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# STORMWATER DRAINAGE ASSESSMENT



**Environmental Assessment Study of Arterial Roads within the Highway 427 Industrial Secondary Plan Area (Area 47)** 

Part B: Stormwater Drainage Assessment

City of Brampton and Region of Peel TP115086

Prepared for:

**City of Brampton & Region of Peel** 

1/20/2023



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#### **Prepared by:**

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#### 1/20/2023

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# Preface

Wood Environment & Infrastructure Solutions, a division of Wood Canada Limited (Wood), has been retained by the City of Brampton and Region of Peel to conduct a Schedule C Municipal Class EA for a future arterial road network within Secondary Plan Area 47.

The City of Brampton, to accommodate future growth in north-east Brampton, has approved a secondary plan for Area 47. The area is bound by Mayfield Road to the north, Castlemore Road to the south, Regional Road 50 (RR50) to the east and The Gore Road to the west.

The City of Brampton has identified through its Transportation and Transit Master Plan (TTMP, 2009), and supporting studies the need for additional road network capacity up to 2031. As part of these studies, road network improvements within Secondary Plan Area 47 were recommended. The recommended road improvements are being addressed by the current Class EA in two parts:

#### Part A (Region owned R.O.W.s<sup>1</sup>):

- 1. A new six-lane north-south major arterial road (Arterial A2) from Mayfield Road east of Clarkway Drive to Major Mackenzie Drive/RR50; and,
- 2. Widening of Coleraine Drive from Arterial A2 to Mayfield Road including realignment at Arterial A2 west of RR50; and,

#### Part B (City owned R.O.W.s):

- 1. A new four-lane east-west minor arterial road from The Gore Road to Arterial A2 (E-W arterial);
- 2. Widening of Clarkway Drive from Castlemore Road to E-W Arterial to four lanes and urbanizing Clarkway Drive between E-W arterial and Mayfield Road with possible continuous centre turn lane; and
- 3. Widening of Countryside Drive to four lanes from Clarkway Drive to RR50 including realignment at RR50.

In order to service this growth, new infrastructure must be provided that recognizes the capacity needs of planned growth and the objectives of protecting established communities and businesses from threats created by surface water drainage. As per Section 4.2.1.1 and Figure 4.4 of the MESP (ref. Aquafor Beech, 2016) the SWM facilities proposed within the Area 47 development blocks are to be designed to service the City and Region R.O.W.s for the required water quantity, water quality, and erosion control SWM requirements. This approach has been adopted as the overall premise for design of the stormwater quantity, quality and erosion features required for all the roadways within the Study Area. Notwithstanding, the following negotiations are still ongoing:

- The Region and City are in discussion to formalize acceptance of stormwater discharge of the Region's roadway drainage systems to City owned drainage systems and SWM facilities; and,
- The Region, City and land owner's are in discussion regarding the overall premise for stormwater management for the Study Area, particularly along Coleraine Drive. This has driven the evaluation of alternatives focused on a stormwater management facility located near the intersection of Coleraine Drive and Arterial A2.

Decisions regarding these ongoing negotiations are a prerequisite to developing a preferred alternative for stormwater management for the Study Area. As such, alternative solutions will be developed and assessed in detailed design leading to a preferred approach and the road drainage as per the catchments divide provided in this report will be the responsibility of the R.O.W. adjacent land owners to accommodate.

<sup>1</sup> R.O.W. = road right-of-way

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# 1.0 INTRODUCTION

Wood Environment & Infrastructure Solutions, a division of Wood Canada Limited (Wood), has been retained by the City of Brampton and Region of Peel to conduct a Schedule C Municipal Class EA (Class EA) for a future arterial road network within Secondary Plan Area 47.

The City of Brampton continues to grow and urbanize, and to accommodate future growth in north-east Brampton, Council has approved a secondary plan for Area 47. Area 47 is bound by Mayfield Road to the north, Castlemore Road to the south, Regional Road 50 (RR50) to the east and The Gore Road to the west (ref. Figure 1-1). To service this growth, new infrastructure must be provided that recognizes the capacity needs of planned growth and the objectives of protecting established communities and businesses from threats created by surface water drainage.

The City of Brampton has identified through its Transportation and Transit Master Plan (TTMP, 2009), and supporting studies (including the Highway 427 Extension Area Transportation Master Plan and the Highway 427 Industrial Secondary Plan (Area 47) Transportation Master Plan) the need for additional capacity in the road network up to the planning horizon year of 2031. As part of these studies, road network improvements within Secondary Plan Area 47 were recommended. The recommended road improvements are being addressed by the current Class EA in two parts:

#### Part A (Region owned R.O.W.s<sup>2</sup>):

- 3. A new six-lane north-south major arterial road (Arterial A2) from Mayfield Road east of Clarkway Drive to Major Mackenzie Drive/RR50; and,
- 4. Widening of Coleraine Drive from Arterial A2 to Mayfield Road including realignment at Arterial A2 west of RR50; and,

#### Part B (City owned R.O.W.s):

- 4. A new four-lane east-west minor arterial road from The Gore Road to Arterial A2 (E-W arterial);
- 5. Widening of Clarkway Drive from Castlemore Road to E-W Arterial to four lanes and urbanizing Clarkway Drive between E-W arterial and Mayfield Road with possible continuous centre turn lane; and
- 6. Widening of Countryside Drive to four lanes from Clarkway Drive to RR50 including realignment at RR50.

The Part A and Part B features, as described above, are illustrated in Figure 1-1, as well as Plans 1 and 12 (ref. Appendix C).

The Highway 427 Industrial Secondary Plan (Area 47) Transportation Master Plan has satisfactorily completed Phases 1 and 2 of the Municipal Class EA process for the recommended arterial road network improvements and recommended commencement of Phases 3 and 4 of the EA process. The current study will satisfy Phases 3 and 4 of the Class EA requirements for the identified arterial road improvements.

This report has been prepared to document the stormwater drainage conditions for Part B of the Study Area. The following sections describe the background review, the assessment of existing and proposed hydraulic structures within Part B of the Study Area including hydraulic analyses, establish the proposed arterial road R.O.W. drainage conditions, and summarize stormwater management criteria for the proposed arterial road improvements, and new arterial roads. Part B of the Study Area includes drainage to the Clarkway and Gore Road Tributaries.

Stormwater drainage conditions for Part A of the Study Area are documented under separate cover.

<sup>2</sup> R.O.W. = road right-of-way





**Figure 1-1 Study Corridors** (background image source Google Earth Pro<sup>™</sup>)

# 2.0 BACKGROUND REVIEW

#### 2.1 **Previous Studies**

Several previous studies have been completed which are relevant to the current project as summarized below.

#### Humber River Hydrology Update, Civica Infrastructure Inc., June 2015

This study, prepared as a joint effort between the Toronto and Region Conservation Authority (TRCA) and Civica Infrastructure Inc. (Civica), was an update to the hydrologic model of the Humber River Watershed. The update was completed to reflect the increase in urban development, including stormwater management facilities constructed within the last 15 years, and included significantly refined subcatchment discretization. The hydrologic model was developed in Visual OTTHYMO 4 (VO4) for existing land uses and future land uses based on approved Regional and local municipality Official Plans. The model for the Humber River Watershed was a new model which superseded the previous SWMHYMO model developed by Aquafor Beech Limited (ref. Humber River Watershed Hydrology Update, November 2002). Peak flows were reported for the 2 to 500-year return periods and the Regional Storm event (Hurricane Hazel). The model was calibrated using rainfall-runoff data from recent storm events. Of the 6-hour, 12-hour, and 24-hour AES distribution design storms simulated, the 6-hour and 12-hour storms were found to be the critical storms (i.e. these storms generated the highest peak flows). The study found that the 2 to 100-year unit flow relationship equations provided in the TRCA Stormwater Management Criteria (2012) are sufficient to maintain existing conditions peak flows under the proposed future land use condition.

# Master Environmental Servicing Plan: Highway 427 Industrial Secondary Plan Area ("Area 47"), Aquafor Beech Limited, May 9, 2016

This Master Environmental Servicing Plan (MESP) was prepared for the "Area 47" study area to address the constraints and opportunities associated with the proposed land use changes. The MESP provides a comprehensive management plan including stormwater and natural heritage strategies to protect the natural environment resources within the Study Area. Part of the MESP involved extending and updating TRCA generated HEC-RAS models of The Gore Road Tributary, the Clarkway Tributary, and Rainbow Creek.

#### 2.2 Data, Mapping & Models

In addition to the reporting described in Section 2.1, additional background data, mapping and models have been provided by the City of Brampton, TRCA, Aquafor Beech, and Wood's Geotechnical Team. The following summarizes the data relevant to this assessment:

#### City of Brampton

- Various digital GIS base mapping layers including roads, property, watercourses, subwatershed boundaries, Official Plan land use, etc.
- Aerial photography
- Digital terrain mapping

#### TRCA

- Various digital GIS mapping layers including watercourses, TRCA regulation limit, meander belt, floodplain limits, etc.
- Visual OTTHYMO 4.0 hydrologic model of the Humber River Watershed (2015)

- Existing Conditions 6-hour AES 2 year 100-year Design Storm Peak Flows (March 2018) from revised Humber River Hydrology Update
- Existing & Future Conditions Regional Storm Peak Flows (March 2018) from revised Humber River Hydrology Update
- HEC-RAS hydraulic models of the Gore Road Tributary, the Clarkway Tributary, and Rainbow Creek (March 2018)

#### **Aquafor Beech**

- HEC-RAS hydraulic models of The Gore Road Tributary, the Clarkway Tributary, and Rainbow Creek (2016 Superseded by CDC. TMIG, dated July 2018).
- Various digital GIS base mapping layers including contours, watercourses, HEC-RAS section lines, and floodlines.

#### Wood's Geotechnical Team

• Borehole logs - 47 borehole logs were advanced by Wood's Geotechnical Team in the period January 2020 to April 2020 along the Coleraine Drive and Arterial A2 R.O.W.s. Relevant borehole logs are provided in Appendix A.

# 3.0 STORMWATER MANAGEMENT

### 3.1 Existing Conditions Storm Drainage

The Part B Study Area is located within the Humber River Watershed and contributes drainage to both the West Humber and the Main Humber subwatersheds. In the context of the West Humber subwatershed, the Study Area is located within the headwaters. There are two (2) tributaries that drain through the Part B Study Area, namely the Gore Road Tributary and the Clarkway Tributary (ref. Figure 3-1).

The existing land uses are predominantly agricultural, with a dispersion of pasture land and low-density residential. The soil type encountered throughout the Study Area is dominated by imperfectly drained stone-free clays, underlain by silty sand.

Under existing conditions, approximately 27.6 ha of existing R.O.W. (imperviousness = 16.3%) (i.e. Countryside Drive and Clarkway Drive) contributes stormwater runoff to the subject watercourses.

The existing R.O.W.s consist of rural cross-sections with ditches. Overland drainage from external lands enters the existing R.O.W.s at various points and is conveyed by the existing ditches to the watercourse receivers (i.e. Gore Road Tributary and the Clarkway Tributary).



Figure 3-1 Existing Condition Drainage

## 3.1.1 Hydrologic Assessment

The hydrologic assessment completed for the Part B Study Area has estimated 2-year through 100-year return period peak flows for study relevant watercourses for existing land use conditions with stormwater management at key locations, including existing road crossings and the Study Area boundary. Application of existing land use conditions is considered conservative for the return period events as the future conditions peak flows are generally lower than existing conditions due to the application of unitary release rates. For the purposes of sizing future hydraulic crossings, as a component of the next phase of the study, the most conservative of the existing and future land use peak flows will be applied.

Peak flows have been simulated in the hydraulic model (Section 4.0) to assess the performance of the existing hydraulic structures (i.e. bridges & culverts).

#### 3.1.1.1 Methodology

The Rational Method has been used to calculate the peak flows for 2 to 100-year storm events according to the Region of Peel IDF data (which is marginally higher than the City's design IDF rainfall). As well, a VO6 model has been developed to simulate the Regional (Hazel Storm), 6-hour and 12-hour AES design storm events peak flows for comparison with the Rational Method results. The subcatchments have been discretized to obtain peak flows suited to each reach within the Clarkway Tributary HEC-RAS model. Figure 3-1 provides the existing conditions catchment layout for the Study Area. The naming for the discretized subcatchments retains the parent catchment number, with a subscript of either "a", "b", or "c".

The estimated peak flows have been input to the HEC-RAS hydraulic model to estimate flood levels throughout the Part B Study Area. The updates to the HEC-RAS model are discussed in Section 4.0 of this report.

#### 3.1.1.2 Results

The 6-hour and 12-hour duration, 2-year to 100-year return period AES distribution and Regional Storm events have been simulated using the VO6 hydrologic model. Peak flow estimates from the Rational Method and the VO6 model have been compared and it has been determined that the Rational Method produced the highest peak flows.

Using Region of Peel IDF data, peak flow estimates for the 2-year to 100-year storm events have been calculated for the existing and proposed conditions. Overall, the size of the discretized subcatchments is the same, however, the subcatchment imperviousness has increased significantly reflecting proposed development. A summary of the peak flows at key locations is included in Appendix B.

#### **3.2 Future Conditions Storm Drainage**

As outlined in Section 1.0, the future condition for Part B of the Study Area proposes a new four-lane eastwest minor arterial road from The Gore Road to Arterial A2 (E-W arterial); widening of Clarkway Drive from Castlemore Road to E-W Arterial to four lanes and urbanizing Clarkway Drive between E-W arterial and Mayfield Road with a possible continuous center turn lane, and widening of Countryside Drive to four lanes from Clarkway Drive to RR50 including realignment at RR50. Urbanized cross-sections are proposed for all R.O.W.s.

A proposed road profile was developed by the City, Region, and Wood. The future condition storm drainage boundaries were developed based on the proposed road profile and are illustrated in Plans 5 to 12 (ref. Appendix C).

Under future conditions: Approximately 33.24 ha of future R.O.W. (imperviousness = 63.7%) (i.e. Clarkway Drive, Countryside Drive, and E-W Arterial) is proposed to contribute to stormwater runoff to the Clarkway Tributary. This proposes an increase of the impervious area of 15.73 ha relative to existing conditions. The increase is made up of the new and widened R.O.W.s. Table 3-1 summarizes the changes in imperviousness of each roadway between the existing and proposed conditions.

Road	ROW (ha)	Existing Imp (%)	Proposed Imp (%)	Net Imp Increase (%)
Countryside Dr.	8.48	19.0	73.6	54.6
Clarkway Dr.	16.93	21.4	57.1	35.7
E-W Arterial	7.83	2.4	67.0	64.6

Table 3-1 Existing and Proposed Subcatchments Imperviousness

Under future ultimate development conditions, external drainage will not enter the R.O.W.s. Notwithstanding, the proposed roadways may be constructed prior to the development of adjacent blocks. As such, and until development of adjacent blocks commences, temporary conveyance (e.g. ditches and culverts) to the downstream receiving systems under the interim conditions will be required.

#### 3.3 Soils and Groundwater

Wood has advanced and prepared 94 borehole logs along the Part B road alignments. The soil types encountered within the Study Area are dominated by imperfectly drained stone-free clays, underlain by silty sand. These soil types have a typical saturated hydraulic conductivity value ranging between 7 x  $10^{-5}$  and 2 x  $10^{-4}$  (ref. User's Guide to SWMM5,  $13^{\text{th}}$  Edition).

Borehole logs indicate that groundwater was encountered within 21 boreholes, ranging in depths of 0.6 m to 4.6 m below existing ground surface for Clarkway Drive and depths of 1.5 m to 8.2 m for Countryside Drive. The remaining boreholes indicate that groundwater was not encountered to the depth of the individual borehole.

In general, the future conditions road profile proposes to raise grades within the R.O.W. limits. Therefore, depths from surface to groundwater levels will increase under future conditions, ranging in depths of 3.1 m to 8.7 m below the proposed ground surface for Coleraine Drive and depths of 1.2 m to 9.7 m for Arterial A2. A summary of the borehole logs, groundwater levels and separation from existing and proposed grades is provided in Appendix B.

#### 3.4 Stormwater Management Design Criteria

The stormwater management analyses of the Study Area has considered design criteria from several agencies including, the City of Brampton, the Toronto and Region Conservation Authority (TRCA), the Ministry of Transportation (MTO). In addition to agency design criteria, the stormwater management analyses of the Study Area will also consider design criteria outlined in the MESP (ref. Aquafor Beech, 2016). The stormwater management criteria relevant to the Study Area are outlined below.

# 3.4.1 City of Brampton (2008)

All design shall comply with the City of Brampton's Subdivision Design Manual (Brampton, 2008)<sup>3</sup>. As previously noted, the future roadways are planned as Arterial Roads. The following excerpts from the

<sup>3</sup> Available via URL https://www.brampton.ca/en/Business/planning-development/Documents/Eng/2008\_subdivision\_design\_manual.pdf

Subdivision Design Manual are relevant:

- Part III (1) Stormwater Management
  - Where required, stormwater management techniques shall be implemented to the satisfaction of the City of Brampton, the local Conservation Authority and all concerned departments and agencies.
- Part III (3) The Minor System (Storm Sewers)
  - The storm sewer design must meet the following City of Brampton criteria for storm sewer design, based on City of Brampton Rainfall Intensity Curves (Standard Drawing No: 343) and a time of concentration of ten (10) minutes.
  - Item (a) Minimum Standard No. 1: A ten-year return storm design plus adequate provision for continuous overland drainage of roads.
- Part III (18) Overland Flow
  - Item (a): The major stormwater system must be designed to accommodate runoff exceeding the capacity of the minor system for the flows up to the 100-year return frequency. Major overland flow must be contained within the road allowance and walkways only.
  - Item: (f) The Major Storm Overland Flow (100-year and greater): In the event that the major storm overland flow from a subdivision exceeds the capacity of the maximum number of catchbasins as specified above, major storm overland flow shall be allowed to flow onto the arterial or major collector roads with the condition that the additional flow from the subdivisions would not cause the ponding depth to exceed 0.15 m above the gutter along the arterial or major collector roads. A minimum of 2 lanes of roadway pavement must be flood-free at all times for emergency vehicles during the major storm event. However, the major overland flow shall not be permitted to flow across any arterial or major collector roads under any circumstances.
- Part VI (3) Culverts and Bridges: Culverts and bridges under arterial roads must be designed to prevent overtopping during all storm conditions including the Regional storm.

#### **3.4.2 Region of Peel (2019)**

- *Minor System:* Storm sewers are to convey the 10-year storm event, and are to be designed using Region of Peel IDF information;
- *Major System:* Regional road R.O.W.s, including both urban and rural, are to convey flows generated by the R.O.W. itself, up to the 100-year storm event;
- External lands should not drain to the Region's storm sewer system;
- *Water Balance:* For Low Volume Groundwater Recharge Areas (LGRA), provided the site does not impact a sensitive ecological feature, or require a subwatershed study, or Environmental Impact Study (EIS), the proponent has the option to:
  - o provide a minimum post development recharge of the first 5 mm for any precipitation event, or;
  - o complete a site-specific water balance to identify pre-development groundwater recharge rates

As per Figure C.10 from the TRCA Stormwater Management Guidelines (ref. TRCA, August 2012) the Study Area is located within a LGRA. Refer to Appendix A for Figure C.10 of (TRCA, August 2012).

• *Road Reconstruction:* New linear projects without restrictions and subject to the approved Source Protection Plan, that results in the creation of impervious surface(s) and/or fully reconstructs the

existing impervious surfaces, shall control per the mandatory control hierarchy the larger of the following:

- The runoff generated from the geographically specific 90<sup>th</sup> percentile rainfall event (27 mm) from the new and/or fully reconstructed impervious surfaces on the site. The site shall be required to maintain the pre-development water balance, or;
- The runoff generated from the geographically specific 90<sup>th</sup> percentile rainfall event (27 mm) from the net increase in impervious area(s) on the site. The site shall be required to maintain the predevelopment water balance.

As per Map 3.4 of the "Approved Source Protection Plan: CTC Source Protection Region", prepared by the CTC Source Protection Committee, dated March 25, 2019 (ref. Appendix A), the Study Area is located outside of the nearest Wellhead Protection Area (WHPA-Q1/Q2), and is therefore not subject to the approved Source Protection Plan. As such, the road reconstruction criteria as stated above would not apply to the Part B Study Area4.

• *Climate Change:* Per Section 7.2.2 of the Region's SWM Criteria (2019), the Region has a four (4) step process for considering climate change resiliency in the design of SWM infrastructure.

#### **3.4.3 Toronto and Region Conservation Authority (2012)**

- *Quantity Control:* Control post-development peak flows to target rates established using the unit flow relationships for Sub Basin 36 (Equation F) for all storms up to and including the 100-year storm (i.e., 2, 5, 10, 25, 50, and 100-year storms);
- *Quality Control:* MOE Enhanced Level (Level 1) Water Quality Control (80% Average Annual Removal of Total Suspended Solids [TSS]). A treatment train solution is to be implemented;
- *Water Balance*: For sites located within a LGRA best efforts to maintain recharge are expected, provided the site does not impact an ecological feature; and
- *Erosion Control:* Minimum infiltration of 5 mm is required. For sites with a SWM pond, extended detention of the 25 mm event for a period of 48 hours may also be required.

As per Figure C.10 from the TRCA Stormwater Management Guidelines (ref. TRCA, August 2012) the Study Area is located within a LGRA. Refer to Appendix A for Figure C.10.

#### 3.4.4 Master Environmental Servicing Plan (2016)

- *Quantity Control: TRCA Criteria Control* post-development peak flows to target rates established using the unit flow relationships for Sub Basin 36 (Equation F) for all storms up to and including the 100-year storm (i.e., 2, 5, 10, 25, 50, and 100-year storms);
- *Quality Control*: MOE Enhanced Level (Level 1) Water Quality Control;
- *Water Balance*: Infiltration of runoff from a 5 mm storm event using Low-Impact Development (LID) Best Management Practices (BMPs); and
- *Erosion Control:* For drainage to Rainbow Creek, Clarkway Tributary, and Gore Road Tributary, extended detention of the 25 mm storm event for a period of 48 hours is required. For drainage to Headwater



<sup>4</sup> Please note that despite this, the Region has noted to Wood that the road reconstruction criteria should still be applied to the Regional owned R.O.W.s within the Study Area (ref. Email correspondence Bubas-Khan, dated October 28, 2020). As such, this criterion is to be applied to the Part A R.O.W.s (i.e. Coleraine Drive and Arterial A2).

Drainage Features (HDFs), extended detention of the 25 mm storm event for a period of 120 hours is required.

As per Section 4.2.1.1 and Figure 4.4 of the MESP (ref. Aquafor Beech, 2016) the SWM facilities proposed within the Area 47 development blocks are to be designed to service the City and Region R.O.W.s for the water quantity, water quality, and erosion control SWM requirements noted above. As such, Wood has not addressed these SWM criteria in this report as it is assumed to be addressed by the reporting prepared for the Area 47 development blocks.

Based on the foregoing, the water balance criteria (ref. Section 3.5), and road reconstruction criteria (ref. Section 3.6) are addressed with this report.

It should be noted that if any of the development blocks that are intended to provide the water quantity, water quality, and erosion control SWM requirements for a portion of the City and Region R.O.W.s be developed with privately-owned SWM infrastructure, the City and Region R.O.W. drainage cannot drain into the development block without a formal agreement. If a formal agreement is not established, then the requisite water quantity, water quality, and erosion control SWM requirements for the R.O.W. drainage must be implemented within the R.O.W. These details are to be determined as each development block advances to the detailed design stage.

Notwithstanding, it should be noted that conveyance of R.O.W. drainage to the SWM facilities within the development blocks may not be feasible (e.g., grading constraints). In addition, the proposed roadways may be constructed prior to the development of adjacent blocks. Therefore, consideration of management of stormwater runoff within the R.O.W. is required.

In this context, discussions between the City and Region are ongoing on the issue of possible management of roadway stormwater runoff from each other's R.O.W.'s. Further discussions are required in this regard and any agreement may influence the design of SWM systems for this development area.

#### 3.5 Water Balance

As outlined in Section 3.4, the Region, TRCA, and MESP have water balance criteria that require the on-site retention of the larger of the runoff volume from a 5 mm storm event and the pre-development water balance/groundwater recharge volume. Table 3-6 below outlines the volumes for each subcatchment, with an identification of the larger volume requirement.

Pre-development water balance volumes were calculated using Table 3-2 (Urban Lawns/Shallow Rooted Crops) of the Ministry of the Environment, Conservation and Parks (MECP) Stormwater Management Planning and Design Manual (SWMPDM, 2003), and historical rainfall data obtained from the Environment Canada rainfall gauge located at the Toronto Lester B. Pearson International Airport (Gauge A). Monthly and daily precipitation data were obtained for the years 1995 to 2019 and converted into an annual average rainfall depth. The pre-development water balance volumes were calculated using the proposed R.O.W. subcatchments and existing impervious conditions (ref. Plans 1 to 4, Appendix C). Supporting calculations are provided in Appendix B.

Post-Development runoff volumes from the 5 mm storm event were calculated using the proposed R.O.W.s and proposed imperviousness (ref. Plans 5 to 12, Appendix C).

Subcatchment	Pre-Development Water Balance/Groundwater Recharge Volume (Average Daily Volume in m <sup>3</sup> )	Post-Development Runoff Volume from 5 mm Storm Event (m³)
CS1	5.0	56.6
CS2	0.8	11.3
CS3	2.6	38.8
CS5	5.9	57.0
CS6	1.4	13.2
CS7	4.2	38.4
CS9	2.3	31.4
CS10	1.3	18.0
CS11	0.4	6.5
CS12	2.0	16.4
CS13	2.3	18.0
CS14	0.8	6.6
CL1	4.5	24.3
CL2	13.3	102.0
CL3	11.6	93.2
CL4	7.6	57.5
CL5	7.7	61.0
CL6	5.4	71.5
CL7	6.2	74.4
EW1	9.9	82.6
EW2	6.1	46.5
EW3	6.1	49.8
EW4	5.0	40.9
EW5	1.2	9.1
EW6	4.1	33.5

#### Table 3-2 Water Balance Retention Volume Requirements

Note(s):

1. Bolded values indicate governing water balance volume

As outlined in Table3-2, the runoff volumes from the 5 mm storm event govern the water balance retention volume requirements, compared to the pre-development groundwater recharge volume. Water Balance retention volume requirements are discussed further in Section 3.7, and a long list of stormwater management practices suitable to achieving the water balance criteria are outlined in Section 3.7.2.

As outlined in Section 3.7.2, the SWM facilities proposed within the Area 47 development blocks are to be designed to service the City and Region R.O.W.s for the water quantity, water quality, and erosion control SWM requirements. Information pertaining to the way the major and minor systems of the City and Region R.O.W.s would be connected to the systems servicing the development blocks has not been made available for the current study. As such, the subcatchments represented on Plans 1 to 12 (ref. Appendix C), and the corresponding water balance volume requirements, should be reviewed and refined when this information becomes available. This is expected to occur at the detailed design stage.

#### 3.6 Road Reconstruction

As outlined in Section 3.4, the Region's road reconstruction criterion is to be applied to Part B R.O.W.s. The road reconstruction criterion requires new linear projects that result in the creation of impervious surface(s) and/or fully reconstructs the existing impervious surface, to provide storage for the greater volume associated with the following scenarios:

- 1. The runoff generated from the geographically specific 90<sup>th</sup> percentile rainfall event (27 mm) from the new and/or fully reconstructed impervious surfaces on the site. The site shall be required to maintain the pre-development water balance, or;
- 2. The runoff generated from the geographically specific 90<sup>th</sup> percentile rainfall event (27 mm) from the net increase in impervious area(s) on the site. The site shall be required to maintain the pre-development water balance.

Based on a review of the proposed R.O.W.s, scenario #1, as described above, would generate larger runoff volume as the new and/or fully reconstructed impervious surface area is larger than the net increase in impervious surface area. Therefore, calculations of the runoff from the 90<sup>th</sup> percentile rainfall event were completed for this scenario. The impervious coverages and resulting runoff volumes are summarized in Table 3-3 below. Supporting calculations for both scenarios are provided in Appendix B.

Subcatchment	Total Proposed Impervious Area (ha)	Runoff Volume from 27 mm Storm Event (m <sup>3</sup> )
CS1	1.1	304.3
CS2	0.2	60.9
CS3	0.8	209.2
CS5	1.1	307.7
CS6	0.3	71.5
CS7	0.8	207.1
CS9	0.6	169.7
CS10	0.4	97.2
CS11	0.1	35.3
CS12	0.3	88.6
CS13	0.4	97.2
CS14	0.1	35.8
CL1	0.5	131.2
CL2	2.0	550.5
CL3	1.9	503.1
CL4	1.2	310.6
CL5	1.2	329.4
CL6	1.4	386.3
CL7	1.5	401.6
EW1	1.7	445.9
EW2	0.9	251.2
EW3	1.0	268.7
EW4	0.8	220.8
EW5	0.2	49.0
EW6	0.7	180.8

Table 3-3 Region's Volume Control Requirements for Linear Developments (m<sup>3</sup>)

It is concluded from a comparison of the water balance retention requirements, presented in Table 3-2 to the road reconstruction runoff volume control requirements, presented in Table 3-3, that the latter criterion governs. Retention volume requirements are discussed further in Section 3.7, along with a long list of stormwater management practices suitable for the study area.

