supply and install stone erosion protection (minimum 450 mm thickness) (approximately 30 m <sup>2</sup> ) including filter fabric underlay beneath small rock dam constructed across the drain bottom for silt and sediment control measures during construction (OPSD 219.211).	\$3,000.00
	<b><u>NO-NAME DRAIN (NEW DRAINAGE WORKS)</u></b>	
12.	Clearing and grubbing of existing drain from Station 0+000B to Station 0+538B (light brushing) including the disposal by burning on-site or removal off-site.	\$2,500.00
13.	<u>Station 0+000B to Station 0+538B</u> - Supply and placement of clay fill within existing drain including grading and compaction (approximately 500 m <sup>3</sup> ).	\$6,000.00
14.	<u>Station 0+000B to Station 0+538B</u> - Supply and placement of topsoil over graded fill materials (minimum 100 mm thickness) including fine grading and hydraulic seeding (approximately 2,200 m <sup>2</sup> ).	\$10,000.00
15.	Supply and install four (4) 450 mm diameter HDPE rear yard catch basins (RYCB) complete with cast iron grate and 6 m long, 300 mm diameter HDPE pipe connection from rear yard catch basin to Rush Drain complete with heavy duty steel flapgate. The work shall also include tie-in of existing drain connections and stone erosion protection on drain bank (approximately 10 m <sup>2</sup> each).	
	a) RYCB - Station 0+076B	\$2,000.00
	b) RYCB - Station 0+190B	\$2,200.00
	c) RYCB - Station 0+236B	\$2,000.00
	d) RYCB - Station 0+327B	\$1,800.00



Item	Description	Amount
16.	Supply and install one (1) 900 mm diameter HDPE rear yard catch basin (RYCB) complete with cast iron grate and 6 m long, 450 mm diameter HDPE pipe connection from rear yard catch basin to Rush Drain complete with heavy duty flapgate. The work shall also include stone erosion protection on drain bank (approximately 10 m <sup>2</sup> ).	
	a) RYCB - Station 0+496B	\$3,000.00
17.	Supply and install one (1) 600 mm x 1200 mm precast concrete catch basin complete with heavy duty galvanized steel grate and 6 m long, 600 mm diameter HDPE connection from rear yard catch basin to Rush Drain complete with heavy duty flapgate. The work shall also include tie-in of existing 600 mm HDPE drainage pipe, grouting all pipe connections to catch basin with non-shrink grout and stone erosion protection on drain bank (approximately 10 m <sup>2</sup> ).	
	a) CB – Station 0+149B	\$4,000.00
18.	Temporary Silt Control Measures During Construction	\$600.00
	<b>SUB-TOTAL – EXCLUDING SECTION 26 COSTS</b>	<b>\$493,700.00</b>
19.	Allowances under Sections 29 and 30	\$14,000.00
20.	Survey, Report, Assessment, Meetings and Final Inspection (cost portion)	\$87,000.00
21.	Application for DFO review & SAR Habitat Screening Assessment.	\$7,000.00
22.	Tendering costs and Part time Construction Observation	\$18,500.00
23.	Expenses and incidentals (cost portion)	5,000.00
24.	Incidentals & Net Harmonized Sales Tax	\$10,800.00
25.	ERCA review permit fee	\$800.00
	<b>TOTAL – EXCLUDING SECTION 26 COSTS</b>	<b>\$636,500.00</b>

Item	Description	Amount
	<b>SECTION 26 NON PRO-RATEABLE COSTS</b>	
26.	<u>Road Bridge works, as follows:</u>	
	a) <u>Bridge No. 2 – (South Talbot Road Station 0+152.75)</u> – Supply and installation of a new 2400 mm span x 1200 mm rise precast concrete box culvert (CHBDC CAN/CSA S6-06), 36 m long including 27 degree bend with sloped stone end walls (approx. 125 m <sup>2</sup> ) including clear stone levelling base (approx. 65 tonnes), compacted Granular ‘B’ backfill up to road subgrade (approx. 580 tonnes) and Granular ‘A’ road base minimum 300 mm thickness (approx. 80 tonnes). Work shall also include full restoration of asphalt surface and concrete curb and gutter.	\$190,000.00
	b) <u>Bridge No. 4 – (Bell Avenue Station 1+055)</u> – Supply and installation of a new 2400 mm span x 1200 mm rise precast concrete box culvert (CHBDC CAN/CSA S6-06), 20 m long with sloped stone end walls (approx. 40 m <sup>2</sup> ) including clear stone levelling base (approx. 30 tonnes), compacted Granular ‘B’ backfill up to road subgrade (approx. 210 tonnes) and Granular ‘A’ road base minimum 300 mm thickness (approx. 80 tonnes).	\$95,000.00
	c) <u>(South Talbot Road Station 0+005)</u> – Supply and install 1800 mm diameter Class 65-D (CSA-A257.2) concrete pipe culvert, 30 m long for outlet of abandoned Rush Drain including clear stone bedding (approx. 25 tonnes), compacted Granular ‘B’ backfill to 300 mm above pipe (approx. 270 tonnes), native material backfill above to existing grade (approx. 20 m <sup>3</sup> ) and sloped stone end wall with filter fabric underlay (approx. 20 m <sup>2</sup> ).	\$80,000.00
27.	Construct gabion stone spillways at west and east ends of new Rush Drain (Station 0+005 and Station 0+130) including the supply and placement of stone erosion protection (approx. 40 m <sup>2</sup> ) with filter fabric underlay.	\$5,000.00
28.	<u>Watermain lowering works, as follows:</u>	
	a) Existing 200 mm diameter watermain to be deflected under South Talbot Road culvert (Bridge No. 2) including testing and commissioning.	\$15,000.00
	b) Future 250 mm diameter watermain extension to be deflected under Bell Avenue culvert (Bridge No. 4) including testing and commissioning.	\$15,000.00
29.	Traffic Control, Plans and Signage in accordance with the current version of the Ontario Traffic Manual and the Occupational Health and Safety Act.	\$1,500.00
	<b>SUB-TOTAL – SECTION 26 NON PRO-RATEABLE COSTS</b>	<b>\$401,500.00</b>



Item	Description	Amount
30.	Survey, Report, Assessment & Final Inspection (cost portion)	\$69,300.00
31.	Tendering costs and Part time Construction Observation	\$16,000.00
32.	Expenses & Incidental (cost portion)	\$3,000.00
33.	Incidentals & Net Harmonized Sales Tax	\$8,700.00
	<b>TOTAL – SECTION 26 NON PRO-RATEABLE COSTS</b>	<b>\$498,500.00</b>
	<b>TOTAL ESTIMATE – RUSH DRAIN</b>	<b>\$1,135,000.00</b>

#### **Cost Estimate (14<sup>th</sup> Concession East Drain)**

We have estimated the costs of the recommended drainage improvements to the 14<sup>th</sup> Concession East Drain, as outlined below:

Item	Description	Amount
	<b><u>14<sup>TH</sup> CONCESSION EAST DRAIN</u></b>	
1.	Brushing of the drain banks with trimming of existing trees as required to accommodate the drainage works from Station 0+000A to Station 0+513A including disposal by burning on-site or removal off-site. Work shall also include tree removal within designated working corridor on the south side of Bridge No. 2A to permit access to west side of drain for drain cleaning work.	\$2,500.00
2.	Excavation, levelling and trucking of excavated materials, as follows:	
	a) Excavation of the drain bottom only, as follows:	
	i) Station 0+000A to Station 0+513A, totalling approx. 513 lineal metres of drain and approx. 140 m <sup>3</sup> of material.	\$4,000.00
	b) Levelling of excavated materials, as follows:	
	i) Station 0+000A to Station 0+203A and Station 0+260A to Station 0+513A, totalling approx. 456 lineal metres of drain and approx. 130 m <sup>3</sup> of material to be levelled.	\$1,000.00
	c) Trucking of excavated materials, as follows:	
	i) Station 0+203A to Station 0+260A, totalling approx. 57 lineal metres of drain and approx. 10 m <sup>3</sup> of material to be trucked and levelled from Station 0+153A and Station 0+203A.	\$400.00

Item	Description	Amount
3.	Supply and install stone erosion protection (minimum 300 mm thickness) on drain banks complete with filter fabric underlay at the following locations:	
	a) Station 0+525A to Station 0+532A - Supply and install stone erosion protection (SEP) approx. 60 m <sup>2</sup> including new filter fabric underlay on existing drain bend.	3,600.00
4.	Bridge cleaning works, as follows:	
	a) <u>Bridge No. 1A</u> – Pinkerton Road Station 0+000A being approx. 10 m long, 3600 mm span x 1800 mm rise concrete culvert. Work shall include disposal of sediment off-site.	\$3,000.00
	b) <u>Bridge No. 2A</u> – (Roll No. 570-03500) Station 0+211A being approx. 5 m long, 2400 mm span x 1800 mm rise concrete culvert. Work shall include disposal of sediment off-site.	\$1,800.00
5.	Temporary Silt Control Measures During Construction	\$500.00
	<b>SUB-TOTAL – EXCLUDING SECTION 26 COSTS</b>	<b>\$16,800.00</b>
6.	Allowances under Section 30	\$2,000.00
7.	Survey, Report, Assessment and Final Inspection (cost portion)	\$3,400.00
8.	Tendering costs and Part time Construction Observation	\$700.00
9.	Expenses and incidentals (cost portion)	\$350.00
10.	Incidentals & Net Harmonized Sales Tax	\$400.00
	<b>TOTAL EXCLUDING SECTION 26 COSTS</b>	<b>\$23,650.00</b>
	<b>SECTION 26 NON PRO-RATEABLE COSTS</b>	
11.	Excavation and trucking of excavated materials, as follows:	
	a) Excavation of the drain bottom only, as follows:	
	i) Station 0+513A to Station 0+566A, totalling approx. 53 lineal metres of drain and approx. 15 m <sup>3</sup> of material.	\$500.00
	b) Trucking of excavated materials off-site, as follows:	
	i) Station 0+513A to Station 0+566A, totalling approx. 53 lineal metres of drain and approx. 15 m <sup>3</sup> of material.	\$500.00
12.	Road bridge works, as follows:	

Item	Description	Amount
	a) Bridge No. 1 – King's Highway No. 3 Station 0+593A – Supply and installation of a new 3000 mm span x 1500 mm rise precast concrete box culvert extension, 2.5 m long including clearstone levelling base (approx. 5 tonnes), compacted Granular 'A' backfill (approx. 110 tonnes) and including connection to existing highway culvert complete with scribed holes, 15M dowels and inserts as required.	\$20,000.00
13.	Bridge cleaning works, as follows:	
	c) Bridge No. 1 – King's Highway No. 3 (Station 0+566A to Station 0+593A) being approx. 27 m long, 3000 mm span x 1500 mm rise precast concrete box road culvert. Work shall include disposal of sediment off-site.	\$8,000.00
	<b>SUB-TOTAL – SECTION 26 NON PRO-RATEABLE COSTS</b>	<b>\$29,000.00</b>
14.	Survey, Report, Assessment & Final Inspection (cost portion)	\$5,200.00
15.	Tendering costs and Part time Construction Observation	\$1,200.00
16.	Expenses & Incidental (cost portion)	\$250.00
17.	Incidentals & Net Harmonized Sales Tax	\$700.00
	<b>TOTAL – SECTION 26 NON PRO-RATEABLE COSTS</b>	<b>\$36,350.00</b>
	<b>TOTAL ESTIMATE – 14<sup>th</sup> CONCESSION EAST DRAIN</b>	<b>\$60,000.00</b>

The estimate provided in this report was prepared according to current materials and installation prices as of the date of this report. In the event of delays from the time of filing of the report by the Engineer to the time of tendering the work, it is understood that the estimate of cost is subject to inflation. The rate of inflation shall be calculated using the Consumer Price Index applied to the cost of construction from the date of the report to the date of tendering. For each of the cost items above, with the exception of the allowances cost items, there is a 1.76% tax included within the estimate that represents the non-rebated portion of the provincial sales tax.

#### **Assessment of Costs**

The individual assessments are comprised of three (3) assessment components:

- i. Benefit (*advantages relating to the betterment of lands, roads, buildings, or other structures resulting from the improvement to the drain*).
- ii. Outlet Liability (*part of cost required to provide outlet for lands and roads*).
- iii. Special Benefit (*additional work or special feature that may not affect function of the drain*) or increased costs to the drainage works due to presence of a public utility or road authority).

#### **Assessment Rationale (Rush Drain)**

We have assessed the estimated costs against the affected lands and roads as listed in Schedule 'C-1' under "Special Benefit," "Benefit" and "Outlet". For the Rush Drain




watershed, we have split the assessment of costs between the Blocks 'A', 'B', 'C', 'D' lands and roads areas where applicable, and the two roads, namely the King's Highway No. 3 and South Talbot Road. Details of Special Benefit listed in Schedule 'C-1' are provided in Schedule 'D-1'.

#### **Special Benefit as per Section 24 (Rush Drain)**

Special Benefit in accordance with Section 24 of the Drainage Act were derived as follows:

1. The costs of the new 750 mm diameter HDPE culvert and flap gate across the south end of the pedestrian trail (Station 0+176 on the Rush Drain), including engineering cost apportionment, shall be assessed 100% against the Block 'B' lands. The rationale being the original culvert was located further south inside the South Talbot Road allowance and previously drained into the Rush Drain Branch, however that outlet has since been abandoned and filled in as part of the 2006 drainage work intended for the development of the Block 'B' lands.
2. The costs of stone erosion protection on the west drain bank of the Rush Drain from Station 0+266 to Station 0+416, including engineering cost apportionment, shall be assessed 60% against the Block 'B' lands and 40% against the Block 'C' lands. The rationale being that in order to maintain the relocated Rush Drain entirely within the Cypher Systems Greenway corridor and to further acquire the necessary separation from the pedestrian trail, the Rush Drain requires a 1:1 bank slope and the use of rip rap for erosion protection.
3. The costs of stone erosion protection for the south drain bank of the relocated Rush Drain adjacent to the existing hydro pole locations between Station 0+925 to Station 1+443, including engineering cost apportionment, shall be assessed 100% against Block 'B' lands, if the said owner of the lands opts to construct the drain before the transmission line is moved. The rationale being the hydro transmission line could be moved before the drain construction to avoid the bank protection costs. The transmission line relocation costs shall be the responsibility of the public utility (Hydro One Networks Inc.) having jurisdiction and would otherwise be assessable to the utility in accordance with Section 26 of the Drainage Act. Under Section 69 of the Drainage Act, the public utility is at liberty to do the work with its own forces, but if it should not exercise this option within a reasonable time, the Municipality will arrange to have this work completed and the costs will be charged to the public utility affected.
4. The costs of a 600 mm diameter HDPE outlet pipe and flap gate on the lateral private ditch outlet at Station 0+374 of the Rush Drain (west bank), including engineering cost apportionment, shall be assessed 100% against the Block 'B' lands. The rationale being to control the rate of overland flows from the Block 'B' lands entering the relocated Rush Drain, given that an outlet to the west into the original Rush Drain will be unavailable once filled in.
5. The costs of a new 2500 mm x 1830 mm aluminized corrugated steel pipe arch culvert (Bridge No. 3 - Station 0+705 on the Rush Drain), including engineering cost apportionment, shall be assessed 100% against Block 'B' lands. The rationale being the bridge will serve to connect the pedestrian trail to the future residential development on the Block 'B' lands. The bridge will also serve as an equipment access to permit future drain maintenance of the Rush Drain from the greenway corridor lands without having to occupy the rear yards of future residential properties on Block 'B'.


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6. The costs of the new 2400 mm x 1200 mm concrete box culvert for the future Bell Avenue crossing (Bridge No. 4 - Station 1+055 on the Rush Drain), including engineering cost apportionment, shall be assessed 80% against the Block 'B' lands. The rationale being the relocated Rush Drain is required mostly for the benefit of the said lands, however the relocated drain also provides a legal outlet for the lands that presently depend on the No-Name Drain for drainage. The No-Name Drain crosses the Bell Avenue road allowance and the road authority would require a culvert to permit future construction of the road to the property limit of the Block 'B' lands. For a local road crossing (Bell Avenue), a 10 year storm design standard being applied would have required a smaller 750 mm diameter concrete culvert that would represent approximately 20% of the costs of the 2400 mm x 1200 mm concrete box culvert.
  7. The costs of the infilling of the abandoned Rush Drain across the Block 'B' lands, including engineering cost apportionment, shall be assessed 100% against the Block 'B' lands. The rationale being the original Rush Drain required relocation and the costs to fill in the abandoned drain portion becomes the responsibility of the property owner on which the drain resides.
  8. The costs of the infilling of the abandoned Rush Drain across the Block 'C' lands, including engineering cost apportionment, shall be assessed 100% against the Block 'C' lands. The rationale being the original Rush Drain required relocation and the costs to fill in the abandoned drain portion becomes the responsibility of the property owner on which the drain resides.
  9. The costs of the new 600 mm diameter HDPE culvert and flap gate across the north end of the pedestrian trail (Station 0+907 on the Rush Drain) and associated ditching and stone erosion protection on inlet side of culvert, including engineering cost apportionment, shall be assessed 75% against the Block 'D' lands and the remaining 25% against the owner of the pedestrian trail (Essex Region Conservation Foundation). The rationale being the new culvert will serve as a legal outlet directly into the Rush Drain for improved drainage of the Block 'D' lands instead of using the No-Name drain that has no municipal drain status and no access to maintain it. The increased costs due to restoration work of the trail represents approximately 25% of the costs of the crossing.

For these special benefit assessment items, the costs shall be kept separate during tendering of the drainage works such that the actual construction costs plus the engineering cost portion that is identified in Schedule 'D-1' are assessed as a non pro-ratable assessment.

#### **Special Benefit as per Section 26 (Rush Drain)**

Special Benefit in accordance with Section 26 of the Drainage Act were derived as follows:

1. The costs of the new 2400 mm x 1200 mm concrete box culvert for the South Talbot Road crossing (Bridge No. 2 Station 0+152.75 on the Rush Drain), including engineering cost apportionment, shall be assessed 100% against the Ministry of Transportation Ontario as the road authority having jurisdiction over the construction of South Talbot Road as part of the King's Highway No. 3 improvements. The rationale being that future highway improvements will eliminate access to the highway from Victoria Avenue that will alternatively require the South Talbot Road to be extended westward to Maidstone Avenue West where there is access to the highway.

- 
2. The costs of the new temporary 1800 mm diameter concrete pipe culvert for the South Talbot Road crossing (Station 0+005 on the Rush Drain), including engineering cost apportionment, shall be assessed 100% against the Ministry of Transportation Ontario. The rationale being that the temporary drain crossing is necessitated by the construction of the South Talbot Road extension in advance of the relocation of the Rush Drain.
  3. The costs to construct rip rap spillways at both the west and east ends of the Rush Drain (Station 0+005 and Station 0+130), including engineering cost apportionment, shall be assessed 100% against the Ministry of Transportation Ontario. The rationale being that the spillways serve as the outlet location into the Rush Drain for the highway drainage swales.
  4. The costs of Traffic Control, Plans and Signage, including engineering cost apportionment, shall be assessed 100% against the Ministry of Transportation Ontario. The rationale being that should the South Talbot Road be constructed and opened to traffic prior to the Rush Drain relocation, the working corridor for the drainage work is within the South Talbot Road allowance and thereby necessitates a traffic control plan.
  5. The costs of the new 2400 mm x 1200 mm concrete box culvert for the future Bell Avenue crossing (Bridge No. 4 - Station 1+055 on the Rush Drain), including engineering cost apportionment, shall be assessed 20% against the Town of Essex Road Authority. The rationale being that a smaller 750 mm diameter concrete culvert would only be required to complete Bell Avenue crossing of the No-Name Drain, if hypothetically the Rush Drain did not require relocation. The 750 mm diameter concrete culvert has the capacity necessary to meet a minimum 1 in 10 year design storm standard for the upstream lands using the No-Name Drain.
  6. The costs of lowering the existing 200 mm diameter watermain located at South Talbot Road and the future 250 mm diameter watermain extension on Bell Avenue to cross under the relocated Rush Drain, including engineering cost apportionment, shall be assessed 100% against the Town of Essex Environmental Services Department, as the affected public utility, in accordance with Section 26 of the Drainage Act. The rationale being the Town of Essex preferred the relocated Rush Drain cross the South Talbot Road allowance and be located within the King's Highway No. 3 corridor necessitating the crossing of the existing infrastructure. The Town of Essex Environmental Services Department also benefits from the future connection and looping of the existing watermain network with the Bell Avenue watermain extension for both existing and future developments.

For these special benefit assessment items, the costs shall be kept separate during tendering of the drainage works such that the actual construction costs plus the engineering cost portion that is identified in Schedule 'D-1' are assessed as a non pro-ratable assessment. Should the Road Authority and/or Public Utility elect to construct the culvert and/or watermain works respectively with their own forces, as per Section 69 of the Drainage Act, R.S.O., 1990, the Road Authority shall remain responsible for their allotment of costs for the preparation of this report as outlined in our estimate. Should the Road Authority elect not to undertake this work, the work items, as noted under Section 26 above, should be kept separate when tendering out the entire drainage works.

### **Benefit and Outlet (Rush Drain)**

For the remaining costs, we have assessed 90% as a Benefit assessment and 10% as an Outlet assessment. The high proportion of Benefit assessment is being attributed to the relocation of the Rush Drain which significantly benefits the future lands to be developed, namely Block 'B' lands and Block 'C' lands. The improved drain capacity with the larger relocated Rush Drain further provides benefit to the surrounding lands and roads including the lands and roads area within Block 'A' that partially drain directly into the No-Name Drain and future relocated Rush Drain, Block 'B' unopened road allowances, Block 'C' and Block 'D' lands, King's Highway No. 3 and South Talbot Road.

### **Assessment Rationale (14<sup>th</sup> Concession East Drain)**

We have assessed the estimated costs against the affected lands and roads as listed in Schedule 'C-2' under "Special Benefit," "Benefit" and "Outlet". For the 14<sup>th</sup> Concession East Drain watershed that uses the drain upstream of Pinkerton Road, we have split the assessment of costs between the Blocks 'A', 'B', 'C', 'D' lands and roads areas where applicable, between the roads, namely the King's Highway No. 3, South Talbot Road and 14<sup>th</sup> Concession Road and adjacent lands thereto. For the lands and roads contributing in to the drain downstream of the King's Highway No. 3 there was no assessment applied for either Benefit or Outlet since the drain was recently maintained during the Spring of 2016. Details of Special Benefit listed in Schedule 'C-2' are provided in Schedule 'D-2'.

### **Special Benefit as per Section 26 (Rush Drain)**

Special Benefit in accordance with Section 26 of the Drainage Act were derived as follows:

1. The costs of excavating and trucking of sediment removed from the drain within the King's Highway No. 3 corridor (Station 0+513A to Station 0+566A) shall be assessed 100% against the Ministry of Transportation Ontario. The rationale being that the Town's contractor may be prohibited from accessing the highway corridor for the duration of the highway improvement project.
2. The costs of extending the north end of the 3000 mm x 1500 mm culvert by 2.5 m additional length beyond Station 0+593A shall be assessed 100% against the Ministry of Transportation Ontario. The rationale being the end of the culvert requires an extension such that the Rush Drain and the sloping stone end treatment on the north end of culvert extend pass the 13.5 m wide clear zone.
3. The costs of cleaning of the 27 m long Bridge No. 1 (King's Highway No. 3 – Station 0+566A to Station 0+593A) shall be assessed 100% against the Ministry of Transportation Ontario. The rationale being the increased costs to remove and dispose of the quantity of sediment from a highway culvert. Should the Road Authority elect to complete the above works respectively with their own forces, as per Section 69 of the Drainage Act, R.S.O., 1990, the Road Authority shall remain responsible for their allotment of costs for the preparation of this report as outlined in our estimate.

### **Future Maintenance (Rush Drain)**

We recommend that future work of repair and maintenance of the Rush Drain be carried out by the Town of Essex and the costs assessed against the affected lands and roads that are upstream of the said future work and listed herein under Schedule 'E-1' in the same relative proportions as the amounts listed under "Benefit" and "Outlet". This includes ancillary lateral outlet drainage works such as the No-Name Drain and the new north and south



pedestrian culverts. The costs are based on an arbitrary \$10,000.00. The exception being road bridges and culverts. The costs to repair or clean out sediment from these road bridges and culverts under South Talbot Road, Bell Avenue and King's Highway No. 3 shall be assessed to the applicable road authority having jurisdiction over the said road. The costs to repair and maintain the pedestrian access bridge over the Rush Drain shall be assessed to the Block 'B' roads to the applicable road authority having jurisdiction over the said road. The costs to repair and maintain the pedestrian trail culverts (north and south) shall be assessed to the Block 'D' lands.

#### **Future Maintenance (14<sup>th</sup> Concession East Drain)**

We recommend that future work of repair and maintenance of the 14<sup>th</sup> Concession East Drain be carried out by the Town of Essex and the costs assessed against the affected lands and roads listed herein under Schedule 'E-2' in the same relative proportions as the amounts listed under "Benefit" and "Outlet". The costs are based on an arbitrary \$10,000.00. The exception being existing road crossings. Costs to repair or clean out sediment from these bridges shall be assessed to the applicable road authority having jurisdiction over the said bridge.

#### **Drawings and Specifications**

Attached to this report is "Schedule F," which contains specifications setting out the details of the recommended works, and "Schedule G," which represents the following drawings that are also attached to this report.

Page 1 of 19:	Overall Watershed Plan
Page 2 of 19:	Plan (Sta. 0+000 to 0+170)
Page 3 of 19:	Plan (Sta. 0+170 to 0+900)
Page 4 of 19:	Plan (Sta. 0+900 to 1+445)
Page 5 of 19:	Profile 1 (Sta. 0+000A to 0+593A)
Page 6 of 19:	Profile 2 (Sta. 0+000 to 0+750)
Page 7 of 19:	Profile 3 (Sta. 0+750 to 1+445)
Page 8 of 19:	Profile 4 (Sta. 0+000B to 0+538B)
Page 9 of 19:	Cross Sections 1
Page 10 of 19:	Cross Sections 2
Page 11 of 19:	Cross Sections 3
Page 12 of 19:	Cross Sections 4
Page 13 of 19:	Bridge No. 2 & 4 Details
Page 14 of 19:	South Talbot Road Culvert Details
Page 15 of 19:	Greenway Culvert Details
Page 16 of 19:	Bridge No. 3 Details
Page 17 of 19:	Details
Page 18 of 19:	Miscellaneous Details
Page 19 of 19:	Guiderail Details

#### **Approvals**

The construction and/or improvement to a drainage works, including repair and maintenance activities, and all operations connected therewith are subject to the approval, inspection, by-laws and regulations of all Municipal, Provincial, Federal and other authorities having jurisdiction in respect to any matters embraced by the proposed works. Prior to any construction or maintenance works, the Municipality or proponent designated on the Municipality's behalf shall obtain all required approvals/permits and confirm any

construction limitations including timing windows, mitigation/off-setting measures, standard practices or any other limitations related to in-stream works.

Respectfully submitted,



**DILLON CONSULTING LIMITED**

Tim Oliver, P.Eng.

TO:wlb



**SCHEDULE 'A'**  
**RECORD OF ON-SITE MEETING**

Date: March 26, 2019, 9:00 am  
Location: Town of Essex Municipal Building  
33 Talbot St South

Attendees: Norm Nussio, Town of Essex  
Richard Beausoleil, Town of Essex  
Chris Nepsey, P. Eng., Town of Essex  
Kevin Money, ERCA  
James Bryant, ERCA  
Murray Troup, 1954990 Ontario Inc. (Block 'C' lands)  
Rob Molliconi, P. Eng., Dillon Consulting Limited  
Tim Oliver, P. Eng., Dillon Consulting Limited

**Norm Nussio** introduced the purpose of the meeting is a requirement of the Drainage Act, and that is in response to a Section 78 request received from Essex Town Centre Ltd. to relocate the Rush Drain. The Town has appointed Dillon to prepare a new drainage report recommending the relocation of the drain. Tim Oliver is the engineer named from Dillon to author this report.

**Norm Nussio** displayed a map to where the relocated drain is being considered. Starting beyond the upper enclosed portion of the drain through the existing industrial lands south of Allen Avenue, it would head east as an open drain along the boundary between the Essex Town Centre lands and the existing Allen Avenue industrial lots. It would run parallel to and south of the No-Name Drain that provides drainage for the industrial properties extending to the Greenway corridor.

From there the drain would head southerly occupying the lands within the greenway corridor where the existing ditch resides on the west side of the existing pedestrian trail to the Highway 3 Essex By-Pass. Very similar to another municipal drain (Essex Outlet Drain) that is located further east along Highway 3 near Victoria Road, the preference is to also locate a portion of the relocated Rush Drain within the highway corridor between South Talbot Road and Highway 3. From there, the Rush Drain would head west and return to the existing highway culvert that aligns and outlets into the 14<sup>th</sup> Concession East Drain. In this fashion, the relocated Rush Drain will not require to occupy lands that will be future residential lots and highway commercial lots currently in the planning and design phase.

**Chris Nepsey** indicated that communication has been initiated with the MTO to consider the new municipal drain within the Highway 3 corridor as part of the previous meetings discussing preliminary design and the future plans for the extension of the Essex By-Pass as a four lane highway along with the completion of the South Talbot Road as part of the same highway project. It was understood that timing for the highway design work is to be completed within the next 2 years with expectations of the highway construction within 5 years. In terms of moving forward, Chris requested that Dillon provide some conceptual plans and sections to him that he can present to MTO at future meetings.

**Tim Oliver** explained there was a previous drainage report that was adopted under by-law in 2006 for the relocation of the Rush Drain when it was previously requested by a former landowner of the same future residential development, now owned by Essex Town Centre Ltd. The report recommended the abandonment of the Rush Drain original alignment and that it follow a similar course with the exception being the

downstream portion along Highway No.3. This portion of drain was also recommended to be located between the highway and South Talbot, however to occupy the South Talbot Road allowance immediately north of the existing highway fence. What has also changed from the 2006 report is the design capacity requirements for the drain. The new requirements established by ERCA, in conjunction with the future Stormwater Master Plan being prepared for the Town of Essex have set out new guidelines for all future developments. This affects the Essex Town Centre Development lands and the net result is a higher design level of service applied to a municipal drain to provide a higher level of protection from flooding. A 1 in 100 year storm event was used in the design analysis and included an additional 40% increase in flows as the climate change factor to be applied.