#### 3.7 Stormwater Management Opportunities

#### 3.7.1 General Stormwater Management Opportunities

Stormwater Management practices (SWMPs) for the management of roadway runoff generally fall into two categories: those that address stormwater quantity (including erosion) and those that manage stormwater quality of surface runoff. In addition, Low Impact Development (LID) best management practices are designed to provide water quality treatment and quantity control for smaller, more frequent storm events, and water retention.

As outlined in Section 3.4.1, stormwater quantity, quality and erosion criteria for the Study Area are to be provided by the internal development blocks within Area 47. As such, proposed works for the current study are limited to water balance and road reconstruction criteria.

In terms of water balance and road reconstruction criteria, the SWMPs relate to the retention (i.e. infiltration) of runoff from the new pavement, and where possible, runoff from the existing pavement; however, current legislation solely relates to the former. Typically, the required retention volumes are dictated by agency standards, and are also often defined in a watershed or subwatershed planning study. Water balance and road reconstruction retention volume requirements for the Study Area are outlined in Table 3-1 and Table 3-2 respectively, and it has been determined that the City's road reconstruction criteria govern the retention volume requirements.

Various Best Management Practices or Stormwater Management practices are available to address the water balance retention volume requirements of runoff from roadways. Due to the linear nature of roadway corridors however, not all stormwater management practices are considered to be appropriate. Typically, suitable BMPs for linear roadway corridor come in the form of Low-Impact Development (LID) BMPs. Various LID BMPs are reviewed in the following section. The review was completed to determine suitability of each LID BMP in managing the water balance retention volume requirements, taking into consideration the Study Area topography, soils, groundwater level, and future conditions land use.

It is directed that detailed evaluation of stormwater management alternatives be evaluated as a component of detailed design.

#### 3.7.2 Low Impact Development Best Management Practices

Low Impact Development represents the application of a suite of BMPs normally related to source and conveyance storm water management controls to promote infiltration and pollutant removal on a local site by site basis. These measures rely on eliminating the direct connection between impervious surfaces such as roads and the storm drainage system, as well as the promotion of infiltration of road drainage. General design guidelines and considerations for source and conveyance controls have been advanced since the early 1990's as part of the Ministry of Municipal Affairs and Housing (MMAH) "Making Choices" and in 1994 as part of the Environment's original Best Management Practices Guidelines.

Subsequent to the 1994 MOE Guidelines, technologies and standards have been developed further for the application of source and conveyance controls. These have evolved into a class of BMPs referred to as Low Impact Development (LID) practices, which have advanced as an integrated form of site planning and storm servicing to maintain water balance and providing storm water quality control for urban developments. Initial results from studies in other settings have demonstrated that LID practices provide benefits by way

of reducing the erosion potential within receiving watercourses and thereby reducing the total volume of end-of-pipe storm water erosion control requirements. In addition, due to volumetric controls afforded by LID BMP's, water quality is also improved through a reduction in mass loading. The benefits from LID storm water management practices are generally focused on the more frequent storm events (e.g. 2-year storm) of lower volumes as opposed to the less frequent storm events (e.g. 100-year storm) with higher volumes. It is also recognized that the forms of LID practices which promote infiltration or filtration through a granular medium provide thermal mitigation for storm runoff.

Guidelines regarding the application of LID practices and techniques have been developed within various jurisdictions in the United States and Canada. The Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC) have produced the 2010 Low Impact Development Stormwater Management Manual, for the design and application of LID measures, various LID techniques, as well as their function that are applicable to road projects. While most of these are typically implemented to provide water quality and/or water quantity control, they can also be utilized to provide water balance retention given their ability to capture and retain runoff volume. Descriptions of various LID BMPs with infiltration capabilities are provided below.

#### 3.7.2.1 Infiltration Trenches

Infiltration trenches can be positioned at surface level or below ground (i.e. subsurface). At-surface infiltration trenches are designed to receive surface runoff, while subsurface infiltration trenches receive runoff that has been captured by catch basins and/or storm sewers. Infiltration trenches are preferred in areas that have reasonable infiltration properties (15 mm/ hr,  $1 \times 10^{-6}$  cm/s), but can be implemented in all soil types as long as they are large enough to store the design volume.

For R.O.W.s, at-surface infiltration trenches are restricted to the pervious areas within the boulevards or island areas (if proposed). Subsurface infiltration trenches can be positioned beneath impervious areas such as sidewalks and multi-use pathways. For subsurface infiltration trenches receiving drainage from catch basins, all catch basins should be fitted with goss traps to filter floatable debris.

Infiltration trenches are restricted in depth by local groundwater levels. As per the Low Impact Development Stormwater Management Planning and Design Guide (ref. CVC, TRCA, 2010), the minimum separation between the underside of an infiltration trench and the seasonally high groundwater level is 1.0 m. As outlined in Section 3.4, depths from surface to groundwater levels will increase under future conditions, ranging in depths of 1.2 m - 9.7 m below proposed ground surface. Infiltration trenches will likely require a depth of at least 500 mm. Therefore, to implement an infiltration trench, the minimum depth from surface to groundwater level would have to be at least 1.5 m. Many boreholes did not encounter groundwater during drilling, indicating that there are no restrictions to the depth of infiltration trenches in those areas, up to the termination of the borehole. Infiltration trench feasibility would need to be considered on a location-by-location basis based on the preceding identified depths.

#### 3.7.2.2 Permeable Pavers/ Pavement

Permeable pavement could be implemented for the entirety, or for sections, of the proposed sidewalks and multi-use trails. Permeable paved sidewalks and multi-use trails would reduce the runoff volume from paved surfaces within the urban road R.O.W. As a standalone LID BMP, however, it would not be able to meet the water balance criteria, as it would treat a limited area and would not treat the roadway itself (which would be expected to generate the largest portion of runoff). It is understood that the Region does not prefer to implement permeable pavement on their projects due to operations/maintenance issues and performance concerns. As such, permeable pavement is not recommended for implementation.

#### 3.7.2.3 Pervious Pipes

Pervious pipes could be used in combination with either bioretention systems or infiltration trenches. As a standalone SWM measure, pervious pipes can be a cost-effective and relatively simple method to achieve water balance requirements, while eliminating the need for surface space within the right-of-way.

#### 3.7.2.4 Conventional Underground Storage (Cellular Systems)

Modular style plastic chambers (e.g. Brentwood<sup>TM</sup>, StormTech<sup>TM</sup>, Triton<sup>T,</sup> or other equivalent and approved systems), could be considered to achieve water balance requirements. Conventional underground storage can be implemented in a similar manner to subsurface infiltration trenches, receiving runoff that has been captured by catch basins and/or storm sewers. Conventional underground storage is typically implemented to achieve water quantity requirements; however, these systems often serve also to achieve water balance requirements by making the bottom of the storage tank infiltrative.

#### 3.7.2.5 Bioretention Systems

Bioretention systems can be implemented in the pervious areas within the boulevards or island areas (if proposed), similar to at-surface infiltration trenches. Bioretention systems should be approximately 10% to 20% in size of the contributing drainage area, with typical drainage areas of 0.50 ha and a maximum drainage area of 0.80 ha. Slopes within bioretention systems are typically 1% to 5%. Bioretention systems are also preferred in areas that have reasonable infiltration properties (15 mm/ hr, 1 x  $10^{-6}$  cm/s), but can be implemented in all soil types if the water quality event can be temporarily stored (typical depths 0.15 m to 0.25 m) before infiltrating and an underdrain is provided. Bioretention systems should have forebays for a form of surface water pre-treatment. Catch basins fitted with goss traps can be used to filter out floatable debris before directing runoff to the infiltrative component of the bioretention system.

#### 3.7.2.6 Enhanced Grassed Swales

Grassed swales designed with a trapezoidal geometry and flat longitudinal profiles with largely unmaintained turf can provide infiltration, similar to bioretention cells. Their application in linear corridors is particularly appropriate and can be further enhanced through the introduction of check dams to provide additional on-line storage. Their application in urbanized roadway cross-sections (i.e. curb and gutter) often requires alternative grading and roadway configurations which can compromise the function of the roadway itself and are therefore typically not preferred in those cases. Notwithstanding, gutter outlets along outside lanes have been demonstrated to function effectively where the right-of-way can accommodate the design. Based on the proposed ultimate urbanized road ROW, enhanced grassed swales are likely not a practical water balance measure.

#### 3.7.2.7 Filter Strips

Filter strips are typically designed for small drainage areas (less than 2 ha  $\pm$ ) and are applied as part of a treatment train. Filter strips require flat areas with slopes ranging from 1 to 5% and are usually in the range of 10 to 20 m in length in the direction of flow. Flow leaving filter strips should be a maximum of 0.10 m depth, based on a 10 mm storm event. Based on the limited space within the proposed R.O.W.s, filter strips are likely not a practical water balance measure.

Based on the foregoing review, the following LID BMPs have been short-listed:

- Infiltration Trenches;
- Pervious Pavers/Pavement;
- Pervious Pipes;

- Conventional Underground Storage; and
- Bioretention Systems

As outlined in Section 3.4.1, the SWM facilities proposed within the Area 47 development blocks are to be designed to service the City and Region R.O.W.s for the water quantity, water quality, and erosion control SWM requirements. Information pertaining to the way the major and minor systems of the City and Region R.O.W.s would be connected to the systems servicing the development blocks has not been made available for the current study. As such, the advantages, and disadvantages of the short-listed LID BMPs should be further reviewed and refined when this information becomes available. This is expected to occur at the detailed design stage.

# 4.0 HYDRAULICS

#### 4.1 Purpose

Hydraulics relates to the calculation of water surface elevations and velocities for the design storm peak flows generated by the hydrologic models and supports assessment of hydraulic structure performance (i.e. capacity, overtopping conditions, etc.) and delineation of floodplains. Structures included in this evaluation are outlined in Table 4-1 and illustrated in Figure 4-1.

This report section documents the evaluation of the Part B crossing.

Project	Crossing	HEC-RAS Reference				Currenting Langting	
Component	Reference	River	Reach	Section	watercourse	Crossing Location	
Part A	I	River-4	Reach-1	24.4425		Coleraine Drive	
	G	River-4	Reach-1	24.343	Rainbow Creek	proposed intersection of Coleraine Drive and E-W Arterial A2	
	Н	River-4	Reach-1	24.424		Countryside Drive	
	В	Gore Road Trib	Reach1	1412.42	Gore Road	Countryside Drive	
	А	Gore Road Trib	Reach1	1410.052	Tributary	E-W Arterial A2	
Part B	Е	Clarkway Trib	Reach3	1512.505		Countryside Drive	
	D	Clarkway Trib	Reach2	1512.372	Clarkway	Clarkway Drive	
	F	River11	Reach 11	356.6	Tributary	Clarkway Drive	
	С	Clarkway Trib	Reach31	1510.123		E-W Arterial A2	

Table 4-1 Structures included for Assessment for Parts A and B

# 4.2 Methodology

TRCA prepared the original HEC-RAS hydraulic models for The Gore Road and Clarkway Tributaries of the West Humber River. The two (2) HEC-RAS models were extended upstream to the northern limit of Area 47 (where required) and updated as part of the Master Environmental Servicing Report (Aquafor Beech Ltd., May 2016).

The Gore Road Tributary model extends from north of Humber Station Road downstream to the confluence of the Gore Road Tributary and the West Humber Main Branch.

The Clarkway Tributary model extends from just north of Healey Road downstream to the confluence of the Clarkway Tributary and the West Humber Main Branch. The same confluence is shared by The Gore Road Tributary.

All models contain several bridges/culverts and branches along their entire lengths. The models, as originally received by Wood, contained 2-year to 100-year return period and Regional Storm peak flows, as well as a set of peak flows entitled "TRCA 2014". The TRCA 2014 peak flows are of similar magnitude to the Regional Storm peak flows. The original models contained a downstream boundary condition of Known Water Surface Elevations.

Environmental Assessment Study of Arterial Roads within the Highway 427 Industrial Secondary Plan Area (Area 47)



Figure 4-1 Structures included for Assessment for Parts A and B

(background image source Google Earth  $\mathsf{Pro}^\mathsf{TM}$ )

The HEC-RAS models have been reviewed and refined for the current study. Revisions include updates to hydraulic crossings within the Study Area, as well as updates to flow change locations and peak flows based on the rational method. The following crossings have been updated with respect to crossing span, crossing length, ineffective flow areas, high chord, reach lengths, deck/roadway data, and road widths:

The Gore Road Tributary	Countryside Drive box culvert (Culvert B)
Clarkway Tributary	Countryside Drive bridge (Culvert E)
	Clarkway Drive bridge (Culvert D)

Updates were based on a combination of topographic survey of the rights-of-way and hydraulic structures, and DTM provided by the City, as well as structural condition assessments completed by Wood.

One (1) culvert crossing (Culvert F as illustrated on Figure 4-1) was added to the Clarkway Tributary HEC-RAS model. The culvert is a 1.5 m diameter Corrugated Steel Pipe (CSP) located on Clarkway Drive, south of Countryside Drive, and conveys drainage from a headwater feature of the Clarkway Tributary. The DTM provided by the City has been utilized to establish two (2) cross-sections upstream and one (1) cross-section downstream of the culvert. The culvert size was measured by Matrix Solutions Inc. as part of the Geomorphologic Assessment for the current study.

Relevant crossing characteristics are provided in Table 4-2.

In addition to the crossing information, peak flows have been updated utilizing the rational method for The Gore Road and Clarkway Tributary models within the Study Area. Flow change locations were also added and removed where required.

Boundary conditions have been maintained consistent with the Aquafor Beech 2016 models. One exception is noted for the Clarkway Tributary model wherein the boundary conditions for this model were set the same as the Gore Road Tributary model as they share the same downstream section.

It is noted that, to Wood's knowledge, the flow values contained in the steady flow files are not reflective of climate change projections. Per Section 7.2.2 of the Region's SWM Criteria (2019), the Region has a four (4) step process for considering climate change resiliency in the design of SWM infrastructure. As such, Wood recommends that climate change influences be assessed at the detailed design stage as necessary.

Crossing		Deed	Structure	Future Road	
Reference	watercourse	KOad	Туре	Size (m)	Classification
В	Gore Trib	Countryside Drive	Concrete Box Culvert - Open Bottom	5.52 x 1.52	Urban Arterial
D	Clarkway Trib	Clarkway Drive	Concrete Box Culvert - Open Bottom	6.82 x 1.94	Urban Arterial
E	Clarkway Trib	Countryside Drive	Steel Girder Bridge	6.88 x 1.34	Urban Arterial
F	Clarkway Trib	Clarkway Drive	CSP	1.50 dia.	Urban Arterial
н	Rainbow Creek	Countryside Drive	Concrete Box Culvert - Open Bottom	3.05 x 1.22	Urban Arterial

#### Table 4-2 Part B Existing Culverts

## 4.3 Hydraulic Structure Performance Assessment

## 4.3.1 Hydraulic Structure Sizing Criteria

The hydraulic assessment of the Study Area has considered design criteria from several agencies including, the Region, City, the MTO, and the Ministry of Natural Resources and Forestry (MNRF) as follows.

#### 4.3.1.1 The Region of Peel

No overtopping of the roadway during the Regional Storm Event is to occur at culverts and bridges.

#### 4.3.1.2 City of Brampton

Culverts and bridges under arterial roads must be designed to prevent overtopping during all storm conditions including the Regional Storm.

#### 4.3.1.3 MTO

MTO guidelines for culvert and bridge hydraulic design are based on providing a set freeboard and clearance. Freeboard is measured from the design event water surface elevation to the edge of travelled way. Clearance is measured from the design event water surface elevation to the obvert of the crossing. The design event, freeboard and clearance required consider the road classification and the total structure span. MTO guidelines are summarized in Table 4-3. The existing crossings have been assessed based on the future road classifications which are proposed to be classified as Urban Arterial.

	MTO <sup>1</sup> Design Flo (yea	w Return Period ars)	Freeboard	Clearance	Clearance Criteria for Open-Footing Culverts (m) <sup>1,2</sup>	
Functional Road Classification	Total Span less than or equal to 6.0 m	Total Span greater than 6.0 m	Criteria (m) <sup>1</sup>	Criteria for Bridges (m) <sup>1</sup>		
Freeway, Urban Arterial	50	100	1.0	1.0	0.3	
Rural Arterial, Collector	25	50	1.0	1.0	0.3	
Local	10	25	0.3	0.3	0.3	

#### Table 4-3 Standard Road Classification Design Flows for Bridges and Culverts

Note(s)

1. Highway Drainage Design Standard (MTO, January 2008)

2. It is noted that there are no clearance criteria for closed-footing culverts

#### 4.3.1.4 MNRF

The MNRF's guidelines relate to the safe passage of pedestrians and passenger and emergency vehicles across the length of road over which the Regulatory storm event may overtop. Safe passage is determined by overtopping depths, overtopping velocities and consideration for the combined impact (i.e. product of depth and velocity) and represents 'low risk' to the method of transportation (i.e. pedestrian or vehicle). Table 4-4 summarizes the maximum allowable depths and velocities.

Access	Maximum Overtopping Depth (m)	Maximum Overtopping Velocity (m/s)	Maximum Product (m²/s)
Pedestrian	0.3	1.7	0.4
Passenger Vehicle	0.3	3.0	N/A <sup>1</sup>
Emergency Vehicle	0.9	4.5	N/A <sup>1</sup>

#### Table 4-4 Design Criteria for Pedestrian and Vehicular Access

Note(s): <sup>1</sup> Highway Drainage Design Standard (MTO, January 2008)

#### 4.3.2 Existing Conditions

#### 4.3.2.1 Hydraulic Performance Evaluation

All existing roads within the Study Area are proposed to be classified as Urban Arterial in the future and have been assessed on this basis. It is noted that the MNRF criteria are not relevant for the proposed conditions since the travelled way is required to be flood-free for the Regional Storm (ref. Section 4.3.1) as directed by Region of Peel requirements. However, the existing conditions assessment has considered these criteria for information purposes. The criteria for safe passage have been applied assuming ingress/egress for pedestrians.

The results of the hydraulic structure performance assessment are summarized in Tables 4-5 and 4-6. The results indicate that none of the existing Study Area Part B culverts meet both applicable MTO and/or MNRF design criteria and will therefore be considered for upgrade as part of the Preferred Alternative. The HEC-RAS model is provided in Appendix B.

It is also noted that Culvert F, under existing conditions, is a private driveway structure and is not within control of the City or Region; however, it has been included in the current assessment as backwater from the structure contributes to flooding of Clarkway Drive (ref. Section 4.4). As such, upgrade of this structure may be required to meet 'flood-free' criteria for the future arterial roads.

Crossing	Capacity Criteria (Frequency in Years		Required Freeboard	Provided Freeboard	Required Clearance	Provided Clearance	Criteria
Reference	Design	Actual	(m)	(m) <sup>1</sup>	(m)	(m) <sup>1</sup>	Achieveu
В	50 Year	100 Year	1.00	0.62	0.30	<0.00	No
C <sup>2</sup>	N/A	50 Year	N/A	0.63	N/A	0.53	N/A <sup>2</sup>
D	100 Year	5 Year	1.00	<0.00	1.00	<0.00	No
E	100 Year	5 Year	1.00	<0.00	1.00	<0.00	No
F	50 Year	<2 Year	1.00	<0.00	N/A	N/A	No
Н	100 Year	5 Year	1.00	<0.00	1.00	<0.00	No

#### Table 4-5 Existing Culvert Performance - MTO Criteria

Notes: <sup>1</sup> Values shown are at the design storm conveyance requirement

<sup>2</sup> Private structure (existing conditions), backwater influences Clarkway Drive

<sup>3</sup> Structure capacity assessed using MTO Nomograph (Design Chart 2.32), ref. Appendix A

Crossing Reference	Ingress/ Egress Mode		Overt	Maximum	Asteral			
		Maximum Allowable Depth (m)	Actual Depth (m)	Maximum Allowable Velocity (m/s)	Actual Velocity (m/s)	Allowable Product (D x V)	Product (D x V)	Criteria Achieved?
В	Pedestrian	0.30	0.44	1.70	0.91	0.40	0.40	No
С	N/A	N/A	0.61	N/A	1.37	N/A	0.84	N/A
D	Pedestrian	0.30	0.52	1.70	2.14	0.40	1.11	No
E	Pedestrian	0.30	1.43	1.70	2.20	0.40	0.10	No
F	Pedestrian	0.30	0.24	1.70	0.25	0.40	0.06	Yes
Н	Pedestrian	0.30	0.23	1.70	2.02	0.40	0.46	No

Table 4-6 Existing Culvert Performance - MNRF Criteria

Notes: <sup>1</sup> Provided values are for Regulatory event (Regional Storm) <sup>2</sup> Culvert performance not assessed against MNRF criteria

#### 4.3.2.2 Existing Conditions Flooding Evaluation

There are existing sections of Clarkway Drive, unassociated with hydraulic crossings, that are predicted to be inundated during various design storm events due to the roadway's proximity to the Clarkway Tributary. The vertical profile of these sections of Clarkway Drive will need to be raised to elevate the travelled way above the Regional Storm floodplain for 'flood-free' access. Table 4-7 summarizes the sections of roadway predicted to be inundated and identifies the frequency of flooding (ref. Figure 4-2).

It is noted that raising the road profile will have impacts on floodplain storage that will need to be mitigated by way of compensatory cut to achieve a net-zero impact, as required by TRCA.

Roadway Flooding ID	Chainage measured south from the Countryside Drive & Clarkway Drive intersection	Flood Frequency (Storm Event)
F1	490 m to 600 m south	Regional
F2	900 m south	25 Year
F3	1040 m south	Regional
F4	1200 m south	10 Year
F5	1400 m to 1580 m south	Regional

#### Table 4-7 Existing Roadway Flooding Areas

#### 4.3.3 Proposed Conditions

Proposed culvert configurations crossing the Gore Road Tributary and the Clarkway Tributary are summarized in Table 4-8. Additionally, four scenarios incorporating alternate crossing configurations have been evaluated for crossings A and C along the proposed new road, Arterial A2 (E-W arterial), namely:

- Scenario 1 Spans are based on an openness ratio of 0.6
- Scenario 2 40 m spans (i.e. the largest single span structures that can be designed as a rigid frame)
- Scenario 3 Full span of floodplains
- Scenario 4 Spans are based on an openness ratio of 1.0
- Scenario 5 35 m spans (proposed by Candevcon)



# Figure 4-2 Existing Conditions Flooding Evaluation

(background image source Google Earth  $\mathsf{Pro}^\mathsf{TM}$ )

In the rest of this report, the "Proposed Condition" refers to scenario 5. The evaluations considered a variety of factors related to potential impacts/issues resulting from the implementation of each scenario, as follows:

- **Existing Creek Re-Alignment** Impacts that the alternative may have on existing creek system, requiring adjustment to the creek alignment. Smaller re-alignment lengths are preferable.
- **Floodplain Encroachment** Impacts that the alternative may have on the existing floodplain limits, requiring supplementation of lost floodplain storage, recognizing that smaller floodplain encroachment area is preferable.
- Hydraulic Criteria as outlined in Section 4.3.1.

Crossing Reference	Watercourse	Road	Span (m)	Rise (m)	Length (m)	Type/Configuration
А	Gore Trib	EW Arterial	35	3	69.41	Bridge
В	Gore Trib	Countryside Drive	6.4	2.13	36	Culvert
С	Clarkway Trib	EW Arterial	35	4	120	Bridge
D	Clarkway Trib	Clarkway Drive	36	4.11	30	Bridge
E	Clarkway Trib	Countryside Drive	40	4.23	36	Bridge
F	Clarkway Trib	Clarkway Drive	1.5	1.5	12	Culvert
Н	Rainbow Creek	Countryside Drive	17	2	53	Bridge

#### Table 4-8 Proposed Culvert Configurations

#### 4.3.3.1 Hydraulic Performance Evaluation

As outlined in Section 1.0, the future conditions for Part B of the Study Area proposes a new four-lane eastwest minor arterial road from The Gore Road to Arterial A2 (E-W arterial); widening of Clarkway Drive from Castlemore Road to E-W Arterial to four lanes and urbanizing Clarkway Drive between E-W arterial and Mayfield Road with possible continuous centre turn lane; and widening of Countryside Drive to four lanes from Clarkway Drive to RR50 including realignment at RR50.

The proposed crossings (ref. Figure 4-1) have been sized using the HEC-RAS models provided by TRCA. The geometry files representing the proposed conditions of the realigned Clarkway Tributary and Gore Road Tributary have been revised, including adjustments to structure coding, as well as the addition, removal, and adjustment to bounding cross sections. Geometries for the added cross sections have been estimated by interpolating between two (2) original cross sections contained in the received model (ref. Appendix B for HEC-RAS model details). The Part B crossings have been sized to meet the criteria outlined under Section 4.3.1 with the proposed configurations outlined in Tables 4-8 and 4-9.

The hydraulic performance of the proposed culverts is summarized in Tables 4-10 and 4-11. The results indicate that the proposed sizes for the crossings within the Study Area satisfy both the MTO and Region design criteria. As previously noted, the MNRF criteria are not relevant for the proposed conditions as the travelled way is required to be flood-free for the Regional Storm (ref. Section 4.3.1). As such, the results for the MNRF criteria have not been presented.

Crossing Reference	Watercourse	Road	Span (m)	Rise (m)	Length (m)	Type/Configuration				
Scenario 1 - Spans are based on an openness ratio of 0.6										
А	Gore Trib	EW Arterial	13.88	3	69.41	Bridge				
С	Clarkway Trib	EW Arterial	26.88	3	120	Bridge				
	Scenario 2 - 40 m spans									
А	Gore Trib	EW Arterial	40	3	69.41	Bridge				
С	Clarkway Trib	EW Arterial	40	3	120	Bridge				
		Scenario 3	3 - Full spa	n of floodpl	ains					
А	Gore Trib	EW Arterial	85	3	69.41	Bridge				
С	Clarkway Trib	EW Arterial	85	3	120	Bridge				
		Scenario 4 - Spans a	re based o	n an openne	ess ratio of	1.0				
А	Gore Trib	EW Arterial	24	3	69.41	Bridge				
С	Clarkway Trib	EW Arterial	45	3	120	Bridge				
Scenario 5 – 35 m Spans										
А	Gore Trib	EW Arterial	35	3	69.41	Bridge				
С	Clarkway Trib	EW Arterial	35	4	120	Bridge				

#### Table 4-9 Proposed Culvert Configurations

#### Table 4-10 Part B Crossings - Proposed Configuration Hydraulic Performance

•	МТО	Design Criteria		Hydraulic Performance						
Crossing Reference	Design Event (Return Period)	Freeboard (m)	Clearance (m)	Design Event (Return Period)	Freeboard (m)	Clearance (m)				
Scenario 1 - Spans are based on an openness ratio of 0.6										
А	100 Year	1.00	0.30	100 Year	2.54 m	1.31 m				
С	100 Year	1.00	0.30	100 Year	5.90 m	1.01 m				
		Sc	enario 2 - 40	m spans						
А	100 Year	1.00	0.30	100 Year	2.80 m	1.70 m				
С	100 Year	1.00	0.30	100 Year	6.60 m	1.20 m				
		Scenario	3 - Full span	of floodplains						
А	100 Year	1.00	0.30	100 Year	2.64 m	1.75 m				
С	100 Year	1.00	0.30	100 Year	6.25 m	1.33 m				
	Sce	nario 4 - Spans	are based on	an openness ratio of 1.	0					
А	100 Year	1.00	0.30	100 Year	2.71 m	1.49 m				
С	100 Year	1.00	0.30	100 Year	6.19 m	1.22 m				
		Sc	enario 5 – 35	m Spans						
А	100 Year	1.00	0.30	100 Year	2.53 m	1.64 m				
С	100 Year	1.00	0.30	100 Year	5.87 m	2.15 m				

<b>C</b>	МТО	Design Criteria		Hydraulic Performance			
Reference	Design Event (Return Period)	Freeboard (m)	Clearance (m)	Design Event (Return Period)	Freeboard (m)	Clearance (m)	
В	50 Year	1.00	0.30	50 Year	1.38	0.81	
D	100 Year	1.00	0.30	100 Year	1.88	1.60	
E	100 Year	1.00	0.30	100 Year	2.07	1.31	
F	50 Year	1.00	0.30	50 Year	1.29	0	
Н	100 Year	1.00	0.30	100 Year	1.85	0.39	

Table 4-11 Part B Crossings - Proposed Configuration Hydraulic Performance

Tables 4-12 to 4-16 summarize the comparison of existing and proposed conditions along the Gore Road Tributary and the Clarkway Tributary from Castlemore Road to Mayfield Road. It is noted that there are no changes in computed water surface elevations or computed channel velocities between proposed and existing conditions downstream of Old Castlemore Road, where no changes are contemplated as part of the Area 47 development plans.

Between Old Castlemore Road and Mayfield, channel alterations are contemplated, as are new and replaced watercourse crossings at roadways (specifically crossings A, C and D). In the reaches of Gore Road Tributary and Clarkway Tributary, the reconfiguration of the HEC-RAS model to model proposed conditions does not allow direct comparison, section for section, with the existing conditions model, however, the following observations are noted:

- Between Old Castlemore Road and the new structures proposed at Arterial A2, computed water surface elevations for proposed conditions are slightly higher than those computed under existing conditions, for both Regional and 100-year flood conditions. But for both crossings, the rise remains less than 0.2 m.
- Between the new structures proposed at the intersection of Arterial A2 and the new Countryside Drive culvert, computed water surface elevations for proposed conditions are generally higher than those computed under existing conditions, for both Regional and 100-year flood conditions.

#### 4.3.3.2 Proposed Conditions Flooding Evaluation

The potential impacts of changed water surface elevations on the existing flooding risk of adjacent private properties and the land use plans approved as part of Block Plan Areas 47-1 and 47-2 planning process has been assessed. The Block Plans, in part, define the valley corridor within which the floodplain should reside. TRCA has noted that the Block Plans were developed in the 2014 time frame and are based, in part, on floodplain mapping current at that time. TRCA acknowledges that the floodplain mapping for the relevant watercourses has since been updated and has advised this EA that the Block Plans will be updated as development proceeds. As such, any comparison to the current Block Plans is considered qualitative only.

This flood risk assessment is founded on floodplain inundation limits generated using the HEC-RAS RAS-Mapper software. The flood limits are based on existing conditions flood data and the existing Digital Elevation Model (DEM) previously provided to Wood by the City. It should be noted that water surface elevations were plotted without any alterations/modifications in the DEM (therefore representing existing conditions).

Wood is not aware of the exact DEM used by TRCA to delineate their floodplain inundation limits, therefore, the comparisons illustrated on Figures 4-3 through 4-7 are considered qualitative only.

		Existing C	Conditions	Proposed	Conditions	Chan	ge in
HEC-RAS Section	Profile	W. S. Elev (m)	Vel Chnl (m/s)	W. S. Elev (m)	Vel Chnl (m/s)	W. S. Elev (m)	Vel Chnl (m/s)
1412.056	р : I	A	B	C	D	=C-A	=D-B
1413.956	Regional	220.29	0.87	220.29	0.87	0	0
1413.794	Regional	219.71	0.57	219.71	0.57	0	0
1413.674	Regional	219.22	0.86	219.22	0.85	0	-0.01
1413.411	Regional	218.4	0.84	218.4	0.85	0	0.01
1413.199	Regional	217.52	1.56	217.55	1.5	0.03	-0.06
1413.003	Regional	216.31	0.95	216.27	1	-0.04	0.05
1412.814	Regional	215.55	1.78	215.65	1.55	0.1	-0.23
1412.603	Regional	215.12	1.57	215.45	1.16	0.33	-0.41
1412.431	Regional	214.63	1.59	215.38	0.84	0.75	-0.75
1412.428	Regional	214.62	1.48	215.2	1.9	0.58	0.42
1412.42			Co	ountryside Driv	ve		
1412.412	Regional	214.28	1.63	214.23	3.53	-0.05	1.9
1412.405	Regional	213.87	1.66	213.79	1.78	-0.08	0.12
1412.236	Regional	213.23	0.96	213.23	0.96	0	0
1411.983	Regional	212.32	0.84	212.32	0.84	0	0
1411.783	Regional	211.6	2.14	211.6	2.14	0	0
1411.583	Regional	210.59	2.35	210.59	2.35	0	0
1411.383	Regional	209.67	1.99	209.67	1.99	0	0
1411.183	Regional	208.72	2.32	208.72	2.32	0	0
1410.983	Regional	207.79	2.27	207.79	2.27	0	0
1410.783	Regional	207.03	1.13	207.03	1.14	0	0.01
1410.583	Regional	205.93	2.54	205.93	2.53	0	-0.01
1410.482	Regional	205.67	0.94	205.67	0.94	0	0
1410.383	Regional	205.15	2.55	205.12	2.66	-0.03	0.11
1410.183	Regional	204.51	2	204.79	1.48	0.28	-0.52
1410.11*	Regional	204.3	1.54	204.59	1.75	0.29	0.21
1410.052		I		EW Arterial A2		I	
1410.00*	Regional	203.91	2.15	204	2.63	0.09	0.48
1409.889	Regional	203.21	1.53	203.21	1.53	0	0

#### Table 4-12 The Gore Road Tributary (Reach-1) – Comparison of Existing and Proposed Hydraulic Conditions – Regional Flood Event

	-	Existing C	onditions	Proposed	Conditions	Chan	ge in
HEC-RAS Section	Profile	W. S. Elev (m) A	Vel Chnl (m/s) B	W. S. Elev (m) C	Vel Chnl (m/s) D	W. S. Elev (m) =C-A	Vel Chnl (m/s) =D-B
1413.956	Regional	219.96	0.61	219.96	0.61	0	0
1413.794	Regional	219.44	0.4	219.44	0.4	0	0
1413.674	Regional	218.94	0.71	218.94	0.7	0	-0.01
1413.411	Regional	218.05	0.63	218.05	0.64	0	0.01
1413.199	Regional	217.15	1.33	217.15	1.31	0	-0.02
1413.003	Regional	216.01	0.71	216	0.72	-0.01	0.01
1412.814	Regional	215.09	1.63	215.1	1.6	0.01	-0.03
1412.603	Regional	214.58	1.18	214.54	1.24	-0.04	0.06
1412.431	Regional	214.06	1.33	214.16	1.38	0.1	0.05
1412.428	Regional	214.01	1.51	214.1	1.55	0.09	0.04
1412.42			Ca	ountryside Driv	ve		
1412.412	Regional	213.7	2.84	213.67	2.57	-0.03	-0.27
1412.405	Regional	213.65	1.86	213.4	1.45	-0.25	-0.41
1412.236	Regional	212.79	0.77	212.79	0.77	0	0
1411.983	Regional	211.86	0.61	211.86	0.61	0	0
1411.783	Regional	211.17	1.63	211.17	1.63	0	0
1411.583	Regional	210.19	1.76	210.19	1.76	0	0
1411.383	Regional	209.22	1.52	209.22	1.52	0	0
1411.183	Regional	208.32	1.58	208.32	1.57	0	-0.01
1410.983	Regional	207.26	1.98	207.26	1.99	0	0.01
1410.783	Regional	206.62	0.73	206.62	0.73	0	0
1410.583	Regional	205.47	2.45	205.47	2.45	0	0
1410.482	Regional	205.1	0.72	205.11	0.71	0.01	-0.01
1410.383	Regional	204.68	1.73	204.62	1.95	-0.06	0.22
1410.183	Regional	203.91	1.71	203.99	1.44	0.08	-0.27
1410.11*	Regional	203.7	1.08	203.8	1.14	0.1	0.06
1410.052			I	EW Arterial A2	2		
1410.00*	Regional	203.42	1.36	203.47	1.47	0.05	0.11
1409.889	Regional	202.57	1.74	202.57	1.74	0	0

#### Table 4-13 The Gore Road Tributary (Reach-1) – Comparison of Existing and Proposed Hydraulic Conditions – 100-Year Flood Event

		Existing Conditions		Proposed	Conditions	Change in		
HEC-RAS Section	Profile	W. S. Elev (m) A	Vel Chnl (m/s) B	W. S. Elev (m) C	Vel Chnl (m/s) D	W. S. Elev (m) =C-A	Vel Chnl (m/s) =D-B	
1511.588	Regional	211.8	2.16	211.74	0.8	-0.06	-1.36	
1511.584	Regional	211.81	1.8	211.75	0.92	-0.06	-0.88	
1511.577		L	Pri	ivate Driveway	y 4	L		
1511.572	Regional	211.74	2.05	211.56	1.46	-0.18	-0.59	
1511.568	Regional	211.74	2	211.54	0.85	-0.2	-1.15	
1511.473	Regional	211.66	0.85	211.45	1	-0.21	0.15	
1511.47	Regional	211.64	1.02	211.45	0.77	-0.19	-0.25	
1511.465			Pri	ivate Driveway	y 3			
1511.459	Regional	211.32	2.64	210.86	1.58	-0.46	-1.06	
1511.456	Regional	211.07	3.47	210.51	3.15	-0.56	-0.32	
1511.385	Regional	210.58	2.5	210.38	1.3	-0.2	-1.2	
1511.185	Regional	210.33	1.56	210.29	0.76	-0.04	-0.8	
1511.156	Regional	210.31	0.85	210.25	0.8	-0.06	-0.05	
1511.151	Regional	210.23	2.06	210.24	0.99	0.01	-1.07	
1511.145			Pri	ivate Driveway	y 2			
1511.138	Regional	209.97	1.47	209.44	2.01	-0.53	0.54	
1511.13	Regional	209.61	3.57	209.37	2.18	-0.24	-1.39	
1510.981	Regional	208.51	2.76	208.28	1.61	-0.23	-1.15	
1510.788	Regional	208.19	0.96	207.94	1.59	-0.25	0.63	
1510.693	Regional	207.77	3.01	207.55	3.2	-0.22	0.19	
1510.589	Regional	207.47	2.68	207.47	0.69	0	-1.99	
1510.56	Regional	207.4	2.34	207.44	0.87	0.04	-1.47	
1510.556	Regional	207.4	1.79	207.41	1.63	0.01	-0.16	
1510.546			Pri	ivate Driveway	y 1			
1510.54	Regional	206.98	2.07	207.06	1.91	0.08	-0.16	
1510.534	Regional	206.97	1.32	207.05	1.2	0.08	-0.12	
1510.386	Regional	206.28	2.55	206.69	1.85	0.41	-0.7	
1510.186	Regional	205.48	3.08	206.26	2.58	0.78	-0.5	
1510.123				EW Arterial A2	2			
1510.06*	Regional	205.12	2.32	205.1	4.43	-0.02	2.11	
1509.93*	Regional	204.74	2.52	204.73	2.53	-0.01	0.01	
1509.863	Regional	204.5	2.76	204.5	2.76	0	0	

# Table 4-14 Clarkway Tributary (Reach-31) – Comparison of Existing and Proposed Hydraulic Conditions – Regional Flood Event


		Existing C	onditions	Proposed	Conditions	Chan	ge in
HEC-RAS Section	Profile	W. S. Elev (m)	Vel Chnl (m/s) B	W. S. Elev (m)	Vel Chnl (m/s)	W. S. Elev (m)	Vel Chnl (m/s)
1511 588	Regional	211 17	1 15	210.75	0.46	-0.42	-0.69
1511 584	Regional	211.17	1.15	210.75	1.04	-0.45	0.04
1511.577	liegionai		Pri	vate Driveway	v 4	0110	0.01
1511.572	Regional	211.15	1.05	210.59	1.32	-0.56	0.27
1511.568	Regional	211.15	1.03	210.61	0.45	-0.54	-0.58
1511.473	Regional	211.12	0.43	210.58	0.46	-0.54	0.03
1511.47	Regional	211.12	0.53	210.58	0.36	-0.54	-0.17
1511.465			Pri	ivate Driveway	y 3	<u> </u>	
1511.459	Regional	210.17	2.18	209.84	2.55	-0.33	0.37
1511.456	Regional	209.85	3.1	209.77	2.53	-0.08	-0.57
1511.385	Regional	209.87	1.55	209.61	0.67	-0.26	-0.88
1511.185	Regional	209.78	0.78	209.57	0.36	-0.21	-0.42
1511.156	Regional	209.77	0.45	209.57	0.38	-0.2	-0.07
1511.151	Regional	209.75	1.06	209.56	0.47	-0.19	-0.59
1511.145			Pri	ivate Driveway	y 2		
1511.138	Regional	209.02	1.94	208.79	3.77	-0.23	1.83
1511.13	Regional	208.64	3.02	208.74	1.16	0.1	-1.86
1510.981	Regional	207.86	<sup>7</sup> .86 2.36 2		2.21	-0.23	-0.15
1510.788	Regional	207.42	0.82	207.23	1	-0.19	0.18
1510.693	Regional	207.14	1.83	207.1	1.49	-0.04	-0.34
1510.589	Regional	206.85	2.14	207.05	0.4	0.2	-1.74
1510.56	Regional	206.83	1.61	207.04	0.45	0.21	-1.16
1510.556	Regional	206.83	1.2	206.61	2.68	-0.22	1.48
1510.546			Pri	vate Driveway	y 1		
1510.54	Regional	206.23	3.42	206.2	3.86	-0.03	0.44
1510.534	Regional	206.32	1.26	206.3	1.29	-0.02	0.03
1510.386	Regional	205.54	1.88	205.59	1.76	0.05	-0.12
1510.186	Regional	204.87	2.02	205.06	1.83	0.19	-0.19
1510.123			I	EW Arterial A2	2		
1510.06*	Regional	204.36	2.27	204.38	2.89	0.02	0.62
1509.93*	Regional	204.01	1.78	204.01	1.78	0	0
1509.863	Regional	203.84	1.84	203.84	1.84	0	0

#### Table 4-15 Clarkway Tributary (Reach-31) – Comparison of Existing and Proposed Hydraulic Conditions – 100-Year Flood Event

		Existing C	onditions	Proposed	Conditions	Chan	ge in
HEC-RAS Section	Profile	W. S. Elev (m) A	Vel Chnl (m/s) B	W. S. Elev (m) C	Vel Chnl (m/s) D	W. S. Elev (m) =C-A	Vel Chnl (m/s) =D-B
1513.456	100-year	218.68	3.35	218.68	3.35	0	0
1513.385	100-year	218.65	1.17	218.66	1.17	0.01	0
1513.185	100-year	217.38	3.07	217.36	3.13	-0.02	0.06
1512.981	100-year	216.74	1.25	216.9	1.09	0.16	-0.16
1512.786	100-year	215.84	3.3	216.57	2.03	0.73	-1.27
1512.589	100-year	215.5	1	216.52	1.03	1.02	0.03
1512.515	100-year	215.47	1.05	216.51	0.97	1.04	-0.08
1512.512	100-year	215.43	1.69	216.49	1.19	1.06	-0.5
1512.505			Ca	ountryside Driv	ve		
1512.494	100-year	214.65	4.12	216.32	2.14	1.67	-1.98
1512.488	100-year	214.45	3.41	215.47	4.67	1.02	1.26
1512.371	100-year	214.22	0.76	215.26	1.59	1.04	0.83
1512.364	100-year	214.2	0.91	214.96	2.89	0.76	1.98
1512.356			(	Clarkway Drive	2		
1512.345	100-year	214.14	1.55	214.04	4.12	-0.1	2.57
1512.34	100-year	214.14	1.33	214.08	1.99	-0.06	0.66
1512.182	100-year	213.9	1.32	213.79	1.25	-0.11	-0.07
1511.983	100-year	213.08	1.63	212.89	1.92	-0.19	0.29
1511.898	100-year	212.74	1.31	212.61	1.03	-0.13	-0.28
1511.787	100-year	212.08	1.92	212.12	1.85	0.04	-0.07
1511.723	100-year	211.91	0.94	211.97	0.89	0.06	-0.05

## Table 4-16 Clarkway Tributary (Reach-2) – Comparison of Existing and Proposed Hydraulic Conditions – Regional Flood Event

		Existing C	Conditions	Proposed	Conditions	Change in		
HEC-RAS Section	Profile	W. S. Elev (m)	Vel Chnl (m/s)	W. S. Elev (m)	Vel Chnl (m/s)	W. S. Elev (m)	Vel Chnl (m/s)	
		A	В	С	D	=C-A	=D-B	
1513.456	100-year	218.17	2.58	218.17	2.58	0	0	
1513.385	100-year	217.97	1.13	217.98	1.12	0.01	-0.01	
1513.185	100-year	216.88	2.06	216.87	2.08	-0.01	0.02	
1512.981	100-year	216.14	1.12	216.17	1.07	0.03	-0.05	
1512.786	100-year	215.25	2.62	215.17	2.89	-0.08	0.27	
1512.589	100-year	215.04	0.66	215.12	1	0.08	0.34	
1512.515	100-year	215.03	0.6	215.11	0.88	0.08	0.28	
1512.512	100-year	215.01	1.08	215.1	0.91	0.09	-0.17	
1512.505			Co	ountryside Dri	ve			
1512.494	100-year	214.15	3.33	214.88	1.55	0.73	-1.78	
1512.488	100-year	213.94	2.46	214.48	2.92	0.54	0.46	
1512.371	100-year	213.73	0.47	213.89	2.52	0.16	2.05	
1512.364	100-year	213.64	1.35	213.92	2.03	0.28	0.68	
1512.356				Clarkway Drive	9			
1512.345	100-year	213.45	1.88	213.04	3.44	-0.41	1.56	
1512.34	100-year	213.45	1.34	213.26	1.7	-0.19	0.36	
1512.182	100-year	213.16	1.08	212.98	0.86	-0.18	-0.22	
1511.983	100-year	212.28	1.3	212.12	1.62	-0.16	0.32	
1511.898	100-year	211.96	0.94	211.85	0.76	-0.11	-0.18	
1511.787	100-year	211.31	1.61	211.2	1.9	-0.11	0.29	
1511.723	100-year	211.21	0.57	210.91	0.83	-0.3	0.26	

Table 4-17 Clarkway Tributary (Reach-2) – Comparison of Existing and Proposed Hydraulic Conditions – 100-Year Flood Event

Table 4-18 describes the four scenarios which have been evaluated with reference to floodplain comparison illustration figures and assessment outcomes. Based on ESRI Areal Imagery in ArcGIS Pro, none of the scenarios that are presented here represent a significant increased flood risk to private properties meaning, no structure/building that was located outside of the current TRCA floodplain would be located within the floodplain under any of the scenarios, however, a detailed comparison with approved Block Plans will be warranted when they are available. Notwithstanding, Scenario 3 (i.e., full span of floodplains) was found to have the least impact to the upstream computed water surface elevations and spatial extent of the floodplain. Detailed tables with water surface elevations comparisons are provided in Tables 4-14 and 4-15 in the preceding section.

Scenario	Reference Figure	Outcome
1	4-3	The resultant computed water surface elevations are approximately 1 to 2 m higher than existing TRCA floodplain conditions. As a result, the Regional Storm floodplain is significantly larger in comparison to the existing TRCA floodplain just upstream of crossings.
2	4-4	The resultant computed water surface elevations are higher by less than 1 m at Crossing A and less than 1.12 m at Crossing B. As a result, the Regional Storm floodplain is somewhat larger in comparison to the existing TRCA floodplain just upstream of crossings.
3	4-5	The resultant computed water surface elevations are essentially unchanged (less than 0.01 m) at Crossing A and less than 0.17 m higher at Crossing B. As a result, the Regional Storm floodplain is only marginally changed in comparison to the existing TRCA floodplain just upstream of crossings.
4	4-6	The resultant computed water surface elevations are higher by less than 0.70 m at Crossing A and less than 0.56 m at Crossing B. As a result, the Regional Storm floodplain is somewhat larger in comparison to the existing TRCA floodplain just upstream of crossings.
5	4-7	The resultant computed water surface elevations are higher by less than 0.29 m at Crossing A and less than 0.57 m at Crossing B. As a result, the Regional Storm floodplain is somewhat larger in comparison to the existing TRCA floodplain just upstream of crossings.

#### Table 4-18 Proposed Conditions Flood Evaluation Summary

#### 4.3.3.3 Preferred Crossing Sizing Scenario

As noted previously, the determination of a preferred crossings (A and C) scenario has been based on consideration of several factors related to potential impacts and/or issues resulting from the implementation of each scenario, namely requirements for watercourse re-alignment, floodplain impacts and hydraulic performance criteria (ref. Table 4-19).

In consideration of the evaluation criteria and information available to this assessment, Scenario 5 has been deemed to best meet the hydraulic criteria. Optimization of the design and associated cost may result in loss of developable lands to accommodate a larger floodplain.

#### 4.3.3.4 Cut/Fill Evaluation

A cut/fill evaluation was performed for Clarkway Tributary-Reach 31 for creek alignment. This creek realignment is required to accommodate the proposed 30m right-of-way for Clarkway Drive. Cut/fill totals for HEC-RAS sections are listed in Table 4-20. Figure 4-7 illustrates an example of cut/fill for a HEC-RAS section. The results along the reach are near balanced with 41,533 m<sup>3</sup> of fill and 43,425 m<sup>3</sup> of cut resulting in an excess cut of 1,892 m<sup>3</sup>.



Figure 4-3 Scenario 1 and Existing Valley Land Comparison



Figure 4-4 Scenario 2 and Existing Valley Land Comparison



Figure 4-5 Scenario 3 and Existing Valley Land Comparison



Figure 4-6 Scenario 4 and Existing Valley Land Comparison



Figure 4-7 Final Proposed Condition Floodline Map (Scenario 5)

Scenario	Basis	Need for Creek Re-Alignment	Floodplain Impacts	Hydraulic Performance (MTO Criteria)
1	Spans are based on an openness ratio of 0.6	Yes	High	Met
2	40 m spans (i.e. the largest single span structures that can be designed as a rigid frame)	Yes	Medium	Met
3	Full span of floodplains	Yes	Low	Met
4	Spans are based on an openness ratio of 1.0	Yes	Medium	Met
5	35 m spans	Yes	Medium	Met

### Table 4-19 Crossing Configurations Evaluations

#### Table 4-20 Cut/Fill Totals

		Volume (	(m <sup>3</sup> )
HEC-RAS Section	Fill	Cut	Change in Cut/Fill
	A	В	=A-B
1510.556	127	147	-20
1510.56	64	66	-2
1510.589	529	573	-44
1510.693	2,549	2,423	126
1510.788	2,582	2,648	-66
1511.13	15,339	16,520	-1,181
1511.138	408	471	-63
1511.151	886	940	-54
1511.156	1,287	1,065	221
1511.185	1,433	1,801	-368
1511.385	5,583	4,790	793
1511.456	2,528	2,567	-39
1511.459	147	186	-39
1511.47	1,160	1,514	-354
1511.473	221	160	61
1511.568	5,962	6,725	-763
1511.572	195	212	-17
1511.584	469	547	-78
1511.588	66	72	-6
Totals	41,533	43,425	-1,892



Figure 4-8 HEC-RAS section showing a cut/fill example

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### 5.0 SUMMARY AND RECOMMENDATIONS

The following conclusions and recommendations stem from the foregoing hydrologic and hydraulic assessments for the Part B right-of-ways.

#### 5.1 Summary

- 1. The right-of-ways are required to control the runoff from the 90<sup>th</sup> percentile storm event, as per the Region of Peel road reconstruction criteria.
- 2. Based on available borehole logs and groundwater information, the runoff from the 90<sup>th</sup> percentile storm event can be controlled via on-site retention by implementing Low-Impact Development Best Management Practices within the right-of-way.
- 3. The existing crossing of Clarkway Drive (F) does not meet the applicable Ministry of Transportation criteria for conveyance, and the applicable Regional Peel criteria for conveyance.
- 4. The proposed crossings of Countryside Drive (B and E) and Clarkway Drive (D) have been sized to meet the applicable Ministry of Transportation criteria for freeboard and conveyance, and the applicable Region of Peel criteria for conveyance.
- 5. The new proposed crossings of EW Arterial have been sized to meet the applicable Ministry of Transportation criteria for freeboard, clearance, and conveyance, and the applicable Region of Peel criteria for conveyance.
- 6. A comparison of computed water surface elevations and computed channel velocities under existing and proposed conditions, indicates that changes are expected, within Area 47.
- 7. A flood risk assessment of alternate crossing configurations has been completed. It has been noted that the underlying Block Plans defining the valley corridor are out of date regarding flood, but will be revised through the land development process. The assessment noted locations where the proposed floodplain extended outside of the valley corridor. However, the comparisons documented for this assessment are consider qualitative only.
- 8. A cut/fill assessment was completed for Clarkway Tributary-Reach 31 for creek alignment.

#### 5.2 Recommendations

- 1. Wood understands that multi-lateral discussions are underway but have yet not reached conclusion at the time of writing of this report. As a result, if there are any changes in the road profiles those will need to be updated to reflect correctly in the hydrologic-hydraulic modeling components and resultant calculations.
- 2. Considering the impacts on the floodplain and water surface elevations, Wood recommends that the bridge spans for the crossings A and C across EW Arterial be set to 35 m.
- 3. It is recommended that Gore Road Tributary and Clarkway Tributary Creek alterations for the reach from EW Arterial to Mayfield Road be designed to achieve a near zero change in computed results between existing and proposed conditions.

# Appendix A: Background Information

# Appendix A: Background Information

wood



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	TP115068
ECHNICAL INVESTIGATIONS	RFQ NO:
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AREA (AREA 17)	FIGURE No.
CITY OF BRAMPTON, ONTARIO	1B



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Sand and Gravel FILL moist     SS     1     83     30       213.8     213.8     0     8       dark grey     0.8     214       dark grey     0.8     214       trace sand, trace organics     SS     2       SS     2     100     38	
213.8     214       dark grey     0.8       Silty Clay / Clayey Silt FILL       trace sand, trace gravel, trace organics       SS     2       1       brown       1.5       SiLTY CLAY / CLAYEY SILT TILL       trace to sandy, trace gravel       hard	
dark grey     0.8     0.8     1       Silty Clay / Clayey Silt FILL     SS     2     100       trace sand, trace gravel, trace organics     SS     2     100       Silty Clay / Clayey Silt FilL     SS     2     100       brown     1.5     213     213       Silty CLAY / CLAYEY SILT TILL     SS     3     83       trace to sandy, trace gravel     SS     3     83	
SS 2 100 38 SS 2 100 38 SS 2 100 38 SILTY CLAY / CLAYEY SILT TILL trace to sandy, trace gravel hard SS 3 83 46 - 2	
SilTY CLAY / CLAYEY SILT TILL     1.5       trace to sandy, trace gravel     SS       hard     213	
SILTY CLAY / CLAYEY SILT TILL trace to sandy, trace gravel hard SS 3 83 46 21	
$[\chi_{\lambda}]$	
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	
grey 3 2 1	
SS 6 79 52 7 7 6 79 52 7 7 6 7 6 7 6 7 7 6 7 7 7 7 7 7 7 7 7	
209.7 SS 7 100 55 / 50 mm 55 mm 150 mm	
END OF BOREHOLE 4.9	
Wood E&IS, a Division of Wood       Image: Constant of the second s	
50 Vogell Road, Units 3 & 4 Richmond Hill, Ontario, L4B 3K6	l
Canada Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log <sup>2</sup> .	