Given the higher flows to be conveyed by the drain, the footprint area now required to locate a larger drain channel exclusively within the South Talbot Road allowance is not available without acquiring adjacent lands from either the Highway No. 3 corridor or the future commercial highway developments. There are overhead transmission lines and the plans for a 3 m wide future multi-purpose trail that would be in conflict with the future alignment of South Talbot Road that would need to be shifted significantly northward to accommodate the new Rush Drain.

**James Bryant** confirmed these design capacity requirements which Tim has eluded to are what ERCA will be requiring in the design of the new Rush Drain. As to the placement of the relocated drain within the Greenway corridor they are amenable to this, however expect that drainage needs of the greenway and pedestrian trail are met as well as consideration for lands east of the trail that are partially draining into the existing ditch infrastructure within the greenway corridor.

Meeting summary prepared by Tim Oliver, P. Eng., Dillon Consulting Limited.



## RE: Summary - 14<sup>th</sup> Concession Drain (Rush Drain)

### P&D Design Requirements / Corridor Permit Requirements

#### Design Deficiencies:

- 1<sup>st</sup> Submission of design provided to MTO (Dillon drawings dated Oct.19, 2019) do not meet MTO standards.
- 90deg culvert extension to redirect water from new municipal drain to the existing drain alignment does not allow highway runoff collected west of Rush Drain to outlet into the drain as it does currently.
- Highway Drainage Design Standards identifies a minimum longitudinal slope for highway ditches and watercourses that also serve as roadside ditches to have a slope of 0.3% Currently the design drawings specify a significantly flatter grade of 0.03% within MTO R.O.W. boundaries.
- Highwater elevation should be clearly identified in all plans and documents
- Desirably ditch water level elevation should be 0.5m below the road subgrade elevation during a 100-year storm event, and 0.3m below the edge of travelled lanes during a regulatory storm event.
- Water level elevation is also required to determine water depth and if hazard protection is necessary due to the water depth. The developer should ensure that all hazards created by realigning the drain are protected.
- There is currently no space provided behind the backslope of the ditch/watercourse and highway fence installed on R.O.W. This is a concern as it does not provide space for maintenance and may cause the fence to go out of plumb in the long run.
- According to MTO Roadside Design Manual Table 2-2, desirable clear zone value for a Negative 4:1 Fore slope should be 13.5m rather than 8m.
- Provide confirmation that clear zone minimum requirements have been met
- Legal Agreement to define maintenance of the drain if warranted for future development & Site Plan Agreement
- Joint drainage assessments required for both Rush & Victoria municipal drainage
- pre/post development flow rates to be confirmed. The development flow rates should not exceed existing flowrate.

#### Required:

- Town of Essex to provide MTO with revised drawings, drainage report, SWMR for all additional subdivision development adjacent to MTO ROW & SWM ponds addressing all of the above noted details.
- **Design alternatives to be further explored and presented to MTO (drainage infrastructure to be located outside MTO ROW)** MTO not opposed to accepting the drain realignment provided; Town of Essex provides drawings, reports and meets all MTO requirements.
- MTO shall not incur any additional costs created by the municipal drain realignment

#### Benefits to Town of Essex not having Rush Drain realignment within MTO ROW:

- Not have to enter into any agreements legal and/or maintenance with MTO
- Would service S Talbot Rd extension as open ditch for drainage
- Would further facilitate development plans for lands north of S Talbot Rd.

**If Town of Essex provides alternatives to locate drain outside MTO ROW – Building and Land Use permit will be required**

- Town to define all works and conditions for MTO review and approval as a condition of permits, comprehensive engineered drawings that define the setbacks from the property limits, grades and elevations, cross-sections, profiles relevant to the highway and details of any new land developments i.e. New subdivision and commercial developments adjacent to the highway and any additional affected culverts
- Design provided for the proposed Rush Drain alignment is cohesive with MTO's Hwy 3 expansion project.

**Town to locate drain within MTO ROW – Encroachment permit will be required (if works to commence prior to Hwy 3 widening project)**

- Town of Essex to provide revised drawings, drainage report, SWMR for all additional subdivision development adjacent to MTO ROW & SWM ponds.
- Drain end treatment / culvert connection (not 90deg culvert extension)
- Fore slope / Back slope details
- Design presented is cohesive with MTO's Hwy 3 expansion project.

April 9, 2020

Highway Corridor Management Section  
Ministry of Transportation Ontario-West Region  
659 Exeter Road  
London, ON  
N6E 1L3

Attention: Mr. Andrew Robertson  
Corridor management Officer



10 Fifth Street South  
Chatham, Ontario  
Canada  
N7M 4V4  
Telephone  
519.354.7802  
Fax  
519.354.2050

**RE: Response to MTO Comment Summary – 14<sup>th</sup> Concession Drain (Rush Drain)**

Dear Mr. Robertson,

On March 11, 2020 we received a copy of MTO's comment summary pertaining to Dillon's first submission design (Dillon drawings dated October 2019). A copy is enclosed herein for reference.

Following our previous conference call discussion of April 2, 2020, we hereby submit our revised drawings (Options 1 & 2, dated April 8, 2020) accompanied by a copy of the Stormwater Management Report for the Essex Town Centre Development lands being proposed to the north of South Talbot Road.

Option 1 drawings (2 pages) entail a plan and corresponding cross sections for the proposed Rush Drain realignment situated between South Talbot Road and Highway No. 3. The drawings take into account the preliminary design and alignment for Highway 3 issued in December 2019.

Design characteristics of Option 1 are outlined below:

- 4:1 Fore slope
- 2:1 Back slope
- 2.5 m wide bottom
- Rush Drain located entirely within Highway 3 corridor and parallel to South Talbot Road (overall channel width = 17.8 m and channel length = 140 m)
- South bank offset from Highway 3 westbound lanes varies - 8 m to 13.1 m
- North bank offset from north property limit – 1 m
- 6% grade for highway shoulder/boulevard
- Road culvert ends and drain bank protection all outside of 13.5 m clear zone

Option 2 drawings (2 pages) entail a plan and corresponding cross sections for the proposed Rush Drain realignment situated between South Talbot Road and Highway No. 3. The drawings take into account the preliminary design and alignment for Highway 3 issued in December 2019.

Design characteristics of Option 2 are outlined below:

- 2:1 Fore slope
- 2:1 Back slope
- 2.5 m wide bottom
- Rush Drain located entirely within Highway 3 corridor and parallel to South Talbot Road (overall channel width = 11.6 m and length = 140 m)
- South bank offset from Highway 3 westbound lanes varies – 14.2 m to 18.7 m
- North bank offset from north property limit – 1 m
- 6% grade for highway shoulder/boulevard
- Road culvert ends and rip rap channel lining all outside of 13.5 m clear zone

For both options noted above, we have addressed the design deficiencies that were previously identified as follows:

1. Eliminated the 90deg culvert extension of the Highway 3 culvert over the 14<sup>th</sup> Concession Drain at the Rush Drain confluence. As such, the east-west drainage swales collecting highway runoff will discharge directly into the west and east ends of the realigned Rush Drain on rip rap lined spillways and are not obstructed by the road culvert ends.
2. Highwater elevation (100 year storm HGL = 193.75 m) determined by storm water modelling analysis is labelled on the cross sections for each option. The desirable minimum 0.5 m clearance between the highway subgrade elevation and the 100 year design storm water depth is achievable as illustrated herein.
3. Water level within the Rush Drain is anticipated to remain under 0.3 m depth during base flow conditions and in between smaller precipitation events under 25 mm per day. For a 1 in 2 year storm event, the maximum depth of 0.8 m; for 1 in 5 year storm event, the maximum depth of 1 m; and for 1 in 100 year storm event, the maximum depth 1.8 m. Water levels comparable for both Options 1 & 2. To ascertain whether the Rush Drain is a hazard that should be protected through a guiderail barrier system, we support whatever the MTO feels is appropriate.
4. A minimum 1 m buffer has been designed between the back slope of the drain and the existing wire fence for the highway in both Options 1 & 2.
5. We confirm that a desirable clear zone of 13.5 m has been met for both Options 1 & 2.
6. Concerning legal and/or maintenance agreements with the MTO, in addition thereto a drainage report is being prepared by Dillon, in accordance with Section 78 of the Drainage Act, to include legal provisions for future drain maintenance. The drainage report and governing by-law associated therewith will establish a working easement on the north side of the Rush Drain where a



minimum 4 m wide boulevard will exist to access the drain from the South Talbot Road right-of-way.

In the design of the realigned Rush Drain, the drainage capacity was increased to convey the 1 in 100 year storm peak flows from the approximate 100 hectare upstream watershed comprised of mixed agricultural, residential, industrial and commercial land uses. As part of this watershed, approximately 33.4 hectares that is currently existing as agricultural lands is proposed for residential development, known as the Essex Town Centre Development. Storm water discharge flows from this development will be controlled to a 1 in 2 year pre-development flow rate being pumped from a storm water detention facility. This size of the facility has been designed to capture not only the 100 year storm runoff but an additional 39% increase in volume for climate change and infrastructure resiliency, as outlined within the Stormwater Management Report.

The existing Rush Drain alignment that is traversing north-south through the proposed Essex Town Centre Development lands is not presently capable of conveying the 1 in 100 year storm flows without experiencing channel overtopping and flooding of adjacent lands. This is typical of most municipal drains which are not designed to handle the flows beyond a 1 in 2 year storm event.

However, the realigned Rush Drain that will be constructed along the northerly and easterly limits of the proposed development, and then continuing westerly within the Highway 3 corridor to its outlet into the existing 14th Concession Drain will be designed to convey the 1 in 100 year storm flows within its banks. In terms of a hydraulic grade line comparison between the existing Rush Drain and the new realigned Rush Drain, a significant drop of 0.22 m in the hydraulic grade upstream of Highway 3 will be experienced lowering it from 193.97 m to 193.75 m during a 1 in 100 year storm event. This is attributed to the reduction in the 100 year storm peak flows resulting from the post development condition with the storm water detention facility.

Following the MTO's decision and preferred selection of either Option 1 or Option 2, or a modification thereof, we will be proceeding with the completion of the drainage report for the Rush Drain realignment and submitting over to the Town of Essex for subsequent circulation and notice to affected landowners. The detailed drawings and specifications will be contained within this report. At the same time, an application for an encroachment permit will be submitted with the intention to commence the construction of these drainage works prior to the Highway 3 widening. We are in agreement that the design provided for the Rush Drain alignment is cohesive with MTO's Highway 3 expansion project.

We trust this submission has addressed all your concerns. Should you have any questions, comments, and/or concerns, please do not hesitate to contact the undersigned at (519) 354-7802 ext. 3317.

Respectfully,



**DILLON CONSULTING LIMITED**

Tim Oliver, P. Eng.

Drainage Engineer

TRO:

Encl. Option 1 & 2 Drawings (Revised April 8, 2020)  
Stormwater Management Report – October 2019 (Final version)  
MTO Comment Summary – March 11, 2020 email to Town of Essex

cc: Robert Molliconi, P. Eng., Project Manager, Dillon Consulting Limited  
Chris Nepsey, P. Eng., Town of Essex  
Kevin Girard, P. Eng., Town of Essex  
Norman Nussio, C.E.T., CRS, Town of Essex

Our file: 19-1023

From: Saraceni, Anthony (MTO) [mailto:[Anthony.Saraceni@ontario.ca](mailto:Anthony.Saraceni@ontario.ca)]  
Sent: Tuesday, April 28, 2020 11:57 AM  
To: Girard, Kevin <[kgirard@essex.ca](mailto:kgirard@essex.ca)>  
Cc: Nussio, Norman <[nnussio@essex.ca](mailto:nnussio@essex.ca)>; Naylor, Amanda (MTO) <[Amanda.Naylor@ontario.ca](mailto:Amanda.Naylor@ontario.ca)>  
Subject: RE: Highway 3 Widening - Utility Meeting

Hi Kevin,

To follow up with my email last week and our phone conversation please find MTO's comments regarding the Rush Drain attached for your review and discussion tomorrow.

The ministry is willing to accept option 2 as the proposed Rush Drain Realignment as long as the requirements of the Municipal Drain Act are met and the Engineer's Report for the Drain demonstrates the following:

- \* The 100 year design storm will be at a minimum 0.5 m below Highway 3 subgrade. (including Highway 3 & South Talbot Road Drainage);
- \* The grading for the drain is outside the clear zone for Highway 3;
- \* The maintenance needs (and increased needs because of combining the drain with the ministry ditch) will be addressed appropriately and immediately by the Town;
- \* The report addresses climate change;
- \* The existing crossing culvert is not perched (without showing it on the cross-section and showing the new bottom of ditch, it appears that it will be perched);
- \* There is no ponding at the culvert inlet or outlet;
- \* Scour control/protection has been reviewed and implemented and reviewed (there may need to be rip-rap added to the ditch west of the culvert);
- \* Reassessment of the drain (if there is any reassessment) is clear and documents the changes to the ministry clearly and take into account the Highway 3 expansion;
- \* South Talbot Road drainage and outlets need to be identified;
- \* Highway 3 drainage will not be negatively impacted.

A Legal Agreement will be created for this realignment where it will outline the maintenance requirements, procedures, contacts and timeline to implement maintenance to the drain. In addition, please also provide 25 m cross-sections along the length of the drain realignment.

The Ministry will provide final approval upon incorporation of the above comments, and review of the engineers report completed as per the drainage act.

Thanks,

Anthony Saraceni, P.Eng.  
Project Engineer  
Planning and Design - West Region  
Ministry of Transportation  
659 Exeter Road,  
London ON N6E 1L3  
Tel: (548) 388 3120

**PROJECT:** Highway 3: Windsor to Leamington Widening  
GWP 317-98-00

**MEETING:** Rush Drain /Utilities Teleconference

**DATE:** Wednesday, April 29th, 2020 **TIME:** 09:00 – 11:00 am

**LOCATION:** N/A

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**ATTENDEES:**

Anthony Saraceni:	Ministry of Transportation
Amanda Naylor:	Ministry of Transportation
Michael Gibb:	Ministry of Transportation
Andrew Robertson:	Ministry of Transportation
Ryan Mentley:	Ministry of Transportation
Allan Hodgins:	Ministry of Transportation
Tim Oliver:	Dillon
Robert Molliconi:	Dillon
Richard Beausoleil:	Town of Essex
Norman Nussio:	Town of Essex
Kevin Girard:	Town of Essex

**MEETING MINUTES**

Item	Discussion	Action By
1.0	Drain Discussions	
1.1.	<p><b>Rush Drain</b></p> <p>Ministry requesting cross section drawings from Dillon along the Rush Drain as the realignment is a change to our current contract design.  <b>-Dillon to provide the cross sections to the Ministry.</b></p> <p>Town of Essex inquiring if Letter of Opinion is required for Rush Drain culvert extension?  <b>-Dillon commenting that end of culvert will split the 14 concession drain and Rush Drain. Dillon can also add the Letter of Opinion to the Engineers Report however costs will be directed to the Ministry if this route is requested.</b></p>	Dillon MTO



	<p><b>-Ministry to review if a Letter of Opinion is required for this section as it is just a culvert extension. Ministry will prepare Letters if required.</b></p> <p>Dillon commenting on Engineers Report, Dillon was waiting on final resolution of the Rush Drain alignment prior to beginning work on the report. 2-3 months required for the Engineers Report. <b>Estimating June/July for the Draft Report.</b> Following up on approvals and permits to try and finish them within the same time period.</p> <p>Town of Essex requesting elevations of the bottom of culvert from Dillon for the Enbridge gas line to still be installed in the meantime.</p> <p>Dillon commenting Bell plant near Rush Drain may conflict with new Rush Drain alignment.</p> <p><b>-Ministry reviewed Bell location. Current relocation plan has plant being relocated Easterly. If the town needs it moved in a different spot and it will cost more, the town will have to pay for that.</b></p>	
1.2	<p><b>Essex Outlet Drain</b></p> <p>Town of Essex scheduled to go to council May 18<sup>th</sup> with the Letter of Opinion by-law amendment.</p>	
2.0	<p><b>Road Closures</b></p> <p>Ministry inquiring about bylaw amendments for road closures at Pinkerton/Old South Talbot road closures. TOE would have to bring road closure to council for these location on their own.</p> <p><b>-Town of Essex to follow up about when Victoria Ave closure is going to council and provide response.</b></p> <p><b>-UPDATE- Town to bring forward a council resolution on May 18<sup>th</sup> accepting the future road closure.</b></p>	TOE
3.0	<p><b>Utilities</b></p>	

3.1	<p><b>Reviewing Town of Essex response to letter 5</b></p> <p>Town of Essex has a need to install a new watermain crossing close to 14<sup>th</sup> Concession Drain, requesting to complete now before construction.</p> <ul style="list-style-type: none"> <li>- Ministry commenting existing utilities should be relocated first, legal agreements and encroachment permits will be required.</li> <li>- Town has no issues with requirements. Significant cost savings to combine new watermain with Victoria Ave relocation.</li> </ul> <p><b>Town of Essex requesting further discussions in the future about new watermain.</b></p> <p>Inquiries into the Cogeco and Bell lines that are to be relocated at Rush Drain location.</p> <ul style="list-style-type: none"> <li>- Dillon to confirm Cogeco is not in conflict with new Rush Drain alignment.</li> <li>- <b>UPDATE:</b> Cogeco confirmed to not be in conflict.</li> <li>- Bell is planning to relocate line, timeline unknown.</li> </ul> <p>Town of Essex doesn't have necessary resources to complete design relocation of the sanitary sewer trunk line, requires additional design to be prepared by engineer. Essex to review cost sharing/utility specifications, Ministry doesn't typically bear those costs and will only cover 50% of labour.</p> <ul style="list-style-type: none"> <li>- <b>Town of Essex and Ministry requesting further discussion at a higher level about the costs associated to this sanitary sewer, manhole, and watermain relocation.</b></li> </ul> <p><b>Town of Essex requesting culvert crossing Victoria Ave to be replaced and incorporated into the contract.</b> Town employing engineer to complete review of culvert. <b>Town of Essex also requesting electrical installation at South Talbot/Victoria for future signalized intersection.</b></p> <ul style="list-style-type: none"> <li>- <b>Ministry to review requirements to add culvert and electrical installation. A legal agreement will be required for this additional work and Town of Essex will be required to provide drawings and cover all associated costs.</b></li> </ul> <p>Watermain conflict at Victoria Ave to be relocated further easterly to the toe of the grade.</p> <p>Town of Essex inquiring what is the process for pedestrian bridge to be constructed?</p> <ul style="list-style-type: none"> <li>- Ministry review of submission and permit required. Typically 20 days to review depending on quality of submission, however experiencing delays due to Covid.</li> </ul>	<p>MTO TOE</p>
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	<p>Town of Essex inquiring about the estimated timeline for needing services relocated.</p> <p>-Ministry requires the services to be moved by Oct 2020.</p> <p><b>-Town of Essex hasn't budgeted for these costs. Town will need to inquire about funding.</b></p>	
<b>4.0</b>	<b>ELK Hydro South Talbot</b>	
2.1	<p>Town of Essex has no issues with removal of concrete sidewalk for construction of MUT. Town willing to accept reduced width of MUT throughout this section if it avoids conflicts.</p> <p><b>-Ministry to review and provide drawing with new MUT proposed design.</b></p> <p><b>-UPDATE: Drawing provided with minutes.</b></p>	MTO
<b>3.0</b>	<b>Closing Comments</b>	
	<p>Ministry inquiring what the Town's clearance requirement for poles is.</p> <p>-Town of Essex typically requires 1m, however 0.5m can be accommodated in this instance.</p> <p>Ministry inquiring is it feasible to have everything relocated this construction season.</p> <p>-Town of Essex estimates that is unlikely due to available funding and COVID delays.</p>	

**"SCHEDULE B-1"**  
**SCHEDULE OF ALLOWANCES**

**RUSH DRAIN**  
**TOWN OF ESSEX**

Roll No.	Con.	Description	Owner	Section 30 Damages	Section 29 Land	Total Allowances
210-00010	STR	Lot 284	Essex Region Conservation Foundation	\$0.00	\$7,500.00	\$7,500.00
200-00117	STR	370 Allen Avenue	1486047 Ontario Inc.	\$0.00	\$700.00	\$700.00
200-00207	STR	370 Allen Avenue	1486047 Ontario Inc.	\$0.00	\$600.00	\$600.00
200-00115	STR	350 Allen Avenue	1413559 Ontario Inc.	\$0.00	\$600.00	\$600.00
200-00114	STR	340 Allen Avenue	1571749 Ontario Inc.	\$0.00	\$600.00	\$600.00
200-00113	STR	340 Allen Avenue	1571749 Ontario Inc.	\$0.00	\$600.00	\$600.00
200-00112	STR	320 Allen Avenue	Essex Ready Mix Inc.	\$0.00	\$600.00	\$600.00
200-00110	STR	300 Allen Avenue	Essex Ready Mix Inc.	\$0.00	\$1,100.00	\$1,100.00
190-01900	STR	280 Allen Avenue	2463154 Ontario Inc.	\$0.00	\$1,200.00	\$1,200.00
190-01902	STR	0 Bell Avenue	1486047 Ontario Inc.	\$0.00	\$500.00	\$500.00
<b>TOTAL ALLOWANCES .....</b>				<b>\$0.00</b>	<b>\$14,000.00</b>	<b>\$14,000.00</b>



**"SCHEDULE B-2"**  
**SCHEDULE OF ALLOWANCES**

**14TH CONCESSION EAST DRAIN**  
**TOWN OF ESSEX**

Roll No.	Con.	Description	Owner	Section 30 Damages	Section 29 Land	Total Allowances
570-03500	14	Lot 17	John P. & Lorraine P. Egeto	\$2,000.00	\$0.00	\$2,000.00
<b>TOTAL ALLOWANCES .....</b>				<b>\$2,000.00</b>	<b>\$0.00</b>	<b>\$2,000.00</b>

**"SCHEDULE C-1"**  
**SCHEDULE OF ASSESSMENT**  
**RUSH DRAIN**  
**TOWN OF ESSEX**

**ONTARIO LANDS:**

Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
King's Highway No. 3	7.42	3.00	Ministry of Transportation Ontario	\$337,330.00	\$25,190.00	\$690.00	\$363,210.00
Total on Ontario Lands.....				\$337,330.00	\$25,190.00	\$690.00	\$363,210.00

**MUNICIPAL LANDS:**

Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
Block 'A' Roads	23.75	9.61	Town of Essex - Ward 1	\$0.00	\$5,466.00	\$10,869.00	\$16,335.00
South Talbot Road	5.95	2.41	Town of Essex	\$0.00	\$24,986.00	\$555.00	\$25,541.00
Total on Municipal Lands.....				\$0.00	\$30,452.00	\$11,424.00	\$41,876.00

**NON-AGRICULTURAL LANDS:**

Roll No. / Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
Block 'A' Lands	87.75	35.51	Town of Essex - Ward 1	\$0.00	\$12,119.00	\$24,101.00	\$36,220.00
Block 'B' Lands	62.40	25.25	Essex Town Centre Ltd.	\$213,570.00	\$304,872.00	\$5,310.00	\$523,752.00
Block 'B' (Unopened road allowance)	20.50	8.30	Essex Town Centre Ltd.	\$0.00	\$4,292.00	\$2,817.00	\$7,109.00
Block 'C' Lands (Roll No. 210-50000)	12.60	5.10	1954990 Ontario Inc.	\$31,310.00	\$45,850.00	\$516.00	\$77,676.00
Block 'C' Lands (Roll No. 210-50200)	3.40	1.37	CL Benninger Equipment (1995) Ltd.	\$0.00	\$446.00	\$138.00	\$584.00
Block 'D' Lands	21.53	8.71	Town of Essex - Ward 1	\$13,860.00	\$2,836.00	\$1,832.00	\$18,528.00
210-00010	7.27	2.94	Essex Region Conservation Foundation (Cypher Systems Group Greenway)	\$4,630.00	\$957.00	\$618.00	\$6,205.00
Total on Non-Agricultural Lands.....				\$263,370.00	\$371,372.00	\$35,332.00	\$670,074.00

**SECTION 26 (NON PRO-RATABLE)**

Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
Public Utility			Town of Essex Environmental Services Department	\$36,600.00	\$0.00	\$0.00	\$36,600.00
Bell Avenue			Town of Essex	\$23,240.00	\$0.00	\$0.00	\$23,240.00
Total Section 26 (Non Pro-ratable).....				\$59,840.00	\$0.00	\$0.00	\$59,840.00
<b>TOTAL ASSESSMENT .....</b>				<b>\$660,540.00</b>	<b>\$427,014.00</b>	<b>\$47,446.00</b>	<b>\$1,135,000.00</b>
<b>Total Area:</b>		<b>252.57 102.20</b>					

**"SCHEDULE C-2"**  
**SCHEDULE OF ASSESSMENT**  
**14TH CONCESSION EAST DRAIN**  
**TOWN OF ESSEX**

**ONTARIO LANDS:**

Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
King's Highway No. 3	17.50	7.08	Ministry of Transportation Ontario	\$36,350.00	\$998.00	\$2,396.00	\$39,744.00
Total on Ontario Lands.....				\$36,350.00	\$998.00	\$2,396.00	\$39,744.00

**MUNICIPAL LANDS:**

Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
Block 'A' Roads	23.75	9.61	Town of Essex - Ward 1	\$0.00	\$341.00	\$3,252.00	\$3,593.00
South Talbot Road	5.95	2.41	Town of Essex	\$0.00	\$496.00	\$816.00	\$1,312.00
14th Concession Road	3.00	1.21	Town of Essex	\$0.00	\$0.00	\$0.00	\$0.00
Total on Municipal Lands.....				\$0.00	\$837.00	\$4,068.00	\$4,905.00

**NON-AGRICULTURAL LANDS:**

Roll No./ Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
Block 'A' Lands	87.75	35.51	Town of Essex - Ward 1	\$0.00	\$756.00	\$7,210.00	\$7,966.00
Block 'B' Lands	62.40	25.25	Essex Town Centre Ltd.	\$0.00	\$1,051.00	\$2,564.00	\$3,615.00
Block 'B' (Unopened road allowance)	20.50	8.30	Essex Town Centre Ltd.	\$0.00	\$267.00	\$843.00	\$1,110.00
Block 'C' Lands (Roll 210-50000)	12.60	5.10	1954990 Ontario Inc.	\$0.00	\$401.00	\$518.00	\$919.00
Block 'C' Lands (Roll 210-50200)	3.40	1.37	CL Benninger Equipment (1995) Ltd.	\$0.00	\$44.00	\$139.00	\$183.00
Block 'D' Lands	21.53	8.71	Town of Essex - Ward 1	\$0.00	\$281.00	\$884.00	\$1,165.00
210-00010	7.27	2.94	Essex Region Conservation Foundation (Cypher Systems Group Greenway)	\$0.00	\$95.00	\$298.00	\$393.00
570-04200      13      Pt. Lot 17	5.95	2.41	1635625 Ontario Inc.	\$0.00	\$0.00	\$0.00	\$0.00
Total on Non-Agricultural Lands.....				\$0.00	\$2,895.00	\$12,456.00	\$15,351.00

**AGRICULTURAL LANDS:**

Roll No.	Con.	Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
570-03500	14	Pt. Lot 17	0.50	0.20	John P. & Lorraine P. Egeto	\$0.00	\$0.00	\$0.00	\$0.00
Total on Agricultural Lands.....						\$0.00	\$0.00	\$0.00	\$0.00

<b>TOTAL ASSESSMENT .....</b>						<b>\$36,350.00</b>	<b>\$4,730.00</b>	<b>\$18,920.00</b>	<b>\$60,000.00</b>
			(Acres)	(Ha.)					
<b>Total Area:</b>			<b>272.10</b>	<b>110.10</b>					

**"SCHEDULE D-1"**  
**DETAILS OF SPECIAL BENEFIT**  
**RUSH DRAIN**  
**TOWN OF ESSEX**

**SPECIAL BENEFIT ASSESSMENT**

**(SECTION 24-NON PRO-RATABLE)**

Roll No.	Owner	Item Description	Estimated Cost	Cost of Report	Special Benefit
Block 'B' Lands	Essex Town Centre Ltd.	<u>Station 0+176 (Cypher Systems Group Greenway)</u> – Supply and install 750 mm diameter HDPE pipe, 9 m long culvert under trail (100%)	\$7,500.00	\$1,730.00	\$9,230.00
		Station 0+226 to Station 0+416 - Supply and install 560 m <sup>2</sup> (300 mm thick) of stone erosion protection (SEP) including new filter fabric underlay on west drain bank (60%)	\$20,160.00	\$4,660.00	\$24,820.00
		Station 0+925 to Station 1+443 - Supply and install 130 m <sup>2</sup> (300 mm thick) of stone erosion protection (SEP) at hydro pole locations (13 @ 10 m <sup>2</sup> each) including new filter fabric underlay on drain banks (100%)	\$7,800.00	\$1,800.00	\$9,600.00
		<u>Lateral private ditch outlet Station 0+374</u> – Supply and install 600 mm diameter HDPE outlet pipe 6 m long, complete with heavy duty flap gate. The work shall also include stone erosion protection on inlet end of pipe (approximately 5 m <sup>2</sup> (100%))	\$2,500.00	\$580.00	\$3,080.00
		<u>Bridge No. 3– ( Station 0+705)</u> Supply and installation of a new 2500 mm x 1830 mm aluminized corrugated steel pipe arch (CSPA), 15.0 m long culvert under trail (100%)	\$30,000.00	\$6,930.00	\$36,930.00
		(Future Work) Remove all vegetation and organic debris from the existing drain slopes from the abandoned Rush Drain on the Block 'B' lands prior to infilling. Fill existing drain (approximately 3,000 m3) including trucking, filling and compaction of material in 250 mm lifts. Compaction to a minimum of 95% standard proctor density. Any excess materials to be stockpiled on site in location specified by property owner. Note: Work shall be completed once the relocated Rush Drain is a fully established grass lined channel (100%).	\$30,000.00	\$6,930.00	\$36,930.00
		<u>Bridge No. 4 – (Bell Avenue Station 1+055)</u> – Supply and installation of a new 2400 mm span x 1200 mm rise precast concrete box culvert (CHBDC CAN/CSA S6-06), 20 m long (80%)	\$76,000.00	\$16,980.00	\$92,980.00
<b>Sub-total - Block 'B' Lands (Essex Town Centre Ltd.)</b>					<b>\$213,570.00</b>