R	ECORD OF BOREHOLE	No.	BH	<u>C6</u>								WOO	d.
Pro	ject Number: TP115086						Drilling	g Location:	Countryside	Drive E:603832 N:4852	529	Logged by: MS	
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by: SN	
Pro	ject Name: Arterial Roads within Highw Area (Area 47)	ay 427 Ir	ndustri	al Seco	ondary I	Plan	Drilling	g Machine:	Track Mount	ted Drill		Reviewed by: SM	
Pro	ject Location: Countryside Drive, Brampto	n, Ontari	io				Date	Started:	<u>Mar 25, 2020</u>	Date Completed: Ma	ar 25, 2020	Revision No.: 0, 8/	14/20
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
olot	DESCRIPTION	be	umber	(%)	3QD (%)	(r	(m) NC	Penetra O SPT D MTO Vane*	tionTesting PPT ● DCPT Nilcon Vane*	A COV (LEL) ■ TOV (LEL)     2 4 6 8     COV (ppm) □ TOV (ppm)     100 200 300 400	ENTATION	COMMENTS & GRAIN SIZE DISTRIBUTION	
Lithology I	Geodetic Ground Surface Elevation: 214.6 m	Sample T	Sample N	Recovery	SPT 'N' / F	DEPTH (r	ELEVATIO		<ul> <li>◇ Intact</li> <li>◆ Remould</li> <li>ear Strength (kPa)</li> <li>60 80</li> </ul>	Wp         W         WL           ■         ●         ●           Plastic         Liquid         20         40         60         80	INSTRUM INSTALL <sup>A</sup>	(%) r sa si	CL
	brown Sand and Gravel FILL moist	ss	1	83	11	-	-	0		3			
	brown 0 Silty Clay / Clayey Silt FILL trace sand, trace to some gravel	0 6 SS	2	88	34	- - - - - 1	214 -	0		<b>a</b>			
	213 brown213 SILTY CLAY / CLAYEY SILT TILL trace to sandy, trace gravel	4 2 SS	3	100	75	-			0	a			
21×X2	hard 213 END OF BOREHOLE 1	7					213 -						
Woo Can	ada Limited	estanding	groundv	water me	easured i	n oper	n boreho	le on completi	on of drilling.	1	<u> </u>		
50 V Rich Can	/ogell Road, Units 3 & 4 imond Hill, Ontario, L4B 3K6 ada Borehole deta a gualified Ge	ils as prese	ented, do Engineer	not cons	titute a tho	prough	understa	nding of all pote	ntial conditions pre	esent and require interpretative as	sistance from	Scale <sup>.</sup>	1:53
www	Nwoodplc.com	and the ac	company	ying'Expl	anation of	Boreh	ole Log'.		une geo			Page: 1	of 1

R	ECORD OF BOREHOLE N	о.	BH	<u>C7</u>								WOOD	9
Pro	ject Number: TP115086						Drilling	g Location:	Countryside	Drive E:603917 N:4852	640	Logged by: MS	
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm Sol	lid Stem Augers		Compiled by: SN	
Pro	ject Name: Arterial Roads within Highway Area (Area 47)	y 427 In	dustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by: SM	
Pro	ject Location: Countryside Drive, Brampton,	Ontari	0				Dates	Started:	<u>Mar 25, 2020</u>	Date Completed: Ma	ir 25, 2020	Revision No.: 0, 8/14/2	20
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	7	000000000	
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetra ○ SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Shi 20 40	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould tear Strength (kPa) 60 80	▲ COV(LEL) ■ TOV(LEL) 2 4 6 8 △ COV(ppm) □ TOV(ppm) 100 200 300 400 W <sub>p</sub> W W, ■ COV(ppm) □ TOV(ppm) 100 200 300 400 W <sub>p</sub> W W, ■ COV(ppm) □ TOV(ppm) 100 200 300 400 W <sub>p</sub> W W, ■ COV(ppm) □ TOV(ppm) 100 200 300 400 0 80	INSTRUMENTATION INSTALLATION	GRAIN SIZE DISTRIBUTION (%)	CL
***	about 100 mm ASPHALT 216.4 brown 0.1					-							
	Sand and Gravel FILL moist	SS	1	50	15	_	016	0		3			
	dark grey 0.6					ŀ	210 -						
	trace sand, trace gravel 215.5					- 1							
	brown 1.1 SILTY CLAY / CLAYEY SILT TILL	SS	2	100	16	-		0		3			
	trace to some sand, trace gravel very stiff to hard					È	215 -						
		SS	3	100	28	-		0		3			
						2							
						-							
	grey					ŀ	214 -						
	212 5	SS	4	100	32			0	· · · · · · · · · · · · · · · · · · ·	3			
AZKI	END OF BOREHOLE 3.0					- 3							
Woo Can	bd E&IS, a Division of Wood $\frac{\nabla}{\Xi}$ No frees	tanding	groundv	water me	easured	in ope	n boreho	le on completi	on of drilling.				
50 V Rich	ogell Road, Units 3 & 4												
Can Tel.	ada Borehole details No.: (905) 415-2632 Borehole details	as prese echnical E	ented, do Engineer.	not cons Also, bo	titute a th	orough formatio	understa	nding of all pote be read in conju	ntial conditions pre nction with the geo	sent and require interpretative ass technical report for which it was	istance from	Scale: 1 :	53
www	woodplc.com	anu trie ac	company	ynng⊏xpl	anduon C	- Boreh	ole rog.					Page: 1 of	f 1

R	ECORD OF BORE	HOLE N	0.	BH	<u>C8</u>								WC	bod.
Pro	ject Number: TP115086							Drilling	Location:	Countryside	Drive E:603915 N:4852	650	Logged by:	MS
Pro	ject Client: City of Brampton	า						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ondary P	lan	Drilling	Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ject Location: Countryside Driv	/e, Brampton,	Ontari	0				Date S	Started:	<u>Mar 25, 2020</u>	Date Completed: Ma	ır 25, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFIL	_E	SC	DIL SA	MPLI	NG			FIELD	TESTING				
ology Plot	DESCRIPTION		nple Type	nple Number	overy (%)	r 'N' / RQD (%)	(m) HTc	EVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ● Remould	Soli Vapour Reading           COV (LEL)         ■         TOV (LEL)           2         4         6         8           Δ         COV (ppm)         □         TOV (ppm)         100           100         200         300         400           Wp         W         WL	TRUMENTATION TALLATION	COMMEN & GRAIN SI DISTRIBUT (%)	ts Ze 10n
Lith	Geodetic Ground Surface Elevation: 216.6 n	n	San	San	Rec	SPT	DE		* Undrained She 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80		r sa	SI CL
	Sand and Gravel FIL moist	L 216.0	SS	1	42	9 -		-	0		g			
	brown SILTY CLAY / CLAYEY SIL trace to some sand, trace very stiff to hard	0.6 TTILL gravel	ss	2	100	22	- 1	216	0	····· •	g			
			ss	3	58	49		-		0	3			
X		214.8						215 -		<u> </u>				
	END OF BOREHOLE	1.8												
Woo	od E&IS, a Division of Wood	$\frac{\nabla}{\Xi}$ No freest	anding	groundw	vater me	asured in	open	boreho	le on completi	on of drilling.				
50 \	/ogell Road, Units 3 & 4						_			-				
Rich Can Tel. www	Imond Hill, Ontario, L4B 3K6 ada No.: (905) 415-2632 J.woodplc.com	Borehole details a qualified Geote commissioned a	as prese chnical E nd the ac	nted, do Engineer. company	not const Also, bo ving'Expla	itute a thor rehole infor anation of E	ough u matior Boreho	understar n should ble Log'.	nding of all poter be read in conju	ntial conditions pre nction with the geo	esent and require interpretative as technical report for which it was	istance from	Pa	Scale: 1 : 53 age: 1 of 1

R	ECORD OF BORE	HOLEN	0.	BH	<u>C9</u>								WC	bod	
Pro	ject Number: TP115086							Drilling	g Location:	Countryside	Drive E:604016 N:4852	761	Logged by:	MS	_
Pro	ject Client: City of Brampto	on						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	SN	_
Pro	ject Name: Arterial Roads v Area (Area 47)	within Highway	427 In	dustria	al Seco	ondary I	Plan	Drilling	g Machine:	Track Mount	ted Drill		Reviewed by:	SM	_
Pro	ject Location: Countryside Dri	ive, Brampton,	Ontari	0				Date	Started:	<u>Mar 25, 2020</u>	Date Completed: Ma	ar 25, 2020	Revision No.:	0, 8/14/20	-
	LITHOLOGY PROFI	LE	SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING				_
lot	DESCRIPTION	N	Эс	mber	(%	QD (%)	~	(m) N	Penetra	tionTesting PPT • DCPT	Soil Vapour Reading           ▲ COV (LEL)         ■ TOV (LEL)           2         4         6         8           △ COV (ppm)         □ TOV (ppm)         □ TOV (ppm)	ENTATION FION	COMMEN & GRAIN SI	TS ZE	
ithology P	0		Sample Ty	Sample Nu	Recovery (	SPT 'N' / R	OEPTH (m	ELEVATIO	A Intact ▲ Remould * Undrained Sh 20 40	Intact     Remould     Arrough (kPa)     60 80	Wp         W         WL           ■         ●         ●           Plastic         Liquid           20         40         60         80	NSTRUME NSTALLA	<b>DISTRIBUT</b> (%)	SI CL	
_	about 110 mm ASPH/	m ALT 218.2	0)	0)					20 40		20 40 00 00				
	Sand and Gravel FII	LL 217.9					-	218 -							
	dark grey / brown Silty Clay / Clayey Silt trace sand, trace gravel, trace	0.6 FILL e organics 217.4	SS	1	83	10	-	-	0						
	SILTY CLAY / CLAYEY SI trace to some sand, trace very stiff	LT TILL gravel 216.8	SS	2	100	20	1 - - -	217 -	0						
~*^/	END OF BOREHOL	E 1.5					-		-	· · · · · · · · · · · · · · · · · · ·					
Woo Can	od E&IS, a Division of Wood ada Limited	$\frac{\nabla}{\Xi}$ No freest	anding g	groundw	vater me	asured in	n oper	n boreho	le on completi	on of drilling.	•	• • •			٦
50 V	fogell Road, Units 3 & 4														
Can Tel. www	ada Ada No.: (905) 415-2632 /.woodplc.com	Borehole details a qualified Geote commissioned ar	as prese chnical E nd the ac	nted, do Ingineer. company	not const Also, bor /ing'Expla	itute a tho rehole info anation of	orough ormatic Boreh	understa on should ole Log'.	nding of all pote be read in conju	ntial conditions pre nction with the geo	esent and require interpretative as otechnical report for which it was	sistance from	P:	Scale: 1 : 53	3

R	ECORD OF BORI	EHOLE N	<b>0</b>	BH	C11								WO	od.
Pro	ject Number: TP115086							Drilling	g Location:	Countryside	Drive E:604113 N:4852	893	Logged by:	<u>IS</u>
Pro	ject Client: City of Brampt	on						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arterial Roads Area (Area 47)	within Highway	427 In	dustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ject Location: Countryside D	rive, Brampton,	Ontario	0				Date	Started:	<u>Mar 27, 2020</u>	Date Completed: Ma	ar 27, 2020	Revision No.: 0	, 8/14/20
	LITHOLOGY PROF	ILE	SC	NL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	_		_
thology Plot	DESCRIPTIO	N	ample Type	ample Number	ecovery (%)	N' / RQD (%)	EPTH (m)	LEVATION (m)	Penetra ○ SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Sho	tionTesting PPT • DCPT Nilcon Vane*	Solit Vapoul reading           COV (LEL)         ■ TOV (LEL)           2         4         6         8           △         COV (ppm)         □         TOV (ppm)         100         200         300         400           Wp         W         W_L         ■         ●         ●         ●         ●         ■         ●         ■         ●         ■         ●         ■         ●         ■         ■         ■         ●         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■         ■	ISTRUMENTATION ISTALLATION	GRAIN SIZI DISTRIBUTIO (%)	S E DN
Ē	Geodetic Ground Surface Elevation: 215. about 120 mm ASPH	2 m IALT 215.0_	ö	ö	Ř	S		215	20 40	60 80	20 40 60 80	<u> </u>	R 5A 51	CL
	brown Sand and Gravel F	0.1 ILL						215 -						
	moist	214.4	SS	1	83	21	-		0		3			
	dark grey / grey Silty Clay / Clayey Sil	0.8					F.	-						
	trace sand, trace to some grave	I, trace organics	SS	2	100	18	1 	214 -			3			
			00	-	100		-							
				_		_	-							
			SS	3	92	7	2							
	brown / brownish g	rey <u>212.9</u> 2.2					-	213 -						
	SILTY CLAY / CLAYEY S trace to some sand, trace	BILT TILL e gravel	22	4	100	17	_				a			
	very stiff to hard		00	7			-				• • • • • •			
							- 3							
			SS	5	100	29	-	212 -	0		g			
							-							
	arev						-							
	groy		SS	6	83	22	4 	211 -	0		3			
							-	-						
								-						
			SS	7	83	34		Z -	0		3			
XX.	END OF BOREHO	210.0 IF 5.2					- 5	210 -						
Woo	d E&IS. a Division of Wood				I						: : : :			
Can	ada Limited	≚ Groundw	ater en	counter	ed on co	ompletio	n of dri	lling on 3	<u>3/27/2020</u> at a	depth of: <u>4.9 m</u> .				
50 V Rich	ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6 ada	Borehole details	as prese	nted. do	not cone	titute a th	orough	understa	nding of all note	tial conditions pro	sent and require interpretative acc	sistance from		
Tel.	No.: (905) 415-2632 /.woodplc.com	a qualified Geote commissioned a	chnical E nd the ac	ngineer. compan	Also, bo ying'Expl	rehole in anation o	formatio f Boreho	on should ole Log'.	be read in conju	nction with the geo	technical report for which it was		Sc Page	ale:1:53 e:1 of 1

R	ECORD OF BORE	HOLE N	o. <u> </u>	BH	C12								W	000	J.
Pro	ject Number: TP115086							Drilling	Location:	Countryside	Drive E:604113 N:4852	900	Logged by:	MS	
Pro	ject Client: City of Brampton	ı						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	SN	
Pro	ject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ndary I	Plan	Drilling	Machine:	Track Mount	ted Drill		Reviewed by:	SM	
Pro	ject Location: Countryside Driv	/e, Brampton,	Ontario	0				Date S	tarted:	<u>Mar 25, 2020</u>	Date Completed: M	ar 25, 2020	Revision No.:	<u>0, 8/14/2</u>	20
	LITHOLOGY PROFIL	E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING				
tot	DESCRIPTION		be	mber	(%	QD (%)	-	(m) N	Penetra O SPT □ MTO Vane*	ationTesting PPT ● DCPT Nilcon Vane*	Soil Vapour Reading           ▲ COV (LEL)         ■ TOV (LEL)           2         4         6         8           △ COV (ppm)         □ TOV (ppm)         100         100	TION	COMMEN & GRAIN SI	TS ZE	
Lithology P	Geodetic Ground Surface Elevation: 213.6 n		Sample Ty	Sample Nu	Recovery (	SPT 'N' / R	DEPTH (m	ELEVATIO	<ul> <li>△ Intact</li> <li>▲ Remould</li> <li>* Undrained Sh 20 40</li> </ul>	<ul> <li>Intact</li> <li>Remould</li> <li>ear Strength (kPa)</li> <li>60 80</li> </ul>	Wp         W         WL           ■         ●         ●           Plastic         Liquid         20         40         60         80	INSTALLA 0	(%) r sa	si c	CL
***	about 100 mm TOPSC	NL 213.5_ 0.1					-	-							
	Sand and Gravel FIL moist	L 213.0	SS	1	75	6	-	213 —	0						
	dark brown / brown Silty Clay / Clayey Silt F trace sand, trace grav	0.6 FILL el	SS	2	100	6	- - 1		0	· · · · · · · · · · · · · · · · · · ·	3				
****	END OF BOREHOLE	1.2					-								
Woo Can	on E&IS, a Division of Wood ada Limited	$\frac{\nabla}{\overline{z}}$ No freest	anding g	groundv	vater me	asured i	n open	n boreho	e on completi	ion of drilling.					
50 V Rich	/ogell Road, Units 3 & 4 Imond Hill, Ontario, L4B 3K6														
Can Tel. www	ada No.: (905) 415-2632 /.woodplc.com	Borehole details a qualified Geote commissioned ar	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, bor ying'Expla	nute a tho ehole info anation of	orough o ormatio Boreho	understar in should ble Log'.	aing of all pote be read in conju	nual conditions pre Inction with the geo	sent and require interpretative as technical report for which it was	sistance from	Pa	Scale:1: age:1 of	53 1

R	ECORD OF BOREHOLE N	0.	BH	C13								WOOd	d.
Pro	ject Number: TP115086						Drilling	g Location:	Countryside	Drive E:604197 N:4852	992	Logged by: MS	
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm Sol	lid Stem Augers		Compiled by: SN	
Pro	ject Name: Arterial Roads within Highway Area (Area 47)	427 In	dustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by: SM	
Pro	ject Location: Countryside Drive, Brampton,	Ontari	0				Date	Started:	<u>Mar 27, 2020</u>	Date Completed: Ma	ar 27, 2020	Revision No.: 0, 8/14	/20
	LITHOLOGY PROFILE	SC	NL SA	MPLI	NG			FIELD	TESTING				
thology Plot	DESCRIPTION	ample Type	ample Number	ecovery (%)	PT 'N' / RQD (%)	EPTH (m)	LEVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Sho	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa)	Soli Vapour Reading     COV (LEL) ■ TOV (LEL)     2 4 6 8     COV (ppm) □ TOV (ppm)     100 200 300 400     Wp, W W,     ■ ● ● ●     Plastic Liquid	ISTRUMENTATION ISTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)	CI
L	Geodetic Ground Surface Elevation: 219.0 m about 140 mm ASPHALT 218.9	٥ ا	Ś	2	S	<u> </u>	ш	20 40	60 80	20 40 60 80	22 0		UL
	brown 0.1 Sand and Gravel FILL 218.5					-							
	dark brown / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics 218.1	SS	1	83	11	-		0		g			
	brown/grey 0.9 SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff to hard	SS	2	100	17	1 - - -	218 -	0		g			
		SS	3	100	23	- - - - 2	217 -	0		3			
						-							
	215.9 END OF BOREHOLE 3.0	SS	4	100	30	- - 3	216 -	0		3 · · · · · · · · · · · · · · · · · · ·			
Wo-	d F&IS a Division of Wood												
Can	ada Limited $\frac{\nabla}{=}$ No freest	anding g	groundv	vater me	easured i	n opei	n boreho	ole on completi	on of drilling.				
50 V Rich	/ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6	as proce	nted de	not conc	tituto a the	rouch	underete	nding of all poter	ntial conditions pro	sent and require interpretative or	sistance from		
Tel.	No.: (905) 415-2632 a qualified Geote woodplc.com	echnical E nd the ac	ingineer. company	Also, bo ying'Expl	rehole info anation of	Boreh	on should ole Log'.	be read in conju	nction with the geo	stechnical report for which it was		Scale: 1 Page: 1 c	:53 of1

R	ECORD OF BORE	HOLE N	<b>o</b> . <u> </u>	BH	<u>C15</u>								WC	ood.
Pro	ject Number: TP115086							Drilling	Location:	Countryside	Drive E:604285 N:4853	111	Logged by:	MS
Pro	ject Client: City of Bramptor	1						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	<u>SN</u>
Pro	oject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ndary	Plan	Drilling	Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	eject Location: Countryside Driv	e, Brampton,	Ontario	0				Date S	Started:	<u>Mar 27, 2020</u>	Date Completed: Ma	ar 27, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFIL	.E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
gy Plot	DESCRIPTION		e Type	e Number	ery (%)	' / RQD (%)	(m) H	vTION (m)	Penetra O SPT	PPT ● DCPT Nilcon Vane* ◇ Intact ● Remould		UMENTATION	COMMEN & GRAIN SI DISTRIBUT (%)	ts Ze ION
Litholo	Geodetic Ground Surface Elevation: 219.7 m about 130 mm ASPHA	<b>T</b> 219.6	Sample	Sample	Recov	SPT 'N	DEPTI	ELEV	* Undrained Sh 20 40	ear Strength (kPa)	Plastic Liquid 20 40 60 80	INSTR INSTA	R SA	SI CL
	brown Sand and Gravel FILI	- 219.2					-	-						
	moist dark grey / brown Silty Clay / Clayey Silt F trace sand, trace to some gravel, t	0.5 ILL race organique 8	SS	1	100	16	-	219 —	• • • • • • • • • • • • • • • • • • •					
	brown SILTY CLAY / CLAYEY SIL trace to some sand, trace of firm	0.9 T TILL gravel	SS	2	100	8	- - 1 -	-	0					
XX	END OF BOREHOI F	218.2					-							
Woo	d E&IS, a Division of Wood	∑ <sub>No freest</sub>	anding	aroundv	vater me	asured i	n oper	) boreho	le on complet	ion of drilling		I I		
<b>Can</b> 50 \	ada Limited /ogell Road, Units 3 & 4		unun y (	JUUIUV	ater me	asarea I	n oper	1 0010110	is on complet	on or animity.				
Rich Can Tel. www	nmond Hill, Ontario, L4B 3K6 ada No.: (905) 415-2632 v.woodplc.com	Borehole details a qualified Geote commissioned a	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, bor ying'Expla	itute a the rehole infe anation of	orough ormatio Boreho	understar on should ole Log'.	nding of all pote be read in conju	ntial conditions pre Inction with the geo	esent and require interpretative as otechnical report for which it was	sistance from	S Pa	Scale: 1 : 53 ige: 1 of 1

R	ECORD OF BOREHOLE N	0.	BH	C17								WOOD	ł
Pro	ject Number: TP115086						Drilling	g Location:	Countryside	Drive E:604386 N:4853	230	Logged by: MS	
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm Sol	lid Stem Augers		Compiled by: SN	
Pro	ject Name: Arterial Roads within Highway	427 In	dustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by: SM	
Pro	ject Location: Countryside Drive, Brampton,	Ontari	0				Date	Started:	<u>Mar 27, 2020</u>	Date Completed: Ma	ır 27, 2020	Revision No.: 0, 8/14/2	20
	LITHOLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
								Penetra	tionTesting	Soil Vapour Reading COV (LEL) TOV (LEL)	NOL		
ot	DESCRIPTION	e	nber	(%	aD (%	_	E		PPT • DCPT	2 4 6 8 △ COV (ppm) □ TOV (ppm)		GRAIN SIZE	
gy PI		le Typ	e Nui	ery (°	4' / R(	ш Н	ATIO	△ Intact ▲ Remould	<ul> <li>♦ Intact</li> <li>♦ Remould</li> </ul>	100 200 300 400 W <sub>P</sub> W W <sub>L</sub>	SUME ALLAT	DISTRIBUTION (%)	
itholo	Quadrita Quartera Flauritaria 240.0 m	Sampl	Sampl	Secov	PT 1	DEPT		* Undrained She	ear Strength (kPa)	Plastic Liquid	HSN ATSN g	R SA SI (	CL
_	about 130 mm ASPHALT 219.8	0,	0,		0,	-				20 40 00 00			
	Sand and Gravel FILL 219.5 moist 0.4					_							
	dark brown / brown	SS	1	100	11	-		0		3			
	trace sand, trace gravel, trace organics 219.0					-	219 -						
	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel	SS	2	88	14	- '		0		g			
	very stiff to hard					-							
						-							
		55	3	100	24	- 2	218 -			3			
						_							
		22	4	100	41	-				a			
		00	-	100		_				• • • • • • • • • • • • • • • • • • • •			
						- 3	217 -						
		SS	5	100	30	-		-		3			
						-							
X						-	216 -						
	grey	SS	6	50	14	- 4		0		3			
						-							
						-							
	214.9	SS	7	100	20	-	215 -	0		3			
272.83	END OF BOREHOLE 5.0					5							
Woo Can	ad E&IS, a Division of Wood $\frac{\nabla}{=}$ No freest	anding (	groundv	vater me	asured i	n ope	n boreho	le on completi	on of drilling.				
50 \ Rich	/ogell Road, Units 3 & 4 Imond Hill, Ontario, L4B 3K6												
Can Tel.	ada Borehole details No.: (905) 415-2632 Borehole details	as prese chnical E	nted, do ingineer.	not const Also, bo	titute a the rehole infe	orough ormatio	understa	nding of all poter be read in conju	ntial conditions pre nction with the geo	sent and require interpretative ass technical report for which it was	sistance from	Scale: 1 :	53
www	v.woodplc.com	ure du	sompany			20161	Long Log.					Bago: 1 of	F 4

R	ECORD OF BORE	HOLE N	0.	BH	C18								WO	od.
Pro	ject Number: TP115086							Drilling	g Location:	Countryside	Drive E:604388 N:4853	229	Logged by:	NS
Pro	ject Client: City of Bramptor	1						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ondary I	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ject Location: Countryside Driv	/e, Brampton,	Ontari	0				Date S	Started:	Apr 1, 2020	Date Completed: Ap	r 1, 2020	Revision No.:	0, 8/14/20
	LITHOLOGY PROFIL	E	SC	IL SA	MPLI	NG			FIELD	TESTING				_
hology Plot	DESCRIPTION		imple Type	imple Number	covery (%)	PT 'N' / RQD (%)	EPTH (m)	EVATION (m)	Penetra ○ SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Shu	tionTesting PPT • DCPT Nilcon Vane* • Intact • Remould ear Strength (kPa)	Soli Vapour Reading           COV (LEL)         ■ TOV (LEL)           2         4         6         8           △         COV (ppm)         □         TOV (ppm)           100         200         300         400           Wp         W         W           Plastic         Liquid	STRUMENTATION STALLATION	COMMENT & GRAIN SIZ DISTRIBUTI( (%)	S E DN
	Geodetic Ground Surface Elevation: 219.9 m brown Sand and Gravel FIL	<u>1</u>	ŝ	s	ž	-S	<u>ā</u>		20 40	60 80	20 40 60 80	<u>zz</u> G	ir sa si	CL
	moist	219.3	SS	1	88	5	-	-	0		g			
	brown SILTY CLAY / CLAYEY SIL trace to some sand, trace stiff to very stiff	0.6 <b>T TILL</b> gravel	SS	2	100	12	- - 1	219 -	0		3			
		218.1	SS	3	100	19	-	-	O		g			
CXX/	END OF BOREHOLE	1.8					-							
Woo	od E&IS, a Division of Wood		andira		ator		0.000	borch -		on of drilling				
Can	ada Limited	≚ No freest	anding (	groundw	ater me	asured in	n oper	1 boreho	ie on completi	on of drilling.				
Rich Can Tel. www	mond Hill, Ontario, L4B 3K6 ada No.: (905) 415-2632 /woodplc.com	Borehole details a qualified Geote commissioned a	as prese chnical E nd the ac	nted, do Engineer. company	not const Also, bor ring'Expla	itute a tho rehole info anation of	orough ormatio Boreho	understa on should ole Log'.	nding of all pote be read in conju	ntial conditions pre nction with the geo	sent and require interpretative ass technical report for which it was	istance from	Sc Pag	ale: 1 : 53 e: 1 of 1

R	ECORD OF BORE	HOLE N	o. <u> </u>	BH	<u>C20</u>								WC	od.
Pro	ject Number: TP115086							Drilling	Location:	Countryside	Drive E:604492 N:4853	362	Logged by:	MS
Pro	ject Client: City of Brampton	1						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ndary I	Plan	Drilling	Machine:	Track Mount	ted Drill		Reviewed by:	SM
Pro	ject Location: Countryside Driv	e, Brampton,	Ontario	0				Date S	started:	<u>Apr 1, 2020</u>	Date Completed: Ar	or 1, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFIL	.E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
ogy Plot	DESCRIPTION		le Type	le Number	rery (%)	N' / RQD (%)	H (m)	ATION (m)	Penetra ○ SPT □ MTO Vane* △ Intact ▲ Remould	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould	Soil Vapour Reading           ▲ COV (LEL)         ■ TOV (LEL)           2         4         6         8           △ COV (ppm)         □ TOV (ppm)         □ TOV (ppm)           100         200         300         400           W <sub>P</sub> W         W <sub>L</sub>	RUMENTATION	COMMENT & GRAIN SIZ DISTRIBUTI (%)	rs Ze On
itholo	0		Samp	Samp	Secov	PT 1	DEPT		* Undrained She	ear Strength (kPa)	Plastic Liquid	HISN G	R SA S	SI CL
	brown Sand and Gravel FILI moist	-	SS	1	100	16	-	220 -	0		3			
	dark grey / brown Silty Clay / Clayey Silt F	0.5 ILL					-	-						
		219.0	SS	2	67	11	- - 1 -	-	0	· · · · · · · · · · · · · · · · · · ·	g			
	END OF BOREHOLE	1.2												
SS         2         67         11          O														
Woo Can 50 V Rich Can Tel.	d E&IS, a Division of Wood ada Limited ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6 ada No.: (905) 415-2632 wooddic com	$\sum_{=}^{\underline{\nabla}} No \text{ freesta}$ Borehole details a qualified Geote commissioned ar	anding ç as presec chnical E nd the acc	proundw nted, do ngineer. company	vater me not const Also, bor ring'Expla	asured i itute a tho ehole info	n open prough o prmatio	n boreho understar n should ble Log'.	le on completi ding of all poter be read in conju	on of drilling. ntial conditions pre nction with the geo	esent and require interpretative as technical report for which it was	sistance from	s	cale: 1 : 53

R	ECORD OF BOREHOLE N	0.	BH	C21								WO	od.			
Pro	ject Number: TP115086						Drilling	Location:	Countryside	Drive E:604570 N:48534	158	Logged by:	MS			
Pro	ject Client: City of Brampton						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	SN			
Pro	ject Name: Arterial Roads within Highway Area (Area 47)	/ 427 In	dustri	al Seco	ondary	Plan	Drilling	Machine:	Track Mount	ed Drill		Reviewed by:	SM			
Pro	ject Location: Countryside Drive, Brampton,	Ontari	0				Date S	Started:	<u>Mar 27, 2020</u>	Date Completed: Ma	r 27, 2020	Revision No.:	0, 8/14/20			
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	_					
nology Plot	DESCRIPTION	mple Type	mple Number	covery (%)	T 'N' / RQD (%)	РТН (m)	EVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Sh	tionTesting PPT • DCPT Nilcon Vane* • Intact • Remould	Soli vapoul reading COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>0</sub> W W <sub>1</sub> ■ OV (PDM) Place □ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	STALLATION STALLATION	COMMENT & GRAIN SIZ DISTRIBUTI (%)	S E ON			
Lit	Geodetic Ground Surface Elevation: 221.3 m about 200 mm ASPHALT 221.1	Sai	Sai	Re	SP	DE		20 40	60 80	20 40 60 80	<u><u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u></u>	R SA S	I CL			
	brown 0.2 Sand and Gravel FILL 220.8 moiet of					-	221 —									
	dark grey / brown Silty Clay / Clayey Silt FILL trace sand trace gravel trace organics 220.4	SS	1	100	9		-	0		3 · · · · · · · · · · · · · · · · · · ·						
	brown 0:9 SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel	SS	2	100	14	1 	220 —	0		g						
X	stiff         219.7           END OF BOREHOLE         1.5					_	-									
14/-	d ERIS a Division of Wood															
Car	ada Limited $\sum_{i=1}^{N}$ No frees	tanding	groundv	water me	asured	in oper	n boreho	le on complet	on of drilling.							
Rich Car Tel	Imond Hill, Ontario, L4B 3K6 ada Borehole details No.: (905) 415-2632 a qualified Geot	as prese echnical E	ented, do Engineer.	not cons Also, bo	itute a th rehole inf	orough	understar	nding of all pote be read in conju	ntial conditions pre Inction with the geo	sent and require interpretative ass technical report for which it was	istance from	So	cale: 1 : 53			
www	.woodplc.com	and the ac	compan	ying'Expl	anation o	f Boreho	ole Log'.	-	2			Pag	e: 1 of 1			
R	ECORD OF BOREHOLE N	0.	BH	C23								WO	bod			
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Pro	ject Number: TP115086						_ Drillin	g Location:	Countryside	Drive E:604645 N:4853	563	Logged by:	MS			
Pro	ject Client: City of Brampton						_ Drillin	g Method:	150 mm Sol	lid Stem Augers		Compiled by:	SN			
Pro	ject Name: Arterial Roads within Highway Area (Area 47)	427 In	dustri	al Seco	ondary	Plan	_ Drilling	g Machine:	Track Mount	ed Drill		Reviewed by:	SM			
Pro	ject Location: Countryside Drive, Brampton,	Ontari	0				_ Date \$	Started:	<u>Mar 27, 2020</u>	Date Completed: Ma	r 27, 2020	Revision No.:	0, 8/14/20			
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING Soil Vapour Reading	z	COMMENT	s			
			er		(%)		Ē	Penetra O SPT □	tionTesting PPT • DCPT	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8	IN N		л Г			
y Plot	DESCRIPTION	Type	Numb	ry (%)	/ RQD	Ē	LION	MTO Vane* △ Intact	Nilcon Vane* ◇ Intact	△ COV (ppm) □ TOV (ppm) 100 200 300 400	LATIC	DISTRIBUTI	ON			
tholog		ample	ample	ecovel	N. To	EPTH	EVA.	<ul> <li>Remould</li> <li>* Undrained She</li> </ul>	<ul> <li>Remould</li> <li>ear Strength (kPa)</li> </ul>	W <sub>P</sub> W W <sub>L</sub> ■ ● ● ● Plastic Liquid	ISTAL	(%)				
Li	Geodetic Ground Surface Elevation: 221.3 m about 150 mm ASPHALT 221.2	Š	š	ž	S	<u> </u>		20 40	60 80	20 40 60 80		R SA S	I CL			
	brown 0.1 Sand and Gravel FILL moist					-	221 -									
	220.7 dark grey 0.6	SS	1	100	16	-		0		3						
	Silty Clay / Clayey Silt FILL 220.4 trace sand, trace gravel, trace organics 0.0					- 1										
	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel.	SS	2	100	8		220 -	0		a						
	cobbles/boulders very stiff to hard						220									
		SS	3	100	23	-		0		3						
						_ 2										
						-	219 -									
		SS	4	100	41	_		0	e	a						
						- 3										
		SS	5	100	44	_	218 -		)	g						
						-	-									
						-										
		SS	6	100	30	- 4		0	P	3						
						-	217 -									
	grey															
	216.1	SS	7	100	18	- 5				3						
~ * 42	END OF BOREHOLE 5.2															
Woo	Ded E&IS, a Division of Wood	andira	around	vator =		in or r	n horst		on of drilling	: : : :						
Can	ada Limited	anuing	yroundv	valer me	asured	п оре	II DOLEUC	ne on completi	on or anilling.							
Rich Can	mond Hill, Ontario, L4B 3K6 ada Borehole details	as prese	nted, do	not consi	titute a th	orough	understa	nding of all poter	ntial conditions pre	sent and require interpretative ass	istance from	9	cale: 1 · 53			
Tel. www	No.: (905) 415-2632 a quaimed Geote woodplc.com a commissioned a	nd the ac	company	ying'Expl	anation o	f Boreh	tole Log'.	ve redu in conju	neuon with the geo	neonitical report for which it was		Pac	ne: 1 of 1			

R	ECORD OF BOREHOLE	No.	BH	C24								wood				
Pro	ject Number: TP115086						Drilling	g Location:	Countryside	Drive E:604647 N:4853	568	Logged by: <u>MS</u>				
Pro	ject Client: City of Brampton					I	Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by: SN				
Pro	vject Name: Arterial Roads within Highv Area (Area 47)	ay 427 lı	ndustri	al Seco	ondary F	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by: SM				
Pro	oject Location: Countryside Drive, Brampto	on, Ontar	io			I	Date S	Started:	Apr 1, 2020	Date Completed: Ap	r 1, 2020	_ Revision No.: <u>0, 8/14/20</u>				
	LITHOLOGY PROFILE	S	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING Soil Vapour Reading	7	COMMENTS				
			Der		(%) (		(E)	Penetra O SPT □	tionTesting PPT ● DCPT	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8	IN IN	COMMENTS & GRAIN SIZE				
y Plot	DESCRIPTION	Type	Numt	IV (%)	/ RQI	Ē	TION	MTO Vane* △ Intact	Nilcon Vane* ◇ Intact	2 COV (ppm) 1 TOV (ppm) 100 200 300 400	JMEN LATIC	DISTRIBUTION				
tholog		ample	ample	ecove	N, Td	EPTH	LEVA.	<ul> <li>Remould</li> <li>* Undrained She</li> </ul>	<ul> <li>Remould</li> <li>ear Strength (kPa)</li> </ul>	W <sub>P</sub> W W <sub>L</sub> ■ O ● Plastic Liquid	ISTRU					
	Geodetic Ground Surface Elevation: 220.9 m brown Sand and Gravel Ell I	ů.	٥ ٥	2	S -		ш.	20 40	60 80	20 40 60 80	<u> </u>	GR SA SI CL				
	moist	SS	1	67	5		-	0		3						
	dark grey ( Silty Clay / Clayey Silt FILL	0.6					-									
	trace sand, trace gravel, trace organics	SS	2	100	15	- 1	220 -	O		g						
X	brown SILTY CLAY / CLAYEY SILT TILL	.2	_	50			-									
	cobbles/boulders	0.1	3	58			-			N						
END OF BOREHOLE 1.8																
		END OF BOREHOLE 1.8														
Woo	od E&IS, a Division of Wood	ootordin -	around	uotor		0.000-0	horsh-		on of driffing	: : : :						
Can	lada Limited	estanding	ground	water me	easured ir	1 open	poreho	ie on completi	on of drilling.							
Rich	ada Borehole del	ails as pres	ented, do	not cons	titute a tho	rough u	ndersta	nding of all pote	ntial conditions pre	sent and require interpretative as	sistance from	Sector 1 - 52				
Tel. www	No.: (905) 415-2632 a qualified G commission	eotechnical ed and the a	⊏ngineer. ccompan	. Aiso, bo ying'Expl	renole info anation of	rmation Borehol	e Log'.	pe read in conju	nction with the geo	necrinical report for which it was		Page: 1 of 1				

R	ECORD OF BOREHOLE N	<b>0</b>	BH	<u>C25</u>								WOO	d.
Pro	ject Number: TP115086						Drilling	g Location:	Countryside	Drive E:604747 N:4853	682	Logged by: MS	
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm Sol	lid Stem Augers		Compiled by: SN	
Pro	ject Name: <u>Arterial Roads within Highway</u> Area (Area 47)	427 In	dustria	al Seco	ondary F	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by: SM	
Pro	ject Location: Countryside Drive, Brampton,	Ontario	0				Date S	Started:	<u>Mar 27, 2020</u>	Date Completed: Ma	ır 27, 2020	Revision No.: 0, 8/1	4/20
	LITHOLOGY PROFILE	SC	IL SA	MPLI	NG			FIELD	TESTING				
thology Plot	DESCRIPTION	ample Type	ample Number	ecovery (%)	N' / RQD (%)	EPTH (m)	LEVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Shu	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa)	Soli Vajour Reading           COV (LEL)         ■ TOV (LEL)           2         4         6         8           Δ         COV (ppm)         □         TOV (ppm)         100         200         300         400           W <sub>p</sub> W         W <sub>c</sub> W <sub>c</sub> W <sub>c</sub> Plastic         Liquid	ISTRUMENTATION ISTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)	0
Ē	Geodetic Ground Surface Elevation: 220.9 m about 150 mm ASPHALT 220.7	ů	ŝ	Ř	л. П		<u> </u>	20 40	60 80	20 40 60 80	<u>zz</u> G	K SA SI	CL
	brown 0.1 Sand and Gravel FILL												
	220.3 dark grey 0.6 Silty Clay / Clayey Silt FILL 210.0	SS	1	100	11			0		g			
		SS	2	100	14	- 1 -	220 -	0		g			
		SS	3	100	25	- - - - 2	219 -	0		g			
						- - - -							
SS         4         100         46         218         0         a           217.8         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0         3.0													
Woo Can	d E&IS, a Division of Wood $\frac{\nabla}{\Xi}$ No freest	anding (	groundw	vater me	asured in	n oper	n boreho	le on completi	on of drilling.				
50 V Rich	ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6												
Can Tel. www	ada Borehole details No.: (905) 415-2632 woodplc.com	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, boi ying'Expla	itute a tho rehole info anation of	rough ormatio Boreho	understa on should ole Log'.	nding of all pote be read in conju	ntial conditions pre nction with the geo	sent and require interpretative as: technical report for which it was	istance from	Scale: 1 Page: 1	1:53 of 1

R	ECORD OF BORE	HOLE No	0.	BH	C27	/ B	H S	7					WC	bod
Pro	ject Number: TP115086							Drilling	Location:	Culvert at Co N:4853816	ountryside Drive E:60485	0	_ Logged by:	MS
Pro	ect Client: City of Brampton	n						Drilling	Method:	150 mm Sol	id Stem Augers		Compiled by:	<u>SN</u>
Pro	ect Name: Arterial Roads w Area (Area 47)	vithin Highway	427 In	dustria	al Seco	ondary	Plan	Drilling	Machine:	Track Mount	ed Drill		_ Reviewed by:	SM
Pro	ject Location: Countryside Driv	ve, Brampton, 0	Ontari	0				Date	Started:	<u> Mar 26, 2020</u>	Date Completed: Ma	r 26, 2020	_ Revision No.:	0, 8/14/20
	LITHOLOGY PROFIL	LE	SC	IL SA	MPLI	NG	_		FIELD	TESTING	LAB TESTING	-	0000051	<b>T</b> 0
				5		(%)		Ê	Penetra	tionTesting PPT ● DCPT	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8	ATION	COMMEN &	15
Plot	DESCRIPTION		ype	lumbe	(%)	RQD	Ê	NO	MTO Vane*	Nilcon Vane*	△ COV (ppm) □ TOV (ppm) 100 200 300 400	ATION	GRAIN SIZ	ZE ION
ology			nple T	nple N	overy	/ .N. J	РТН (	EVAT	▲ Remould	Remould	W <sub>P</sub> W W <sub>L</sub>	TALL	(%)	
Lith	Geodetic Ground Surface Elevation: 217.8 n about 130 mm ASPHA	n LT 2176	Sar	Sar	Rec	SP	DEI		20 40	ear Strengtn (kPa) 60 80	Plastic Liquid 20 40 60 80	SN G	R SA S	SI CL
	brown Sand and Gravel FIL	L <u></u>					Ē	-						
	trace to some silt moist		SS	1	83	17	_		0		a			
		216.9					-	217 -						
	dark brown / dark gre Silty Clay / Clayey Silt F some sand, trace to some gravel	y 0.9 FILL trace organics	SS	2	100	11	- 1 -				<b>1</b>			
		uude organieo	00	-	100			-						
			00		100	10	_	216 -						
			55	3	100	13	- 2		0					
	brown	<u>215.6</u> 2.2					- - -							
	SILTY CLAY / CLAYEY SIL trace to some sand, trace ( cobbles/boulders	gravel,	SS	4	21	40	-		O		a			
	hard							Z215 -						
							- 3							
			SS	5	100	59	_			•••••••••••••••••••••••••••••••••••••••	J			
		·					-	214 -						
						62/	- 4	214		62				
			SS	6	50	150mm	Ē	-		O 150 mm	3			
										55				
			SS	7	100	55 / 150mm	- -	213 -		150 mm	3			
							- 5 -							
							_							
							-	212 —						
							- 6	2.12						
	grey									_				
			SS	8	25	67	-			0				
							Ē	211 -						
							— 7 _							
							_	-						
							-	210 -						
			SS	9	100	44	- 8			)······	3			
							Ē							
							Ē							
								209 -						
							- 9 -							
			SS	10	67	50				0	a			
		208.0					-							
34/-		= 9.8								i i				
Can	ada Limited	⊈ Groundw	ater en	counter	ed on co	ompletio	n of dri	illing on <u>;</u>	<u>3/26/2020</u> at a	depth of: <u>2.7 m</u> .				
50 V Rich	ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6 ada	Borehole details	as prese	nted. do	not cons	titute a th	norouah	understa	nding of all pote	ntial conditions pre-	sent and require interpretative ass	stance from		
Tel.	No.: (905) 415-2632 woodplc.com	a qualified Geoted commissioned an	chnical E nd the ac	ingineer. company	Also, bo ving'Expl	rehole in anation o	formation formation formation formation for a second secon	on should ole Log'.	be read in conju	inction with the geo	technical report for which it was		S	cale: 1 : 53
L		1											<sup>1-</sup> a	50. I UI Z

## RECORD OF BOREHOLE No. <u>BH C27 / BH S7</u>

Project Name: Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)

Project Location: Countryside Drive, Brampton, Ontario

Project Number: TP115086

Open         Open <th< th=""><th>LITHOLOGY PROFILE</th><th>SO</th><th colspan="14">LITHOLOGY PROFILE     SOIL SAMPLING     FIELD TESTING     LAB TESTING       Soil Vapour Reading     Soil Vapour Reading     Soil Vapour Reading     Soil Vapour Reading       Renetration Testing     Soil Vapour Reading     Soil Vapour Reading     Soil Vapour Reading</th></th<>	LITHOLOGY PROFILE	SO	LITHOLOGY PROFILE     SOIL SAMPLING     FIELD TESTING     LAB TESTING       Soil Vapour Reading     Soil Vapour Reading     Soil Vapour Reading     Soil Vapour Reading       Renetration Testing     Soil Vapour Reading     Soil Vapour Reading     Soil Vapour Reading													
S         O         B         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D         D <thd< th=""> <thd< th=""> <thd< th=""> <thd< th=""></thd<></thd<></thd<></thd<>	DESCRIPTION	nple Type	nple Number	covery (%)	T 'N' / RQD (%)	PTH (m)	EVATION (m)	PenetrationTesting O SPT PPT DCPT MTO Vane* Nilcon Vane* A Intact Remould Remould Short Strendth (JRR)	Soll Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>p</sub> W W <sub>1</sub> ■ O V W <sub>1</sub>	STRUMENTATION STALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)					
	DESCRIPTION           S0 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface):           Xmd:         0.0.05 mm dia.monitoring well with flushmount protective casing installed (depth below ground surface):           Xmd:         0.0.05 mm dia.monitoring well with flushmount protective casing installed (depth below ground surface):           Xmd:         0.0.05 mm dia.monitoring well with flushmount protective casing installed (depth below ground surface):           Xmd:         0.0.05 mm dia.monitoring well with flushmount protective casing installed (depth below ground surface):           Xmd:         0.0.05 mm dia.monitoring well with flushmount protective casing installed (depth below ground surface):           Xmd:         0.0.05 mm dia.monitoring well with flushmount protective casing installed (depth below ground surface):           Xmd:         0.0.05 mm dia.monitoring well with flushmount protective casing installed (depth below ground surface):           Xmd:         0.0.05 mm dia.monitoring well with flushmount protective casing installed (depth below ground surface):           Xmd:         0.0.05 mm dia.monitoring well with flushmount protective casing installed (depth below ground surface):           Xmd:         0.0.05 mm dia.monitoring well well well well well well well wel	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80 	Son vapour recealing ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>6</sub> W W W Plastic Liquid 20 40 60 80 	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL					
Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from	Borehole details a	as prese	nted, do I	not const	itute a th	orough u	understar	ding of all potential conditions pre	seent and require interpretative ass	istance fro	om					

WOO

R	ECORD	OF BOREH	HOLE N	<b>o.</b>	BH	C29								WO	od
Pro	ject Number:	TP115086							_ Drilling	g Location:	Countryside	Drive E:604945 N:4853	935	Logged by:	MS
Pro	ject Client:	City of Brampton							_ Drilling	g Method:	150 mm Sol	lid Stem Augers		Compiled by:	SN
Pro	ject Name:	Arterial Roads wit	thin Highway	427 In	dustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ject Location:	Countryside Drive	e, Brampton,	Ontari	0				Date	Started:	<u>Mar 19, 2020</u>	Date Completed: Ma	ır 19, 2020	Revision No.:	0, 8/14/20
	LITHO	LOGY PROFIL	E	SC	NL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
					_					Penetra	tionTesting	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	NOI	COMMENT	S
đ	r	DESCRIPTION		Q	nber	(%	2D (%		E N		PPT • DCPT	2 4 6 8 △ COV (ppm) □ TOV (ppm)	ION	GRAIN SIZ	E
gy PI	-			le Typ	e Nur	ery (°	4' / R(	ш́н	ATIO	△ Intact ▲ Remould	<ul> <li>NIICON Vane"</li> <li>♦ Intact</li> <li>♦ Remould</li> </ul>	100 200 300 400 W <sub>P</sub> W W <sub>L</sub>	KUME	DISTRIBUTI (%)	ON
-itholo	Condutio Cround Su	face Elevation, 221.4 m		Sampl	Sampl	Secov	SPT "	DEPT		* Undrained Sh	ear Strength (kPa)	Plastic Liquid 20 40 60 80	NSTF NSTA	ir sa si	CL
-	abo	but 150 mm ASPHAL	T 221.2			-		_							
	∖ Sa	and and Gravel FILL moist	224:1 0.3						221 -			·····;····;····;····;····;····;····;			
	Silty	dark grey /grey Clay / Clayey Silt Fl	, LL	SS	1	100	18	-		••••••	••••	°20			
	trace sand	l, trace gravel, trace o	organics					- 1				· · · · · · · · · · · · · · · · · · ·			
				SS	2	83	11	-		0		23			
		<u></u>						-	220 -	· · · · · · · · · · · · · · · · · · ·		20			
SILTY CLAY / CLAY EXILT TILL trace to some sand, trace gravel hard SS 4 100 155/ 219 - 55 - 12 - 12 - 55 - 12 - 12 - 55 - 12 - 12															
X		hard			_			2				15			
X							55/	_	219 -		55_				
				SS	4	O 150 mm	13 13								
								_							
				SS	5	100	50 /	- 3		5	0	3 0.			
							TUUMM	-	218 -		100 mm	12			
X								-		· · · · · · · · ·					
X		grey		SS	6	100	50 / 100mm	- 4	-	5	0	3 O			
								-							
								_	217 -						
			216.5	SS	7	100	74 / 150mm				74 0 150 mm	12			
~	E	ND OF BOREHOLE	4.9								100 11				
Woo	od E&IS, a Divisio ada Limited	n of Wood	$\frac{\nabla}{\Xi}$ No freest	anding g	groundv	water me	easured	in ope	n boreho	ble on completi	on of drilling.				
50 \	/ogell Road, Units	3 & 4	-												
Can	imona Hill, Ontario iada No : (905) 415 26	0, L4B 3K6	Borehole details a qualified Geote	as prese chnical E	nted, do ngineer.	not cons Also, bo	titute a th rehole inf	orough	understa on should	nding of all poter be read in coniu	ntial conditions pre nction with the geo	sent and require interpretative ass technical report for which it was	istance from	Sc	ale: 1 : 53
www	v.woodplc.com		commissioned a	nd the ac	company	ying'Expl	anation o	f Boreh	nole Log'.					Pag	e∙1 of 1

R	ECORD OF BOREH	IOLE N	<b>o.</b> _	BH	<u>C30</u>													W	00	О.
Pro	oject Number: TP115086							Drilling	g Loca	tion:	<u>Cou</u>	ntryside	Drive	E:604	944 N:485	3931	Log	ged by:	MS	
Pro	oject Client: City of Brampton							Drilling	g Meth	od:	150	mm So	lid Sten	n Auge	ers		Co	mpiled by:	SN	
Pro	bject Name: Arterial Roads wit	hin Highway	427 in	dustria	al Seco	ndary	Plan	Drilling	g Mach	nine:	Trac	k Moun	ted Drill				Rev	viewed by:	SM	
Pro	oject Location: Countryside Drive	, Brampton, (	Ontario	0				Date S	Started	l:	Mar	19, 2020	)Da	te Cor	mpleted: <u>N</u>	lar 19, 20	20 Rev	vision No.:	<u>0, 8/1</u>	4/20
	LITHOLOGY PROFILI	=	SO	IL SA	MPLI	NG			FI	ELD	TEST	ING	LA	B TE	STING					
						%)		2	F	Penetra	tionTe	sting	So ▲ COV	il Vapour (LEL)	■ TOV (LEL	NOIL	(	COMMEN &	ITS	
lot	DESCRIPTION		be	umber	(%)	Rad (	Ê	L) NO	MTO	U ⊔ Vane*	Nilco	DCPT     Nane*	△ COV	7 (ppm) 200	□ TOV (ppm 300 400			GRAIN S		
logy F			ple Ty	ple Nu	very (	'N' / F	TH (n	VATIC	∆ Int ▲ Re	act emould	♦ li ♦ F	ntact Remould	W <sub>P</sub>	W	WL	RUM ALLA		(%)		
Litho	Geodetic Ground Surface Elevation: 221.0 m		Sam	Sam	Reco	SPT	DEP	ELE	* Undra 20	ined She	ear Strer 60	ngth (kPa) 80	Plasti 20	ic 40	Liquid 60 80	LSNI	GR	SA	SI	CL
	brown Sand and Gravel FILL	220.7	22	1	83	10	-													
	dark grey /brown Silty Clay / Clayey Silt Fil	0.ð	00		00	10	-	-												
	trace sand, trace gravel, trace c	rganics					_	-												
		210.0	SS	2	100	19	- 1	220 -												
Â	brown SILTY CLAY / CLAYEY SILT	1.2 TILL					_	-												
	trace to some sand, trace gr very stiff	avel	SS	3	25	17	_		0				a · · · · · · · · · · · · · · · · · · ·							
XX	END OF BOREHOLE	219.2 1.8						-								-				
													-							
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Wo Car	od E&IS, a Division of Wood nada Limited	$\frac{\nabla}{\overline{=}}$ No freesta	anding g	groundv	vater me	asured	in oper	n boreho	ole on co	ompleti	on of d	rilling.								
50 N Rich	/ogell Road, Units 3 & 4 hmond Hill, Ontario, L4B 3K6																			
Car Tel. www	nada No.: (905) 415-2632 v.woodplc.com	Borehole details a a qualified Geoteo commissioned an	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, bor /ing'Expla	itute a the rehole inf anation of	orough ormatic f Boreh	understa on should ole Log'.	nding of be read	all poter in conju	ntial cor nction v	ditions pre vith the geo	esent and r otechnical	equire in report fo	nterpretative a or which it was	ssistance fro	om	P	Scale: ′ age: 1	1:53 of 1

R	ECORD OF BOREHOLE N	0.	BH	C31									WOO	bd.
Pro	ject Number: TP115086						Drilling	g Location:	Countryside	Drive E:60	5023 N:4854	)46	Logged by: MS	
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm So	lid Stem Auç	gers		Compiled by: SN	
Pro	ject Name: Arterial Roads within Highway Area (Area 47)	/ 427 In	dustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ted Drill			Reviewed by: SM	<u> </u>
Pro	ject Location: <u>Countryside Drive, Brampton,</u>	Ontari	0				Date S	Started:	<u>Mar 19, 2020</u>	Date Co	ompleted: Ma	r 19, 2020	Revision No.: 0,8	3/14/20
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TI Soil Vapo		7	COMMENTS	
nology Plot	DESCRIPTION	mple Type	mple Number	covery (%)	T 'N' / RQD (%)	PTH (m)	EVATION (m)	Penetra ○ SPT □ MTO Vane* △ Intact ▲ Remould	tionTesting PPT • DCPT Nilcon Vane* • Intact • Remould	▲ COV (LEL) 2 4 △ COV (ppm) 100 200 W <sub>p</sub> V ■	■ TOV (LEL) 6 8 □ TOV (ppm) 300 400 N W <sub>L</sub>	STALLATION STALLATION	GRAIN SIZE DISTRIBUTION (%)	I
Lit	Geodetic Ground Surface Elevation: 221.7 m about 150 mm ASPHALT 221.6	Sa	Sa	Re	SР	B		20 40	60 80	20 40	60 80	<u> </u>	r sa si	CL
	brown 0.1 Sand and Gravel FILL					-	-							
	moist 221.1	ss	1	83	11	-	-	0		o 5				
	Silty Clay / Clayey Silt FILL					-	221 -			°12				
	g g g		2	100		- 1	-							
	220.2	33	2	100	5	- 7				ີ 21				
	brown 1.5 SILTY CLAY / CLAYEY SILT TILL						220 –							
X	trace to sandy, trace gravel hard	SS	3	100	38	- 2				15				
						_								
		SS	4	100	94	-			O	a o,_				
						-	219 -			15				
XX	218.7 END OF BOREHOLE 3.0					- 3								
Woo	od E&IS, a Division of Wood $\nabla$ Groundy	l water en	l counter	ed on co	mpletion	1 of dri	illina on f	3/19/2020 at a	depth of: 15 m	. 🖪 Cave in	1 depth after ren	loval of augers	: 2.7 m.	
<b>Can</b> 50 \	ada Limited = Groundw /ogell Road, Units 3 & 4		Joannel	54 011 00		. or ull		<u></u> al a	_ 5p a. ol. <u>_1.0 III</u>		. separater reli		- <u></u>	
Rich Can	mond Hill, Ontario, L4B 3K6 ada Borehole details	as prese	nted, do	not cons	titute a the	orough	understa	nding of all poter	ntial conditions pre	esent and require	interpretative ass	istance from	Scale	. 1 . 53
Fel.	NO.: (905) 415-2632 a qualified Geote commissioned a	ind the ac	company	ying'Expl	anation of	Boreh	ole Log'.	se reau in conju	nouon with the geo	Accumical report	TO WHICH IT Was		Deve	4 - 6 4

R	ECORD OF BOREHO	DLE No.	. <u>E</u>	3H (	C32								WO	od.
Pro	ject Number: TP115086							Drilling	Location:	Countryside	Drive E:605023 N:4854	047	Logged by:	MS
Pro	ject Client: City of Brampton							Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arterial Roads within Area (Area 47)	n Highway 42	?7 Inc	dustria	I Seco	ndary F	Plan	Drilling	Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ject Location: Countryside Drive, E	Brampton, On	itario	)				Date S	Started:	<u>Mar 19, 2020</u>	Date Completed: Ma	r 19, 2020	Revision No.:	0, 8/14/20
	LITHOLOGY PROFILE		SO	IL SA	MPLI	NG			FIELD	TESTING				
ogy Plot	DESCRIPTION	i i	le Type	le Number	/ery (%)	N' / RQD (%)	(m) H	ATION (m)	Penetrat O SPT □ MTO Vane* △ Intact ▲ Remould	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould	Soil Vapour Reading           ▲ COV (LEL)         ■ TOV (LEL)           2         4         6         8           △ COV (ppm)         □ TOV (ppm)         □ TOV (ppm)           100         200         300         400           W <sub>p</sub> W         W <sub>L</sub>	RUMENTATION ALLATION	COMMENT & GRAIN SIZ DISTRIBUTI (%)	'S IE ON
Lithold	Geodetic Ground Surface Elevation: 221.7 m		Samp	Samp	Recov	SPT '	DEPT	ELEV	* Undrained She 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80	HISNI GF	R SA S	I CL
	brown Sand and Gravel FILL moist	s	ss	1	50	8		-	0		3			
	dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace orga	221.1 0.6 anics S	ss	2	100	13	- 1	221	0		<b>1</b> · · · · · · · · · · · · · · · · · · ·			
	brown SILTY CLAY / CLAYEY SILT TII trace to sandy, trace gravel hard	220.5 1.2 LL S	SS	3	100	33			0		3			
XX	END OF BOREHOLE	219.8 1.8												
L														
Woo Can	od E&IS, a Division of Wood ada Limited	⊻ No freestand	ding g	roundw	ater me	asured ir	n oper	n boreho	le on completio	on of drilling.				
50 \ Rich	/ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6													
Can Tel. www	ada Bo No.: (905) 415-2632 woodplc.com	rehole details as p ualified Geotechni mmissioned and th	oresen ical Er he acc	ted, do r ngineer. company	not const Also, bor ing'Expla	itute a tho ehole info ination of	rough rmatic Boreh	understar on should ole Log'.	iding of all poter be read in conju	ntial conditions pre nction with the geo	sent and require interpretative ass stechnical report for which it was	istance from	So Pag	cale: 1 : 53 je: 1 of 1