Roll No.	Owner	Item Description	Estimated Cost	Cost of Report	Special Benefit
Block 'C' Lands 210-50000	1954990 Ontario Inc.	Station 0+226 to Station 0+416 - Supply and install 560 m <sup>2</sup> (300 mm thick) of stone erosion protection (SEP) including new filter fabric underlay on west drain bank (40%)	\$13,440.00	\$3,100.00	\$16,540.00
		(Future Work) Remove all vegetation and organic debris from the existing drain slopes from the abandoned Rush Drain on the Block 'B' lands prior to infilling. Fill existing drain (approximately 3,000 m <sup>3</sup> ) including trucking, filling and compaction of material in 250 mm lifts. Compaction to a minimum of 95% standard proctor density. Any excess materials to be stockpiled on site in location specified by property owner. Note: Work shall be completed once the relocated Rush Drain is a fully established grass lined channel (100%).	\$12,000.00	\$2,770.00	\$14,770.00
<b>Sub-total - Block 'C' Lands (1954990 Ontario Inc.)</b>					<b>\$31,310.00</b>
Block 'D' Lands	Town of Essex - Ward 1	Station 0+907 (Cypher Systems Group Greenway) - Supply and install 600 mm diameter HDPE pipe, 15 m long for outlet of under trail (75%)	\$11,250.00	\$2,610.00	\$13,860.00
210-00010	Essex Region Conservation Foundation	Station 0+907 (Cypher Systems Group Greenway) - Supply and install 600 mm diameter HDPE pipe, 15 m long for outlet of under trail (25%)	\$3,750.00	\$880.00	\$4,630.00
<b>Total Special Benefit Assessment (Section 24 Non Pro-Ratable)</b>			<b>\$214,400.00</b>	<b>\$48,970.00</b>	<b>\$263,370.00</b>
<b>(SECTION 26-NON PRO-RATABLE)</b>					
King's Highway No. 3	Ministry of Transportation Ontario	Bridge No. 2-Station 0+152.75 - Supply & installation of 37.5 m long, 2400 mm x 1200 mm precast concrete box culvert (CHBDC CAN/CSA S6-06) (100%)	\$190,000.00	\$41,800.00	\$231,800.00
King's Highway No. 3	Ministry of Transportation Ontario	(South Talbot Road Station 0+005) - Supply and install 1800 mm diameter Class 65-D (CSA-A257.2) concrete pipe culvert, 30 m long	\$80,000.00	\$17,600.00	\$97,600.00
		Construct gabion stone spillways at west and east ends of new Rush Drain (Station 0+005 and Station 0+130) (100%)	\$5,000.00	\$1,100.00	\$6,100.00
		Traffic Control, Plans and Signage in accordance with the current version of the Ontario Traffic Manual and the Occupational Health and Safety Act (100%)	\$1,500.00	\$330.00	\$1,830.00
<b>Sub-total - King's Highway No. 3 (Ministry of Transportation Ontario)</b>					<b>\$337,330.00</b>

Roll No.	Owner	Item Description	Estimated Cost	Cost of Report	Special Benefit
Bell Avenue	Town of Essex Road Authority	<u>Bridge No. 4</u> = (Bell Avenue Station 1+055) – Supply and installation of a new 2400 mm span x 1200 mm rise precast concrete box culvert (CHBDC CAN/CSA S6-06), 20 m long (20%)	\$19,000.00	\$4,240.00	\$23,240.00
Public Utility	Town of Essex Environmental Services Department	Existing 200 mm diameter watermain at South Talbot Road culvert crossing (Bridge No. 2) including testing and commissioning (100%)	\$15,000.00	\$3,300.00	\$18,300.00
		Future 250 mm diameter watermain extension to be deflected under Bell Avenue culvert crossing (Bridge No. 4) including testing and commissioning (100%)	\$15,000.00	\$3,300.00	\$18,300.00
<b>Sub-total - Public Utility (Town of Essex Public Works)</b>					<b>\$36,600.00</b>
<b>Total Special Benefit Assessment (Section 26 Non Pro-Ratable)</b>			<b>\$325,500.00</b>	<b>\$71,670.00</b>	<b>\$397,170.00</b>
<b>OVERALL TOTAL SPECIAL BENEFIT ASSESSMENT .....</b>					<b>\$660,540.00</b>

**"SCHEDULE D-2"**  
**DETAILS OF SPECIAL BENEFIT**  
**14TH CONCESSION EAST DRAIN**  
**TOWN OF ESSEX**

**SPECIAL BENEFIT ASSESSMENT**

**(SECTION 26-NON PRO-RATABLE)**

Roll No.	Owner	Item Description	Estimated Cost	Cost of Report	Special Benefit
King's Highway No. 3	Ministry of Transportation Ontario	Excavation and trucking of excavated materials from Station 0+513A to Station 0+566A (100%)	\$1,000.00	\$250.00	\$1,250.00
		<u>Bridge No. 1</u> – King's Highway No. 3 Station 0+593A – Supply and installation of a new 3000 mm span x 1500 mm rise precast concrete box culvert extension, 2.5 m long (100%)	\$20,000.00	\$5,070.00	\$25,070.00
		<u>Cleaning of Bridge No. 1</u> – King's Highway No. 3 Station 0+566A to Station 0+593A – approx. 27 m long including disposal of sediment off-site. (100%)	\$8,000.00	\$2,030.00	\$10,030.00
<b>Total Special Benefit Assessment (Section 26 Non Pro-Ratable)</b>			<b>\$29,000.00</b>	<b>\$7,350.00</b>	<b>\$36,350.00</b>
<b>OVERALL TOTAL SPECIAL BENEFIT ASSESSMENT .....</b>					<b>\$36,350.00</b>

**"SCHEDULE E-1"**  
**SCHEDULE OF ASSESSMENT**  
**RUSH DRAIN (FUTURE MAINTENANCE)**  
**TOWN OF ESSEX**

**ONTARIO LANDS:**

Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
King's Highway No. 3	7.42	3.00	Ministry of Transportation Ontario	\$0.00	\$35.00	\$61.00	\$96.00
Total on Ontario Lands				\$0.00	\$35.00	\$61.00	\$96.00

**MUNICIPAL LANDS:**

Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
Block 'A' Roads	23.75	9.61	Town of Essex - Ward 1	\$0.00	\$214.00	\$1,595.00	\$1,809.00
Block 'B' Roads	20.50	8.30	Town of Essex - Ward 1	\$0.00	\$168.00	\$413.00	\$581.00
South Talbot Road	5.95	2.41	Town of Essex	\$0.00	\$34.00	\$49.00	\$83.00
Total on Municipal Lands				\$0.00	\$416.00	\$2,057.00	\$2,473.00

**NON-AGRICULTURAL LANDS:**

Roll No. /Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
Block 'A' Lands	87.75	35.51	Town of Essex - Ward 1	\$0.00	\$925.00	\$3,536.00	\$4,461.00
Block 'B' Lands	62.40	25.25	Town of Essex - Ward 1	\$0.00	\$1,109.00	\$861.00	\$1,970.00
Block 'C' Lands	16.00	6.47	Town of Essex - Ward 1	\$0.00	\$69.00	\$93.00	\$162.00
Block 'D' Lands	21.53	8.71	Town of Essex - Ward 1	\$0.00	\$243.00	\$293.00	\$536.00
210-00010	7.27	2.94	Essex Region Conservation Foundation (Cypher Systems Group Greenway)	\$0.00	\$203.00	\$99.00	\$302.00
Total on Non-Agricultural Lands				\$0.00	\$2,549.00	\$4,882.00	\$7,431.00

<b>TOTAL ASSESSMENT</b>				<b>\$0.00</b>	<b>\$3,000.00</b>	<b>\$7,000.00</b>	<b>\$10,000.00</b>
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	(Acres)	(Ha.)
<b>Total Area:</b>	<b>252.57</b>	<b>102.20</b>



**"SCHEDULE E-2"**  
**SCHEDULE OF ASSESSMENT**  
**14TH CONCESSION EAST DRAIN (FUTURE MAINTENANCE)**  
**TOWN OF ESSEX**

**ONTARIO LANDS:**

Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
King's Highway No. 3	17.50	7.08	Ministry of Transportation Ontario	\$0.00	\$335.00	\$980.00	\$1,315.00
Total on Ontario Lands.....				\$0.00	\$335.00	\$980.00	\$1,315.00

**MUNICIPAL LANDS:**

Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
Block 'A' Roads	23.75	9.61	Town of Essex - Ward 1	\$0.00	\$136.00	\$1,330.00	\$1,466.00
Block 'B' Roads	20.50	8.30	Town of Essex - Ward 1	\$0.00	\$107.00	\$345.00	\$452.00
South Talbot Road	5.95	2.41	Town of Essex	\$0.00	\$104.00	\$333.00	\$437.00
14th Concession Road	3.00	1.21	Town of Essex	\$0.00	\$238.00	\$167.00	\$405.00
Total on Municipal Lands.....				\$0.00	\$585.00	\$2,175.00	\$2,760.00

**NON-AGRICULTURAL LANDS:**

Roll No./Description	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
Block 'A' Lands	87.75	35.51	Town of Essex - Ward 1	\$0.00	\$303.00	\$2,948.00	\$3,251.00
Block 'B' Lands	62.40	25.25	Town of Essex - Ward 1	\$0.00	\$323.00	\$1,046.00	\$1,369.00
Block 'C' Lands	16.00	6.47	Town of Essex - Ward 1	\$0.00	\$84.00	\$269.00	\$353.00
Block 'D' Lands	21.53	8.71	Town of Essex - Ward 1	\$0.00	\$112.00	\$362.00	\$474.00
210-00010	7.27	2.94	Essex Region Conservation Foundation (Cypher Systems Group Greenway)	\$0.00	\$38.00	\$122.00	\$160.00
570-04200      13    Pt. Lot	5.95	2.41	1635625 Ontario Inc.	\$0.00	\$140.00	\$92.00	\$232.00
Total on Non-Agricultural Lands.....				\$0.00	\$1,000.00	\$4,839.00	\$5,839.00

**AGRICULTURAL LANDS:**

Roll No.	Con.	Descrip	Area Affected (Acres) (Ha.)		Owner	Special Benefit	Benefit	Outlet	Total Assessment
570-03500	14	Pt. Lot	0.50	0.20	John P. & Lorraine P. Egeto	\$0.00	\$80.00	\$6.00	\$86.00
Total on Agricultural Lands.....						\$0.00	\$80.00	\$6.00	\$86.00
<b>TOTAL ASSESSMENT .....</b>						<b>\$0.00</b>	<b>\$2,000.00</b>	<b>\$8,000.00</b>	<b>\$10,000.00</b>

	(Acres)	(Ha.)
<b>Total Area:</b>	<b>272.10</b>	<b>110.10</b>

"SCHEDULE F"  
DRAINAGE REPORT FOR THE  
**RELOCATION OF THE RUSH DRAIN**  
TOWN OF ESSEX

**SPECIAL PROVISIONS - GENERAL**

**1.0 GENERAL SPECIFICATIONS**

The General Specifications attached hereto is part of "Schedule F." It also forms part of this specification and is to be read with it, but where there is a difference between the requirements of the General Specifications and those of the Special Provisions which follow, the Special Provisions will take precedence.

**2.0 DESCRIPTION OF WORK**

The work to be carried out under this Contract includes, but is not limited to, the supply of all **labour and materials** to complete the following items:

- Tree and brush removal within the Cypher Systems Group Greenway corridor specifically the west side of the pedestrian trail including the existing ditch. The work shall also include the removal of tree stumps to permit construction of the new drain and the disposal of all trees, brush and stumps by burning on-site or removal off-site as required to accommodate the drainage works.
- Fencing and Guiderail works, as follows:
  - Remove existing wire fence along north side of King's Highway No. 3 right-of-way for access and re-instate fence as per drawing details when work is completed.
  - Supply and installation of a steel guiderail (OPSD 912.125) and Type M20 steel posts (OPSD 912.127) complete with a flared extruder terminal at the east end (overall guiderail length approximately 150 metres) meeting the Ministry of Transportation Ontario highway safety requirements.
- Strip and place topsoil as follows:
  - From Station 0+925 to Station 1+440 strip topsoil (minimum 150 mm depth) across a minimum 10 m width over the proposed drain location and temporarily stockpiled separately within the designated working corridors. Upon completion of excavation, spread a thin layer of salvaged topsoil a minimum 25 mm thickness over the drain banks of the new drain from Station 0+000 to Station 1+440 and fine grade.
- Excavation, trucking, filling and compaction of excavated materials, as follows:
  - Excavation of new Rush Drain from Station 0+000 to Station 1+440, totalling approximately 1,440 lineal metres of drain and approximately 11,200 m<sup>3</sup> of material including trucking to temporary stockpile area on site of (Block 'B' lands) as directed by the property owner.
  - **(Future Work)** Excavation of new Rush Drain from Station 1+440 to Station 1+445, totalling approximately 5 lineal metres of drain and approximately 50 m<sup>3</sup> of material including trucking to temporary stockpile area on site of (Block 'B' lands) as directed by the property owner.  
Note: Work shall be completed once the relocated Rush Drain is a fully established grass lined channel.

- **(Future Work)** Remove all vegetation and organic debris from the existing drain slopes from the abandoned Rush Drain on the Block 'B' lands prior to infilling. Fill existing drain (approximately 3,000 m<sup>3</sup>) including trucking, filling and compaction of material in 250 mm lifts. Compaction to a minimum of 95% standard proctor density. Any excess materials to be stockpiled on site in location specified by property owner. Note: Work shall be completed once the relocated Rush Drain is a fully established grass lined channel.
- **(Future Work)** Remove all vegetation and organic debris from the existing drain slopes from the abandoned Rush Drain on the Block 'C' lands prior to infilling. Fill existing drain (approximately 1,200 m<sup>3</sup>) including trucking, filling and compaction of material in 250 mm lifts. Compaction to a minimum of 95% standard proctor density. Any excess materials to be stockpiled on site in location specified by property owner. Note: Work shall be completed once the relocated Rush Drain is a fully established grass lined channel and connected to upstream Rush Drain portion between Station 1+440 and Station 1+445.
- Seeding of drain banks and filled in drain as follows:
  - Supply and placement of bonded fibre matrix hydro-seed on new drain banks from Station 0+000 to Station 1+440 (approximately 15,000 m<sup>2</sup>).
- Supply and plant new trees (red cedar or other as specified by ERCA) @ minimum 9 m spacing along west side of Greenway pedestrian trail from Station 0+180 to Station 0+898 providing a minimum 1 m clearance from trail edge (approx. 80 trees). Between the trees, supply and plant shrubs (Black Chokeberry or Winterberry Holly or other as specified by ERCA) @ minimum 3 m spacing providing a minimum of 1 m clearance from trail edge (approx. 160 shrubs). Work shall include watering, fertilizer and staking where required.
- Pedestrian trail drainage works, as follows:
  - **Station 0+176 (Cypher Systems Group Greenway)** – Supply and install 750 mm diameter HDPE pipe, 9 m long culvert under trail including heavy duty steel flap gate, clear stone bedding (approximately 10 tonnes), compacted full Granular 'B' backfill (approximately 55 tonnes) Granular 'A' subgrade (approximately 5 tonnes) and asphalt restoration of pedestrian trail (approximately 2 tonnes) and sloped stone end walls with filter fabric underlay (approximately 40 m<sup>2</sup>). **Note: Contractor to hydrovac excavate & daylight existing Cogeco fibre line prior to installation..**
  - **Station 0+907 (Cypher Systems Group Greenway)** – Supply and install 600 mm diameter HDPE pipe, 15 m long for outlet of under trail including heavy duty steel flap gate, clear stone bedding (approximately 10 tonnes), compacted full Granular 'B' backfill (approximately 70 tonnes), Granular 'A' subgrade (approximately 5 tonnes) and asphalt surface for trail (approximately 2 tonnes). The work shall also include excavation and re-grading of south side ditch on upstream end of culvert and sloped stone erosion protection (approximately 100m<sup>2</sup>). **Note: Contractor to hydrovac excavate & daylight existing Cogeco fibre line prior to installation.**
- Supply and install stone erosion protection (minimum 300 mm thickness) on drain banks complete with filter fabric underlay at the following locations:
  - Station 0+000 - Supply and install 150 m<sup>2</sup> (300 mm thick) of stone erosion protection (SEP) including new filter fabric underlay on drain banks.
  - Station 0+226 to Station 0+416 - Supply and install 560 m<sup>2</sup> (300 mm thick) of stone erosion protection (SEP) including new filter fabric underlay on north drain bank.

- Station 0+898 to Station 0+925 - Supply and install 350 m<sup>2</sup> (300 mm thick) of stone erosion protection (SEP) including new filter fabric underlay on drain banks.
- Station 0+925 to Station 1+443 - Supply and install 130 m<sup>2</sup> (300 mm thick) of stone erosion protection (SEP) at hydro pole locations (13 @ 10 m<sup>2</sup> each) including new filter fabric underlay on drain banks.
- Station 1+443 to Station 1+449 - Supply and install 120 m<sup>2</sup> (300 mm thick) of stone erosion protection (SEP) including new filter fabric underlay on drain banks.
- Lateral private ditch outlet Station 0+374 - Supply and install 600 mm diameter HDPE outlet pipe 6 m long, complete with heavy duty flap gate. The work shall also include stone erosion protection on inlet end of pipe (approximately 5 m<sup>2</sup>)
- Bridge No. 3 – ( Station 0+705) Supply and installation of a new 2500 mm x 1830 mm aluminized corrugated steel pipe arch (CSPA), 15.0 m long with 3.5 mm thickness (see specifications) complete with clear stone bedding up to springline of pipe complete with filter fabric overlay (approximately 60 tonnes), clean native backfill material above (approximately 70 m<sup>3</sup>), Granular 'A' driveway material (approximately 30 tonnes) and sloping stone end walls c/w filter fabric underlay (approximately 60 m<sup>2</sup>) providing a minimum 6.0 m (20 ft.) top width.
- Station 0+005 to Station 0+013 Rock flow check dam – Supply and install stone erosion protection (minimum 450 mm thickness) (approximately 30 m<sup>2</sup>) including filter fabric underlay beneath small rock dam constructed across the drain bottom for silt and sediment control measures during construction (OPSD 219.211).
- Road Bridge works, as follows:
  - Bridge No. 2 – (South Talbot Road Station 0+152.75) – Supply and installation of a new 2400 mm span x 1200 mm rise precast concrete box culvert (CHBDC CAN/CSA S6-06), 36 m long including 27 degree bend with sloped stone end walls (approx. 125 m<sup>2</sup>) including clear stone levelling base (approx. 65 tonnes), compacted Granular 'B' backfill up to road subgrade (approx. 580 tonnes) and Granular 'A' road base minimum 300 mm thickness (approx. 80 tonnes). Work shall also include full restoration of asphalt surface and concrete curb and gutter.
  - Bridge No. 4 – (Bell Avenue Station 1+055) – Supply and installation of a new 2400 mm span x 1200 mm rise precast concrete box culvert (CHBDC CAN/CSA S6-06), 20 m long with sloped stone end walls (approx. 40 m<sup>2</sup>) including clear stone levelling base (approx. 30 tonnes), compacted Granular 'B' backfill up to road subgrade (approx. 210 tonnes) and Granular 'A' road base minimum 300 mm thickness (approx. 80 tonnes).
  - (South Talbot Road Station 0+005) – Supply and install 1800 mm diameter Class 65-D (CSA-A257.2) concrete pipe culvert, 30 m long for outlet of abandoned Rush Drain including clear stone bedding (approx. 25 tonnes), compacted Granular 'B' backfill to 300 mm above pipe (approx. 270 tonnes), native material backfill above to existing grade (approx. 20 m<sup>3</sup>) and sloped stone end wall with filter fabric underlay (approx. 20 m<sup>2</sup>).
- Construct gabion stone spillways at west and east ends of new Rush Drain (Station 0+005 and Station 0+130) including the supply and placement of stone erosion protection (approx. 40 m<sup>2</sup>) with filter fabric underlay.
- Traffic Control, Plans and Signage in accordance with the current version of the Ontario Traffic Manual and the Occupational Health and Safety Act.

- Watermain lowering, as follows:
  - Lowering of existing 200 mm diameter watermain at South Talbot Road culvert crossing (Bridge No. 2) including testing and commissioning.
  - Future 250 mm diameter watermain extension to be deflected under Bell Avenue culvert (Bridge No. 4) including testing and commissioning.

#### NO NAME DRAIN (NEW DRAINAGE WORKS)

- Clearing and grubbing of existing drain from Station 0+000B to Station 0+538B (light brushing) including the disposal by burning on-site or removal off-site with trimming and/or removal of existing trees as required to accommodate the drainage works.
- Station 0+000B to Station 0+538B - Supply and placement of clay fill within existing drain including grading and compaction (approximately 500 m<sup>3</sup>).
- Station 0+000B to Station 0+538B - Supply and placement of topsoil over graded fill materials (minimum 100 mm thickness) including fine grading and hydraulic seeding (approximately 2,200 m<sup>2</sup>).
- Supply and install 450 mm diameter HDPE rear yard catch basin (RYCB) complete with cast iron grate, 6 m long, 300 mm diameter HDPE connection from rear yard catch basin to Rush Drain complete with heavy duty steel flapgate. The work shall also include tie-in of existing drain connections and stone erosion protection on drain bank (approximately 10 m<sup>2</sup> each) as follows:
  - RYCB - Station 0+076B
  - RYCB - Station 0+190B
  - RYCB - Station 0+236B
  - RYCB - Station 0+327B
- Supply and install 450 mm diameter HDPE rear yard catch basin (RYCB) complete with cast iron grate, 6 m long, 300 mm diameter HDPE connection from rear yard catch basin to Rush Drain complete with heavy duty steel flapgate. The work shall stone erosion protection on drain bank (approximately 10 m<sup>2</sup> each) as follows:
  - RYCB - Station 0+496B
- Supply and install one (1) 600 mm x 1200 mm precast concrete catch basin complete with heavy duty galvanized steel grate and 6 m long, 600 mm diameter HDPE connection from rear yard catch basin to Rush Drain complete with heavy duty flapgate. The work shall also include tie-in of existing 600 mm HDPE drainage pipe, grouting all pipe connections to catch basin with non-shrink grout and stone erosion protection on drain bank (approximately 10 m<sup>2</sup>).
  - CB – Station 0+149B.
- Temporary Silt Control Measures During Construction

#### 14TH CONCESSION EAST DRAIN

- Brushing of the drain banks with trimming of existing trees as required to accommodate the drainage works from Station 0+000A to Station 0+513A including disposal by burning on-site or removal off-site. Work shall also include tree removal within designated working corridor on the south side of Bridge No. 2A to permit access to west side of drain for drain cleaning work.
- Excavation, levelling and trucking of excavated materials, as follows:



- Excavation of the drain bottom only, as follows:
  - Station 0+000A to Station 0+513A, totalling approx. 513 lineal metres of drain and approx. 140 m<sup>3</sup> of material.
- Levelling of excavated materials, as follows:
  - Station 0+000A to Station 0+203A and Station 0+260A to Station 0+513A, totalling approx. 456 lineal metres of drain and approx. 130 m<sup>3</sup> of material to be levelled.
- Trucking of excavated materials, as follows:
  - Station 0+203A to Station 0+260A, totalling approx. 57 lineal metres of drain and approx. 10 m<sup>3</sup> of material to be trucked and levelled from Station 0+153A and Station 0+203A
- Supply and install stone erosion protection (minimum 300 mm thickness) on drain banks complete with filter fabric underlay at the following locations:
- Station 0+525A to Station 0+532A - Supply and install stone erosion protection (SEP) approx. 60 m<sup>2</sup> including new filter fabric underlay on existing drain bend.
- Road bridge works, as follows:
  - Bridge No. 1 – King's Highway No. 3 Station 0+593A – Supply and installation of a new 3000 mm span x 1500 mm rise precast concrete box culvert extension, 2.5 m long including clearstone levelling base (approx. 5 tonnes), compacted Granular 'A' backfill (approx. 110 tonnes) and including connection to existing highway culvert complete with scribed holes, 15M dowels and inserts as required.
- Bridge cleaning works, as follows:
  - Bridge No. 1A – Pinkerton Road Station 0+000A being approx. 10 m long, 3600 mm span x 1800 mm rise concrete culvert. Work shall include disposal of sediment off-site.
  - Bridge No. 2A – (Roll No. 570-03500) Station 0+211A being approx. 5 m long, 2400 mm span x 1800 mm rise concrete culvert. Work shall include disposal of sediment off-site.
- Excavation of the drain bottom only, as follows:
  - Bridge No. 1A – Pinkerton Road Station 0+000A being approx. 10 m long, 3600 mm span x 1800 mm rise concrete culvert. Work shall include disposal of sediment off-site.
- Levelling of excavated materials, as follows:
  - Station 0+000A to Station 0+203A and Station 0+260A to Station 0+513A, totalling approx. 456 lineal metres of drain and approx. 130 m<sup>3</sup> of material to be levelled.
- Trucking of excavated materials, as follows:
  - Station 0+203A to Station 0+260A, totalling approx. 57 lineal metres of drain and approx. 10 m<sup>3</sup> of material to be trucked and levelled from Station 0+153A and Station 0+203A
- Bridge cleaning works, as follows:
  - Bridge No. 1 – King's Highway No. 3 (Station 0+566A to Station 0+593A) being approx. 27 m long, 3000 mm span x 1500 mm rise precast concrete box road culvert. Work shall include disposal of sediment off-site.
- Temporary Silt Control Measures During Construction

### 3.0 ACCESS TO THE WORK

#### Rush Drain

Access to the Rush Drain shall be from the Bell Avenue right-of-way entering the working area on the Block 'B' lands. From there, the designated access corridors shall be used as defined herein.

The Contractor shall make his/her own arrangements for any additional access for his/her convenience. All roads, pedestrian trail and grassed areas disturbed during construction and/or future maintenance of the drain shall be restored to original conditions at the Contractor's expense.

#### 14<sup>th</sup> Concession East Drain

Access to the 14<sup>th</sup> Concession East Drain shall be from the 14<sup>th</sup> Concession Road entering the working area from Bridge No. 2A. One lane shall remain open during the construction period and traffic control (found in General Specifications) maintained at all times. The Contractor shall make his/her own arrangements for any additional access for his/her convenience. All roads and grassed areas disturbed during construction and/or future maintenance of the drain shall be restored to original conditions at the Contractor's expense.

### 4.0 DRAIN CONSTRUCTION & FUTURE MAINTENANCE CORRIDORS

The Contractor shall restrict his equipment to the working corridors as specified in this Section. Any damage resulting from non-compliance with this Section shall be borne by the Contractor. The working corridor shall be measured from the top of the nearest drain bank and shall be as follows:

FROM STA.	TO STA.	PRIMARY (See Note 1)	SECONDARY (See Note 2)
<b>RUSH DRAIN (CONSTRUCTION)</b>			
0+000	0+170	South Talbot Road allowance	King's Highway No. 3 corridor (north of westbound lanes only)
0+170	0+925	15.0 m wide on west side of drain	5.0 m wide on east side of drain Cypher Systems Group Greenway
0+925	1+445	15.0 m wide on south side of drain	4.5 m wide on north side of drain (4 m width at the back of the Allen Avenue industrial lots)
<b><u>14<sup>th</sup> CONCESSION EAST DRAIN (CONSTRUCTION)</u></b>			
0+000A	0+203A	9.0 m wide on west side of drain	14 <sup>th</sup> Concession Road allowance
0+203A	0+260A	14 <sup>th</sup> Concession Road allowance	5.0 m wide around perimeter of existing farmstead (buildings and grassed areas)
0+260A	0+513A	9.0 m wide on west side of drain	14 <sup>th</sup> Concession Road allowance
0+513A	0+525A	14 <sup>th</sup> Concession Road allowance	N/A

FROM STA.	TO STA.	PRIMARY (See Note 1)	SECONDARY (See Note 2)
0+525A	0+566A	King's Highway No. 3 corridor (south of eastbound lanes only)	N/A
		<b><u>RUSH DRAIN (FUTURE MAINTENANCE)</u></b>	
0+000	0+170	South Talbot Road allowance	King's Highway No. 3 corridor (north of westbound lanes only)
0+170	0+700	5.0 m wide on east side of drain Cypher Systems Group Greenway	N/A
0+700	0+925	7.3 m wide on west side of drain	5.0 m wide on east side of drain Cypher Systems Group Greenway
0+925	1+445	4.5 m wide on north side of drain (4 m width at the back of the Allen Avenue industrial lots)	N/A
		<b><u>14<sup>th</sup> CONCESSION EAST DRAIN (FUTURE MAINTENANCE)</u></b>	
0+000A	0+203A	9.0 m wide on west side of drain	14 <sup>th</sup> Concession Road allowance
0+203A	0+260A	14 <sup>th</sup> Concession Road allowance	5.0 m wide around perimeter of existing farmstead (buildings and grassed areas)
0+260A	0+513A	9.0 m wide on west side of drain	14 <sup>th</sup> Concession Road allowance
0+513A	0+525A	14 <sup>th</sup> Concession Road allowance	N/A
0+525A	0+566A	King's Highway No. 3 corridor (south of eastbound lanes only)	N/A

Note 1: *Primary working corridor* indicates the access corridor along the side of the drain where drain excavation, levelling or trucking of drain spoils is recommended unless noted otherwise below and/or in the Specifications, as well as all purposes listed for Secondary Working Corridors.

Note 2: *Secondary working corridor* indicates the access corridor alongside the drain where equipment may travel for the purpose of trucking, drain bank repairs, culvert work, tile outlet repairs, surface water inlet repairs, and other miscellaneous works. **No disposal of fill or levelling of materials shall be permitted within a secondary working corridor. As further specified, use of this secondary working corridor may be further restricted due to site condition. Read all Specifications, Drawings and/or notes before completing works.**

## SPECIAL PROVISIONS – OPEN DRAIN

### 5.0 BRUSHING

Brushing shall be carried out on the entire drain within the above identified sections of the drain where required and as specified herein. **All** brush and trees located within the drain side slopes shall be cut parallel to the side slopes, as close to the ground as practicable. Tree branches that overhang the drain shall be trimmed. Small branches and limbs are to be disposed of by the Contractor along with the other brush. Tree stumps, where removed to facilitate the drain excavation and reshaping of the drain banks, may be burned by the Contractor where permitted; otherwise, they shall be disposed of, off the site. The Contractor shall make every effort to preserve mature trees which are beyond the drain side slopes, and the working corridors. If requested to do so by the Drainage Superintendent, the Contractor shall preserve certain mature trees within the designated working corridors (see Section 4.0).

Except as specified herein, all brush and trees shall be stockpiled adjacent to the drain within the working corridors. Stockpiles shall not be less than 100 m apart and shall be a minimum of 2.0 m from the edge of the drain bank. All brush, timber, logs, stumps, large stones or other obstructions and deleterious materials that interfere with the construction of the drain, as encountered along the course of the drain are to be removed from the drain by the Contractor. Large stones and other similar material shall be disposed of by the Contractor off the site.

Following completion of the work, the Contractor is to trim up any broken or damaged limbs on trees which remain standing, disposing of the branches cut off along with other brush and leaving the trees in a neat and tidy condition. Brush and trees removed from the working area are to be put into piles by the Contractor, in locations where they can be safely burned, and to be burned by the Contractor after obtaining the necessary permits, as required. Should these locations be outside of the working corridors to obtain safe distance from neighbouring property owners and roadways, the Contractor shall first obtain permission of the landowner(s) of Blocks 'B' and 'C'.

If, in the opinion of the Drainage Superintendent, any of the piles are too wet or green to be burned, or smoke is excessive, the Contractor may be advised to haul away the unburned materials to an approved dump site. When burning is permitted, during the course of burning operations the Contractor shall comply with the current guidelines prepared by the Air Quality Branch of the Ontario Ministry of Environment and shall ensure that the Environmental Protection Act is not violated.

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

### 6.0 NEW OPEN DRAIN CONSTRUCTION (RUSH DRAIN)

#### 6.1 Setting Out

Benchmarks are provided on the attached drawings (Page No. 13 of 18). From these benchmarks, the Contractor will do his own setting out. The setting out by the Contractor shall include but shall not be limited to the preparation of grade sheets, the installation of centreline stakes, grade stakes, offsets, and sight rails.

If, during the setting out, the Contractor finds a discrepancy in the benchmarks provided by the Engineer in the attached drawings, or is uncertain as to the interpretation of the information provided or the work intended, he shall notify the Engineer immediately for additional verification or clarification before proceeding with construction.

The Contractor shall be responsible for the true and proper setting out of the works and for the correctness of the position, levels, dimensions and alignment of all parts of the work. The Contractor shall take every precaution and to ensure that the property limit is clearly and regularly marked and to have its accuracy confirmed by a professional land surveyor prior to constructing any part of the new drain.

If, at any time during the progress of the works, an error shall appear or arise in the position, levels, dimensions or alignment of any part of the works, the Contractor shall, at his own expense, rectify such error to the satisfaction of the Engineer, unless such error is based on incorrect data supplied in writing by the Engineer.

## **6.2 Profile and Excavation of New Drain Construction**

Excavation shall be carried out in accordance with the profile shown on the drawings for the drain relocation.

In all cases, the Contractor shall use the benchmarks to establish the proposed grade. However, for convenience, the drawings provide the approximate depth from the surface of the ground and from the existing drain bottom to the proposed grades. **The Contractor shall not excavate deeper than the gradelines shown on the drawings.**

Should over excavation of the drain bank occur, the Contractor will not be permitted to repair with native material packed into place by the excavator and re-shaped. Should over excavation occur, the Contractor will be required to have a bank repair detail engineered by a Professional Engineer (hired by the Contractor), to ensure long term stability of the bank is maintained. Such repairs shall be subject to approval by the Engineer and will be at no extra cost to the item.

All excavation work shall be done in such a manner as to not harm any vegetation or trees, not identified in this report or by the Drainage Superintendent for clearing. Any damages to trees or vegetation caused by the Contractors work shall be rectified to the satisfaction of the Drainage Superintendent. The Contractor shall exercise caution around existing tile outlets and shall confirm with the property owners that all tiles have been located and tile ends repaired as specified.

## **6.3 Topsoil Stripping, Salvaging and Re-use on new drain banks**

Prior to any drain excavation from Station 0+925 to Station 1+440, the topsoil shall be stripped across a minimum 10 m width over the proposed new drain location (515 m length) and temporarily stockpiled within the designated working corridors. Drain excavation materials shall be stockpiled separately. The salvaged topsoil shall be trucked within the working corridor where it can be later spread and levelled to a minimum 25 mm thickness on the banks of the newly constructed drain alignment from Station 0+000 to Station 1+440. It is anticipated that the amount of topsoil stripped will be greater than the amount required to fully dress the banks of the new drain alignment, however if needed, the Contractor may elect to import screened topsoil to complete the work at their expense. Excess topsoil shall not be removed from the site.

## **6.4 Construction of relocated drain portion offline**

The Contractor shall construct the relocated Rush Drain offline from its outlet at the King's Highway No. 3 culvert (Station 0+000) continuing upstream to Station 1+440 and stopping short of and without connecting into the abandoned Rush Drain at Station 1+445. The purpose of the off line drain construction is to fully establish a grass lined channel and stabilize the banks to minimize erosion and sediment transport once the off line drain is subsequently connected to the upstream and covered portion of the Rush Drain starting at Station 1+449. Over this time period, the abandoned Rush Drain shall remain open and drainage maintained through the original alignment.

During the construction of the off line drain, the drainage from the King's Highway No. 3 and South Talbot Road that is directly into the Rush Drain, the Block 'D' lands and the Allen Avenue industrial lots within Block 'A' which are using the No-Name Drain shall be permitted to outlet. That is provided there is stone erosion protection placed at the designated new lateral pipes, culverts and spillways as shown on the drawings. The exception being, the private outlet swale from the Block 'B' lands that shall be blocked from entering the new drain until approval has been given by the Drainage Superintendent and Engineer to fill in the abandoned Rush Drain and connect the upstream Rush Drain at Station 1+449. The temporary stockpiled materials along the east side of the abandoned Rush Drain shall be placed no closer than 2 m from the edge of the drain. Openings to be provided within the stockpiled windrow where necessary to ensure surface drainage is maintained for the vacant Block 'B' lands. Prior to constructing the off line drain, the



rock flow check dam shall be installed between Station 0+005 and 0+013 across the bottom of the drain in accordance with specification OPSD 219.211.

#### **6.5 Stone erosion protection on new drain banks**

Stone erosion protection at the drain bend locations, where specified, shall be constructed at same time as the new channel excavation between Station 0+000 and Station 1+440. For the locations where the new drain channel will be constructed parallel to and in close proximity (minimum 1 m clearance) to the existing overhead hydro transmission, the north drain bank shall be provided with a 3 m wide strip of stone erosion protection centred at each of the existing poles. Should the existing utility be relocated prior to the drain construction, its alignment will still remain in close proximity to the south bank (minimum 1 m clearance) and as such the same stone erosion protection would be required.

For the new drain segment between Station 0+266 and Station 0+416 along the Cypher Systems Group Greenway, stone erosion protection is required to fully cover the west drain bank where a steeper 1:1 side slope is required to maintain the drain channel entirely within the greenway corridor lands. The top of the west drain bank shall be no closer than 0.5 m from the property limit and the top of the east bank shall be no closer than 1.5 m from the west edge of the pedestrian trail.

#### **6.6 New Road Culverts and Pedestrian Access Culverts**

The Contractor may elect to install the new road culverts and pedestrian access culvert into the offline relocated Rush Drain prior to it be connected to the upstream portion of the Rush Drain.

The new road culvert required for the drain crossing of South Talbot Road (Bridge No. 2 at Station 0+152.75) shall consist of a 2400 mm span x 1200 mm rise precast concrete box culvert, 36 m long including one 27 degree bend section complete with sloping stone endwalls. The culvert shall be designed and manufactured to the Canadian Highway Bridge Design Code (CHBDC CAN/CSA S6.06). Prior to installing the culvert, an existing 200 mm diameter watermain shall require to be lowered to a minimum 0.5 m below the bridge structure. Should the construction of South Talbot Road occur prior to the new culvert placement, there will be additional works to restore the roadway to its original new condition.

The new road culvert required for the drain crossing of Bell Avenue (Bridge No. 4 at Station 1+055) shall consist of a 2400 mm span x 1200 mm rise precast concrete box culvert, 20 m long complete with sloping stone endwalls. Prior to installing the culvert, there is an existing 250 mm diameter watermain on Bell Avenue that will require extension further south to cross under the bridge structure providing a minimum 0.5 m clearance. The watermain extension work should be coordinated with the Town of Essex Public Works Department and scheduled to go before the installation of the bridge.

An additional road culvert on South Talbot Road may be necessary should the road be constructed prior to the offline Rush Drain. With the intent to have the offline drain constructed before the construction of South Talbot Road, a minimum 1800 mm diameter size precast concrete pipe culvert shall be installed. This culvert will convey only the upstream flows of the abandoned Rush Drain (Block 'A' portion excluding the No-Name Drain flows), the Block 'B' and Block 'C' pre-development flows with outlet into the 14<sup>th</sup> Concession East Drain at the existing 3000 mm x 1500 mm concrete culvert under King's Highway No. 3.

The offline drain will convey the flows from the No-Name Drain, Block 'D' and the greenway corridor drainage and would by-pass the new 1800 mm diameter culvert.

The new pedestrian access culvert is required to permit the future trail extension westerly and crossing the drain into the Block 'B' lands. It shall consist of a 2500 mm x 1830 mm aluminized corrugated steel pipe arch culvert, 15 m long, 125 mm x 25 mm corrugations and 3.5 mm thickness, complete with sloping stone endwalls and a gravel driveway surface having a minimum top width of 6 metres.

There are two (2) existing culverts that cross the pedestrian trail within the Cypher Systems Group Greenway. The Contractor shall replace them with two new culverts of equal size. The south culvert shall be located at Station 0+176 consisting of a 9 m long, 750 mm diameter high density polyethylene (HDPE) Boss 2000 pipe, 320 kPa with split coupler joining system and complete with sloping stone endwalls and a heavy duty

galvanized steel flapgate attached to the outlet end of the pipe. The ends of the existing 750 mm diameter culvert shall be capped and sealed with non-shrink grout.

The north culvert shall be located at Station 0+907 consisting of a 15 m long, 600 mm diameter high density polyethylene (HDPE) Boss 2000 pipe, 320 kPA with gasket insert bell and spigot joining system complete with sloping stone endwalls and a heavy duty galvanized steel flapgate attached to the outlet end of the pipe.

#### **6.7 No-Name Drain Infilling and New Drainage Works**

In conjunction with the construction of the offline Rush Drain between Station 0+925 and Station 1+440, the Contractor shall be required to re-direct the drainage flows from the No-Name Drain into the new drain. The work includes clearing and grubbing of brush and vegetation, filling in of the existing ditch with clean clay fill from the new drain excavation and the re-grading a new swale to be directed to new catch basins to be installed in the locations as shown on the drawings.

The catch basins shall consist of high density polyethylene (HDPE) Boss 2000 pipe to the diameters as specified and to be supported on a clearstone base and to include a foundry cast iron grate of same diameter to fit the top of the catch basin pipe. The grades and elevations are provided on the drawings. Any variation made to these grades shall first obtain approval from the Drainage Superintendent and Engineer. Associated with the catch basin work, the Contractor shall re-connect all the existing storm drain outlets to the catch basins using inserta tee fittings and including the supply and installation of the new drainage outlet pipes to the new Rush Drain complete with a 3 m wide strip of sloping stone erosion protection on the entire north drain bank. The outlet pipes to consist of high density polyethylene (HDPE) Boss 2000 pipes, 320 kPA, to the diameters specified, and 6 m in length.

For the existing 600 mm diameter storm drain that outlets drainage flows from Allen Avenue to the No-Name Drain, the Contractor shall connect to the new Rush Drain. The work shall include a 600 mm x 1200 mm precast concrete catch basin complete with galvanized heavy duty steel grate, a 6 m long, 600 mm diameter high density polyethylene (HDPE) Boss 2000 outlet pipe and the tie-in of the existing 600 mm diameter pipe to the catch basin with grouting of all pipe connections with non-shrink grout. The work shall also include a 3 m wide strip of sloping stone erosion protection on the entire north drain bank.

Once grading and drainage works installed, the Contractor shall place a minimum 100 mm layer of topsoil, fine grade and hydro seed to grass. Prior to grass being established, silt and erosion control measure shall be put in place including straw bale filter dams to be staked on each side of the new catch basins.

#### **6.8 Filling and Levelling of Abandoned Rush Drain**

Native soil materials excavated from the new Rush Drain alignment shall be used to fill the upstream portion of the abandoned Rush Drain original alignment across the Block 'B' and Block 'C' lands. The work may proceed once approval has been given to connect the offline relocated Rush Drain at Station 1+445. Prior to the infilling of the open drain, the Contractor shall remove all vegetation, organic debris and topsoil from the existing drain. The native materials used to fill the drain shall be placed in maximum 250 mm loose lifts and compacted with a sheepsfoot type compaction equipment capable of achieving 95% of the maximum standard proctor density or better. For any existing lateral and main tile outlets that may exist within abandoned Rush Drain, the Contractor shall mark them for future relocation. The relocation of lateral drain tiles are the responsibility of the landowner.

#### **6.9 Lateral private ditch outlet at Station 0+374**

Following the filling in of the abandoned Rush Drain, the Contractor shall re-connect the existing lateral private ditch to the Rush Drain at Station 0+374. The work shall include the supply and installation of a 600 mm diameter high density polyethylene (HDPE) Boss 2000 pipe, 320 kPA with gasket insert bell and spigot joining system complete with heavy duty galvanized steel flapgate attached to the outlet end of the pipe and sloping stone erosion protection on inlet side of the pipe.

## 7.0 EXCAVATION AND LEVELLING (14<sup>th</sup> CONCESSION EAST DRAIN)

### 7.1 Excavation of Existing Drain Channel

In all cases, the Contractor shall use the benchmarks to establish the proposed grade. However, for convenience, the drawings provide the approximate depth from the surface of the ground and from the existing drain bottom to the proposed grades. **THE CONTRACTOR SHALL NOT EXCAVATE DEEPER THAN THE GRADELINES SHOWN ON THE DRAWINGS.** Should over-excavation of the drain bank occur, the Contractor will **not** be permitted to repair with native material packed into place by the excavator and re-shaped. Should over-excavation occur, the Contractor will be required to have a bank repair detail engineered by a Professional Engineer (hired by the Contractor), to ensure long term stability of the bank is maintained. Such repairs shall be subject to approval by the Engineer and will be at no extra cost to the item.

All excavated material shall be handled as specified in Section 7.2. Materials deposited on the farmlands shall be within the working corridors, at least 2.0 m from the top of the drain bank, or as specified on the drawings. Upon allowing drying of excavated materials (if necessary) and as approved by the Drainage Superintendent, the Contractor shall level excavated materials in accordance with Section 7.2. Excavated material shall not be placed on dykes, in ditches, tiles or depressions intended to conduct water into the drain.

All excavation work shall be done in such a manner as to not harm any vegetation or trees, not identified in this report or by the Drainage Superintendent for clearing. Any damages to trees or vegetation caused by the Contractors work shall be rectified to the satisfaction of the Drainage Superintendent. The exception being at Station 0+203A where the existing tree line to the west side of the access bridge (Bridge No. 2A) prevents access to the working corridor. Only the trees within the 9 m wide corridor may be removed for equipment access. The Contractor may dispose of the trees by means of burning as defined in Section 5 above.

The Contractor shall exercise caution around existing tile inlets and shall confirm with the property owners that all tiles have been located and tile ends repaired as specified.

### 7.2 Levelling of Excavated Materials

Excavation of the drain bottom shall be completed as specified in Section 7.1, above and also as specified below and as shown on the drawings. Excavated drain materials shall be spread to a depth not to exceed 150 mm and kept within the designated working corridors as defined in Section 4 above. The material shall be sufficiently levelled to allow further working by agricultural implements. All stones and other debris removed from the drain, which may interfere with agricultural implements, shall be disposed of off-site. Excavated material shall not be placed on dykes, in ditches, tiles or depressions intended to conduct water into the drain.

### 7.3 Trucking of Excavated Materials

Excavated materials to be removed from the drain in between Station 0+203A and Station 0+260A are to be trucked to the property adjacent to the drain and downstream of Station 0+203A to be levelled as specified in Section 7.2. **The Contractor shall be solely responsible for acquiring any and all permits and approvals required prior to hauling and disposal of materials off-site.** The Contractor shall restore any such areas which are damaged by his operations, to original or better condition. The Contractor will be held liable for damages to roads and grassed areas resulting from his non-compliance with **these specifications.**

## 8.0 STONE EROSION PROTECTION (SEP)

The Contractor shall supply and install the required quantities of graded stone rip-rap erosion protection materials where specified. All stone to be used for erosion protection shall be 125 - 250 mm clear **quarried rock** or OPSS 1001 placed over a non-woven filter fabric Terrafix 270R or approved equivalent. **Concrete rip-rap will not be permitted.** The minimum thickness requirement of the erosion stone layer is 300 mm with no portion of the filter fabric to be exposed.

## 9.0 HYDRAULIC SEEDING OF DRAIN BANKS ON NEW DRAIN CHANNEL

The newly established drain banks and all existing grassed areas disturbed by construction shall be hydraulic mulch seeded as specified herein. The surface shall be predominantly fine and free from weeds and other unwanted vegetation. All other loose surface litter shall be removed and disposed of.

Bonded Fibre Matrix shall consist of thermally refined wood fibers and 10% cross-linked hydro-colloidal tackifiers. It should be 100% biodegradable. The curing period shall be not more than 48 hours. Bonded Fibre Matrix shall be hydraulically applied and after application be capable of adhering to the soil. In a dry state, shall be comprised of not less than 70% by weight of long, stranded wood fibres held together by organic or mineral bonding agents or both.

Bonded Fibre Matrix shall be applied at a minimum rate of 3,700 kg of dry product per 10,000 m<sup>2</sup>. It shall be thoroughly mixed with water in a hydraulic seeder and mulcher at a rate of 20-30 kg of dry product to 500-600 litres of water to form a homogeneous slurry. Refer to OPSS.PROV 804 for specifications.

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

The hydraulic seeder/mulcher shall be equipped with mechanical agitation equipment capable of mixing the materials into a homogenous state until applied. The discharge pumps and gun nozzles shall be capable of applying the material uniformly. Grass seed shall be Canada No. 1 grass seed mixture meeting the requirements of a Waterway Slough Mixture as supplied by Growmark or approved equal, as follows:

<i>Creeping Red Fescue</i>	20%
<i>Meadow Fescue</i>	30%
<i>Tall Fescue</i>	30%
<i>Timothy</i>	10%
<i>White Clover</i>	10%

Bags shall bear the label of the supplier indicating the content by species, grade and mass. Seed shall be applied at a rate of 200 kg per 10,000 m<sup>2</sup>. Fertilizer shall be 8-32-16 applied at 350 kg per 10,000 m<sup>2</sup>. It shall be in granular form, dry, free from lumps and in bags bearing the label of the manufacturer, indicating mass and analysis. **The hydraulic seeding shall be deemed "Completed by the Contractor" when the seed has established in all areas to the satisfaction of the Engineer. Re-seeding and/or other methods required to establish the grass will be given consideration to achieve the end result and the costs shall be incidental to the works.**

## 10.0 CLEANING OF PRIVATE ACCESS CULVERTS AND ROAD BRIDGES

At the locations listed below, the Contractor shall clean the existing pipes or culverts to their full capacity and cross section or width. The operation may be carried out by mechanical means or by flushing. Any damage resulting from the Contractor's operation shall be rectified at his expense. All material removed from the pipes or culverts shall be transported to a dump site arranged by the Contractor. The Contractor shall be solely responsible for acquiring all permits required for the dump site. The Contractor shall take precautions during the construction period to avoid re-sedimentation of the pipes and culverts. Any sediment deposited as a result of construction activities shall be removed at the Contractor's expense.

- Bridge No. 1 – King's Highway No. 3 Station 0+000, 27 m long, 3000 mm span x 1500 mm rise concrete box road culvert.
- Bridge No. 1A – Pinkerton Road Station 0+000A, 10 m long, 3600 mm span x 1800 mm rise concrete culvert.



- Bridge No. 2A – Roll No. 570-03500 Station 0+211A, 5 m long, 2400 mm span x 1800 mm rise concrete culvert.

## 12.0 ROAD BRIDGE CONSTRUCTION

### 12.1 Location of New Road Bridges

The bridges shall be located and installed as shown on the drawings attached hereto.

### 12.2 Materials for New Road Bridges

Materials shall be as follows:

*Culvert*

**Bridge No. 1** – **King's Highway No. 3 Station 0+000:** New 2.5 m long, 3000 mm span x 1500 mm rise precast concrete box culvert extension as per CHBDC CAN/CSA S06-06.

**Bridge No. 2** – **South Talbot Road Station 0+152.75:** New 36.0 m long, 2400 mm span x 1200 mm rise precast concrete box culvert as per CHBDC CAN/CSA S06-06.

**Bridge No. 4** – **Bell Avenue Station 1+055:** New 20.0 m long, 2400 mm span x 1200 mm rise precast concrete box culvert as per CHBDC CAN/CSA S06-06.

**South Talbot Road Culvert** – **Station 0+005:** New 30.0 m long, 1800 mm diameter precast concrete pipe, Class 65-D, as per CSA-A257.2

*Pipe Bedding Below  
Pipe*

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

*Backfill to 300 mm  
above culvert (Bridge  
No. 1)*

Granular 'A' conforming to OPSS Division 10.

*Backfill 300 mm below  
existing ground  
(temporary condition)*

Dry native material free of topsoil, organic matter, broken concrete, steel, wood and deleterious substances. Alternatively, Granular 'A' or 'B' conforming to OPSS Division 10.

*Backfill to 300 mm  
above culvert (Bridge  
No. 2 & 4, South  
Talbot Road culvert)*

Granular 'B' conforming to OPSS Division 10.

### 12.3 Lateral Tile Drains

The Contractor shall re-route any outlet tile drains, in consultation with the Drainage Superintendent, as required to accommodate the new culverts. Tile drain outlets through the wall of the new culvert will not be permitted. All costs associated with re-routing lateral tile drains (if any) shall be at the Contractor's expense.

### 12.4 Bridge Installation

Suitable dykes shall be constructed in the drain so that the installation of the pipe or culvert can be accomplished in the dry. The drain bottom shall be cleaned, prepared, shaped and compacted to suit the new culvert configuration, as shown on the drawings. Granular materials shall be compacted to 100% of their maximum dry density; native materials shall be compacted to 95% of their maximum dry density.



### 12.5 Sloping Stone End Walls

Sloping stone end walls shall be constructed of quarry stone rip-rap, as shown on the drawings and as specified herein. Each end wall shall extend from the invert of the new culvert to the top of the proposed lane. The end walls shall be sloped 1 vertical to 1.5 horizontal, with a filter fabric underlay surrounding the pipe and spanning across the entire width of the drain. The minimum thickness requirement of the erosion stone layer is 300 mm, with no portion of the filter fabric to be exposed.

### 12.6 Native Materials

Native materials suitable for use as backfill, as defined under Section 12.2, shall be salvaged from the bridge site as required to complete the work as shown on the drawings and/or from the drain excavation. Where there is an insufficient amount of native fill materials for backfilling the culvert, the Contractor may elect to import additional dry native materials or alternatively use Granular 'B' at his/her own expense.

## 13.0 PEDESTRIAN ACCESS BRIDGE

### 13.1 Location of Access Bridge

The bridges shall be located and installed as shown on the drawings attached hereto.

### 13.2 Materials for Access Bridge

Materials shall be as follows:

<i>Culvert pipe</i>	<b>Bridge No. 3 – Station 0+705 (Essex Town Centre Ltd.):</b> <i>New 15 m long, 2500 mm x 1830 mm aluminized Type II corrugated steel pipe arch culvert (CSPA), wall thickness of 3.5 mm and 125x25 corrugations with rerolled ends.</i>
<i>Coupler</i>	<i>New culvert shall be joined with annular aluminized corrugated wide bolt and angle couplers (minimum of 8 corrugation overlap and 2.8 mm wall thickness) and no single pipe less than 6.0 m length. All pipes connected with couplers shall abut to each other with no more than a 25 mm gap between pipes prior to installation of the coupler and wrapped with filter fabric.</i>
<i>Pipe Bedding Below Pipe</i>	<i>20-25 mm clear stone conforming to OPSS Division 10.</i>
<i>Backfill</i>	<i>Native material or Granular 'B' conforming to OPSS Division 10</i>
<i>Driveway surface</i>	<i>Granular 'A' conforming to OPSS Division 10.</i>

### 13.3 Lateral Tile Drains

The Contractor shall re-route any outlet tile drains, in consultation with the Drainage Superintendent, as required to accommodate the new culverts. Tile drain outlets through the wall of the new culvert will not be permitted. All costs associated with re-routing lateral tile drains (if any) shall be at the Contractor's expense.

### 13.4 Bridge Installation

Suitable dykes shall be constructed in the drain so that the installation of the pipe or culvert can be accomplished in the dry. The drain bottom shall be cleaned, prepared, shaped and compacted to suit the new culvert configuration, as shown on the drawings. Granular materials shall be compacted to 100% of their maximum dry density; native materials shall be compacted to 95% of their maximum dry density.

### 13.5 Sloping Stone End Walls

Sloping stone end walls shall be constructed of quarry stone rip-rap, as shown on the drawings and as specified herein. Each end wall shall extend from the invert of the new culvert to the top of the proposed

lane. The end walls shall be sloped 1 vertical to 1.5 horizontal, with a filter fabric underlay surrounding the pipe and spanning across the entire width of the drain. The minimum thickness requirement of the erosion stone layer is 300 mm, with no portion of the filter fabric to be exposed.

### **13.6 Native Materials**

Native materials suitable for use as backfill, as defined under Section 13.2, shall be salvaged from the bridge site as required to complete the work as shown on the drawings and/or from the drain excavation. Where there is an insufficient amount of native fill materials for backfilling the culvert, the Contractor may elect to import additional dry native materials or alternatively use Granular 'B' at his/her own expense.

## **14.0 NEW PRECAST CONCRETE CATCH BASINS**

The Contractor shall arrange for the supply and installation of concrete catch basins at the locations and elevations as shown on the Details and Profiles. The Contractor shall install all precast structures plumb and true to line and grade. Precast bases shall be set to the specified grade, shall be level, and shall have uniform overall contact with the underlying soil.

All catch basins installed shall meet the dimensions and locations outlined in the drawings. Precast concrete catch basins shall conform to the requirements of Ontario Provincial Standard Specification (OPSS) 1351. The floor elevation shall be at least 300 mm below the invert of the outlet pipe in the wall of the catch basin.

Pipe placed in the walls for inlet and outlet connections shall extend through the wall a sufficient distance to allow for connections. The pipes shall be trimmed flush with the inside wall and shall be securely sealed into place using grout.

All catch basins shall be supplied with 1 – 150 mm riser section installed on top of the structure so that future adjustments can be made. The catch basins shall be supplied with heavy duty galvanized grates as manufactured by Coldstream Concrete or approved equal.

## **15.0 NEW HDPE CATCH BASINS (RYCB)**

The Contractor shall supply and install 450 mm diameter and 900 mm diameter solid corrugated high density polyethylene (HDPE) smooth wall 320 kPa pipe (Boss 2000 or approved equal) rear yard catch basins complete with cast iron grate and 300 mm diameter or 450 mm diameter solid corrugated high density polyethylene (HDPE) smooth wall 320 kPa pipe (Boss 2000 or approved equal) connection. The base of the rear yard catch basin shall consist of a minimum 300 mm layer of 19 mm size free draining clear stone material with no bottom within catch basin. The base elevation shall be at least 600 mm below the invert of the lowest outlet pipe in the wall of the catch basin.

Rear yard catch basins shall be backfilled with clean native materials in maximum 300 mm lifts and compacted to 98% of the maximum standard proctor density.

## **16.0 ROCK CHECK DAM**

Rock check dam shall be installed at the downstream end of the proposed works prior to commencing construction. The location and exact dimensions of the rock check dam will be confirmed with the Drainage Superintendent prior to installation. Installation shall be in accordance with OPSD 219.211 with the modifications to size as discussed with the Drainage Superintendent.

The rock check dam will not be removed until vegetation is established in the new channel or as directed by the Drainage Superintendent.

## **17.0 GUIDERAIL SYSTEM ALONG NORTH SIDE OF KING'S HIGHWAY NO. 3**

The Contractor shall supply and install a galvanized steel beam guiderail system (OPSD 912.186) using Type

M rail (OPSD 912.125) and M20 galvanized steel posts, 2438 mm length (OPSD 912.127 and to be located 0.5 m south of the south drain bank for the relocated Rush Drain. The guiderail shall be approximately 150 metres long starting from Station 0+000 and proceeding eastward on the same alignment as the Rush Drain. The work shall also include a flared extruder terminal end rail (OPSD 922.532). The new guiderail's location will be outside of the 13.5 m wide clear zone once the highway is widened and the new lanes shifted further south. It therefore does not present a traffic hazard and may remain in place thereafter. The guiderail system shall adhere to the Ministry of Transportation Highway Design and Safety Manual and Ontario Provincial Standard Drawings. Should the Ministry elect to remove the guiderail after the highway is widened, the removal costs shall be the responsibility of the road authority having jurisdiction over the highway.

#### **18.0 TREE & SHRUB PLANTINGS ALONG WEST SIDE OF GREENWAY TRAIL**

Following completion of the Rush Drain relocation along the Cypher Systems Group Greenway, the Contractor shall supply and install the tree and shrub line along the west side of the pedestrian trail from Station 0+180 to Station 0+898. The trees recommended are a red cedar species or other as specified by the Essex Region Conservation Authority to be planted at a minimum 9 m spacing and maintaining a minimum 1 m clearance from the asphalt trail edge. Following the planting of trees, the Contractor shall supply and install the shrubs between the tree spacing to be planted at a minimum 3 m spacing and maintaining a minimum 1 m clearance from the asphalt trail edge. The shrubs recommended are Black Chokeberry and Winterberry Holly or other as specified by the Essex Region Conservation Authority. The total quantity of trees and shrubs required is 80 plantings for each species. The work shall also include watering complete with fertilizer and staking where required.