R	ECORD OF BOREHOLE N	0.	BH	C33								W	000	J.
Pro	ject Number: TP115086						Drilling	Location:	Countryside	Drive E:605131 N:4854	170	Logged by:	MS	
Pro	ject Client: City of Brampton						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	SN	_
Pro	ject Name: Arterial Roads within Highway Area (Area 47)	427 In	dustri	al Seco	ondary	Plan	Drilling	Machine:	Track Mount	ed Drill		_ Reviewed by:	SM	—
Pro	ject Location: Countryside Drive, Brampton,	Ontari	0				Date S	Started:	<u>Mar 19, 2020</u>	Date Completed: Ma	ar 19, 2020	_ Revision No.:	<u>0, 8/14/2</u>	<u>:0</u>
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	_			
t	DECODIDEION		ber	_	D (%)		Ē	Penetra O SPT □	tionTesting PPT ● DCPT	COV (LEL) ■ TOV (LEL)     2 4 6 8     COV (nnm) □ TOV (nnm)	UTATION	COMMEN & GRAIN SI	ITS IZE	
gy Plo	DESCRIPTION	e Type	e Num	%) (ve	' / RQ	(ш) т	TION	MTO Vane* △ Intact	Nilcon Vane* ◇ Intact	100 200 300 400 W <sub>P</sub> W W	LLATI	DISTRIBUT	TION	
itholog		ample	ample	(ecove	N' TQ	EPT	ILE VA	* Undrained Sh	ear Strength (kPa)	Plastic Liquid	NSTR NSTAI	R SA	SI C	CL
	Geodetic Ground Surface Elevation: 221.8 m about 100 mm ASPHALT 221.7 brown 0.1	0	0	<u> </u>	0		<u> </u>	20 40	00 80	20 40 60 80	== -			
	Sand and Gravel FILL 221.3 moist					_	-							
	dark grey / brown Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics 220.9	SS	1	83	12		221 -	0		3				
	brown 0.9 SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	SS	2	100	22	1 	-	0		g				
XX)	220.2 END OF BOREHOLE 1.5						-							
Woo	d E&IS. a Division of Wood						. h !	<u> </u>						_
Can	ada Limited	anding	groundv	vater me	asured	in oper	1 boreho	ie on complet	ion of drilling.					
50 \ Rich Can	imond Hill, Ontario, L4B 3K6 ada Borehole details	as prese	nted, do	not const	itute a th	orouah	understa	nding of all pote	ntial conditions pre	sent and require interpretative as	sistance from			_
Tel.	No.: (905) 415-2632 a qualified Geote commissioned a	chnical E nd the ac	ngineer. compan	Also, bo ying'Expl	rehole inf anation o	ormatio f Boreho	n should ble Log'.	be read in conju	inction with the geo	technical report for which it was		Pi	Scale: 1 : { age: 1 of	53 1

R	ECORD OF BOREH	OLE N	0.	BH	<u>C35</u>								WC	000	٥.
Pro	ject Number: TP115086							Drilling	g Location:	Countryside	Drive E:605211 N:4854	296	Logged by:	MS	
Pro	ject Client: City of Brampton							Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	SN	
Pro	ject Name: Arterial Roads with Area (Area 47)	in Highway	427 in	dustri	al Seco	ndary	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by:	SM	
Pro	ject Location: Countryside Drive,	Brampton,	Ontario	0				Date	Started:	<u>Mar 19, 2020</u>	Date Completed: Ma	ır 19, 2020	Revision No.:	<u>0, 8/14/</u>	/20
	LITHOLOGY PROFILE		SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING				
						(%		2	Penetr	ationTesting	Soil Vapour Reading COV (LEL) TOV (LEL)	NOIT	COMMEN &	TS	
lot	DESCRIPTION		be	mber	(%	S) CD	ê	L)	O SPT	PPT ● DCPT		TION	GRAIN SI		
ogy F			ole Ty	ole Nu	very (	N'/ R	л) Н	ATIC	△ Intact ▲ Remould	<ul> <li>♦ Intact</li> <li>♦ Remould</li> </ul>	W <sub>P</sub> W W <sub>L</sub>	ALLA	(%)		
Lithol	Geodetic Ground Surface Elevation: 220.6 m		Sam	Sam	Reco	SPT	DEP.	ELEY	* Undrained S 20 4	hear Strength (kPa) 0 60 80	Plastic Liquid 20 40 60 80	LSNI G	R SA	SI	CL
****	about 100 mm ASPHALT brown	220.5 0.1					-								
	Sand and Gravel FILL moist	220.2					-								
	dark grey /brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	- 219.7	SS	1	100	10	_	220 -	0		3				
	brownish grey SILTY CLAY / CLAYEY SILT T trace to some sand, trace grav	0.9 TILL vel	SS	2	100	45	- 1 -			0	3				
XX	hard	219.1													
	END OF BOREHOLE	1.5													
Woo Can	od E&IS, a Division of Wood ada Limited	$\frac{\nabla}{=}$ No freest	anding g	groundv	vater me	asured	in oper	n boreho	le on comple	tion of drilling.		- I			
50 V Rich	/ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6														
Can Tel. www	ada B No.: (905) 415-2632 a wwoodplc.com co	orehole details qualified Geote ommissioned ar	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, bor ying'Expla	itute a th rehole inf anation o	orough ormatic f Boreh	understa on should ole Log'.	nding of all pot be read in conj	ential conditions pre unction with the geo	sent and require interpretative as: technical report for which it was	sistance from	Pa	Scale:1: age:1 c	:53 of1

R	ECORD OF BOREHC	DLE No	0.	BH	C37								WC	ood.
Pro	oject Number: TP115086							Drilling	g Location:	Countryside	Drive E:605295 N:4854	406	Logged by:	MS
Pro	oject Client: <u>City of Brampton</u>							Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	oject Name: Arterial Roads within Area (Area 47)	Highway	427 in	dustri	al Seco	ndary	Plan	Drilling	g Machine:	Track Mount	ted Drill		Reviewed by:	SM
Pro	iject Location: Countryside Drive, B	rampton, (	Ontario	0				Date	Started:	<u>Mar 19, 2020</u>	Date Completed: Ma	ır 19, 2020	Revision No.:	0, 8/14/20
	LITHOLOGY PROFILE		SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
						(%		2	Penetra	tionTesting	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	NOIT		TS
lot	DESCRIPTION		be	mber	(%	OD (°	Ê	L)	O SPT □ MTO Vane*	PPT   DCPT  Nilcon Vane*		TION	GRAIN SI	ZE
ogy F			ole Ty	ole Nu	very (	N'/ R	۳ ۲	ATIC	△ Intact ▲ Remould	<ul> <li>Intact</li> <li>Remould</li> </ul>	W <sub>P</sub> W W <sub>L</sub>	ALLA	(%)	
Litho	Geodetic Ground Surface Elevation: 220.0 m		Sam	Sam	Reco	SPT	DEP.	ELEY	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80	LSNI G	R SA	SI CL
***	about 90 mm ASPHALT brown	220.0- 0.1					-							
	Sand and Gravel FILL moist	219.6 0. <del>4</del>					-							
	brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	219.1	SS	1	100	16	-	-	0		<b>a</b>			
	brown SILTY CLAY / CLAYEY SILT TIL trace to some sand, trace grave hard	0.9 L I	SS	2	83	47	1  	219 -		0				
XX	END OF BOREHOLE	218.5 1.5					-							
Woo Can	od E&IS, a Division of Wood	Z No freesta	anding g	groundv	vater me	asured	in oper	n boreho	le on complet	on of drilling.				
50 N Rich	/ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6	abola dec 1		ntod 1	not · · ·	i			nding of all and	ntial agentities of	next and post-in- inter-sect of	intener for a		
Can Tel. www	ada Borr No.: (905) 415-2632 a qu v.woodplc.com	alified Geoted	as prese chnical E nd the ac	ntea, do ingineer. company	Also, boi /ing'Expla	nute a th rehole inf anation o	formatic formatic f Boreh	understa on should ole Log'.	be read in conju	inction with the geo	sent and require interpretative as stechnical report for which it was	istance from	Pa	Scale: 1 : 53 age: 1 of 1

R	ECORD OF BOREHOLE N	<b>o.</b> [	BH :	<u>S8</u>								WO	od
Proj	ect Number: TP115086					Drilling	Location:	Culvert at Co	ountryside Drive E:6048	54	Logged by:	MS	
Proj	ect Client: City of Brampton						Drilling	Method:	N:4853824 150 mm Sol	lid Stem Augers		Compiled by:	SN
Proj	ect Name: Arterial Roads within Highway Area (Area 47)	427 In	dustria	al Seco	ondary	Plan	Drilling	Machine:	Track Mount	ed Drill		Reviewed by:	SM
Proj	ect Location: Countryside Drive, Brampton,	Ontario	<b>b</b>				Date S	Started:	<u>Mar 26, 2020</u>	Date Completed: Ma	ar 26, 2020	Revision No.:	0, 8/14/20
	LITHOLOGY PROFILE	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
Plot	DESCRIPTION	be	umber	(%)	(%)	(-	(m) NO	Penetra ○ SPT □ MTO Vane*	ationTesting PPT ● DCPT Nilcon Vane*	Soil Vapour Reading           COV (LEL)         ■         TOV (LEL)           2         4         6         8           △         COV (ppm)         □         TOV (ppm)           100         200         300         400	TION	COMMENT & GRAIN SIZ	S E
ology F		(T aldr	JDIe Nu	overy	'N' / F	TH (n	VATIC	<ul> <li>△ Intact</li> <li>▲ Remould</li> </ul>	<ul><li>♦ Intact</li><li>♦ Remould</li></ul>	W <sub>P</sub> W W <sub>L</sub>	TALLA	(%)	
Lithe	Geodetic Ground Surface Elevation: 219.5 m	San	San	Reo	SPT	DEF		* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80		R SA SI	CL
	about 140 mm ASPHAL1 219.4 brown 0.1					-	-						
	trace to some silt moist	SS	1	42	15	-	219 -	0					
	dark brown 0.9 Silty Clay / Clayey Silt FILL some sand, trace to some gravel, trace organics	SS	2	92	6	1   		0					
	217.3	SS	3	83	6	2		0					
	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders hard	SS	4	100	56	- <u>-</u>	Z - - 217 -		0				
		SS	5	33	45	- 3 	216 -		<b>D</b>				
		SS	6	100	72 / 150mm	- - - 4	-		72 0 150 mm				
	trace to some shale fragments	SS	7	100	50 / 80mm		215 -	e	50 80 mm				
						- 5 - - - - -	214 —						
	grey	SS	8	100	60	- 6	213 -		0				
						- - - 7 - -	-						
		SS	9	100	31	- - - -	212	O		3			
							211 -						
						- - - 9 -	-						
	209.9 END OF BOREHOLE 9.7	SS	10	100	50		210 -		.0	a			
Woo	d E&IS, a Division of Wood Z Groundwa	ater en	counter	ed on co	mpletio	n of dri	lling on '	)/26/2020 at a	depth of 24 m		1 1		
Cana 50 V	bgell Road, Units 3 & 4		Santon					<u></u>					
Rich Cana Tel. I www	nond Hill, Ontario, L4B 3K6 Ida loc: (905) 415-2632 woodplc.com	as prese chnical E nd the ac	nted, do ngineer. company	not const Also, bo ving'Expla	itute a the rehole inf anation of	orough ormatio f Boreho	understa on should ole Log'.	nding of all pote be read in conju	ntial conditions pre Inction with the geo	sent and require interpretative as technical report for which it was	sistance from	So	ale: 1 : 53 e: 1 of 2

## RECORD OF BOREHOLE No. BH S8

Project Number: TP115086

Project Name: Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)

Project Location: Countryside Drive, Brampton, Ontario

	LITHOLOGY PROFILE	SO	IL SA	MPLI	NG			FIELD TESTING	LAB TESTING		
gy Plot	DESCRIPTION	e Type	e Number	(%) Xıə	' / RQD (%)	H (m)	ATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact A Removid ● Removid	Soil Vapour Reading           COV (LEL)         ■         TOV (LEL)           2         4         6         8           △         COV (ppm)         □         TOV (ppm)         100         200         300         400           W <sub>p</sub> W         W <sub>i</sub> W <sub>i</sub> W <sub>i</sub> W <sub>i</sub> W <sub>i</sub>	UMENTATION LLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
itholo		Sample	Sample	Recovi	N' TAS	DEPTI	ILE V	* Undrained Shear Strength (kPa)	Plastic Liquid	NSTR NSTA	GR SA SI CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground	0	0	Ľ.	0	0	ш				
	Sand: 0.0 - 0.6 m										
	Bentonite: 0.6 - 5.8 m Sand Filter: 5.8 - 6.1 m Screen: 6.1										
	Borehole details a qualified Geote commissioned a	as prese chnical E nd the ac	nted, do i ingineer. company	not const Also, bor ring'Expla	itute a the rehole information of	orough u ormation f Borehol	nderstar should le Log'.	ding of all potential conditions pre be read in conjunction with the geo	sent and require interpretative ass technical report for which it was	istance fro	Scale: 1 : 53

WOO

RE	CORD OF BOREHOLE	No.	BH	<u>S9</u>								wood
Proje	ect Number: TP115086						_ Drilling	Location:	Culvert at Co N:4852848	ountryside Drive E:604080	Logge	d by: <u>MS</u>
Proje	ect Client: City of Brampton						Drilling	Method:	150 mm Sol	id Stem Augers	Compi	led by: SN
Proje	Arterial Roads within Highw Area (Area 47) ect Location: <u>Countryside Drive, Brampto</u>	ay 427 Ir n, Ontari	io	al Seco	ondary	Plan	_ Drillinę _ Date \$	Machine: Started:	Track Mount Mar 18, 2020	ed DrillDate Completed: Mar	Review 18, 2020 Revision	ved by: <u>SM</u> on No.: <u>0, 8/14/20</u>
	LITHOLOGY PROFILE	s	DIL SA	AMPLI	NG			FIELD	TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained She 20 40	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould tear Strength (kPa) 60 80	Soll Vapour Reading           ▲ COV (LEL)         ■ TOV (LEL)           2         4         6         8           △ COV (ppm)         □ TOV (ppm)         100         TOV (ppm)           100         200         300         400           Wp         W         W_L           ■         ●         ●           Plastic         Liqud         20           20         40         60	NOTTATILIA CO NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTTATILIAN NOTT	MMENTS & AIN SIZE RIBUTION (%) SA SI CL
***	about 150 mm ASPHALT214	.3 .2				_						
	Sand and Gravel FILL trace to some silt moist dark brown Silty Clay / Clayeg Silt FILL trace to some gravel	3 SS	1	100	9	-	214 -	0		19 · · · O <sub>1</sub> 9		
	uace to some sand, trace to some graver	SS	2	83	8		213 -	0		23		
	212 brown to grey 1 SILTY CLAY / CLAYEY SILT TILL	.6 .8 SS	3	100	7	- - - - 2		0		°19 °15		
	trace to some sand, trace to some gravel, cobbles/boulders firm to hard	SS	4	100	53		212 -		0	<sup>3</sup> 0 <sub>18</sub>		
	grey					- 						
		SS	5	100	19 50 /	-	211 -	5	i0 C	14		
					30mm	- - 4 - -	210		. 30 mm			
		SS	7	100	50 / 80mm	- - -	210 -	5	0 0 80:mm	9 9		
						-	209 -					
		SS	8	100	<u>50/</u>	- 6		5	i0.	9 O.		
					TUUMM	-	208 -		100 mm	11		
						- - - 7 -						
		SS	9	100	65 / 150mm		207 -		65 150 mm	° 014		
						8	206 -					
						9						
	END OF BOREHOLE	.0 SS .4	10	100	65 / 150mm	-			65 0 150 mm	15		
West												
Cana	da Limited $\sum_{i=1}^{N} No \text{ fre}$	estanding	ground	water me	easured	in ope	n boreho	le on completi	on of drilling.			
Richr Cana Tel. N www.	ond Hill, Ontario, L4B 3K6 da lo.: (905) 415-2632 woodplc.com	ils as prese otechnical I d and the ad	ented, do Engineer ccompan	not cons Also, bo ying'Expl	titute a th rehole inf anation o	orough formati f Boreh	understa on should iole Log'.	nding of all poter be read in conju	ntial conditions pre nction with the geo	sent and require interpretative assist technical report for which it was	tance from	Scale: 1 : 53 Page: 1 of 1

RECORI	O OF BOREHOLE N	0.	BH	<u>S10</u>								WC	bo
Project Numbe	TP115086						Drilling	g Location:	Culvert at Co	ountryside Drive E	604082	Logged by:	MS
Project Client:	City of Brampton						Drilling	g Method:	150 mm Sol	id Stem Augers		_ Compiled by:	SN
Project Name:	Arterial Roads within Highway Area (Area 47)	427 In	dustria	al Seco	ondary	Plan	Drilling	g Machine:	Track Mounte	ed Drill		_ Reviewed by:	SM
Project Location	n: Countryside Drive, Brampton,	Ontari	0				Date S	Started:	<u>Mar 18, 2020</u>	Date Completed	i: <u>Mar 18, 2020</u>	_ Revision No.:	<u>0, 8/14/20</u>
LIT	HOLOGY PROFILE	SC	NL SA	MPLI	NG			FIELD	TESTING	LAB TESTING Soil Vapour Reading		COMMENT	rs
			ber		(%) C		Ē	O SPT □	PPT   DCPT	▲ COV (LEL) ■ TOV 2 4 6 ▲ COV (norm) □ TOV		& GRAIN SIZ	Έ
Jy Plot	DESCRIPTION	e Type	Mumt	iry (%)	' / RQI	٦ E	TION	MTO Vane* △ Intact	Nilcon Vane* ◇ Intact	100 200 300 4		DISTRIBUTI	ON
	d Ourferer Flaurtiene 040.0 m	Sample	Sample	Recove	N' TAS	DEPTH		* Undrained Sh	ear Strength (kPa)	Plastic Liq		GR SA S	SI CL
	about 150 mm ASPHALT 213.6 m	0)	0)		0)	-				20 40 00 0			
$\otimes$	Sand and Gravel FILL 0.3 trace to some silt					-							
	brown Silty Clay / Clayey Silt FILL	SS	1	100	7	-	213 -	0		<sup>0</sup> 16			
	trace to some gravel		_			1 1							
	212.3	SS	2	100	9	-		0		°22			
SIL	brown to grey 1.5 TY CLAY / CLAYEY SILT TILL		2	02	10	_	212 -						
trace to	cobbles/boulders very stiff to hard	55	3	83	19	2				18			
						-							
		SS	4	75	25	-		0	25	<sup>3 0</sup> 15			
						- - - 3	211 -						
	grey	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	5	100	15	-							
		33	5	100	15	-			10	12			
		SS	6	100	64 / 150mm	-	210 -		64 150 mm	10 <sub>8</sub>			
						- 4 - -			150 mm	0			
						-							
		SS	7	100	53 / 150mm	-	209 -		53 150 mm	16			
						- 5	-						
						-	208 -						
					62/	6	200		62				
		SS	8	100	150mm	-			0 150 mm	19 19			
						-							
						- - - 7	207 -						
						-	-						
				100	75/	-	-		75				
		55	9	100	150mm	-	206 -		150 mm	12			
						- 2	Z -						
						-	205 -						
					EQ /	- 9			0				
	204.4 END OF BOREHOLE 9.4	SS	10	100	100mm				0 100 mm	13			
Wood E&IS, a Div	rision of Wood						line a						
Canada Limited	Inits 3 & 4	ater en	counter	ed on co	ompletio	n of dril	ling on <u></u>	<u>5/18/2020</u> at a	aeptn ot: <u>8.2 m</u> .				
Richmond Hill, Or Canada	tario, L4B 3K6 Borehole details	as prese	nted, do	not const Also bo	titute a th	orough u	understa	nding of all poter	ntial conditions pres	sent and require interpreta	tive assistance from	.S.	cale: 1 : 53
www.woodplc.com	commissioned ar	nd the ac	company	/ing'Expl	anation o	Boreho	ble Log'.		And the geol			Pa	ge: 1 of 2

## RECORD OF BOREHOLE No. BH S10

Project Number: TP115086

Project Name: Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)

Project Location: Countryside Drive, Brampton, Ontario

	LITHOLOGY PROFILE	SO	IL SA	MPLI	NG			FIELD TESTING	LAB TESTING		
					(%		=	PenetrationTesting	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8	TION	COMMENTS &
olot	DESCRIPTION	,pe	umber	(%)	Rad (9	Ê	۳) NC	○ SPT □ PPT ● DCPT. MTO Vane* Nilcon Vane*		ENTA	GRAIN SIZE
ology F		T) The	nple N	overy	'N' / F	TH (r	VATIO	<ul> <li>△ Intact</li> <li>◇ Intact</li> <li>▲ Remould</li> <li>◆ Remould</li> </ul>	W <sub>P</sub> W W <sub>L</sub>	TRUM TALL <sup>A</sup>	(%)
Lith	50 mm dia, monitoring well with flushmount	San	San	Rec	SPT	DEF	ELE	* Undrained Shear Strength (kPa) 20 40 60 80	Plastic Liquid 20 40 60 80	INS	GR SA SI CL
	protective casing installed (depth below ground surface):										
	Sand: 0.0 - 0.6 m Bentonite: 0.6 - 5.5 m										
	Sand Filter: 5.5 - 9.1 m Screen: 6.1										
	Borehole details a qualified Geote commissioned a	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, bor ring'Expla	itute a th rehole inf anation o	orough u formation f Borehol	inderstar n should le Log'.	nding of all potential conditions pre- be read in conjunction with the geo	sent and require interpretative ass technical report for which it was	istance fro	Scale: 1 : 53

WOO

R	ECORD OF BOREH	OLE N	<b>o</b> . <u> </u>	BH	<u>S11</u>								WC	bod
Pro	ject Number: TP115086							Drilling	g Location:	Culvert at Con	untryside Drive E:6038	49	Logged by:	MS
Pro	ect Client: City of Brampton							Drilling	g Method:	150 mm Soli	d Stem Augers		Compiled by:	<u>SN</u>
Pro	ect Name: Arterial Roads with Area (Area 47)	in Highway	427 In	dustria	al Seco	ondary	Plan	Drilling	g Machine:	Track Mounte	d Drill		Reviewed by:	SM
Pro	iect Location: <u>Countryside Órive,</u>	Brampton,	Ontario	0				Date	Started:	<u>Mar 24, 2020</u>	Date Completed: Ma	ır 24, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFILE		SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	7	COMMENT	T0
				ዀ		(%)		Ê	Penetra	tionTesting	COV (LEL) ■ TOV (LEL) 2 4 6 8	ATION		
Plot	DESCRIPTION		Type	qunp	y (%)	RQD	Ē	NOI	MTO Vane*	Nilcon Vane*	△ COV (ppm) □ TOV (ppm) 100 200 300 400	ATIO	DISTRIBUT	ZE ION
hology			mple -	mple I	cover	'.N' T	PTH	EVAT	Remould     * Undrained Sh	Remould ear Strength (kPa)	W <sub>P</sub> W W <sub>L</sub> ■ ● ● ●	STALL	(%)	
Lit	Geodetic Ground Surface Elevation: 213.2 m about 200 mm ASPHALT	213.0	Sa	Sa	Re	SP	B	Ē	20 40	60 80	20 40 60 80	<u>ŽŽ</u> GR	SA	SI CL
***	brown Sand and Gravel FILL							213 -						
	trace to some silt moist	212.6 0.6	SS	1	100	9	_		0					
	dark grey/brown Silty Clay / Clayey Silt FILL						-							
	trace to some gravel, trace orga	nics	SS	2	83	7	Ē	212 -	0					
							-							
			SS	3	100	16	-							
		211.0		Ũ			2	$\overline{}$						
	brown to grey SILTY SAND / SANDY SILT	2.2						= 211 -						
	trace gravel dense		SS	4	100	46	-			о <b>в</b>				
	moist to wet						-							
							- 3	210 -						
			SS	5	83	39	-			*				
	grey		SS	6	83	44	- 4							
			00	0			_	209 -						
			SS	7	333	35	F							
							- 5	208 -						
							-							
							-							
							- 6							
			SS	8	88	35	-	207 -						
			0	Ũ	00	00	_							
							F'	206 -						
	trace shale fragments						-							
			SS	9	100	55 / 150mm				55				
							8							
							-	205 -						
		<u>204.7</u>					_							
	trace sand to sandy, trace to some cobbles/boulders	gravel,					-							
		204.0	SS	10	100	50 / 80mm	- 9	- 204 -		50 0 mm				
	END OF BUKEHULE	9.2								JUIIII				
Woo	d E&IS, a Division of Wood		nter		d or r		n of 4-	illing of	3/24/2020 -+ -	dopth of 2.1 -			7.6 m	
<b>Can</b>	ada Limited	- Groundw	aler en	counter	eu UN CC	mpietio	n of df	ming on	<u>5:24/2020</u> at a	uepin oi: <u>2.1 m</u> .	Cave in depth after rer	novai oi augers: _	<u>1 .0 III</u> .	
Rich Can	mond Hill, Ontario, L4B 3K6 ada Be	orehole details	as prese	nted, do	not consi	titute a th	orough	understa	nding of all pote	ntial conditions pres	ent and require interpretative ass	sistance from		cale: 1 · 53
Tel. www	No.: (905) 415-2632 cc	ommissioned a	nd the ac	company	/ing'Expl	anation o	f Boreh	ole Log'.	Se reau in conju				Pa	ige: 1 of 1

R	ECORD OF BOREHOLE N	0.	BH	<u>S12</u>							WOOD	ł
Pro	ject Number: TP115086						Drillin	g Location:	Culvert at Cou	untryside Drive E:603857	_ Logged by: <u>MS</u>	
Pro	ject Client: City of Brampton						Drillin	g Method:	150 mm Solid	d Stem Augers	_ Compiled by: SN	
Pro	ject Name: Arterial Roads within Highway Area (Area 47)	427 In	dustri	al Seco	ondary	Plan	Drillin	g Machine:	Track Mounte	d Drill	_ Reviewed by: SM	—
Pro	ject Location: <u>Countryside Drive, Brampton,</u>	Ontari	0				Date	Started:	Mar 24, 2020	Date Completed: Mar 24, 2020	Revision No.: 0, 8/14/2	20
	LITHOLOGY PROFILE	sc	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING Soil Vapour Reading	COMMENTS	
			ber		(%) C		Ē	O SPT □	PPT   DCPT	COV (LEL) ■ TOV (LEL) 2 4 6 8 COV (app) □ TOV (app)	& GRAIN SIZE	
gy Plot	DESCRIPTION	e Type	Mum	sry (%	' / Ral	(m) H	TION	MTO Vane* △ Intact	Nilcon Vane* ◇ Intact	100 200 300 400 Wo W W.	DISTRIBUTION	
itholog		Sample	Sample	Recove	N' TY	DEPTH	ILEVA	* Undrained Sh	ear Strength (kPa)	Plastic Liquid SXX	GR SA SI C	CL
 XXXX	about 140 mm ASPHALT 213.3 m brown 213.3 m	0)	0)		0)	-		20 40				
	Sand and Gravel FILL trace to some silt					-	213 -					
	darkgrey/ brown 0.6	SS	1	100	12	-		0				
	trace to some gravel, trace organics					- 1 -						
		SS	2	67	6	-	212 -		<b>2</b>			
					-	_						
		55	3	83	1	2						
						-						
	trace gravel compact to very dense	SS	4	75	20	-	211 -	0	8			
	moist to wet					- 3						
	grey	SS	5	83	36	-						
						-	210 -					
						-						
		SS	6	100	91	- 4			0			
						_	209 -					
		SS	7	100	104	-			104			
						— 5 _						
						-	208 -					
	207.7		8	100	<u>50 /</u>	-		5	0			
	Auger refusal at 5.8 m depth. 50 mm dia. monitoring well with flushmount				3011111				30 mm			
	protective casing installed (depth below ground surface):											
	Sand: 0.0 - 0.6 m Bentonite: 0.6 - 2.1 m											
	Sand Filter: 2.1 - 5.8 m Screen: 2.7											
Woo	d E&IS, a Division of Wood ∑ No freest	anding	aroundv	vater me	asured	in one	n boreh	le on completi	on of drilling			$\neg$
<b>Can</b> 50 \	ada Limited = 100 meest /ogell Road, Units 3 & 4		an av			ope						
Rich Can Tel	mond Hill, Ontario, L4B 3K6 ada No.: (905) 415-2632 Borehole details a qualified Geote	as prese chnical E	nted, do Engineer.	not cons Also, bo	titute a th rehole inf	orough	understa	nding of all poter be read in conju	ntial conditions presented included in the sector of the s	ent and require interpretative assistance from echnical report for which it was	Scale: 1 : !	53
www	.woodplc.com	nd the ac	company	yıng'Expl	anation o	r Boreh	ole Log'.				Page 1 of	1

R	ECORD OF BOREHOLE N	0.	BH	<u>D1</u>								WO	od.	
Pro	ject Number: TP115086						Drilling	g Location:	Clarkway Dr	ive E:606251 N:485067	6	Logged by:	MS	
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	SN	
Pro	ject Name: Arterial Roads within Highway Area (Area 47)	427 In	dustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ted Drill		Reviewed by:	SM	
Pro	ject Location: Clarkway Drive, Brampton, On	itario					Date	Started:	Feb 18, 2020	Date Completed: Fe	b 18, 2020	Revision No.:	0, 8/14/20	
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING				
					(%		<b>_</b>	Penetra	tionTesting	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8	NOIL	COMMENT &	S	
lot	DESCRIPTION	be	mber	(%)	DD (	Ē	L) NO	MTO Vane*	Nilcon Vane*	△ COV (ppm) □ TOV (ppm) 100 200 300 400	TION		E	
ogy F		ole Ty	ole NL	very (	N. / R	LH (n	ATIC	<ul> <li>△ Intact</li> <li>▲ Remould</li> </ul>	<ul><li>♦ Intact</li><li>♦ Remould</li></ul>	W <sub>P</sub> W W <sub>L</sub>	ALLA	(%)		
Litho	Geodetic Ground Surface Elevation: 205.6 m	Sam	Sam	Reco	SPT	DEP.	ELEV	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80	LSNI G	r sa si	CL	
****	about 150 mm ASPHALT         205.5           brown         0.1	-				-								
	Sand and Gravel FILL moist	ss	1	100	94	F			0	D				
	<u>brown</u> <u>204.9</u>						205 -		Ĭ	3				
	Silty Clay / Clayey Silt FILL trace sand, trace gravel					- 1								
		SS	2	100	29	-	-	0	•••••	s o 17				
X	204.1 brown 1.5	-				F	204 -							
Û	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel	SS	3	100	27			0		a o 14				
X	very sum to hard					- 2 -								
X						-	-							
X		SS	4	100	36	-	203 -	0	i	n o 14				
	202.6					- 3								
202.6 - 3 3														
Woo Can	ada Limited $\sum_{i=1}^{n}$ No frees	tanding	groundv	water me	asured	in ope	n boreho	le on complet	on of drilling.					
50 \ Rich	/ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6													
Can Tel.	ada Borehole details a qualified Geote	as prese	nted, do Engineer.	not const Also, bo	titute a th rehole in	formation	understa	nding of all pote be read in conju	ntial conditions pre Inction with the geo	esent and require interpretative as otechnical report for which it was	sistance from	Sc	ale: 1 : 53	
www	v.woodplc.com	une dC	pan	, ng cxpi		. Doren	515 LUY.					Pag	e: 1 of 1	

R	ECORD OF BORE	HOLE N	<b>o</b> . <u> </u>	BH	D2							WO	od.
Pro	ject Number: TP115086						Dril	illing Location:	Clarkway Dr	ive E:606254 N:4850680	)	Logged by:	MS
Pro	ject Client: City of Brampto	on					Dril	illing Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arterial Roads Area (Area 47)	within Highway	427 In	dustria	al Seco	ndary Pl	<b>an</b> Dril	illing Machine:	Track Mount	ted Drill		Reviewed by:	SM
Pro	ject Location: Clarkway Drive	, Brampton, On	tario				Dat	ate Started:	Feb 18, 2020	Date Completed: Fe	b 18, 2020	Revision No.:	0, 8/14/20
	LITHOLOGY PROF	ILE	SO	IL SA	MPLI	NG		FIELD 1	resting	LAB TESTING			
ithology Plot	DESCRIPTION	N	ample Type	ample Number	tecovery (%)	3PT 'N' / RQD (%)	DEPTH (m)	Penetrat O SPT □ 1 MTO Vane* △ Intact A Remould * Undrained She	ionTesting PPT • DCPT Nilcon Vane* Intact Remould ara Strength (kPa) on	Soli Vapour Reading     COV (LEL)     COV (LEL)     COV (ppm) □ TOV (ppm)     100 200 300 400     Wp W WL     COV     Plastic     COV     Cov	NSTRUMENTATION NSTALLATION	COMMENT & GRAIN SIZ DISTRIBUTI (%)	'S 'E ON
	about 50 mm TOPS	m DIL 205.9	<i>w</i>	0	100	<u> </u>		<u> </u>	60 80	20 40 60 80			
	Silty Clay / Clayey Silt trace sand, trace gravel, trac	FILL e organics		1	100	6				<b>3</b>			
	brouz	204.8	SS	2	100	15 -	1 205	05					
	SILTY CLAY / CLAYEY SI trace to some sand, trace cobbles/boulders hard	LT TILL gravel, 204.1_	SS	3	100	36		0		3			
	END OF BOREHOL	E 1.8											
Wo Car 50 <sup>1</sup> Riccar	od E&IS, a Division of Wood ada Limited /ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6 ada	∑ No freest Borshole details	anding c	groundw nted, do	vater me	asured in	open bor	rehole on completic	on of drilling.	sent and require interpretative as	sistance from	S	

R	ECORD OF BOREHOLE N	lo.	BH	<u>D3</u>								WC	bod.
Pro	ject Number: TP115086						Drilling	g Location:	Clarkway Dr	rive E:606138 N:4850776	3	Logged by:	MS
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	<u>SN</u>
Pro	ject Name: Arterial Roads within Highwa Area (Area 47)	y 427 Ir	ndustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ted Drill		_ Reviewed by:	SM
Pro	ject Location: Clarkway Drive, Brampton, O	ntario					Date S	Started:	Feb 18, 2020	Dete Completed: Fe	b 18, 2020	_ Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFILE	sc	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
logy Plot	DESCRIPTION	ple Type	ple Number	overy (%)	'N' / RQD (%)	TH (m)	VATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould	Soli vapoui reading           COV (LEL)         TOV (LEL)           2         4         6           △         COV (ppm)         TOV (ppm)           100         200         300         400           Wp         W         WL	RUMENTATION	COMMENT & GRAIN SIZ DISTRIBUTI (%)	rs 1e On
Litho	Geodetic Ground Surface Elevation: 206.0 m	Sam	Sam	Reco	SPT	DEP	ELE	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80	LSNI G	ir sa s	SI CL
***	about 130 mm ASPHALT 205.8 brown 0.7	-				-							
	moist 205.4		1	70	12	_							
	brown 0.6 Silty Clay / Clayey Silt FILL	33		/9	12	-							
	trace sand, trace gravel					- 1	205 -						
	204.6	SS	2	100	16	-		0					
CXX/	SILTY CLAY / CLAYEY SILT TILL 1.5					_					-		
	Very stiff												
Wee	nd F&IS, a Division of Wood			<u> </u>		<u> </u>		<u>  : :</u>	: :	: : : :			
Can	ada Limited	standing	ground	water me	asured	in oper	1 boreho	ie on complet	on of drilling.				
50 N Rich	rogeli Road, Units 3 & 4 Imond Hill, Ontario, L4B 3K6 ada Borehole detail	s as prese	ented. do	not const	itute a th	orouah	understa	nding of all note	ntial conditions pre	esent and require interpretative as	sistance from		
Tel.	No.: (905) 415-2632 a qualified Geo woodplc.com	and the ac	Engineer	. Also, bo ying'Expl	rehole infanation o	formatio f Boreho	on should ole Log'.	be read in conju	inction with the geo	otechnical report for which it was		S Par	cale:1:53 de:1 of 1

R	ECORD OF BOREHO	LE No.	B		<u>)5</u>								wood
Proj	ect Number: TP115086							Drilling	Location:	Clarkway Dri	ive		Logged by: <u>MS</u>
Proj	ect Client: City of Brampton							Drilling	Method:	150 mm So	lid Stem Augers		Compiled by: SN
Proj	ect Name: Arterial Roads within	Highway 427	7 Indu	stria	I Seco	ndary	Plan	Drilling	Machine:	Track Mount	ed Drill		Reviewed by: SM
Proj	ect Location: Clarkway Drive, Bram	oton, Ontario	0					Date S	Started:	Feb 18, 2020	Date Completed: Fe	o 18, 2020	Revision No.: 0, 8/14/20
	LITHOLOGY PROFILE		SOIL	SAI	MPLI	NG			FIELD	TESTING	LAB TESTING		
thology Plot	DESCRIPTION	amna Tynne		ample Number	ecovery (%)	PT 'N' / RQD (%)	EPTH (m)	LEVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Sh	tionTesting PPT  DCPT Nilcon Vane* Intact Remould ear Strength (kPa)	Soil Vapour Reading           ▲ COV (LEL)         ■ TOV (LEL)           2         4         6         8           △ COV (pm)         □ TOV (ppm)         □ TOV (ppm)           100         200         300         400           W <sub>P</sub> W         W         W           ■ Oot         ■ Oot         ■ Oot         ■ Oot           Plastic         Liquid         ■ Oot         ■ Oot	ISTRUMENTATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	Geodetic Ground Surface Elevation: 205.7 m about 110 mm ASPHALT	205.6	5 0	ő	Å	S		<u> </u>	20 40	60 80	20 40 60 80	<u> </u>	R SA SI CL
	brown Sand and Gravel FILL	0.1	_				_	-					
	moist brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	205.1 0.6	S	1	100	20	- - - -	205 -	0		°6 °12		
	brown/grey SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel,	204.5 1.2 S	s :	2	100	9	-	-	0		<sup>3</sup> 0 <sub>19</sub>		
	cobbles/boulders stiff	s	s :	3	58	11	2	204 -	0		<sup>3 0</sup> 16		
		s	s ·	4	0	9		203 —	0	E	9		
		s	s	5	17	14	- 3	-	0		°22		
		s	s i	6	75	10	- - - - 4	202 -	0	e	<sup>3</sup> • • <u>21</u>		
				7				201 —					
		200.7	3	<i>'</i>		INA	5			· · · · · · · · · · · · · · · · · · ·	15		
Woo Cana	d E&IS, a Division of Wood $\begin{tabular}{lllllllllllllllllllllllllllllllllll$	No freestandi	ng grou	undwa	ater me	asured	in ope	n boreho	le on completi	on of drilling.			
50 V Rich Cana	ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6 ada Boret	nole details as pr	resented	l, do n	ot const	itute a th	orough	understa	nding of all pote	ntial conditions pre	sent and require interpretative ass	istance from	Coole: 4 - 52
Tel. I www	No.: (905) 415-2632 a qua comm	nissioned and the	e accom	neer. A npanyi	ng'Expla	enole infination of	ormatio f Boreh	ole Log'.	ue read în conju	nction with the geo	nechnical report for which it was		Page: 1 of 1

R	ECORD OF	BOREHOLE	ΞNc	). <u>I</u>	<u>3H  </u>	<u>D6</u>								WC	ood.
Pro	ject Number: TP1*	15086							Drilling	Location:	Clarkway Dr	ive		Logged by:	MS
Pro	ject Client: City	of Brampton							Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arter Area	rial Roads within Higl a (Area 47)	hway 4	427 Inc	lustria	al Seco	ndary	Plan	Drilling	Machine:	Track Mount	ted Drill		Reviewed by:	SM
Pro	ject Location: Clarl	kway Drive, Bramptor	n, Onta	ario					Date S	Started:	Feb 18, 2020	Date Completed: Fel	<u>b 18, 2020</u>	Revision No.:	0, 8/14/20
	LITHOLO	GY PROFILE		SO	IL SA	MPLIN	١G			FIELD	TESTING	LAB TESTING	7	COMMEN	<b>T</b> 0
ithology Plot	DES			sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetrat ○ SPT □ MTO Vane* △ Intact ▲ Remould * Undrained She 20 40	tionTesting PPT • DCPT Nilcon Vane* • Intact • Remould ear Strength (kPa) 60 80	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>p</sub> W W <sub>L</sub> ■ ○ ● Plastic Liquid 20 40 60 80	NSTRUMENTATION NSTALLATION	GRAIN SI GRAIN SI DISTRIBUT (%)	IS ZE ION SI CL
	Geodetic Ground Surface E Sand a S	ievation: 206.1 m brown and Gravel FILL come fines moist		ss	1	100	17		206	0			36	49	(15)
	SILTY CLAY	brown '/ CLAYEY SILT TILL	205.5 0.6		2	33			-						
	fi	irm to stiff	+		2	55		- 1 - -	205 -			"			
	END(		204.3	SS	3	25	8		-	0	···· ···· ·	a o 13			
		" BOREHOLE	1.0												
	<u> </u>														
Woo Can	d E&IS, a Division of ada Limited	Wood $\sum_{=}^{\underline{\nabla}} No$	freestar	.nding g	roundw	/ater me:	asured	in oper	n boreho	le on completio	on of drilling.		•		
50 V Rich Can Tel.	ogell Road, Units 3 & 4 mond Hill, Ontario, L4E ada No.: (905) 415-2632	ł 3 3K6 Borehole a qualified commissi	details a: d Geotecl ioned and	s preser hnical E	ited, do i ngineer.	not const Also, bor	itute a th ehole in anation c	orough formatic	understar on should tole Log'.	nding of all poter be read in conju	itial conditions pre	esent and require interpretative ass otechnical report for which it was	istance from	5	Scale: 1 : 53

R	ECORD OF BOREHOLE N	о.	BH	<u>D7</u>								WOOD	J.	
Pro	ject Number: TP115086						Drilling	g Location:	Clarkway Dr	ive E:605935 N:4850986	6	Logged by: MS		
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by: SN		
Pro	ject Name: Arterial Roads within Highway Area (Area 47)	y 427 In	dustri	al Seco	ondary I	Plan	Drilling	g Machine:	Track Mount	ted Drill		Reviewed by: SM		
Pro	ject Location: Clarkway Drive, Brampton, Or	ntario					Dates	Started:	Feb 18, 2020	Date Completed: Fe	b 18, 2020	Revision No.: 0, 8/14/2	20	
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	-	000000000		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 205.9 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetra ○ SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Shu 20 40	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>p</sub> W W, ■ 0 0 Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GRAIN SIZE DISTRIBUTION (%)	CL	
***	about 100 mm ASPHALT 205.8 brown 0.1	—				-								
	Sand and Gravel FILL moist 205 3	SS	1	100	36	-		0		a o <sub>11</sub>				
	dark grey 0.6 Silty Clay / Clayey Silt FILL					-								
	trace sand, trace gravel, trace organics					- 1	205 -							
		SS	2	100	10	-		0		°23				
		<u> </u>				-								
		SS	3	100	6	-	004	0		a o. 28				
						- 2 -	204 -							
Silty CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff SS 4 100 20														
	very stiff	SS	4	100	20	-		0		<b>a</b> · · O · _ · · · · · · · · · · · · · · ·				
	202.9					- - 3	203 -			15				
	END OF BOREHOLE 3.0													
Woo	od E&IS, a Division of Wood ⊇ No frees	tanding	groundv	vater me	asured i	n ope	n boreho	le on completi	on of drilling.		<u>. I</u>			
50 V	/ogell Road, Units 3 & 4	5							5					
Rich Can	Imond Hill, Ontario, L4B 3K6 ada No : (005) 415 2632 a gualified Gent	s as prese echnical F	nted, do Engineer	not cons	titute a tho rehole info	orough	understa	nding of all poter be read in coniu	ntial conditions pre	esent and require interpretative as	sistance from	Scale: 1 : 4	53	
www	Allowed pic.com	and the ac	company	ying'Expl	anation of	Boreh	ole Log'.					Page: 1 of	1	

RE	CORD OF	BOREHOLE	No.	BH	<u>D8</u>								wood
Proj	ect Number: TP1	15086						Drilling	Location:	Clarkway Dr	ive E:605935 N:		Logged by: MS
Proj	ect Client: City	of Brampton						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by: SN
Proj	ect Name: Arte	erial Roads within Highw	ay 427 Ir	ndustri	al Seco	ondary	Plan	Drilling	Machine:	Track Mount	ted Drill		Reviewed by: SM
Proj	Are ect Location: Cla	a (Area 47) rkway Drive, Brampton, (	Ontario					Date S	Started:	Feb 18, 2020	Date Completed: Fe	b 18, 20	20 Revision No.: 0, 8/14/20
							1						
	LITHOLO	GY PROFILE	SC	DIL SA		NG	-		FIELD	TESTING	LAB TESTING Soil Vapour Reading	z	COMMENTS
				5		(%)		Ê	Penetra ○ SPT □	tionTesting PPT ● DCPT	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8	ATIO	&
Blot	DES	SCRIPTION	ype	nmbe	(%)	go	Ê	NO	MTO Vane*	Nilcon Vane*	△ COV (ppm) □ TOV (ppm) 100 200 300 400		GRAIN SIZE
l qgo l			ple T	ple N	very	N./ F	TH (r	ATIC	<ul> <li>△ Intact</li> <li>▲ Remould</li> </ul>	<ul> <li>♦ Intact</li> <li>♦ Remould</li> </ul>	W <sub>P</sub> W W <sub>L</sub>	RUM ALL4	(%)
Litho	Geodetic Ground Surface	Elevation: 205.6 m	Sam	Sam	Reco	SPT	DEP	ELE	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80	INST INST	GR SA SI CL
	Sand	brown and Gravel FILL					_						
		moist	SS	1	83	22	F	-	O	•••••	<b>a</b> ·····)·····(·····)·····)·····		
							£	205 -					
		204	.7 SS	2	0	NA	-	-					
	END (		.9										existing utility cables.
	Borenole was termi	cable.											
Was	HERIS a Division of	Wood					1		: :		: : : :		<u> </u>
Cana	da Limited	$\stackrel{\text{VIOU}}{=}$ No fre	estanding	ground	water me	easured	in oper	n boreho	le on completi	on of drilling.			
50 Vo Richr	ogell Road, Units 3 & mond Hill, Ontario, L4	4 B 3K6											
Cana Tel. N	ida lo.: (905) 415-2632	Borehole deta a qualified Ge	ails as prese otechnical	ented, do Engineer	not const Also, bo	titute a th rehole in	horough formatio	understar	nding of all poter be read in conju	ntial conditions pre	esent and require interpretative ass otechnical report for which it was	sistance fro	Scale: 1 : 53
www	woodplc.com	commissione	u and the a	compan	yıng Expl	anation o	or Boreh	ole Log'.					Page: 1 of 1

R	ECORD OF BORE		o. <u>I</u>	BH	D9							WO	od.
Pro	ject Number: TP115086						Dril	illing Location:	Clarkway Dr	ive E:605832 N:4851092		Logged by:	/IS
Pro	ject Client: City of Brampton						Dril	illing Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arterial Roads wi Area (Area 47)	thin Highway	427 In	dustria	al Seco	ondary Pla	<b>an</b> Dril	illing Machine:	Track Mount	ed Drill		Reviewed by: §	SM
Pro	ject Location: Clarkway Drive, E	Brampton, On	tario				Dat	ate Started:	Feb 19, 2020	Date Completed: Fe	b 19, 2020	Revision No.: 0	, 8/14/20
	LITHOLOGY PROFIL	E	SO	IL SA	MPLI	NG		FIELD	resting				
hology Plot	DESCRIPTION		imple Type	mple Number	covery (%)	7T 'N' / RQD (%)	EPTH (m)	Penetrat     O SPT     O     MTO Vane*     A Intact     * Undrained She	ionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ar Strength (kPa)	Soli Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 ▲ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>p</sub> W W <sub>L</sub> ■ O W <sub>L</sub> Plastic Liouid	STRUMENTATION STALLATION	COMMENT: & GRAIN SIZI DISTRIBUTIO (%)	S E DN
Lit	Geodetic Ground Surface Elevation: 207.0 m about 100 mm ASPHAL	T 206.9	Sa	Sa	Re	S L		<u>20</u> 40	60 80	20 40 60 80	<u>ŽŽ</u> GF	r sa si	CL
	brown Sand and Gravel FILL	0:1											
	moist		ss	1	75	27		-		3			
		206.1				Ē							
	grey Silty Clay / Clayey Silt FI trace sand, trace gravel, col	0.9 LL obles	SS	2	83	12	1 206	)6 - - - - -	···· £	3			
****	END OF BOREHOLE	205.5 1.5						-					
Woo Can	od E&IS, a Division of Wood ada Limited	$\frac{\nabla}{\overline{z}}$ No freest	anding g	groundw	vater me	asured in o	pen bor	rehole on completion	on of drilling.				
50 V	/ogell Road, Units 3 & 4	-											
Rich Can Tel. www	imond Hill, Untario, L4B 3K6 ada No.: (905) 415-2632 /.woodplc.com	Borehole details a qualified Geote commissioned ar	as preser chnical E nd the acc	nted, do ingineer. company	not const Also, bo /ing'Expla	titute a thoro rehole inform anation of Bo	ugh under nation sho prehole Lo	erstanding of all poten ould be read in conjur og'.	tial conditions pre	sent and require interpretative ass technical report for which it was	istance from	Sc Pag	ale:1:53 e:1 of 1