## **GENERAL SPECIFICATIONS**

### **1.0 AGREEMENT AND GENERAL CONDITIONS**

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

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

Tenders will be received and contracts awarded only in the form of a lump sum contract for the completion of the whole work or of specified sections thereof. The Tenderer agrees to enter into a formal contract with the Municipality upon acceptance of the tender. The General Conditions of the contract and Form of Agreement shall be those of the Stipulated Price Contract CCDC2-Engineers, 1994 or the most recent revision of this document.

### **2.0 EXAMINATION OF SITE, PLANS AND SPECIFICATIONS**

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

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

### **3.0 MAINTENANCE PERIOD**

The successful Tenderer shall guarantee the work for a period of one (1) year from the date of acceptance thereof from deficiencies that, in the opinion of the Engineer, were caused by faulty workmanship or materials. The successful Tenderer shall, at his/her own expense, make good and repair deficiencies and every part thereof, all to the satisfaction of the Engineer. Should the successful Tenderer for any cause, fail to do so, then the Municipality may do so and employ such other person or persons as the Engineer may deem proper to make such repairs or do such work, and the whole costs, charges and expense so incurred may be deducted from any amount due to the Tenderer or may be collected otherwise by the Municipality from the Tenderer.

### **4.0 GENERAL CO-ORDINATION**

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

### **5.0 RESPONSIBILITY FOR DAMAGES TO UTILITIES**

The Contractor shall note that overhead and underground utilities such as hydro, gas, telephone and water are not necessarily shown on the drawings. It is the Contractor's responsibility to contact utility companies for information regarding utilities, to exercise the necessary care in construction operations and to take other precautions to safeguard the utilities from damage. All work on or adjacent to any utility, pipeline, railway, etc., is to be carried out in accordance with the requirements of the utility, pipeline, railway, or other, as the case may be, and its specifications for such work are to be followed as if they were part of this specification. The Contractor will be liable for any damage to utilities.

## **6.0 CONTRACTOR'S LIABILITY**

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

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

## **7.0 PROPERTY BARS AND SURVEY MONUMENTS**

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

## **8.0 MAINTENANCE OF FLOW**

The Contractor shall, at his/her own cost and expense, permanently provide for and maintain the flow of all drains, ditches and water courses that may be encountered during the progress of the work.

## **9.0 ONTARIO PROVINCIAL STANDARDS**

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

## **10.0 APPROVALS, PERMITS AND NOTICES**

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

## **11.0 SUBLETTING**

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

## **12.0 TIME OF COMPLETION**

The Contractor shall complete all work on or before the date fixed at the time of tendering. The Contractor will be held liable for any damages or expenses occasioned by his/her failure to complete the work on time and for any expenses of inspection, superintending, re-tendering or re-surveying, due to their neglect or failure to carry out the work in a timely manner.

## **13.0 TRAFFIC CONTROL**

The Contractor will be required to control vehicular and pedestrian traffic along roads at all times and shall, at his/her own expense, provide for placing and maintaining such barricades, signs, flags, lights and flag persons as may be required to ensure public safety. The Contractor will be solely responsible for controlling traffic and shall appoint a representative to maintain the signs and warning lights at night, on weekends and holidays and at all other times that work is not in progress. All traffic control during construction shall be strictly in accordance with the **Occupational Health and Safety Act** and the current version of the **Ontario**



**Traffic Manuals.** Access to the electronic version of the **Ontario Traffic Manual** is available online through the MTO website, free of charge to all users. To access the electronic standards on the Web go to <http://www.mto.gov.on.ca/english/transrd/>, click on "Library Catalogue," under the "Title," enter "Ontario Traffic Manual" as the search. Open the applicable "Manual(s)" by choosing the "Access Key," once open look for the "Attachment," click the pdf file. Users require Adobe Acrobat to view all pdf files.

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

#### **14.0 SITE CLEANUP AND RESTORATION**

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

#### **15.0 UTILITY RELOCATION WORKS**

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

#### **16.0 FINAL INSPECTION**

All work shall be carried out to the satisfaction of the Drainage Superintendent for the Municipality, in compliance with the specifications, drawings and the Drainage Act. Upon completion of the project, the work will be inspected by the Engineer and the Drainage Superintendent. Any deficiencies noted during the final inspection shall be immediately rectified by the Contractor.

Final inspection will be made by the Engineer within 20 days after the Drainage Superintendent has received notice in writing from the Contractor that the work is completed, or as soon thereafter as weather conditions permit.

#### **17.0 FISHERIES CONCERNS**

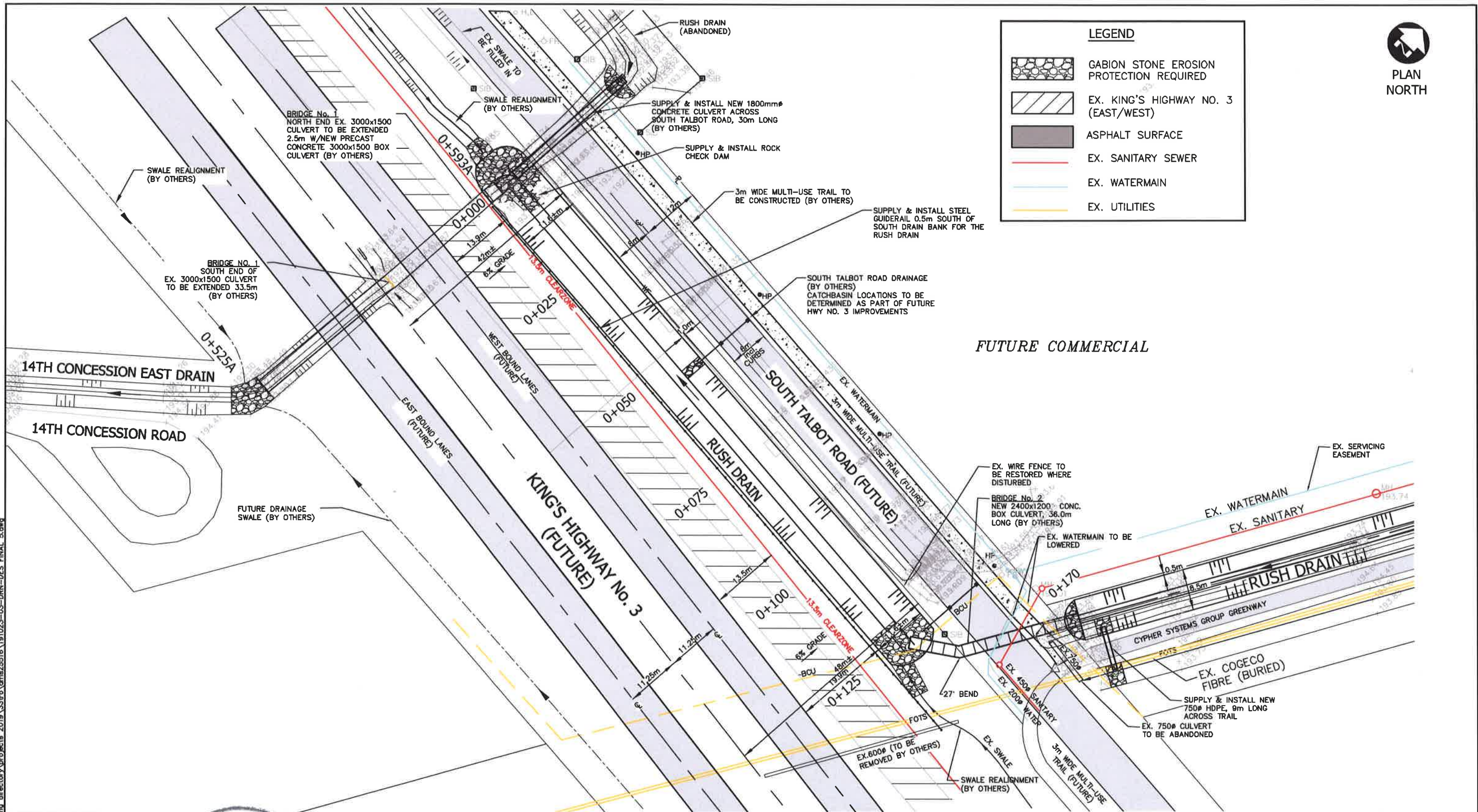
Standard practices to be followed to minimize disruption to fish habitat include embedment of the culvert a minimum 10% below grade, constructing the work 'in the dry' and cutting only trees necessary to do the work (no clear-cutting). No in-water work is to occur during the timing window unless otherwise approved by the appropriate authorities.







Jan 07, 2021 - 8:35pm C:\pwworking\directory\projects\2019\3319\dms25516\191023-03-DRN-DES FINAL 5.dwg



PLAN VIEW (STA. 0+000 TO STA. 0+170)  
SCALE: 1:750 (11x17)



Conditions of Use

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3	FINAL REPORT FOR CONSIDERATION	JAN. 8/21	TRO
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1	CLIENT REVIEW	NOV. 26/20	TRO

DESIGN	TRO	REVIEWED BY	JJT
DRAWN	WLB	CHECKED BY	RM
DATE	January 8, 2021		
SCALE	AS SHOWN		

PROJECT NO	19-1023
DRAWING SCALES BASED ON A 11" X 17" SHEET	

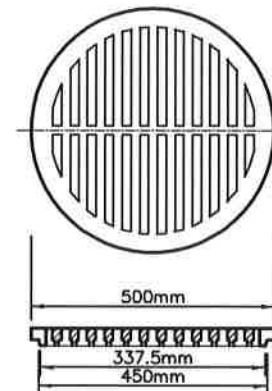
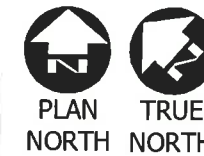
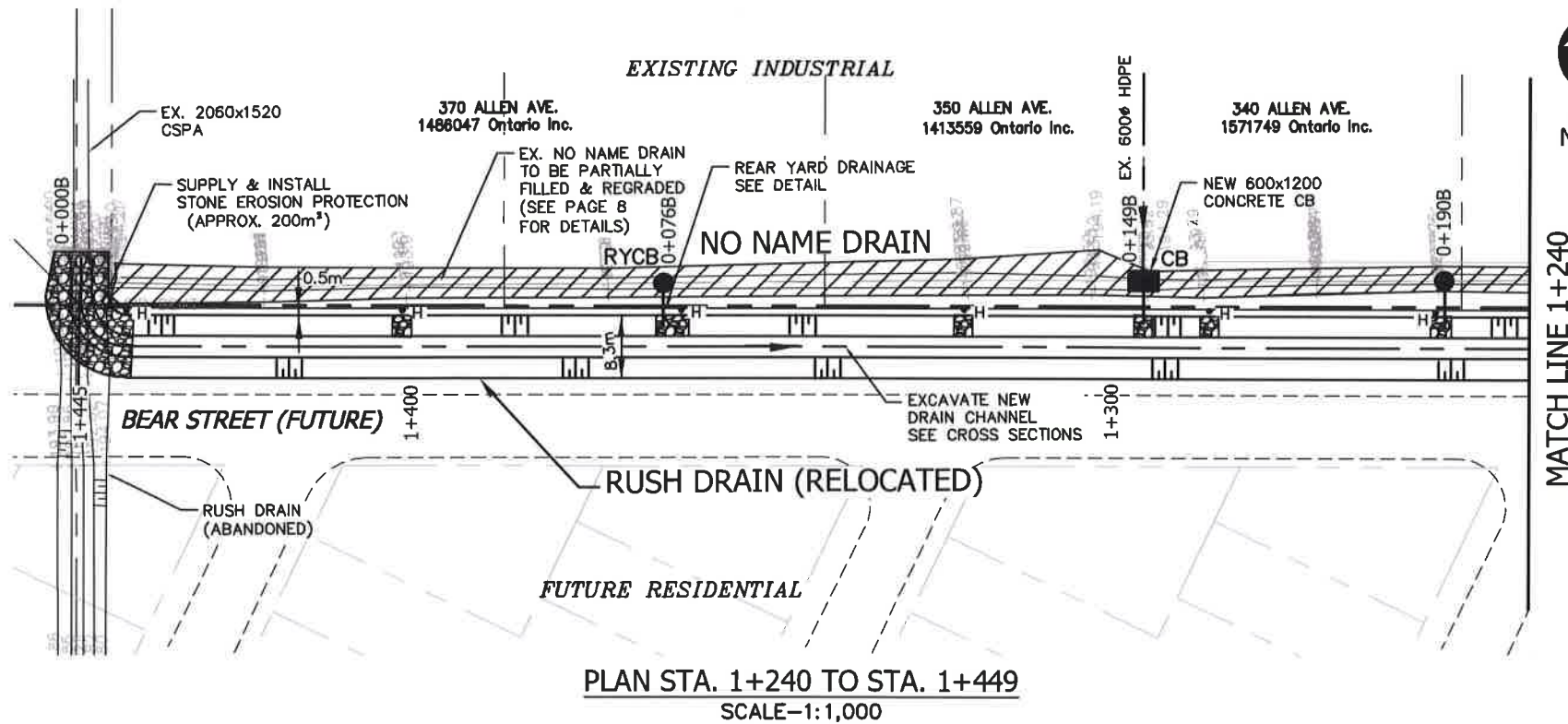
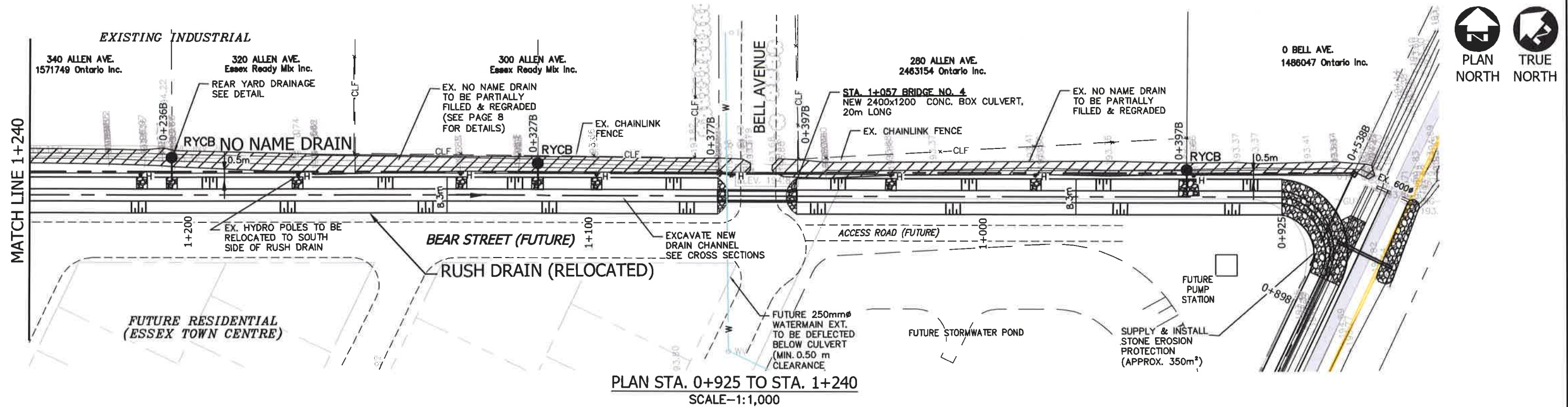
'SCHEDULE G' Drainage Report for the RELOCATION OF THE RUSH DRAIN Town of Essex	
SHEET TITLE	PLAN (STA. 0+000 TO STA. 0+170)
PAGE NO	2 of 19



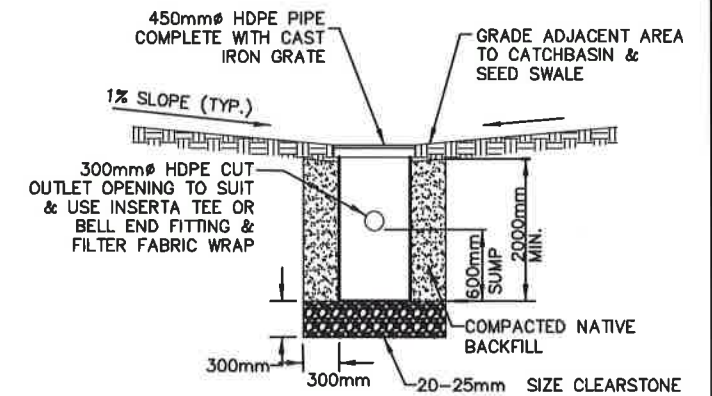




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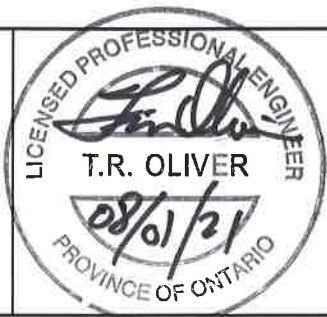


STANDARD CAST IRON GRATE FOR  
450mm $\phi$  HDPE CATCHBASIN  
NOT TO SCALE



YARD CATCHBASIN DETAIL (450mm $\phi$  HDPE)  
NOT TO SCALE

NOTE: REAR YARD CATCHBASIN (RYCB) LOCATED EAST OF BELL AVENUE TO CONSIST OF A 900mm $\phi$  HDPE CATCHBASIN & CAST IRON GRATE WITH 450mm $\phi$  HDPE CUT OPENING TO SUIT



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DESIGN	TRO	REVIEWED BY	JJT
DRAWN	WLB	CHECKED BY	RM
DATE	January 8, 2021		
SCALE	AS SHOWN		

PROJECT NO.	19-1023
DRAWING SCALES BASED ON A 11" X 17" SHEET	

Drainage Report for the <b>RELOCATION OF THE RUSH DRAIN</b> Town of Essex	
SHEET TITLE	PLAN STA. (0+900 TO STA. 1+445)
PAGE NO.	4 of 19



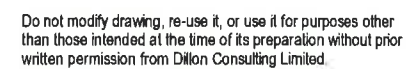
0+593A/0+000—BRIDGE NO. 1  
N. END EX. HWY. NO. 3 CULVERT  
(3000x1500)  
START OF RUSH DRAIN



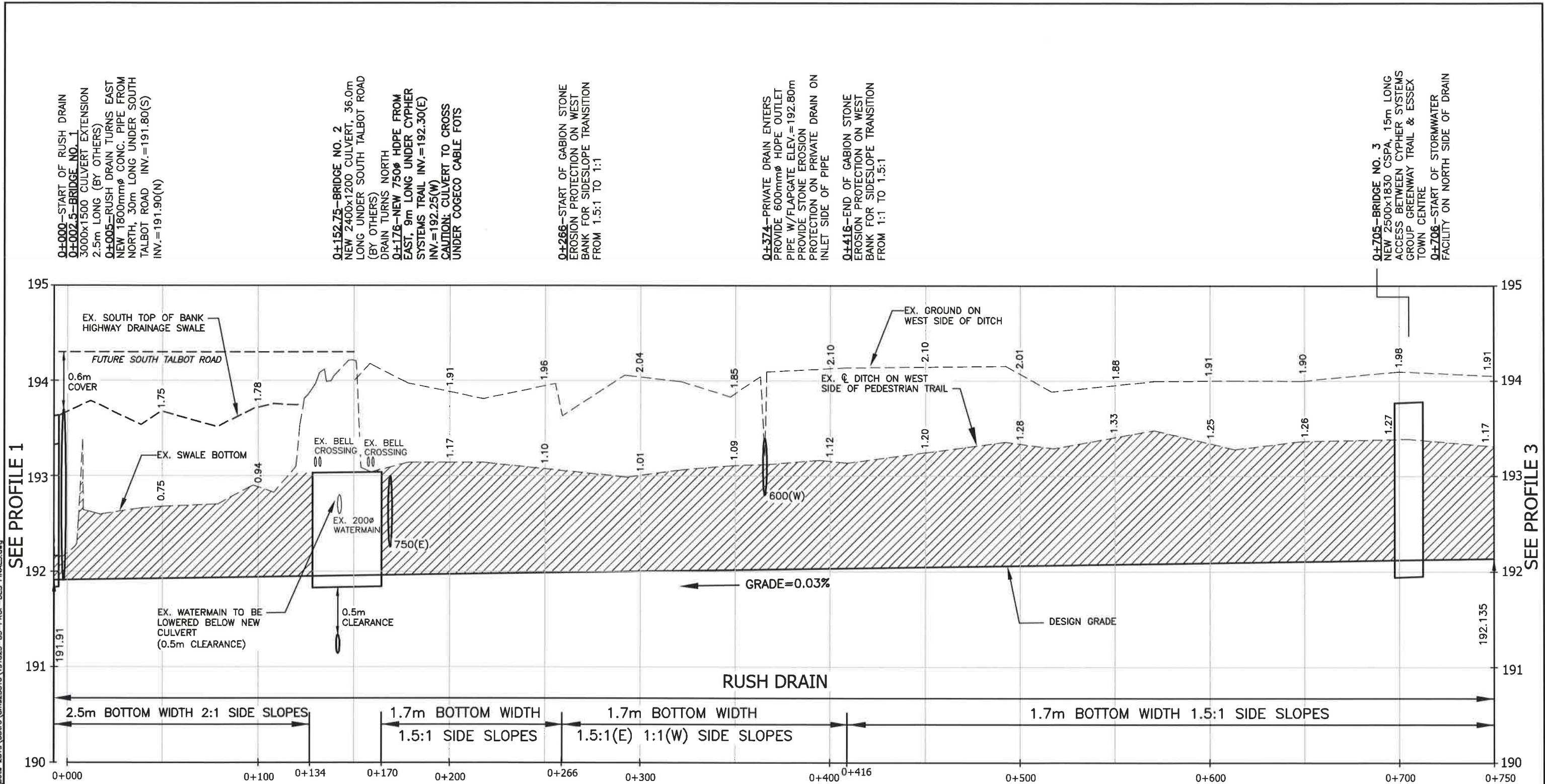
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VERT. =1:40

SHEET TITLE	PROFILE 1 (STA. 0+000A TO STA. 0+593A)
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PAGE NO. 5 of 19

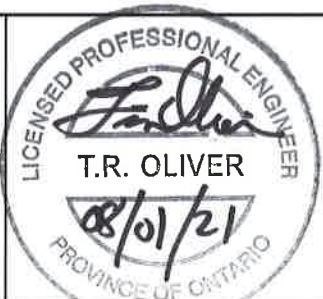


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PROFILE 2 (STA. 0+000 TO STA. 0+750)

SCALE-HORIZ=1:2,000  
VERT. =1:40



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DESIGN	TRO	REVIEWED BY	JJT
DRAWN	WLB	CHECKED BY	RM
DATE	January 8, 2021		
SCALE	AS SHOWN		

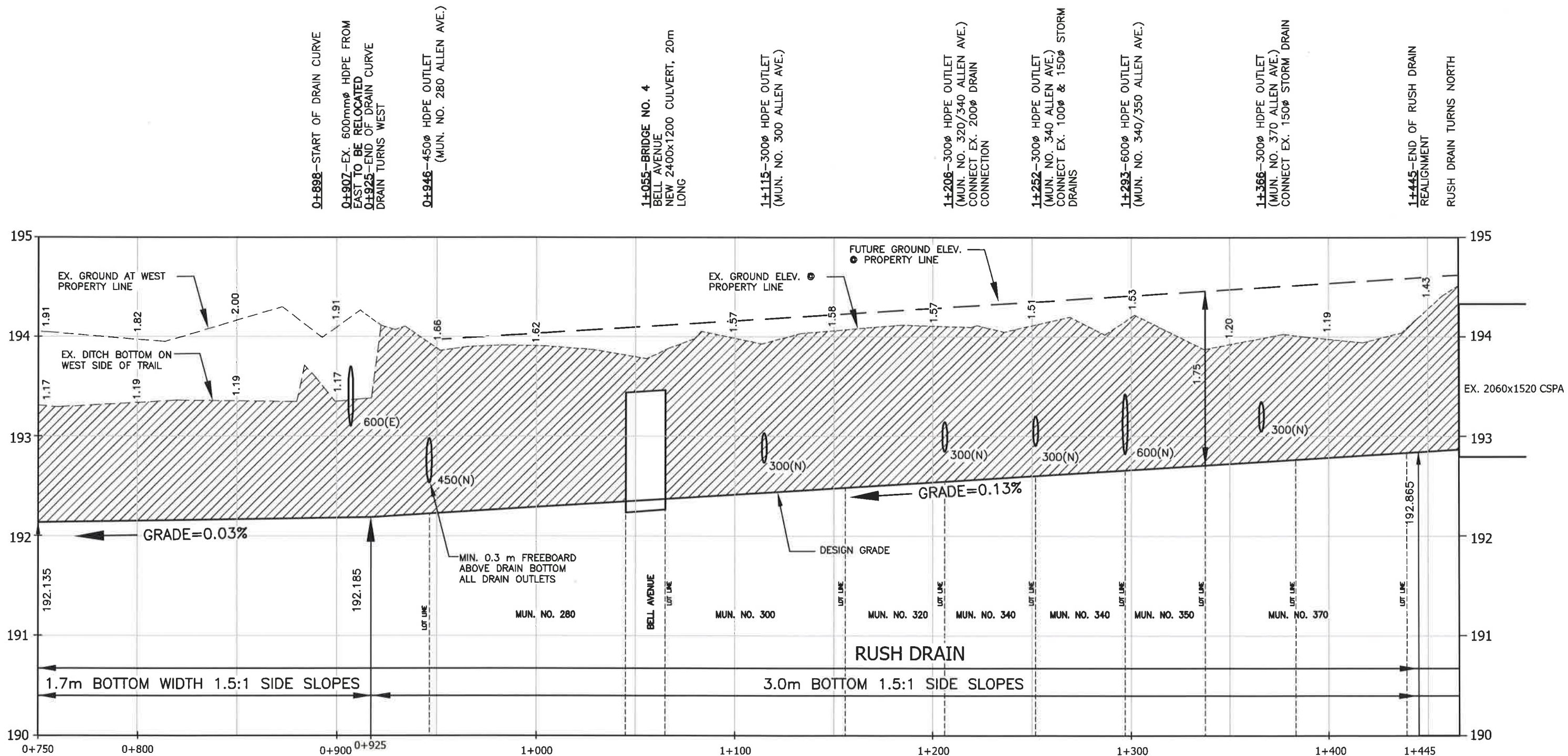
PROJECT NO.	19-1023
DRAWING SCALES BASED ON A 11" X 17" SHEET	

'SCHEDULE G'	
Drainage Report for the RELOCATION OF THE RUSH DRAIN Town of Essex	
SHEET TITLE	PROFILE 2 (STA. 0+000 TO STA. 0+750)
PAGE NO.	6 of 19



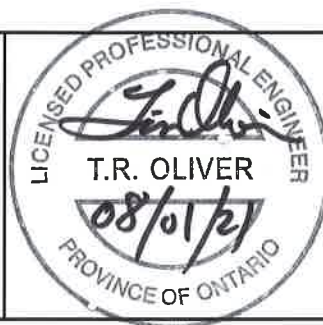
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SEE PROFILE 2



PROFILE 3 (STA. 0+750 TO STA. 1+445)

SCALE-HORIZ=1:2,000  
VERT. =1:40



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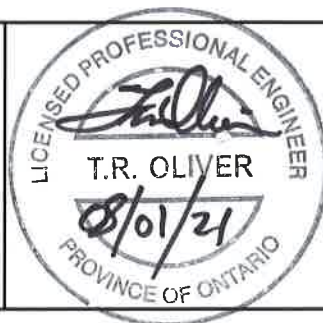
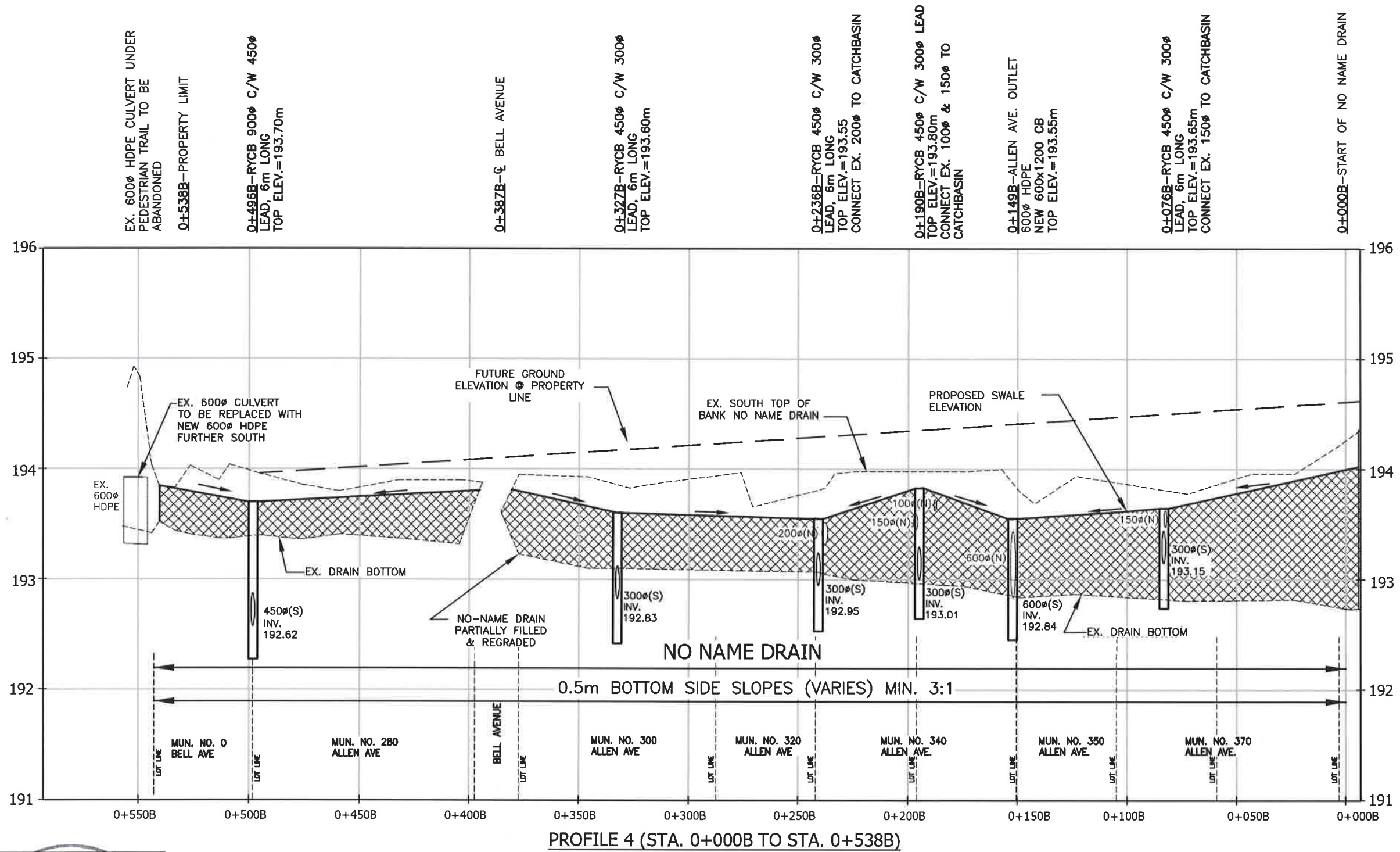
SHEET TITLE PROFILE 3 (STA. 0+750 TO STA. 1+445)	
PAGE NO.	7 of 19

'SCHEDULE G'

Drainage Report for the  
RELOCATION OF THE  
RUSH DRAIN  
Town of Essex



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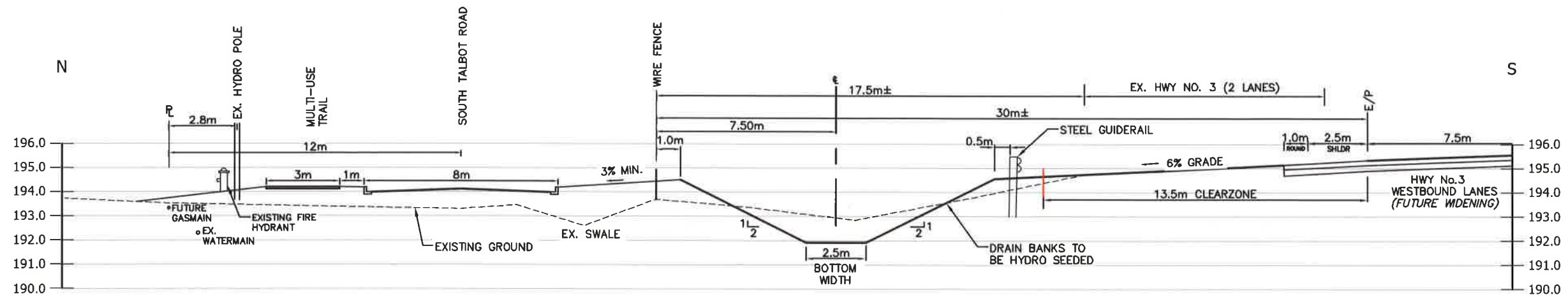
No.	ISSUED FOR	DATE	BY
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DRAWN	WLB	CHECKED BY	RM
DATE	January 8, 2021		
SCALE	AS SHOWN		

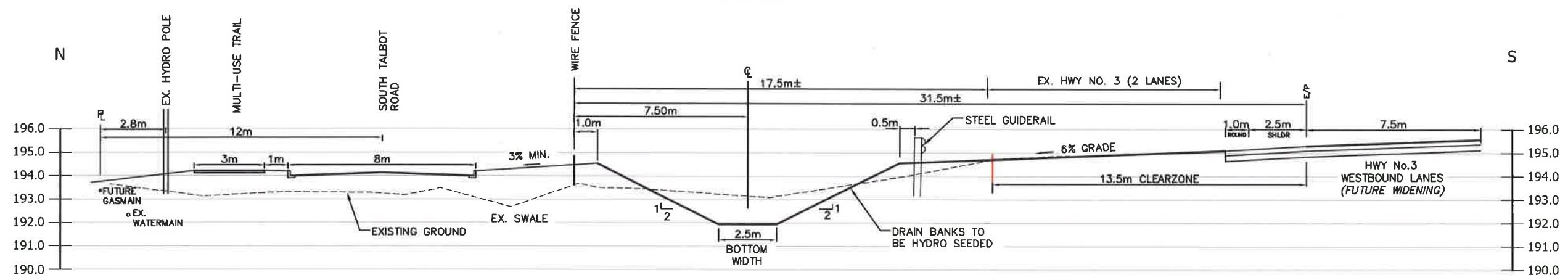
PROJECT NO.	19-1023
DRAWING SCALES BASED ON A 11" X 17" SHEET	

'SCHEDULE G'	
Drainage Report for the RELOCATION OF THE RUSH DRAIN Town of Essex	
SHEET TITLE	PROFILE 4 (STA. 0+000B TO STA. 0+538B)
PAGE NO.	8 of 19

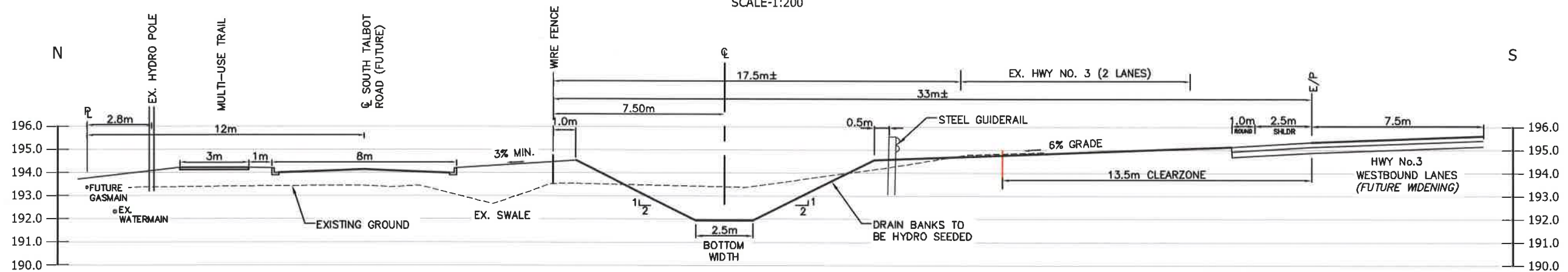
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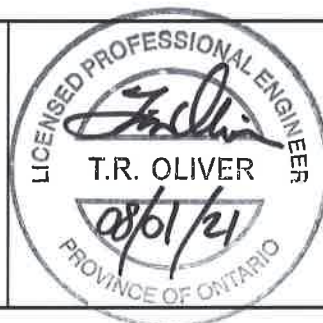
STA. 0+011 RUSH DRAIN CROSS SECTION  
(LOOKING UPSTREAM)  
SCALE:1:200



STA. 0+050 RUSH DRAIN CROSS SECTION  
(LOOKING UPSTREAM)  
SCALE:1:200



STA. 0+075 RUSH DRAIN CROSS SECTION  
(LOOKING UPSTREAM)  
SCALE:1:200



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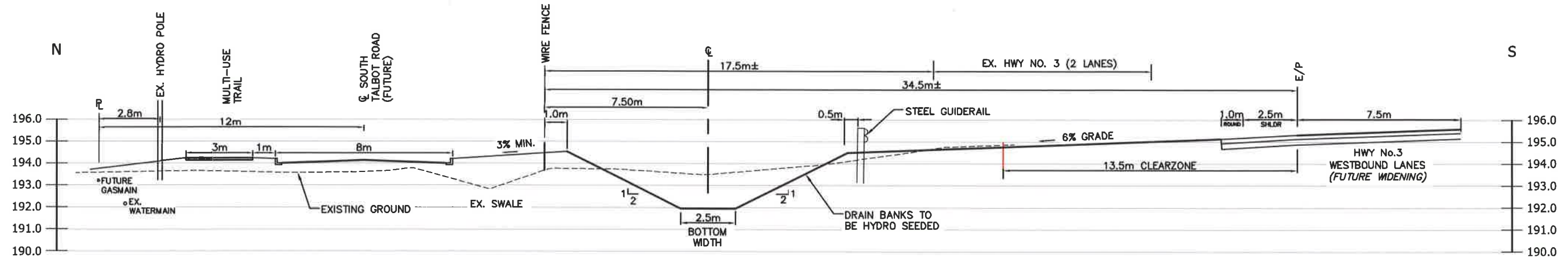
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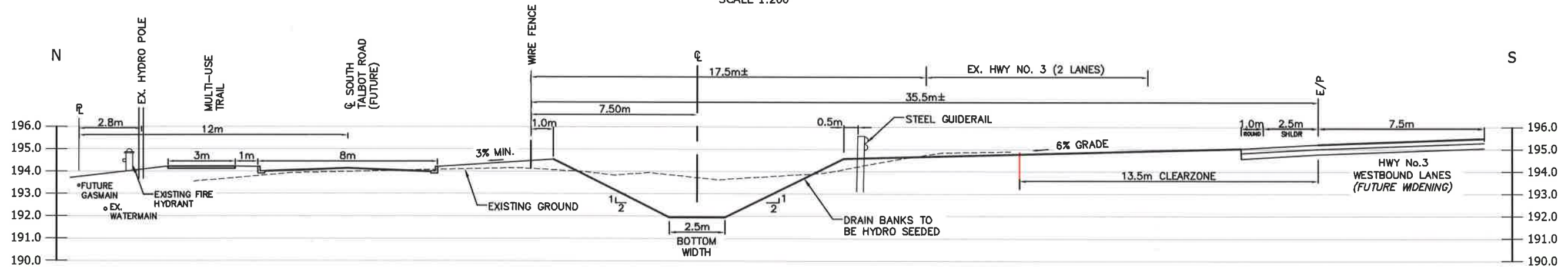
'SCHEDULE G'	
Drainage Report for the <b>RELOCATION OF THE RUSH DRAIN</b> Town of Essex	
SHEET TITLE	<b>CROSS SECTIONS 1</b>
PAGE NO.	9 of 19



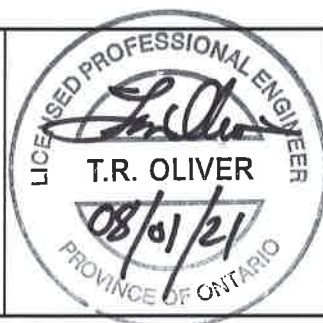
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STA. 0+100 RUSH DRAIN CROSS SECTION  
(LOOKING UPSTREAM)  
SCALE-1:200



STA. 0+125 RUSH DRAIN CROSS SECTION  
(LOOKING UPSTREAM)  
SCALE-1:200



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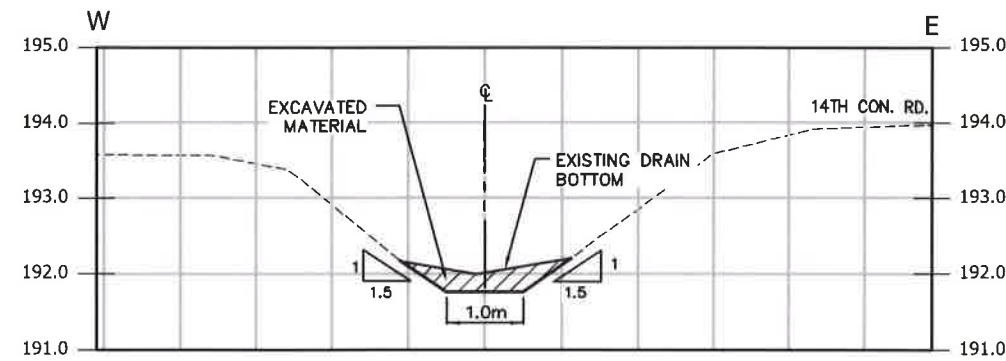
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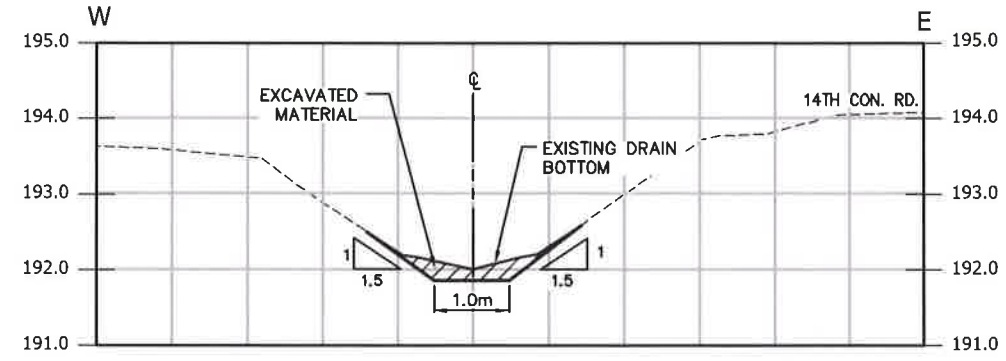
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DRAWN	WLB	CHECKED BY	RM
DATE	January 8, 2021		
SCALE	AS SHOWN		

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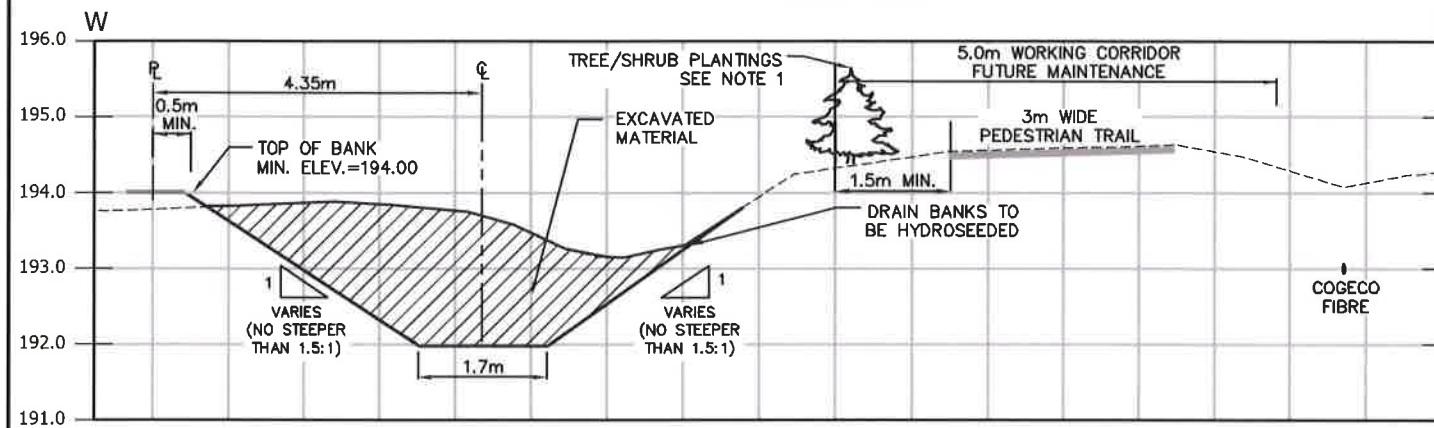
'SCHEDULE G'	
Drainage Report for the <b>RELOCATION OF THE RUSH DRAIN</b> Town of Essex	
SHEET TITLE	<b>CROSS SECTIONS 2</b>
PAGE NO.	10 of 19



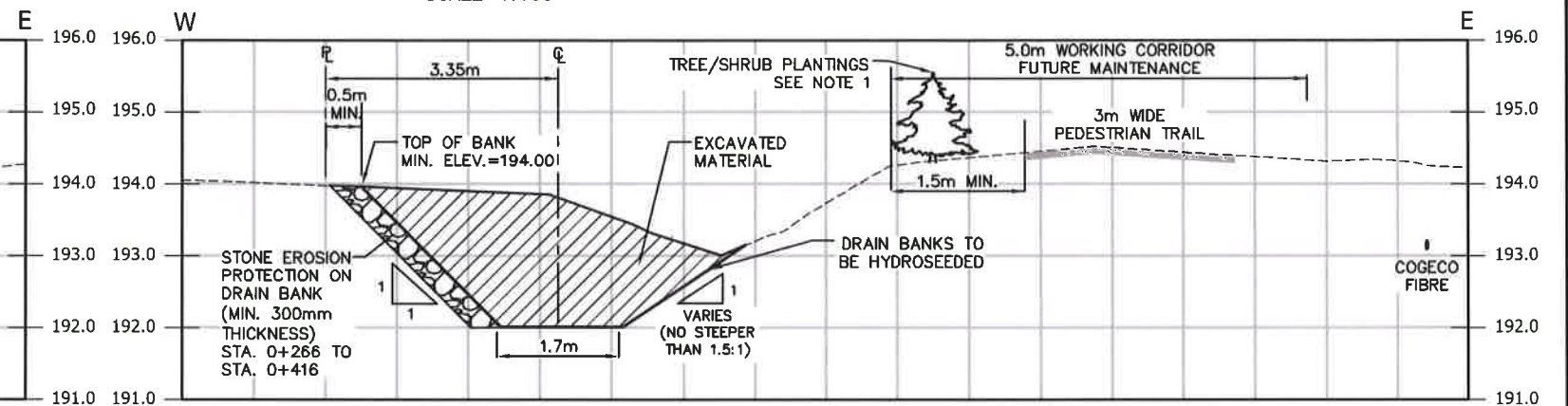
STATION 0+000A (LOOKING UPSTREAM)  
14TH CONCESSION EAST DRAIN  
CROSS SECTION  
SCALE-1:100



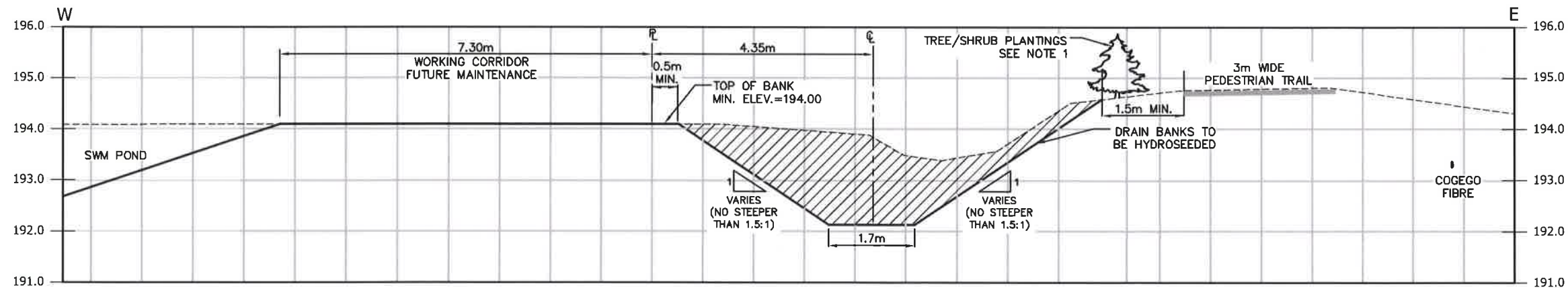
STATION 0+400A (LOOKING UPSTREAM)  
14TH CONCESSION EAST DRAIN  
CROSS SECTION  
SCALE-1:100



STATION 0+200 (LOOKING UPSTREAM)  
RUSH DRAIN CROSS SECTION  
SCALE-1:100

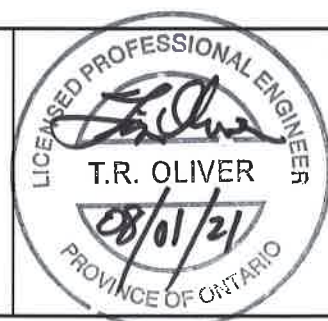


STATION 0+300 (LOOKING UPSTREAM)  
RUSH DRAIN CROSS SECTION  
SCALE-1:100



STATION 0+750 (LOOKING UPSTREAM)  
RUSH DRAIN CROSS SECTION  
SCALE-1:100

**NOTE 1:** TREE/SHRUB PLANTINGS ON WEST SIDE OF PEDESTRIAN TRAIL TO CONSIST OF THE FOLLOWING OR AS OTHERWISE SPECIFIED BY ERCA:  
RED CEDAR TREES (9 m APART) QTY - 80  
SHRUBS IN BETWEEN TREES (3 m APART)  
BLACK CHOKEBERRY SHRUB QTY - 80  
WINTERBERRY HOLLY SHRUB QTY - 80



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<b>DILLON CONSULTING</b>	
PROJECT NO.	19-1023
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#### 'SCHEDULE G'

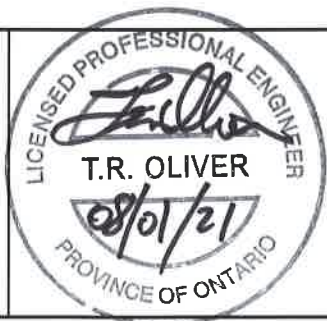
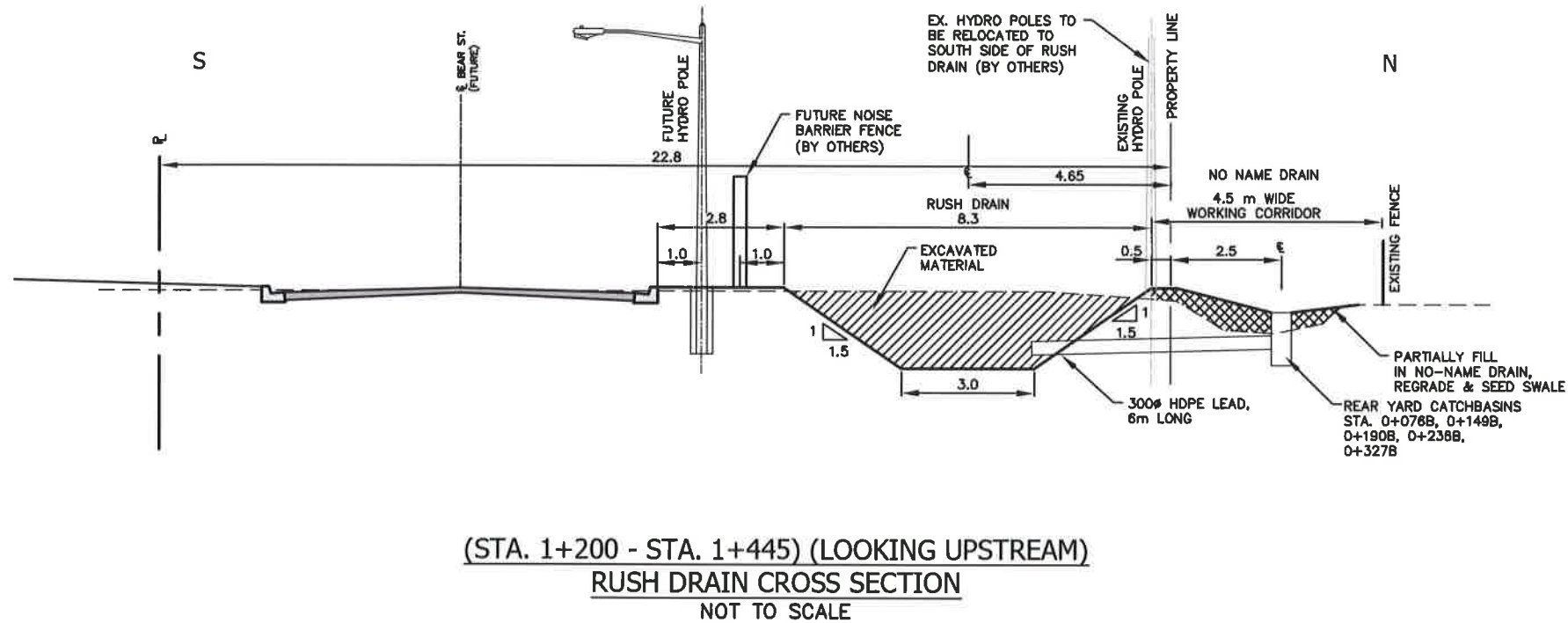
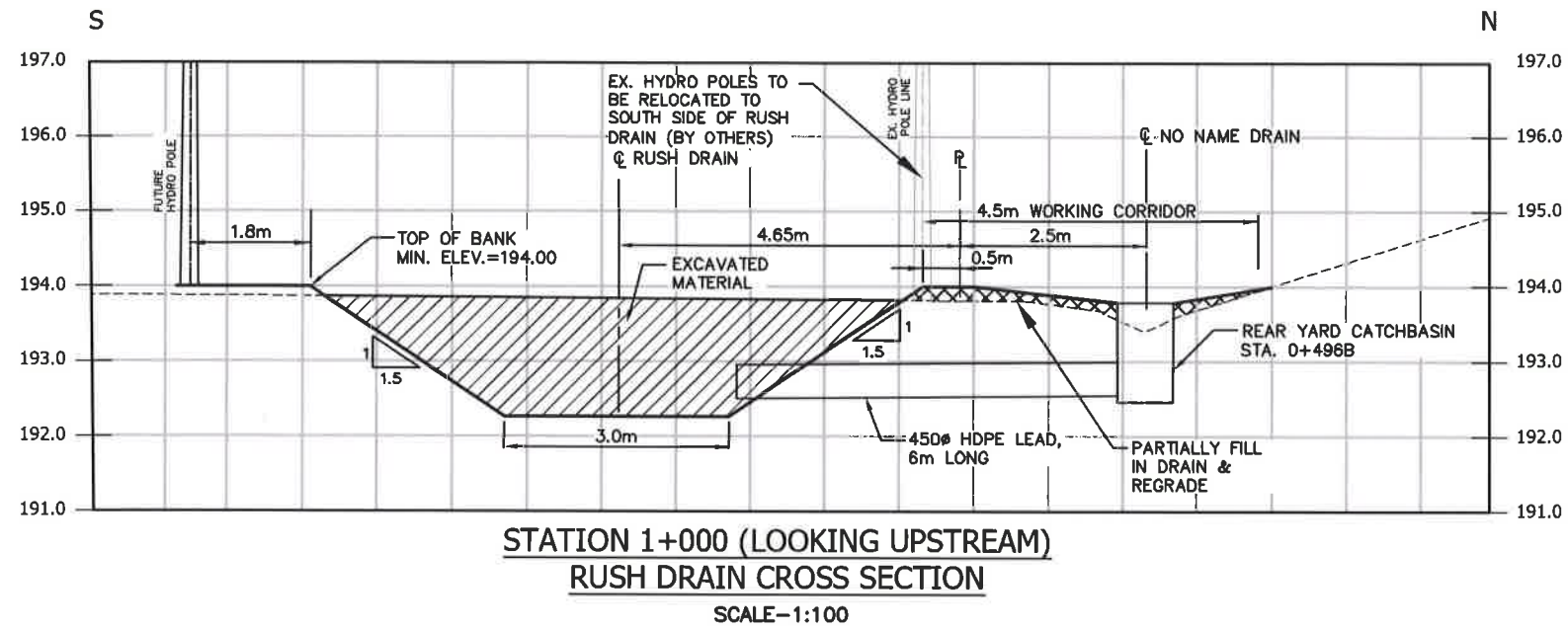
Drainage Report for the  
**RELOCATION OF THE RUSH DRAIN**  
Town of Essex

SHEET TITLE **CROSS SECTIONS 3**

PAGE NO. **11 of 19**



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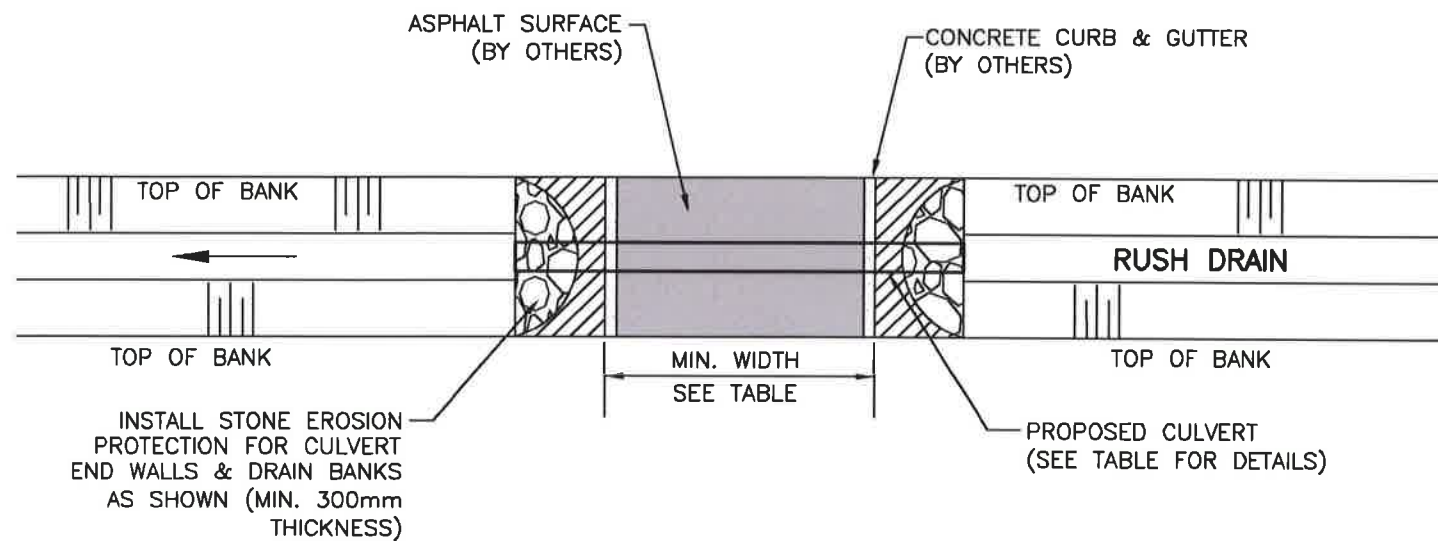
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DATE	January 8, 2021		
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PROJECT NO.	19-1023
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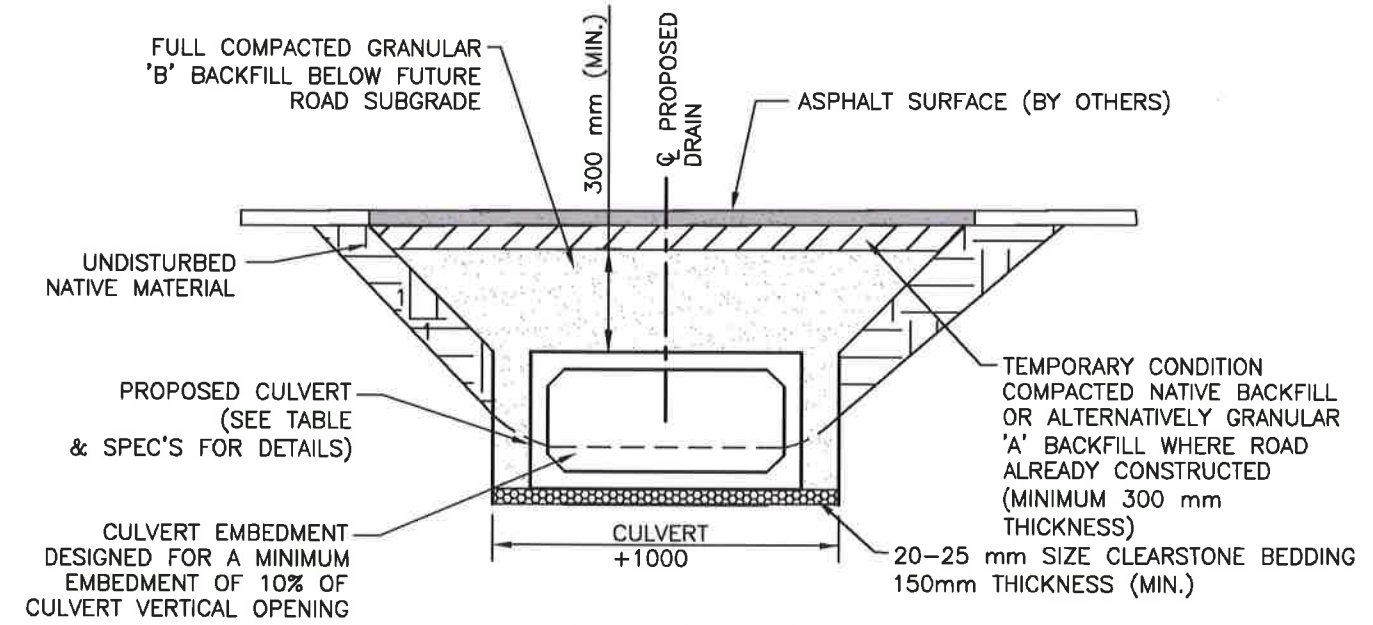
SHEET TITLE	CROSS SECTIONS 4
PAGE NO.	12 of 19

'SCHEDULE G'

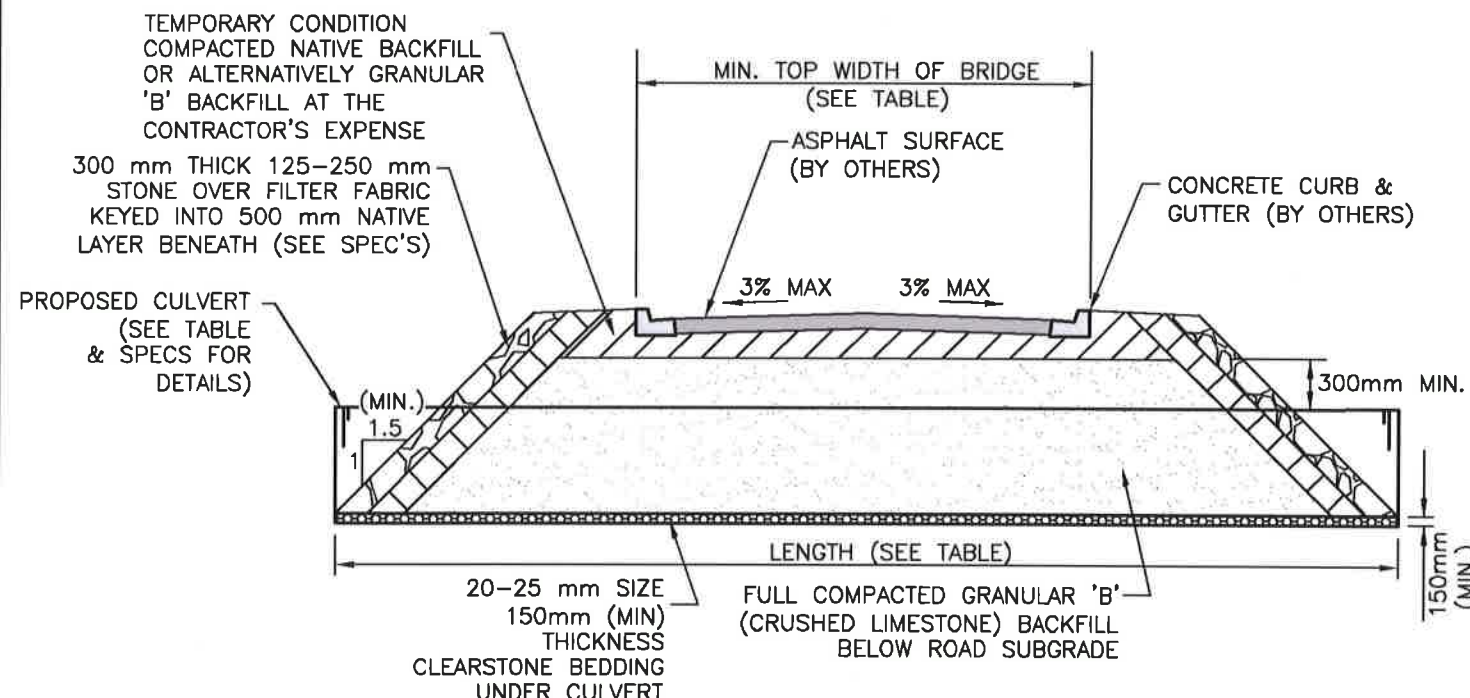
Drainage Report for the  
RELOCATION OF THE  
RUSH DRAIN  
Town of Essex



ACCESS BRIDGE PLAN  
NOT TO SCALE



ACCESS BRIDGE  
CROSS SECTION  
NOT TO SCALE



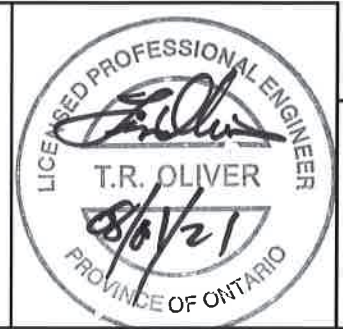
ACCESS BRIDGE  
LONGITUDINAL SECTION  
NOT TO SCALE

TABLE 1 - ROAD BRIDGE DESIGN INFORMATION		
DESCRIPTION	BRIDGE No. 2 SOUTH TALBOT RD.	BRIDGE No. 4 BELL AVENUE
BRIDGE C/L LOCATION (STA.)	0+152.75	1+055
PIPE INVERT ELEV. U/S SIDE(m)	191.84	192.25
PIPE INVERT ELEV. D/S SIDE(m)	191.83	192.22
TOP OF C/L DRIVEWAY SURFACE ELEV. (m)	194.44	193.95
DRAIN BOTTOM (m) (DESIGN) (AT CENTRELINE OF CULVERT)	191.955	192.355
MIN. ROAD WIDTH (INCL. CURBS) (m)	8.0	8.5
MIN. CULVERT GRADE (%)	0.03%	0.13%
CULVERT TYPE	BOX	BOX
CULVERT MATERIAL	CONCRETE	CONCRETE
CULVERT LENGTH (m)	37.5	20.0
CULVERT SIZE (mm)	2400x1200	2400x1200
CULVERT ENDWALL TYPE	SLOPING	SLOPING

SITE BENCHMARKS	
BM1-TOP OF CENTRELINE OF NORTH END OF CONCRETE CULVERT CROSSING KING'S HIGHWAY NO. 3 AT APPROX. STA. 0+593A.	ELEVATION=193.62m
BM2- TOP OF MANHOLE FRAME ON WEST SIDE OF EXISTING RUSH DRAIN AT APPROX. 192m NORTH OF SOUTH TALBOT ROAD CORRIDOR.	ELEVATION=193.94m
BM3-TOP OF 600mmØ BIG 'O' PIPE ON NORTH SIDE OF TRAIL AT UPSTREAM END OF NO NAME DRAIN APPROX. STA. 0+551B.	ELEVATION=193.90m
BM4-TOP OF CORRUGATIONS OF 2060X1520mm CSPA AT APPROX. STA. 1+445.	ELEVATION=194.36m

NOTE: CONTRACTOR TO VERIFY  
BENCHMARKS PRIOR TO CONSTRUCTION.

Jan 07, 2021 - 8:10pm C:\pwworking\directory\projects\2018\333ro\dms25516\191023-03-DRN-CONS.dwg



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PROJECT NO. 19-1023

DRAWING SCALES BASED  
ON A 11" X 17" SHEET

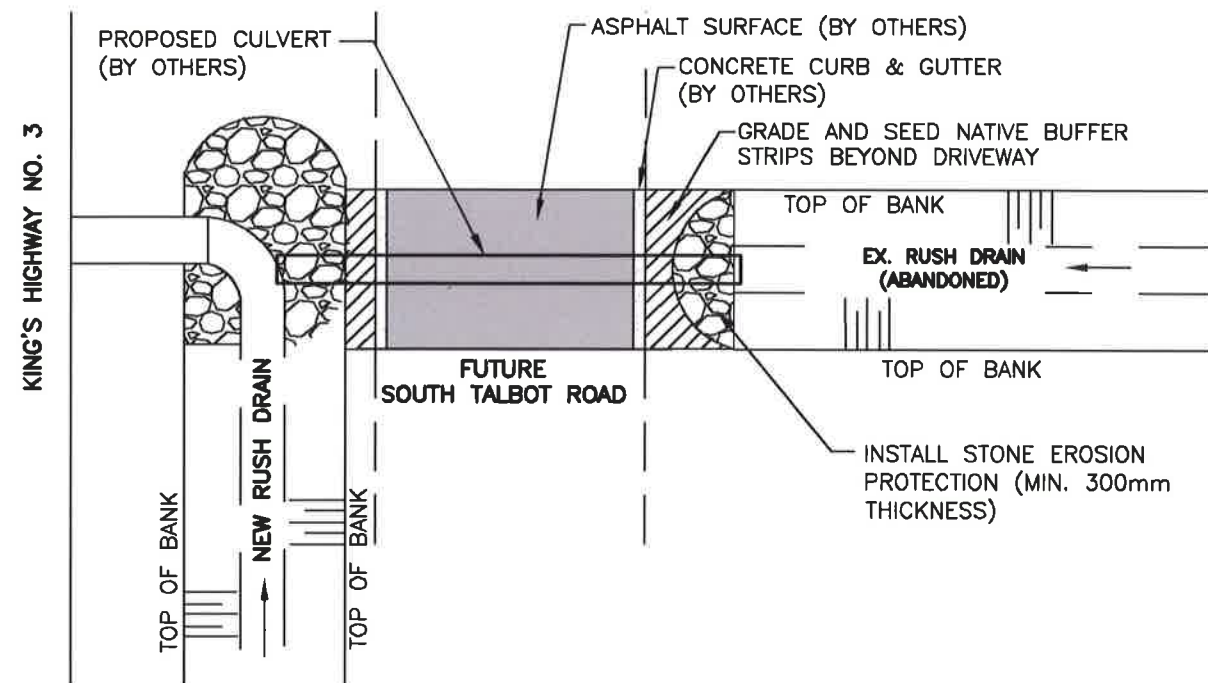
'SCHEDULE G'

Drainage Report for the  
**RELOCATION OF THE  
RUSH DRAIN**  
Town of Essex

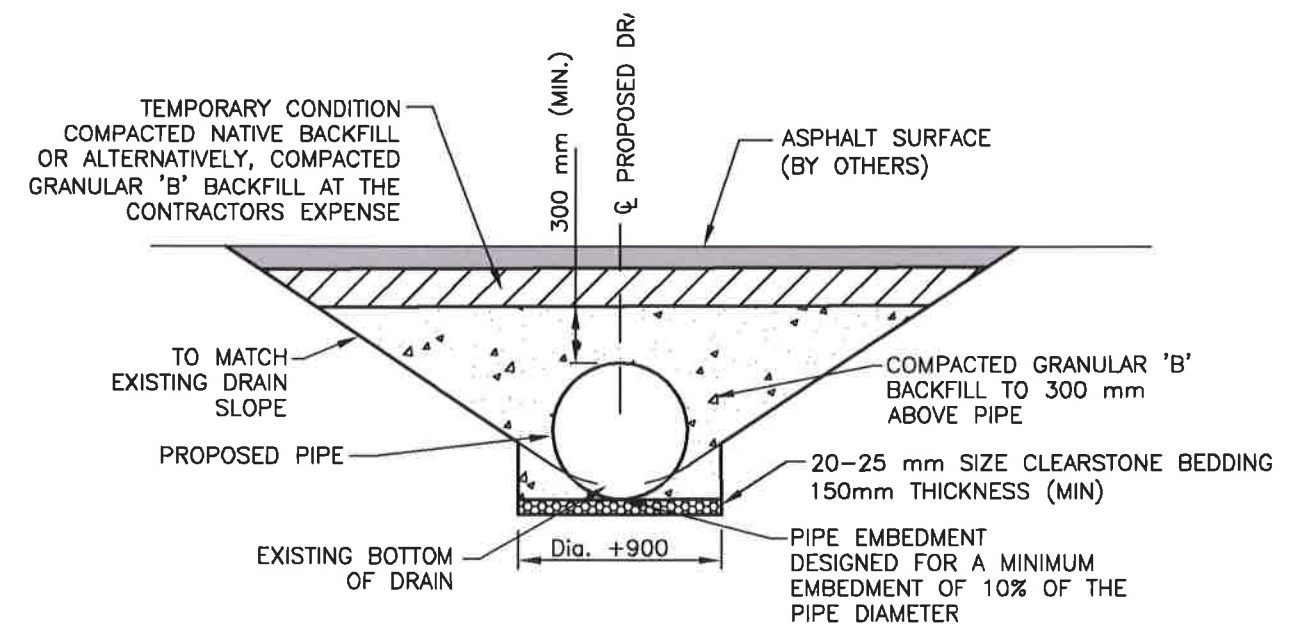
SHEET TITLE **BRIDGE NO. 2 & 4 DETAILS**

PAGE NO. 13 of 19

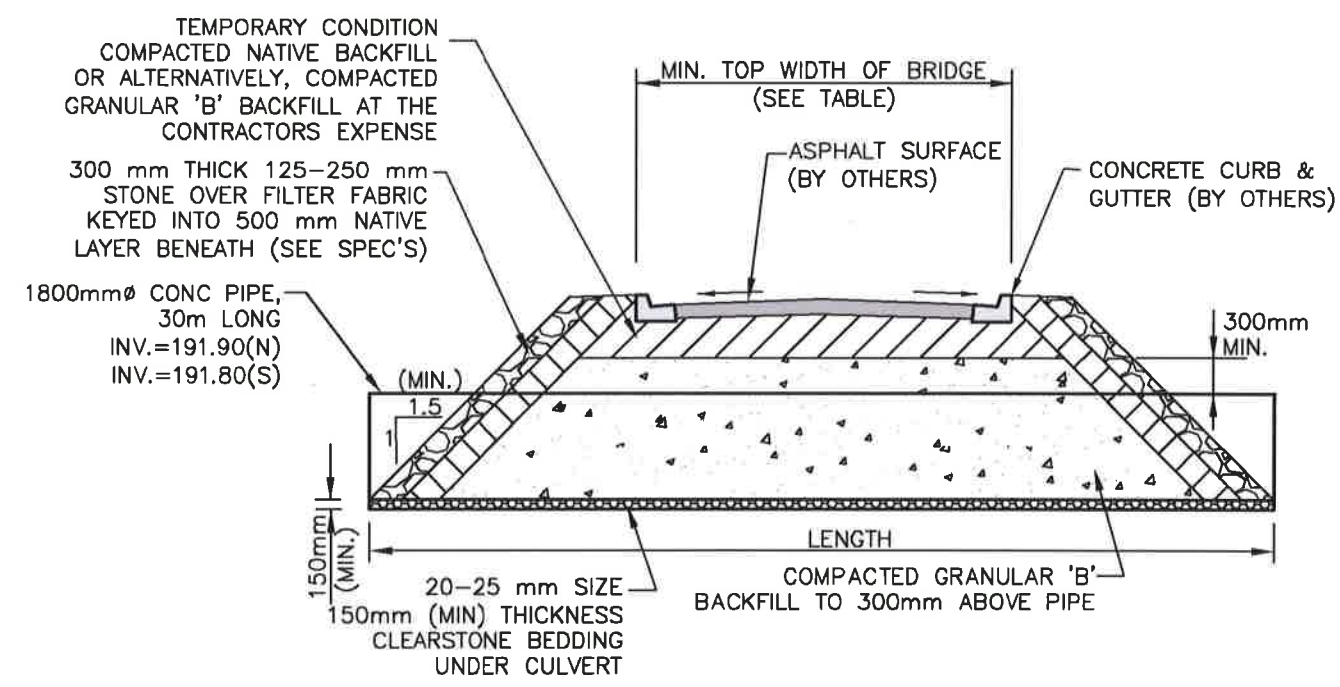




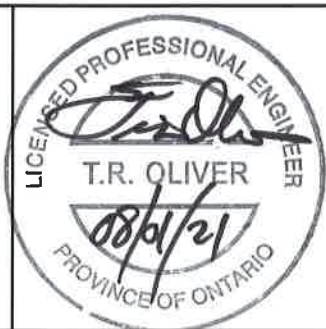
**NEW OUTLET CULVERT (EX. RUSH DRAIN) PLAN**  
(BY OTHERS)  
NOT TO SCALE



**NEW OUTLET CULVERT (EX. RUSH DRAIN)**  
**CROSS SECTION**  
NOT TO SCALE



**NEW OUTLET CULVERT (EX. RUSH DRAIN)**  
**LONGITUDINAL SECTION**  
NOT TO SCALE



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1	CLIENT REVIEW	NOV. 26/20	TRO

DESIGN	TRO	REVIEWED BY	JJT
DRAWN	WLB	CHECKED BY	RM
DATE	January 8, 2021		
SCALE	AS SHOWN		

**DILLON CONSULTING**

PROJECT NO. 19-1023

DRAWING SCALES BASED ON A 11" X 17" SHEET

**'SCHEDULE G'**

Drainage Report for the  
**RELOCATION OF THE RUSH DRAIN**  
Town of Essex

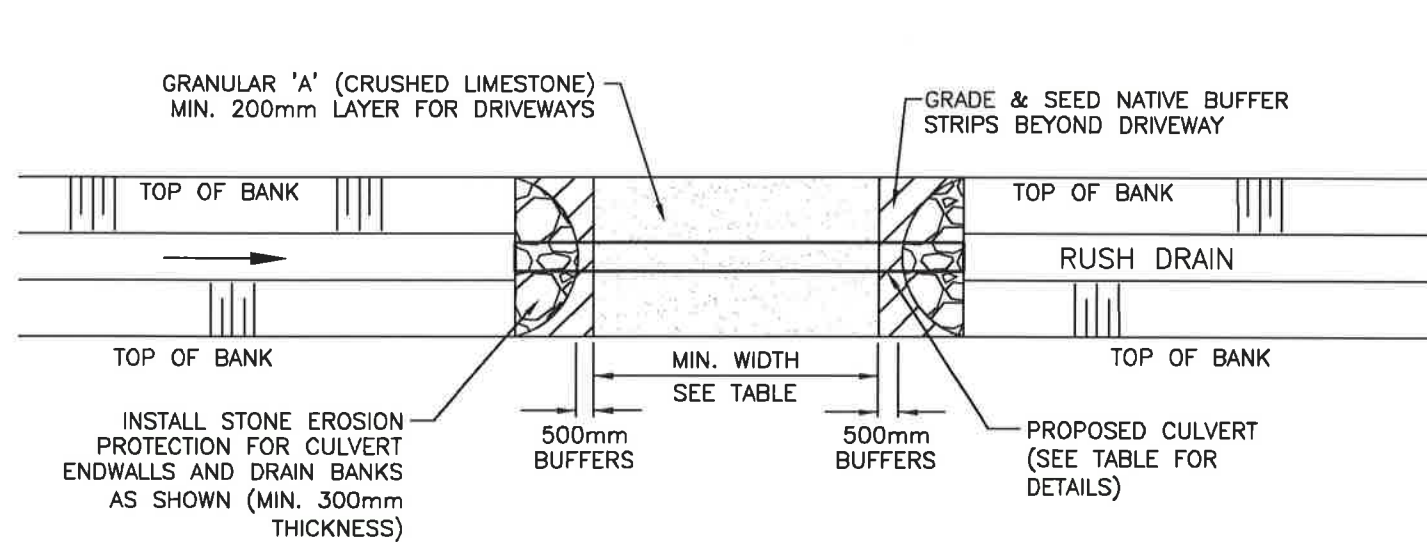
SHEET TITLE  
**SOUTH TALBOT ROAD CULVERT DETAILS**

PAGE NO  
**14 of 19**

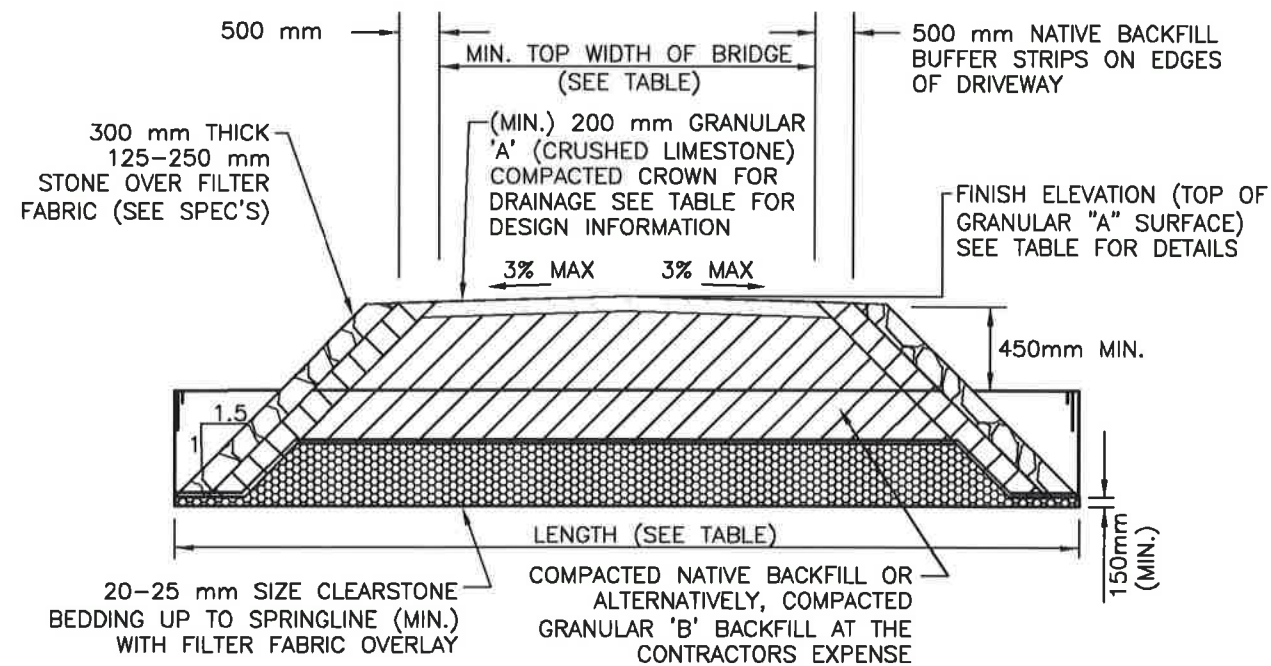
Jan 07, 2021 - 8:14pm C:\pwworking\directory\projects\2019\33tro\dra25516\191023-03-DRN-CONS.dwg



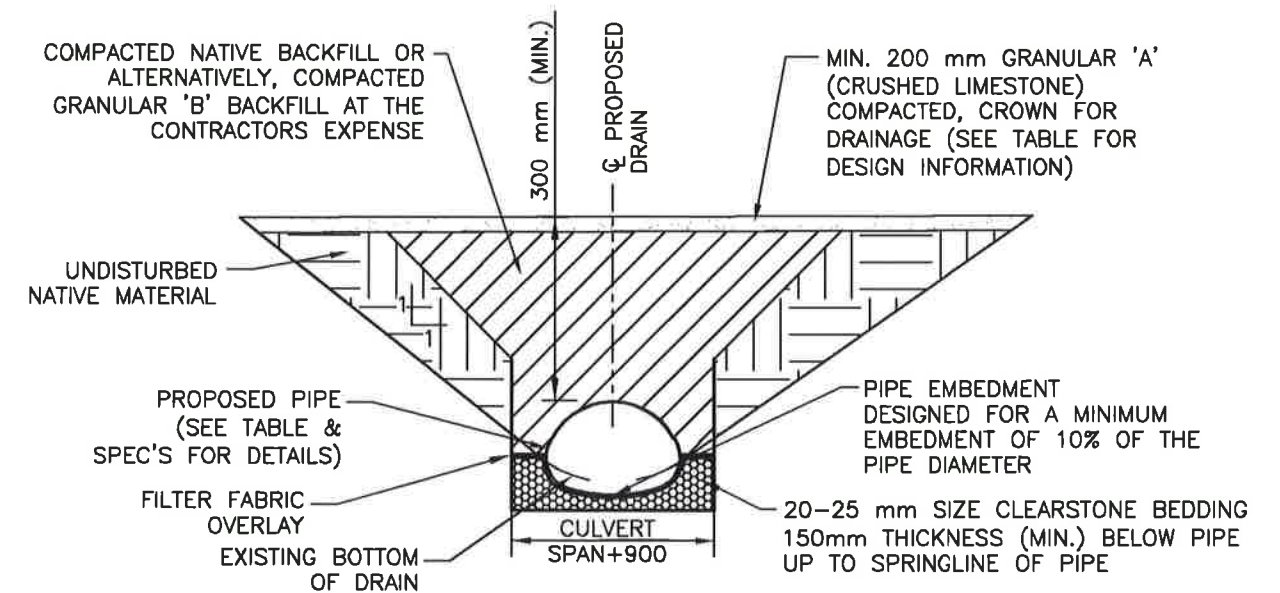




BRIDGE NO. 3 PLAN  
NOT TO SCALE



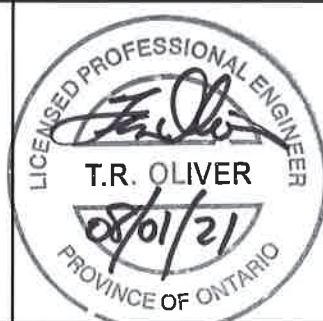
BRIDGE NO. 3  
LONGITUDINAL SECTION  
NOT TO SCALE



BRIDGE NO. 3  
CROSS SECTION  
NOT TO SCALE

TABLE 3 - BRIDGE DESIGN INFORMATION

DESCRIPTION	BRIDGE No. 3 ESSEX TOWN CENTRE LTD.
BRIDGE $\phi$ LOCATION (STA.)	0+705
PIPE INVERT ELEV. U/S SIDE(m)	191.95
PIPE INVERT ELEV. D/S SIDE(m)	191.94
TOP OF $\phi$ DRIVEWAY SURFACE ELEV. (m)	194.30
DRAIN BOTTOM (m) (DESIGN) (AT CENTRELINE OF CULVERT)	192.12
MIN. DRIVEWAY WIDTH (m)	6.0
MIN. CULVERT GRADE (%)	0.03%
CULVERT TYPE	CSPA
CULVERT MATERIAL	ALUMINIZED
CULVERT LENGTH (m)	15.0
CULVERT THICKNESS (mm)	3.5
CULVERT CORRUGATIONS (mm)	125x25
CULVERT SIZE (mm)	2500x1830
CULVERT ENDWALL TYPE	SLOPING



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DESIGN	TRO	REVIEWED BY	JJT
DRAWN	WLB	CHECKED BY	RM
DATE	January 8, 2021		
SCALE	AS SHOWN		

PROJECT NO.	19-1023
DRAWING SCALES BASED ON A 11" X 17" SHEET	

'SCHEDULE G'

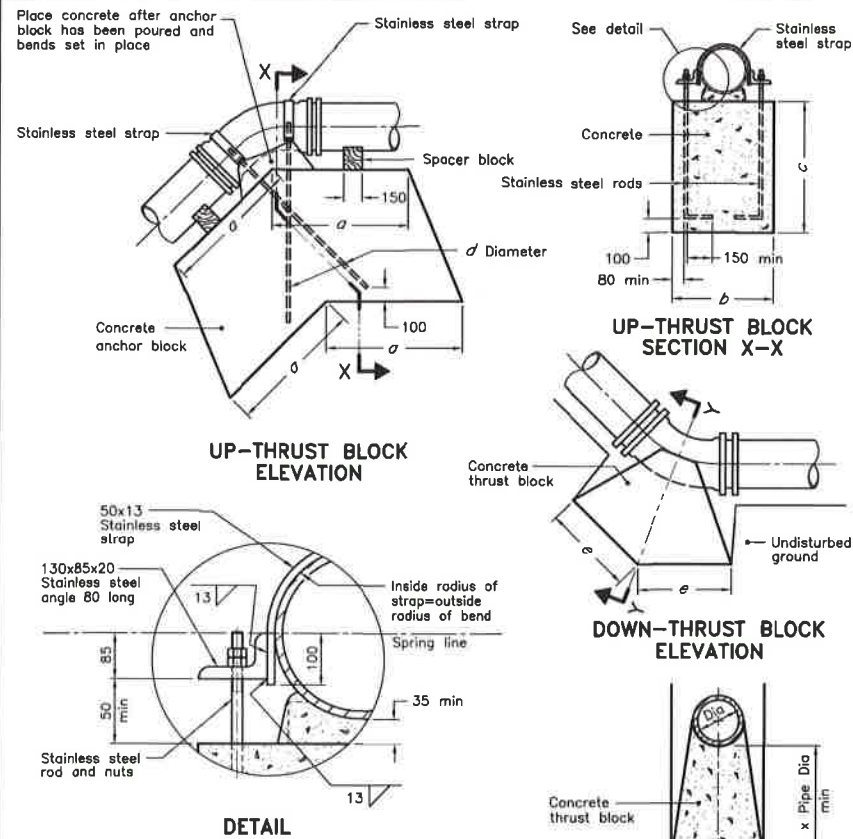
Drainage Report for the  
**RELOCATION OF THE  
RUSH DRAIN**  
Town of Essex

SHEET TITLE  
**BRIDGE NO. 3 DETAILS**

PAGE NO  
**16 of 19**



Jan. 07, 2021 - 8:45pm C:\pw working directory\projects\2019\33\ro\dms25516\191023-03-DRN-DES FINAL 5.dwg



#### NOTES:

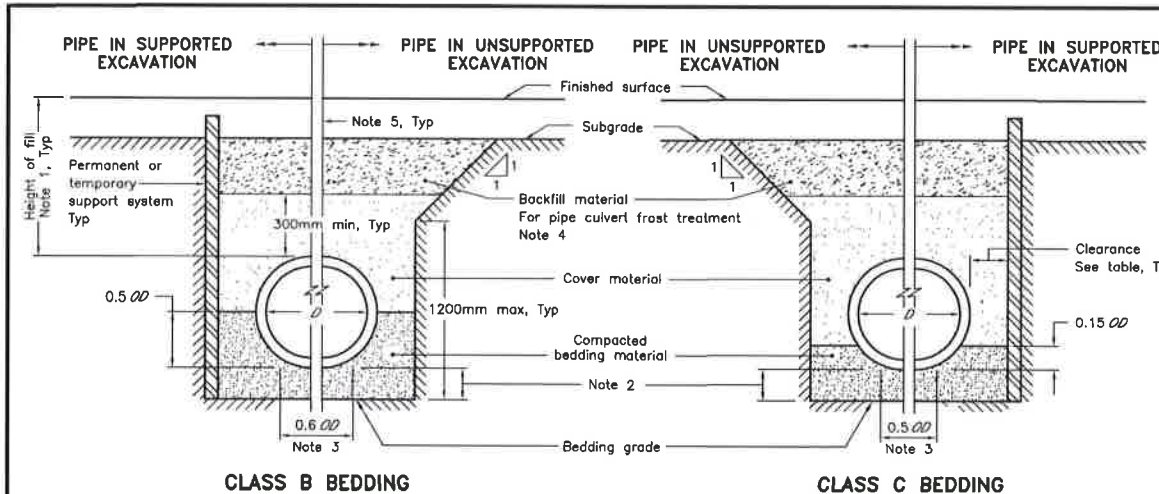
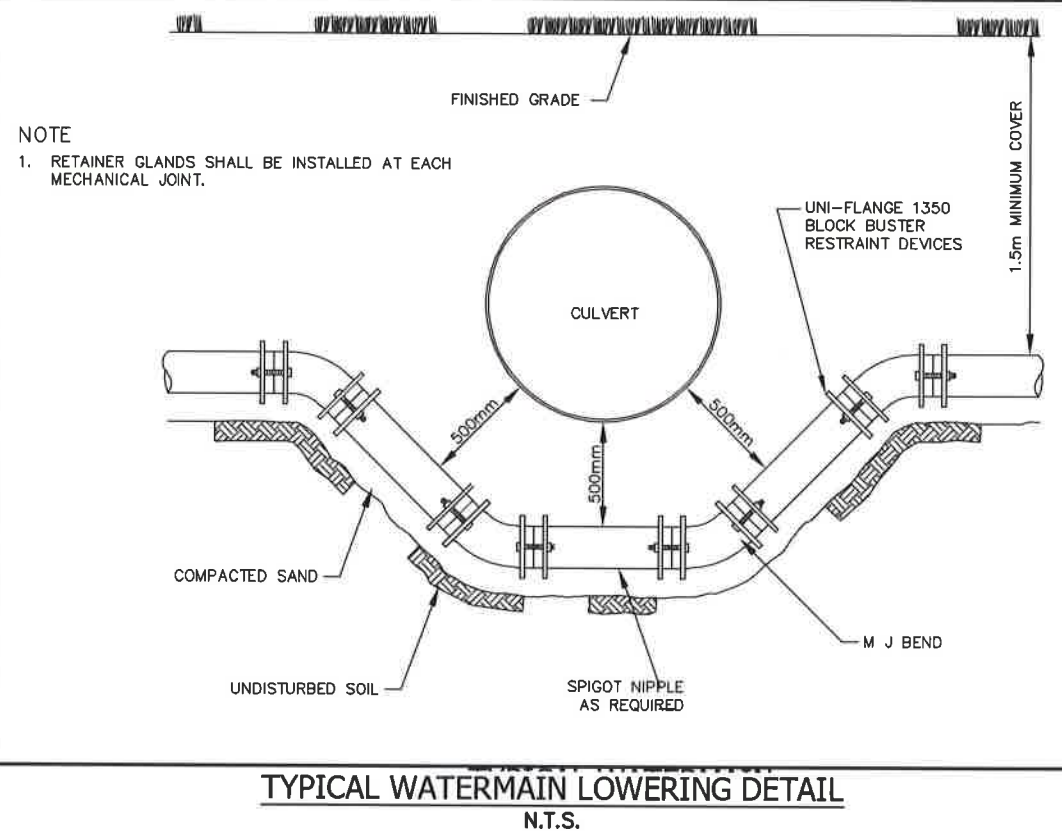
- A Concrete shall be placed to within 50mm of the face of the bell.  
B Bond breaker shall be used between concrete and fittings.  
C This blocking is for bends up to 45° for up-thrust and 90° for down-thrust.  
D This OPSD shall be read in conjunction with OPSD 1103.021.  
E All stainless steel to be type 316.  
F Stainless steel rods and nuts to be designed based on actual watermain diameter and surge pressure.  
G All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2018 Rev 4

### CONCRETE THRUST BLOCKS FOR VERTICAL BENDS

OPSD 1103.020



#### LEGEND:

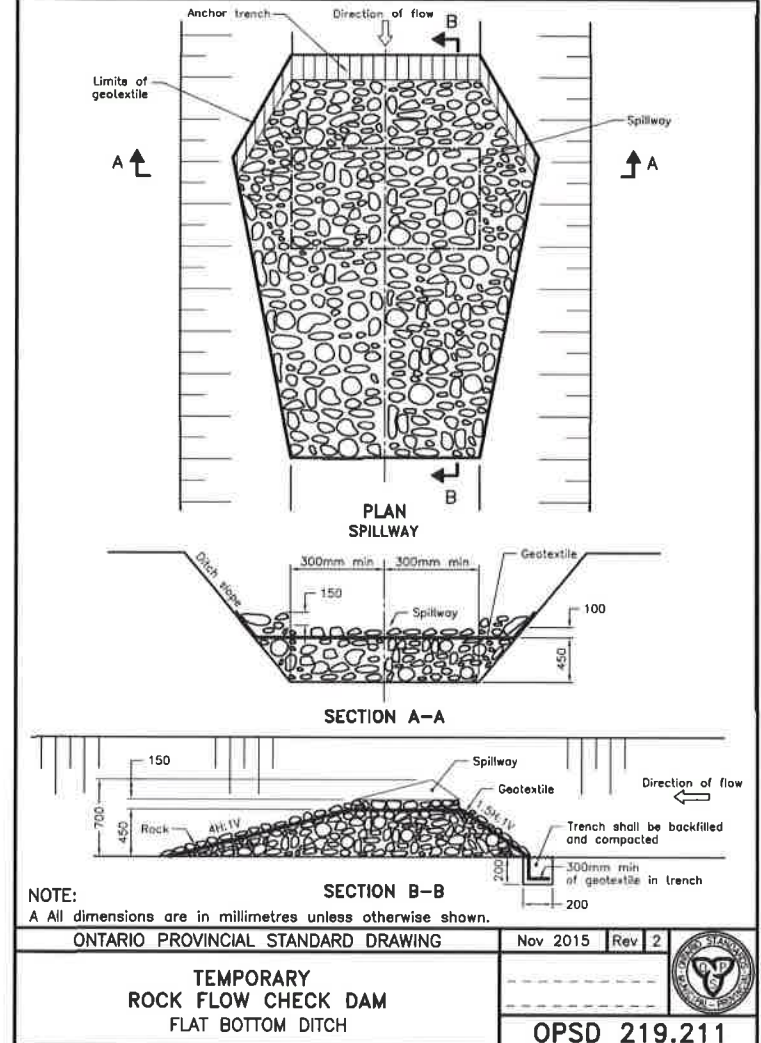
D - Inside diameter  
OD - Outside diameter

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING  
RIGID PIPE BEDDING,  
COVER, AND BACKFILL  
TYPE 1 OR 2 SOIL - EARTH EXCAVATION

Nov 2015 Rev 3

OPSD 802.030



#### NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015 Rev 2

### TEMPORARY ROCK FLOW CHECK DAM FLAT BOTTOM DITCH

OPSD 219.211



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TRO	JJT
DRAWN	CHECKED BY
WLB	RM
DATE	January 8, 2021
SCALE	AS SHOWN

PROJECT NO.	
19-1023	
DRAWING SCALES BASED ON A 11" X 17" SHEET	

#### 'SCHEDULE G'

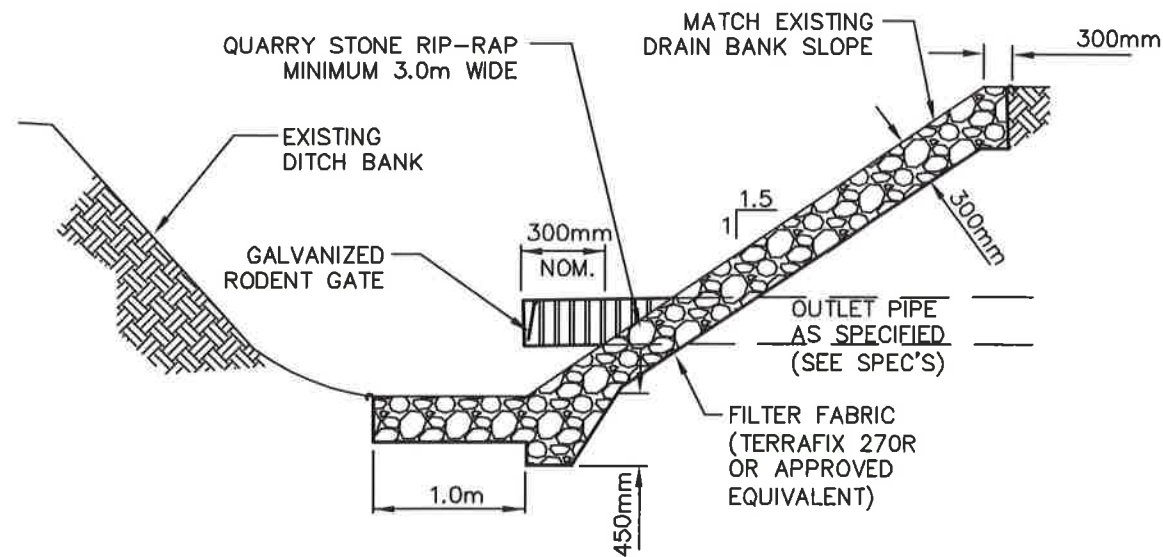
Drainage Report for the  
RELOCATION OF THE  
RUSH DRAIN  
Town of Essex

SHEET TITLE	DETAILS
PAGE NO.	17 of 19

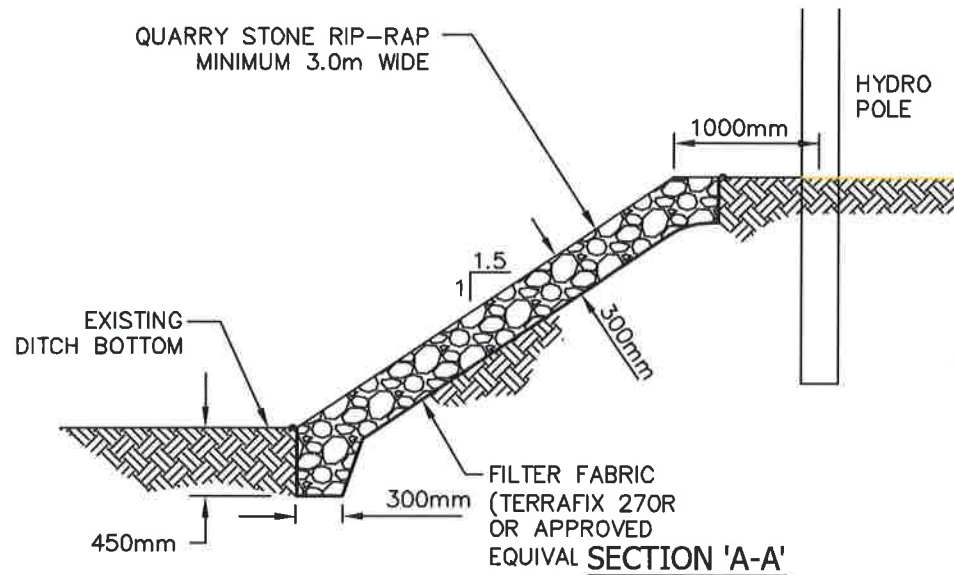




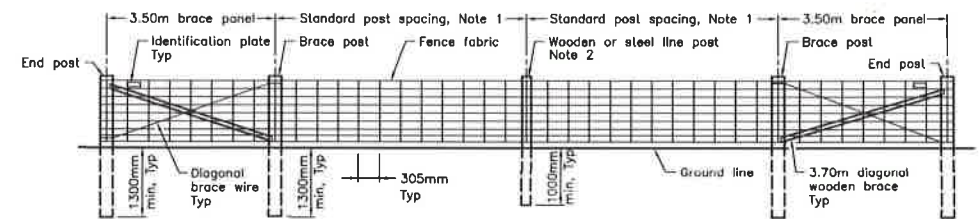
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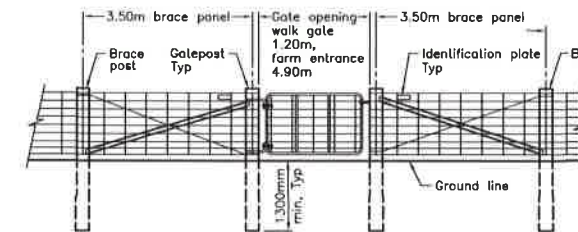
**DRAIN CONNECTION  
OUTLET DETAIL**  
N.T.S.



**DRAIN BANK EROSION PROTECTION AT  
EXISTING HYDRO POLE LOCATIONS**  
N.T.S.



**HIGHWAY FENCE  
IN EARTH, SHALE, LOOSE ROCK, OR FRIABLE ROCK**

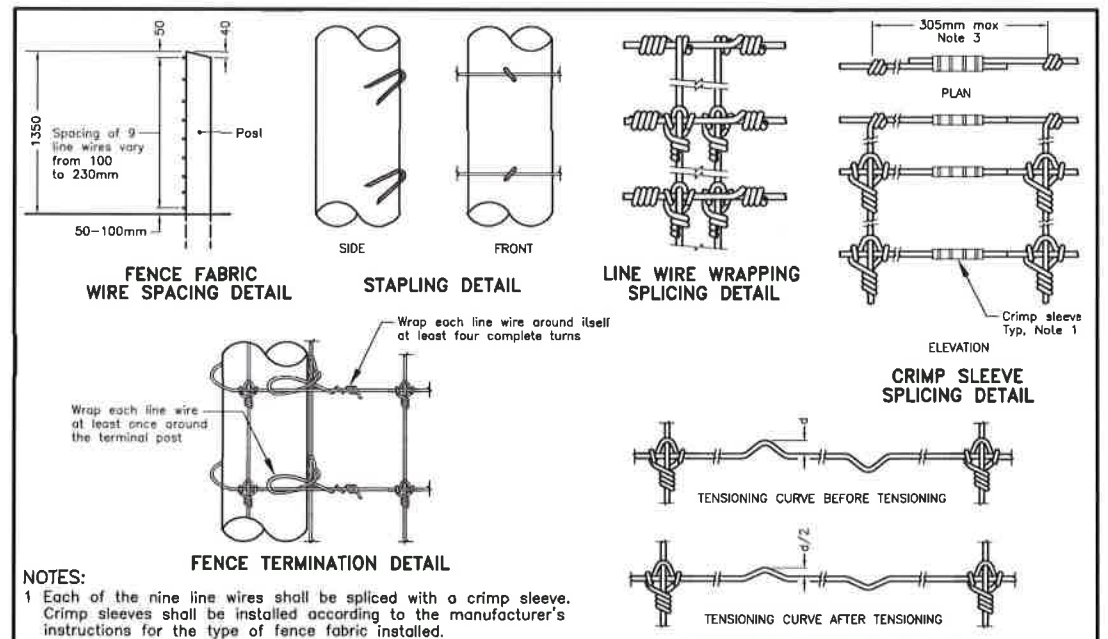


**GATE DETAIL**

**NOTES:**

- Standard post spacing shall be 6.0m for wooden post to wooden post and 5.0m for steel post to steel or wooden post.
  - Ratio of steel posts to wooden posts shall be 3:1.
- A This OPSD shall be read in conjunction with OPSD 971.103.
- B All dimensions are in millimetres unless otherwise shown.

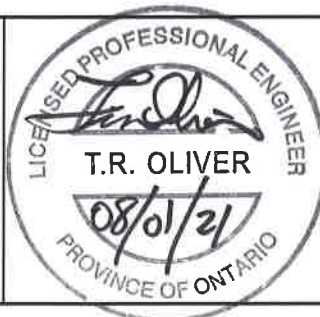
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2016	Rev 4	
FENCE, HIGHWAY IN EARTH, SHALE, LOOSE ROCK, OR FRIABLE ROCK INSTALLATION			
OPSD 971.101			



**NOTES:**

- Each of the nine line wires shall be spliced with a crimp sleeve. Crimp sleeves shall be installed according to the manufacturer's instructions for the type of fence fabric installed.
  - The tensioned curves shall be one half the size of the untensioned curves.
  - Both fabric end vertical stay wires shall be within a maximum of 305mm centres.
- A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2016	Rev 0	
FENCE, HIGHWAY INSTALLATION DETAILS			
OPSD 971.103			



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PROJECT NO.	19-1023
DRAWING SCALES BASED ON A 11" X 17" SHEET	

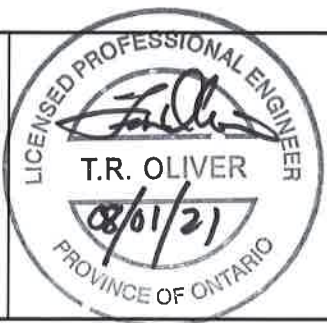
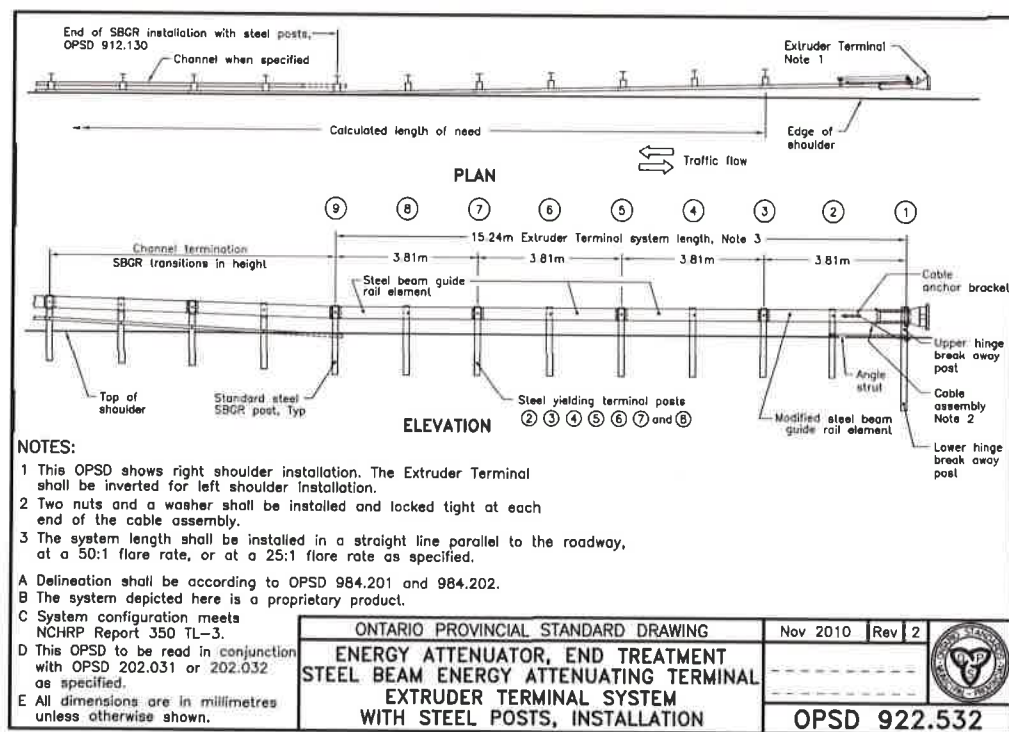
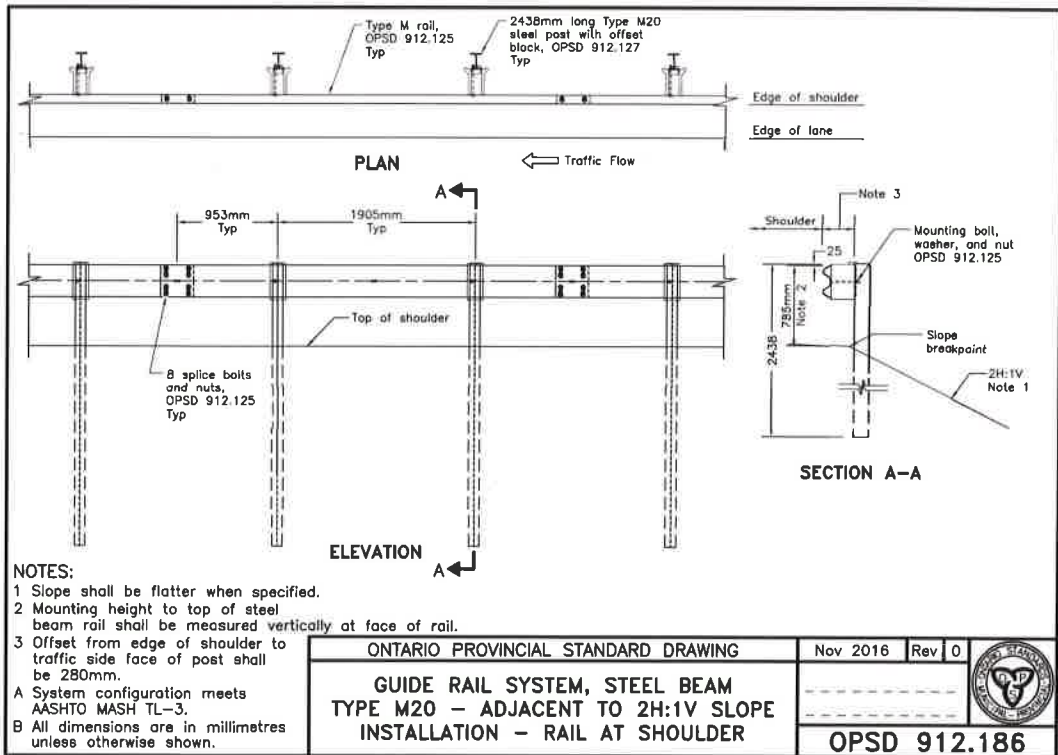
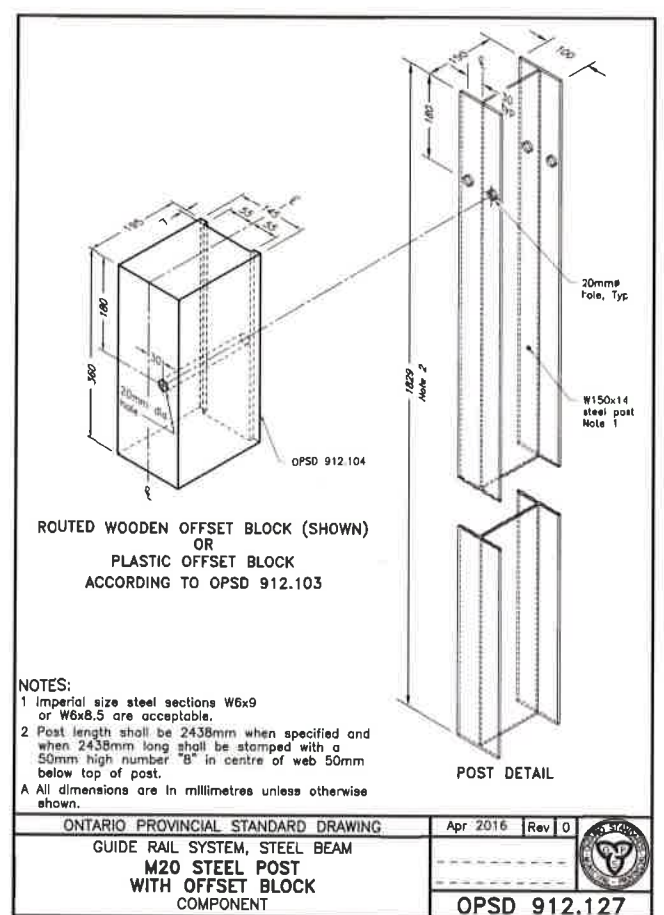
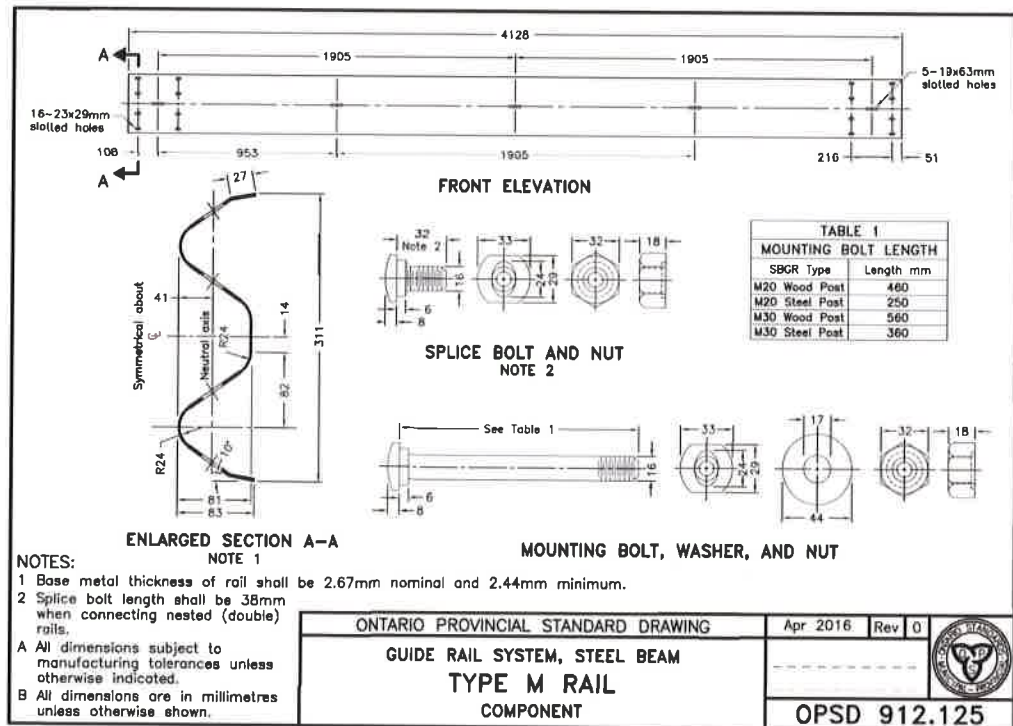
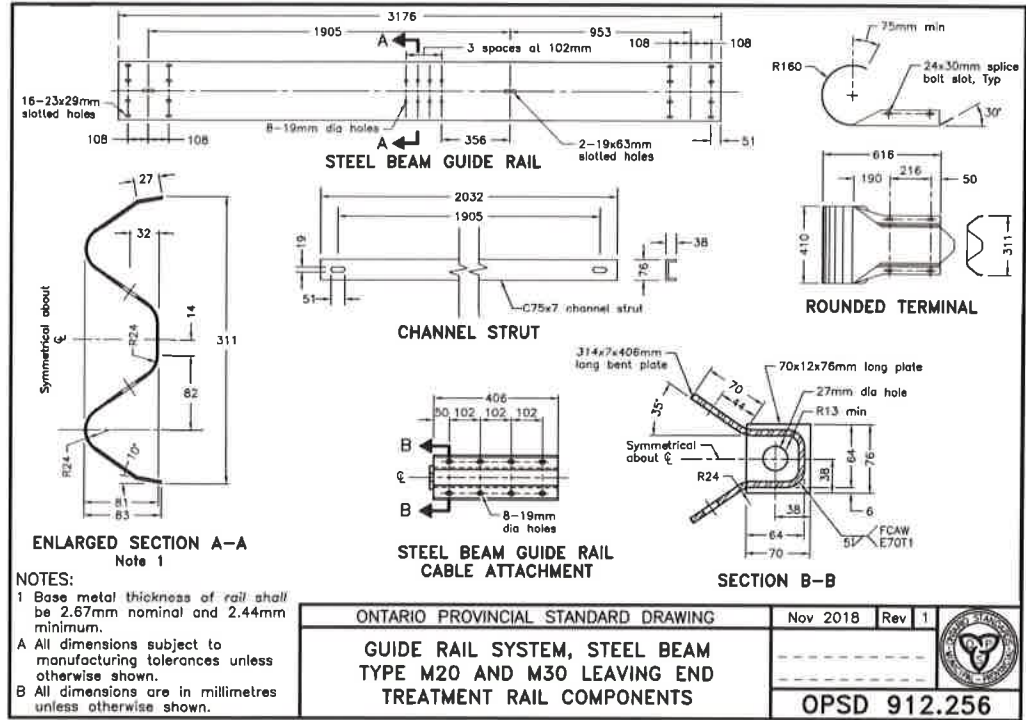
SHEET TITLE	MISCELLANEOUS DETAILS
PAGE NO.	18 of 19

**'SCHEDULE G'**

Drainage Report for the  
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Jan. 07, 2021 - 8:47pm C:\ow working director\projects\2019\33\ro\dms25516\191023-03-DRN-DES FINAL 5.dwg



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TRO	JJT
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'SCHEDULE G'	
Drainage Report for the <b>RELOCATION OF THE RUSH DRAIN</b> Town of Essex	
PROJECT NO. 19-1023	SHEET TITLE <b>GUIDERAIL DETAILS</b>
DRAWING SCALES BASED ON A 11" X 17" SHEET	PAGE NO. 19 of 19