R	ECORD OF BOREHOLE	No.	BH	D11	-							WOO	bd
Pro	ject Number: TP115086						Drilling	g Location:	Clarkway Dri	ive E:605720 N:4851194		Logged by: MS	5
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm Sol	lid Stem Augers		Compiled by: SN	<u> </u>
Pro	ject Name: Arterial Roads within Highw	ay 427 I	ndustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by: SN	<u> </u>
Pro	ject Location: Clarkway Drive, Brampton,	Ontario					Date	Started:	Feb 19, 2020	Date Completed: Fe	b 19, 2020	Revision No.: 0,	8/14/20
	LITHOLOGY PROFILE	S		AMPLI	NG			FIELD	TESTING	LAB TESTING			
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Sh 20 40	ttionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa) 60 80	Soil Vapour Reading           ▲ COV (LEL)         ■ TOV (LEL)           2         4         6           ▲ COV (ppm)         □ TOV (ppm)           100         200         300         400           ₩ <sub>p</sub> ₩         ₩ <sub>L</sub> ■           ■ Distic         Liquid         ■         ■           20         40         60         80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) R SA SI	<b>N</b> CL
~~~	about 90 mm ASPHALT 207					_							
	Sand and Gravel FILL C	.3				_							
	brown Silty Clay / Clayey Silt FILL trace sand, trace gravel	SS	1	75	38	- - - - 1	207 -	• • • • •		<sup>30</sup> 6			
	206	SS .4	2	100	14			0		<sup>3</sup> <sup>0</sup> 15			
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel stiff to very stiff	.5 SS	3	83	11	- - - 2	206 -	0		<sup>3</sup> <sup>0</sup> 20			
		SS	4	100	11	-	-	0		<sup>3</sup> 0 <sub>15</sub>			
			5	100	22	- 	205 -						
	grey						204 -			16			
		SS	6	92	19	- 4 - -	204	Q	2	<sup>3</sup> 0 <sub>14</sub>			
	202	.9 SS	7	100	16	- - - - 5	203 -	0		<sup>a</sup> 0 <sub>15</sub>			
	dd E&ilS, a Division of Wood ⊻ No fre	estandinc	ground	water m	asured	in ope	n boreho	le on complet	ion of drilling.				
50 N Rich Can Tel. www	Vogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6 ada No.: (905) 415-2632 woodplc.com	ails as pres otechnical od and the a	ented, do Engineer accompan	not cons . Also, bo ying'Expl	titute a th rehole inf anation o	orough ormatio f Boreh	understa on should ole Log'.	nding of all pote be read in conju	ntial conditions pre Inction with the geo	sent and require interpretative ass technical report for which it was	istance from	Scal	e: 1 : 53

R	ECORD OF BORE	HOLE No	0.	BH	D13								WOO	ba
Pro	ject Number: TP115086							Drilling	g Location:	Clarkway D	rive E:605607 N:4851398	Lo	ogged by: <u>MS</u>	
Pro	ject Client: City of Bramptor	1						Drilling	g Method:	150 mm Sc	olid Stem Augers	C	ompiled by: SN	
Pro	ject Name: Arterial Roads w	ithin Highway	427 in	dustria	al Seco	ondary	Plan	Drilling	Machine:	Track Moun	nted Drill	R	eviewed by: SM	
Pro	ject Location: Clarkway Drive,	Brampton, Ont	ario					Date	Started:	Feb 19, 202	Date Completed: Fel	<b>19, 2020</b> R	evision No.: 0,8	/14/20
	LITHOLOGY PROFIL	.E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
									Penetra	itionTesting	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	NOL	COMMENTS	
t	DESCRIPTION		e	nber	(%	%) QC	_	E Z		PPT • DCPT	2 4 6 8 △ COV (ppm) □ TOV (ppm)	ION	GRAIN SIZE	
gy Pl	BEGORA HOR		e Typ	e Nur	ery (9	V'/RC	ш Н	ATIO	MIO Vane^ △ Intact ▲ Remould	<ul> <li>Nilcon Vane<sup>*</sup></li> <li>♦ Intact</li> <li>♦ Remould</li> </ul>	100 200 300 400 W <sub>P</sub> W W <sub>L</sub>		DISTRIBUTION (%)	
itholc			Sampl	sampl	Secov	PT '	DEPT		* Undrained Sh	ear Strength (kPa)	Plastic Liquid	LLSN GR	SA SI	CL
_ ****	about 100 mm ASPHA	_ <b>T</b> 209.2- 0.1	0)	0)		0)			20 40					
	Sand and Gravel FILI	-	22	1	100	50 /	_	209 -		50	<b>a</b>			
	brown / grey	<u>208.7</u>		1	100	150mm	_			150 mm	4			
	Silty Clay / Clayey Silt F trace sand, trace gravel, cobble	ILL s/boulders												
		208.0	SS	2	83	NA	- 1 -				<b>a</b> • • • •			
	brown / grey SILTY CLAY / CLAYEY SIL trace to some send trace of	T TILL		_			-	208 -			13			
	cobbles/boulders	li avei,					_							
	very sun		SS	3	54	NA	- 2				a o 14			
							-	207 -						
							_							
			SS	4	100	NA	_				B 0			
		206.2					- 3							
	END OF BOREHOLE	3.0												
Woo Can	d E&IS, a Division of Wood ada Limited	$\frac{\nabla}{\overline{z}}$ No freesta	anding g	groundv	vater me	asured	in opei	n boreho	le on complet	ion of drilling.				
50 V Rich	ogell Road, Units 3 & 4 mond Hill, Ontario, I 4B 3K6													
Can Tel.	ada No.: (905) 415-2632	Borehole details a a qualified Geoteo	as prese chnical E	nted, do ingineer.	not cons Also, bo	titute a th rehole in	orough	understa	nding of all pote be read in conju	ntial conditions pr Inction with the ge	resent and require interpretative ass eotechnical report for which it was	istance from	Scale	: 1 : 53
www	woodplc.com	commissioned an	iu ine ac	company	nna ⊏xbi	anation 0	- Boren	ole roĝ.					Page:	1 of 1

R	ECORD OF BORE	HOLE N	o. <u> </u>	BH	D15							WOO	od.
Pro	ject Number: TP115086						Drill	ling Location:	Clarkway Dr	ive E:605513 N:4851403		Logged by: MS	
Pro	ject Client: City of Brampton	n					Drill	ling Method:	150 mm So	lid Stem Augers		Compiled by: SN	
Pro	ject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ndary Pla	an_Drill	ling Machine:	Track Mount	ed Drill		Reviewed by: SM	<u> </u>
Pro	ject Location: Clarkway Drive,	Brampton, On	tario				Date	te Started:	Feb 19, 2020	Date Completed: Fe	b 19, 2020	Revision No.: 0, 8	3/14/20
	LITHOLOGY PROFIL	LE	SO	IL SA	MPLI	NG		FIELD	resting	LAB TESTING			
logy Plot	DESCRIPTION		ple Type	ple Number	(%) (%)	'N' / RQD (%)	VATION (m)	Penetrat O SPT □ MTO Vane* △ Intact ▲ Remould	ionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 5 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>p</sub> , W W <sub>L</sub> ■ ○ ●	IRUMENTATION FALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)	ı
Lithc	Geodetic Ground Surface Elevation: 209.5 n	n	Sam	Sam	Rec	SPT		* Undrained She 20 40	ar Strength (kPa) 60 80	Plastic Liquid 20 40 60 80		r sa si	CL
***	about 100 mm ASPHA brown	LT 209.4 0.1				-		-					
	Sand and Gravel FIL moist	L	SS	1	100	44	209	)	ι···· <u>β</u>	3			
	dark grey	208.6					1	-					
	trace sand, trace grav	el	SS	2	67	15				9 · · · · · · · · · · · · · · · · · · ·			
		208.0					208	3-					
Woo Can	od E&IS, a Division of Wood ada Limited	$\frac{\nabla}{=}$ No freest	anding g	groundw	vater me	asured in c	pen bore	ehole on completion	on of drilling.				
50 V	/ogell Road, Units 3 & 4												
Rich Can Tel. www	Imond Hill, Untario, L4B 3K6 ada No.: (905) 415-2632 /.woodplc.com	Borehole details a qualified Geote commissioned ar	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, bor ying'Expla	itute a thoro rehole inform anation of Bo	ugh unders ation shou orehole Log	standing of all poten uld be read in conju g'.	tial conditions pre	esent and require interpretative ass technical report for which it was	istance from	Scale Page:	e: 1 : 53 1 of 1

R	ECORD O	F BOREHOLE	No.	E	BH	D17								WO	od
Pro	oject Number: <u>T</u>	P115086							Drilling	g Location:	Clarkway Dr	ive E:605385 N:4851532		Logged by:	/IS
Pro	ject Client: C	ity of Brampton							Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	<u>SN</u>
Pro	ject Name: A	rterial Roads within High rea (Area 47)	way 427	7 Ind	ustria	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ted Drill		Reviewed by:	<u>SM</u>
Pro	ject Location: C	larkway Drive, Brampton	, Ontario	0					Date	Started:	<u>Apr 1, 2020</u>	Date Completed: Ap	r 1, 2020	Revision No.: 0	), 8/14/20
	LITHOL	OGY PROFILE		SOI	L SA	MPLI	NG			FIELD	TESTING	LAB TESTING	7	COMMENT	0
y Plot	DI	ESCRIPTION	Two	- jype	Number	ry (%)	/ RQD (%)	(m)	TION (m)	Penetra O SPT MTO Vane* A Intact	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400	JMENTATION LATION	GRAIN SIZI	s E DN
itholog			alame		ample	tecove	'N' Td	EPTH	ILEVA	<ul> <li>Remould</li> <li>* Undrained She</li> </ul>	Remould ar Strength (kPa)	W <sub>P</sub> W W <sub>L</sub> ■ O ● Plastic Liquid	NSTAL NSTAL	(70) ir sa si	CI
	Geodetic Ground Surfa	t 100 mm ASPHALT 2	10.4 0.1	2	S	Ľ.	S		<u> </u>	20 40	60 80	20 40 60 80			02
	San	d and Gravel FILL moist	s	s	1	83	37		210 -	O		<b>6</b>			
	b O'th C	rown / dark grey	09.3 1.2 S	s	2	92	9	- 1 		0		<b>B</b>			
	trace sand, t	lay / Clayey Silt FILL trace gravel, trace organics	s	s	3	100	10		209 -	0		<b>6</b>			
			-					- 2 - -	208 -						
			s	S	4	100	11			0					
		<u>21</u>	<u>06.7</u>	s	5	100	10	-	207 -	0					
	SILTY CL trace to s	AY / CLAYEY SILT TILL some sand, trace gravel stiff	s	s	6	100	10	- - 4 -		0		<b>6</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b> <b>1</b>			
			s	s	7	83	11		206 -	0		<b>G</b>			
XX	EN	20 D OF BOREHOLE	05.3 5.2					-							
Woo	od E&IS, a Division	of Wood ⊻ No f	reestandi	ng gr	oundw	/ater me	asured	in ope	n borehc	le on completi	on of drilling.				
50 \ Rich	/ogell Road, Units 3	& 4 4B 3K6													
Can Tel. www	ada No.: (905) 415-2632 v.woodplc.com	Borehole d a qualified commissio	etails as pr Geotechnio ned and th	resent cal En e acco	ed, do i gineer. ompany	not const Also, bo ring'Expla	titute a th rehole in anation c	orough formatio f Boreh	understa on should ole Log'.	nding of all poter be read in conju	ntial conditions pre nction with the geo	esent and require interpretative as otechnical report for which it was	istance from	Sc	ale: 1 : 53

R	ECORD OF BOREHOL	E No.	BH	D18								wood
Pro	ject Number: TP115086					D	Drilling	Location:	Clarkway Dr	ive E:605387 N:4851534	ļ	Logged by: MS
Pro	ject Client: City of Brampton					D	Drilling	Method:	150 mm So	lid Stem Augers		Compiled by: SN
Pro	ject Name: Arterial Roads within Hi	ghway 427 Ir	dustri	al Seco	ondary F	<b>Plan</b> D	Drilling	Machine:	Track Mount	ted Drill		Reviewed by: SM
Pro	ject Location: Clarkway Drive, Brampto	on, Ontario				D	Date St	tarted:	<u>Apr 1, 2020</u>	Date Completed: Ap	r 1, 2020	_ Revision No.: 0, 8/14/20
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING Soil Vapour Reading	7	COMMENTS
			5		(%)		Ê	Penetra	tionTesting	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8	ATION	COMMENTS &
Plot	DESCRIPTION	ype	lumbe	(%)	RaD	Ê	NO	MTO Vane*	Nilcon Vane*	△ COV (ppm) □ TOV (ppm) 100 200 300 400	ATION	GRAIN SIZE DISTRIBUTION
ology		nple T	nple N	overy		) TH	EVATI	△ Intact ▲ Remould	<ul> <li>Intact</li> <li>Remould</li> </ul>	W <sub>P</sub> W W <sub>L</sub>	TALL	(%)
Lith	Geodetic Ground Surface Elevation: 210.1 m	Sar	Sar	Rec	SP	DE		20 40	60 80	20 40 60 80	NSN (	GR SA SI CL
	Sand and Gravel FILL moist	SS	1	83	12		-	0		<b>9</b>		
							-					
		22	2	75	12		-	0		a		
	dark grey	209.0 1.1				- 1 2	209 -					
	Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organics						-					
		SS SS	3	63	8		-	0				
~~~~	END OF BOREHOLE	1.8										
Woo	bd E&IS, a Division of Wood	o freestandina	around	water me	asured in	open	orebol		on of drilling			
Can 50 \	ada Limited	o neestanuing	ground	water me	asureu Ir	i operi bi	010101016	e on completi	on or unining.			
Rich	amond Hill, Ontario, L4B 3K6 ada Borehol	e details as prese	nted, do	not cons	titute a tho	rough und	derstand	ding of all poter	ntial conditions pre	esent and require interpretative as	sistance from	Scalo: 1 · F2
Tel. www	No.: (905) 415-2632 a qualifi v.woodplc.com commis	sioned and the ad	compan	. Aiso, bo ying'Expl	anation of	Borehole	Log'.	ve read in conju	neuon with the geo	Accumical report for which it was		Page: 1 of 1

R	ECORD OF BOREHOLE	No.	BH	D19								W	00	d.
Pro	ject Number: TP115086						Drilling	g Location:	Clarkway Dr	ive E:605297 N:4851614	•	Logged by:	MS	
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by	: <u>SN</u>	
Pro	ject Name: Arterial Roads within Highw Area (Area 47)	ay 427 Ir	ndustri	al Seco	ondary	Plan	Drilling	y Machine:	Track Mount	ed Drill		Reviewed by	: <u>SM</u>	
Pro	ject Location: Clarkway Drive, Brampton, (	Ontario					Date S	Started:	Feb 19, 2020	Date Completed: Fe	b 19, 2020	Revision No	: <u>0, 8/1</u> 4	4/20
	LITHOLOGY PROFILE	SC	DIL SA	AMPLI	NG			FIELD	TESTING	LAB TESTING	7	00000	NTO	
hology Plot	DESCRIPTION	mple Type	mple Number	covery (%)	rt 'N' / RQD (%)	EPTH (m)	EVATION (m)	Penetra ○ SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Sh	titionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa)	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 ▲ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>p</sub> W W <sub>L</sub> ■ O Uppm	STRUMENTATION STALLATION	GRAIN S DISTRIBL (%)	NTS SIZE ITION	
Lit	Geodetic Ground Surface Elevation: 210.6 m about 90 mm ASPHALT 210	s-	Sa	Re	S	B		20 40	60 80	20 40 60 80	<u>žž</u> g	R SA	SI	CL
	brown Sand and Gravel FILL	.1				-								
	moist 210 brown / dark grey 0 Sitly Clay / Clayey Sitt FILL 209 trace sand trace mayel 209	.0 .6 .7	1	100	47	-	210 -		0	<sup>30</sup> 5				
	grey SILTY CLAY / CLAYEY SILT TILL trace sand to sandy, trace gravel very stiff	.9 SS	2	58	13	1 - - -	-	0	····· 6	<sup>3</sup> 0				
		SS	3	79	23	- - - - - 2	209 -	O		s <b>a</b>	2	22	49	27
						-	-							
	207 END OF BOREHOLE 3	.6	4	83	29	- - - 3	208	0	····· •	16 16				
Wo	od E&IS, a Division of Wood ⊻ No fre						n borebo		ion of drilling					
<b>Car</b> 50 \	ada Limited	Sianang	ground	water me	asureu I	1 opel	n boreno	ne on complet	on or unining.					
Rich Car Tel. www	Infond Hill, Ontario, L4B 3K6 ada No.: (905) 415-2632 wwoodplc.com	ils as prese otechnical d and the a	ented, do Engineer. ccompan	not cons . Also, bo ying'Expl	itute a the rehole infe anation of	orough ormatic Boreh	understar on should ole Log'.	nding of all pote be read in conju	ntial conditions pre Inction with the geo	sent and require interpretative ass technical report for which it was	sistance from		Scale: 1 Page: 1	1:53 of 1

R	ECORD	OF BORE	HOLE N	o. <u> </u>	BH	D21								WC	ood.
Pro	ject Number:	TP115086							Drilling	g Location:	Clarkway Dr	ive E:605194 N:4851719	)	Logged by:	MS
Pro	ject Client:	City of Brampton	l						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name:	Arterial Roads wi Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ndary	Plan	Drilling	g Machine:	Track Mount	ted Drill		Reviewed by:	SM
Pro	ject Location:	Clarkway Drive, E	Brampton, Ont	ario					Date S	Started:	Feb 19, 2020	Date Completed: Fe	b 19, 2020	Revision No.:	0, 8/14/20
	LITH	ology profil	E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
ology Plot		DESCRIPTION		nple Type	nple Number	overy (%)	r 'N' / RQD (%)	(m) HTc	EVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould	PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould	Soli Vapour Reading COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>p</sub> W W <sub>L</sub>	TRUMENTATION TALLATION	COMMEN & GRAIN SI DISTRIBUT (%)	ts Ze 10n
Lith	Geodetic Ground S	urface Elevation: 209.0 m	T 000.0	Sar	Sar	Rec	SPI	DE		* Undrained Sh 20 40	60 80	Plastic Liquid 20 40 60 80		R SA	SI CL
	a	brown	<u>209.0</u> - 0.1					_	-						
		cobbles/boulders moist		SS	1	79	48	-	-		0	8			
				SS	2	42	29	1 1 	208 —	0		a			
****		END OF BOREHOLE	207.5 1.5					_	-						
Woo	od E&IS, a Divis	on of Wood	$\frac{\nabla}{=}$ No freesta	anding g	groundv	vater me	asured i	in oper	n boreho	le on complet	ion of drilling.				
50 V	ogell Road, Uni	s 3 & 4	-					-			-				
Rich Can Tel. www	imond Hill, Onta ada No.: (905) 415-2 /.woodplc.com	10, L4B 3K6 1632	Borehole details a qualified Geotec commissioned ar	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, bor ying'Expla	itute a the ehole info anation of	orough ormatic f Boreh	understar on should ole Log'.	nding of all pote be read in conju	ntial conditions pre unction with the geo	esent and require interpretative as otechnical report for which it was	sistance from	Pa	Scale: 1 : 53 age: 1 of 1

R	ECORD OF BOREHOLE	lo.	BH	D23								WOO	d.
Pro	ject Number: TP115086						Drilling	Location:	Clarkway Dri	ve E:605071 N:4851839	1	Logged by: MS	
Pro	ject Client: City of Brampton						Drilling	Method:	150 mm Sol	id Stem Augers		Compiled by: SN	
Pro	ject Name: Arterial Roads within Highwa	ay 427 Ir	ndustri	al Seco	ondary I	Plan	Drilling	Machine:	Track Mounte	ed Drill		Reviewed by: SM	
Pro	ject Location: Clarkway Drive, Brampton, C	ntario					Date S	Started:	Feb 19, 2020	Date Completed: Fe	b 19, 2020	Revision No.: 0,8	/14/20
	LITHOLOGY PROFILE	s	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
ology Plot	DESCRIPTION	nple Type	nple Number	overy (%)	' N' / RQD (%)	TH (m)	VATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould	Soil Vapour Reading           ▲ COV (LEL)         ■ TOV (LEL)           2         4         6           A         COV (pm)         □ TOV (ppm)           100         200         300         400           Wp         W         WL         WL	TRUMENTATION TALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)	
Lithe	Geodetic Ground Surface Elevation: 209.2 m	San	San	Reo	SPT	DEF		* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80		R SA SI	CL
	- about 90 mm ASPHALT 209.	H				-	209 -						
	Sand and Gravel FILL moist	ss	1	58	35		-	0	· · · · · · · · · · · · · · · · · · ·	<sup>10</sup> 4			
	grey 0: Silty Clay / Clayey Silt FILL trace sand, trace gravel	9 SS	2	75	11	- 1 - -	208 -	0		1. o <sub>16</sub>			
	brown 1. SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel hard to very stiff	5 SS	3	100	30	- - - - - -	-	0		1. o 19			
	grey	ss	4	100	36	-	207 -	0		1 o <sub>n</sub>			
						- - 3	-			20			
		SS	5	100	22		206 -	0		20			
		ss	6	0	18	- 4 - 4 -	205 -	O		<sup>1</sup> <sup>0</sup> 19			
	204.	ss	7	22	19	- - - - - 5	-	0		1 0 <sub>21</sub>			
	END OF BOREHOLE 5.	D											
Was	rd E&IS a Division of Wood												
Woo Can	ad E&IS, a Division of Wood $\frac{\nabla}{\Xi}$ No free	standing	ground	water me	easured i	n open	boreho	le on complet	on of drilling.				
50 \ Rich Can Tel. www	Vogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6 ada No.: (905) 415-2632 woodplc.com	Is as presented by the second se	ented, do Engineer ccompan	not consi . Also, bo ying'Expl	titute a the rehole info anation of	orough u ormation Boreho	understa n should ble Log'.	nding of all pote be read in conju	ntial conditions pres Inction with the geot	sent and require interpretative ass technical report for which it was	sistance from	Scale	:1:53

R	ECORD OF BOREHOLE N	lo.	BH	D25								WO	od.
Pro	ject Number: TP115086						Drilling	Location:	Clarkway Dr	ive E:604975 N:4851935	;	Logged by: M	s
Pro	ject Client: City of Brampton						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by: S	N
Pro	ject Name: Arterial Roads within Highwa Area (Area 47)	y 427 In	dustri	al Seco	ondary	Plan	Drilling	Machine:	Track Mount	ed Drill		Reviewed by: S	M
Pro	ject Location: Clarkway Drive, Brampton, O	ntario					Date S	Started:	Feb 24, 2020	Date Completed: Fe	b 24, 2020	Revision No.: 0,	8/14/20
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING				
nology Plot	DESCRIPTION	mple Type	mple Number	covery (%)	T 'N' / RQD (%)	РТН (m)	EVATION (m)	Penetra ○ SPT □ MTO Vane* △ Intact ▲ Remould	PPT ● DCPT Nilcon Vane* ◇ Intact ● Remould	Soli Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>0</sub> W W <sub>1</sub> ■ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	STRUMENTATION STALLATION	COMMENTS & GRAIN SIZE DISTRIBUTIO (%)	N
Lith	Geodetic Ground Surface Elevation: 209.1 m about 90 mm ASPHALT 209.0	Sai	Sai	Re	SP	DE		20 40	60 80	20 40 60 80	<u>ZZ</u> GF	r sa si	CL
	brown Sand and Gravel FILL					_	-						
	moist 208.	SS	1	100	28		-	0		<sup>30</sup> 5			
	grey 0.5 Silty Clay / Clayey Silt FILL trace sand, trace gravel 207 f	ss	2	100	12	- 1 - -	208 -	0	····· 6	<sup>3</sup> 0.14			
	grey 1.5 SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel stiff to firm	SS	3	83	10	2	207 —	0		<sup>3 0</sup> 13			
SS 4 83 7 0 18 018													
	206.0		-	00	'	- 3	-			18			
	END OF BOREHOLE 3.0	)											
Woo	od E&IS, a Division of Wood	tanding	aroust	vator =		in or c	n horsh-		ion of drilling				
Can	ada Limited	sianoing	groundv	water me	asured	и ореі	n poreno	e on complet	ion of aniling.				
Rich Can Tel. www	mond Hill, Ontario, L4B 3K6 ada No: (905) 415-2632 /.woodplc.com	s as prese technical E and the ac	ented, do Engineer. ccompan	not const . Also, bor ying'Expla	titute a th rehole inf anation o	orough ormatic f Boreh	understa on should ole Log'.	nding of all pote be read in conju	ntial conditions pre Inction with the geo	sent and require interpretative ass technical report for which it was	istance from	Sca	le: 1 : 53 : 1 of 1
R	ECORD OF BOREHO	LE No.	BH	D27							wood.		
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Pro	ject Number: TP115086					_ Drilling	g Location:	Clarkway Dri	ive E:604867 N:4852040		Logged by: MS		
Pro	ject Client: City of Brampton					_ Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by: SN		
Pro	ject Name: Arterial Roads within Area (Area 47)	Highway 427	Industr	ial Seco	ndary Plan	_ Drilling	g Machine:	Track Mount	ed Drill		Reviewed by: SM		
Pro	ject Location: Clarkway Drive, Bram	pton, Ontario				_ Date \$	Started:	<u>Feb 24, 2020</u>	Date Completed: Fel	<u>b 24, 2020</u>	Revision No.: 0, 8/14/20		
	LITHOLOGY PROFILE	S		AMPLI	NG		FIELD	TESTING	LAB TESTING Soil Vapour Reading	7	COMMENTS		
thology Plot	DESCRIPTION	ample Type	ample Number	ecovery (%)	PT 'N' / RQD (%) EPTH (m)	LEVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained She	tionTesting PPT • DCPT Nilcon Vane* Intact Remould ear Strength (kPa)	COV (LEL)     COV (LEL)     COV (LEL)     COV (LEL)     COV (DPM)     COV (DPM)	USTRUMENTATION USTALLATION	GRAIN SIZE DISTRIBUTION (%)		
	Geodetic Ground Surface Elevation: 208.6 m about 90 mm ASPHALT	208.5	S	2	<u>o</u>	<u>ш</u>	20 40	60 80	20 40 60 80				
	brown Sand and Gravel FILL moist	5.1 SS	1	100	26	208 -	0		g				
	dark grey Silty Clay / Clayey Silt FILL trace sand, trace gravel, trace organ	0.9 iics SS 207.1	2	100	7 – -		0		g				
Woo	END OF BOREHOLE	207.1 1.5 No freestandin	g ground	Water me	asured in ope	n boreho	le on completi	on of drilling.					
50 \	/ogell Road, Units 3 & 4												
Rich Can Tel. www	Innond Hill, Ontario, L4B 3K6 ada No.: (905) 415-2632 a qui v.woodplc.com	hole details as pre alified Geotechnica missioned and the	sented, do I Enginee accompa	o not const r. Also, bor nying'Expla	itute a thorough ehole informati anation of Boreh	n understa on should nole Log'.	nding of all poter be read in conju	ntial conditions pre nction with the geo	sent and require interpretative ass technical report for which it was	istance from	Scale: 1 : 53 Page: 1 of 1		

R	ECORD OF BORE	HOLE N	0.	BH	D29								WO	od
Pro	ject Number: TP115086							Drilling	g Location:	Clarkway Dr	ive E:604765 N:4852155	;	Logged by:	MM
Pro	ject Client: City of Brampton	n						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arterial Roads w Area (Area 47)	/ithin Highway	427 In	dustria	al Seco	ndary I	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ject Location: Clarkway Drive,	Brampton, On	tario					Date	Started:	Feb 25, 2020	Date Completed: Fe	b 25, 2020	Revision No.:	), 8/14/20
	LITHOLOGY PROFI	LE	SC	DIL SA	MPLI	١G			FIELD	TESTING	LAB TESTING Soil Vapour Reading	7	COMMENT	c
Lithology Plot	DESCRIPTION	n	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetrat ○ SPT □ MTO Vane* △ Intact ▲ Remould * Undrained She 20 40	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould tar Strength (kPa) 60 80	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>p</sub> W W <sub>i</sub> ■ O Plastic Liquid 20 40 60 80	INSTRUMENTATIO	GRAIN SIZ GRAIN SIZ DISTRIBUTIO (%)	E DN <sub>CL</sub>
	about 150 mm TOPSC brown Silty Clay / Clayey Silt I	DIL 211.6 0.2 FILL	SS	1	83	7	-	-	0		9			
	trace sand, trace grav	el	55	2	100	17	-	211 -						
				-			- 1 - -				·····			
		209.9	SS	3	92	20	-	210 -	0	· · · · · · · · · · · · · · · · · · ·	3			
98       3       92       20       210       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0 <th></th> <th></th>														
50 N Rich	ada Limited /ogell Road, Units 3 & 4 imond Hill, Ontario, L4B 3K6												I	
Can Tel. www	ada No.: (905) 415-2632 /.woodplc.com	Borehole details a qualified Geote commissioned a	as prese chnical E nd the ac	nted, do Engineer. company	not const Also, bor /ing'Expla	itute a the ehole info ination of	orough ormatio Boreh	understa on should ole Log'.	noung of all poten be read in conjur	mal conditions pre	esent and require interpretative ass stechnical report for which it was	sistance from	Sc Pag	ale: 1 : 53 e: 1 of 1

R	ECORD OF BOREH	OLE N	0.	BH	D31								WC	ood.
Pro	ject Number: TP115086							Drilling	g Location:	Clarkway Di	ive E:604668 N:4852236	;	Logged by:	MD
Pro	ject Client: City of Brampton							Drilling	g Method:	150 mm Sc	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arterial Roads withi Area (Area 47)	in Highway	427 In	dustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Moun	ted Drill		Reviewed by:	SM
Pro	ject Location: Clarkway Drive, Bra	ampton, On	tario					Date	Started:	Feb 12, 2020	Date Completed: Fe	b 12, 2020	Revision No.:	0, 8/14/20
	LITHOLOGY PROFILE		SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
						(%		2	Penetra	itionTesting	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8	NOIL	COMMEN &	TS
olot	DESCRIPTION		þe	umber	(%)	soD (°	Ē	L) NO	O SPT ⊔ MTO Vane*	PPT ● DCPT Nilcon Vane*	△ COV (ppm) □ TOV (ppm) 100 200 300 400	TION		ZE
logy F			ple Ty	ple Nr	very (	N./ H	TH (n	ATIC	<ul> <li>△ Intact</li> <li>▲ Remould</li> </ul>	<ul><li>♦ Intact</li><li>♦ Remould</li></ul>	W <sub>P</sub> W W <sub>L</sub>	ALLA	(%)	
Litho	Geodetic Ground Surface Elevation: 210.0 m		Sam	Sam	Reco	SPT	DEP	ELE	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80		R SA	SI CL
***	about 130 mm ASPHALT	<u>209.9</u> 0.1	SS	1	94	68	_			0	ao,			
	Sand and Gravel FILL moist						-				•			
	dark brown	<u>209.3</u> 0.7					_							
	trace to some clay, trace grav	el	SS	2	100	9	- 1	209 -	0		a⊐ o_ 14			
							-				· · · · · ; · · · · ; · · · · ; · · · ·			
							_							
			SS	3	100	9		000	0		°23			
							- 2	208 -						
	grey SILTY CLAY / CLAYEY SILT T trace to some sand, trace gray	2.2 ILL /el	SS	4	100	8	-							
	firm to stiff				100	Ŭ	_		Ĭ		15			
							- 3	207 -						
SS         5         100         9         -         -         O         #         o           206.5         -         -         -         -         -         -         -         -         -         -         13         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -														
SS         5         100         9         0         10         13           206.5         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S														
Woo Can	od E&IS, a Division of Wood ada Limited	$\frac{\nabla}{\overline{=}}$ No freest	anding	groundv	water me	easured	in ope	n boreho	le on complet	ion of drilling.				
50 \ Rich	/ogell Road, Units 3 & 4 Imond Hill, Ontario. L4B 3K6													
Can Tel.	ada Bo No.: (905) 415-2632 a	orehole details qualified Geote	as prese chnical E	nted, do Engineer.	not const Also, bo	titute a th rehole inf	orough ormatio	understa	nding of all pote be read in conju	ntial conditions pro Inction with the ge	esent and require interpretative ass otechnical report for which it was	sistance from		Scale: 1 : 53
www	v.woodplc.com	di	au	sempan	,9 = vhi		. 20101	LUy .					Pa	age: 1 of 1

R	ECORD OF BORE	HOLE N	<b>o</b>	BH	D32	1						WO	od.
Pro	ject Number: TP115086						Dri	illing Location:	Clarkway Dr	ive E:604666 N:4852234	•	Logged by: M	ID
Pro	ject Client: City of Bramptor	1					Dri	illing Method:	150 mm So	lid Stem Augers		Compiled by: S	N
Pro	iject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ondary Pl	<b>an</b> Dri	illing Machine:	Track Mount	ted Drill		Reviewed by: S	M
Pro	ject Location: Clarkway Drive,	Brampton, On	tario				Da	ate Started:	Feb 12, 2020	Date Completed: Fe	b 12, 2020	Revision No.: 0.	, 8/14/20
	LITHOLOGY PROFIL	E	SO	IL SA	MPLI	NG		FIELD	resting		_		
ithology Plot	DESCRIPTION		ample Type	ample Number	tecovery (%)	:PT 'N' / RQD (%)	DEPTH (m)	Penetrat     O SPT     O     MTO Vane*     A Intact     A Remould     * Undrained She     Constant of the second se	ionTesting PPT • DCPT Nilcon Vane* Intact Remould ar Strength (kPa)	COV (LEL)     COV (LEL)     COV (LEL)     COV (ppm)     COV (ppm)	NSTRUMENTATION VSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTIO (%)	5 E IN CI
 ****	about 110 mm ASPHA	T 208.1	0	1	100	41 -			60 80	20 40 80 80			
	Sand and Gravel FILI moist		55	1	100	41	20	)8 — 0 -					
	dark brown	207.6				-							
	trace to some sand, trace of	Iravel	SS	2	92	10	1		<u>-</u>	g			
		206.4	SS	3	83	13	20	- 0	· · · · · · · · · · · · · · · · · · ·	<b>a</b>			
~~~~	END OF BOREHOLE	206.4							· · · · ·				
2064         E         E           END OF BOREHOLE         1.8													
Can	ada Limited	÷ No freest	anding (	yroundw	ater me	asured in	pen bor	renoie on completio	on of drilling.				
Rich Can Tel. www	mond Hill, Ontario, L4B 3K6 ada No.: (905) 415-2632 wwoodplc.com	Borehole details a qualified Geote commissioned ar	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, bor ring'Expla	itute a thoro rehole inforr anation of B	ugh unde nation sho prehole Lo	erstanding of all poten ould be read in conjur .og'.	tial conditions pre	esent and require interpretative ass stechnical report for which it was	sistance from	Sca	ale: 1 : 53 e: 1 of 1

R	ECORD OF BORE	HOLE N	o. <u> </u>	BH	D33								W	00	С.
Pro	ect Number: TP115086							Drilling	g Location:	Clarkway Dr	ive E:604548 N:485236		Logged by:	MD	
Pro	ect Client: City of Bramptor	1						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	SN	
Pro	ject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ndary	Plan	Drilling	g Machine:	Track Mount	ted Drill		Reviewed by:	SM	
Pro	ect Location: Clarkway Drive,	Brampton, On	tario					Date S	Started:	Feb 13, 2020	Date Completed: Fe	b 13, 2020	Revision No.:	<u>0, 8/14</u>	/20
	LITHOLOGY PROFIL	E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING				
thology Plot	DESCRIPTION		ample Type	ample Number	ecovery (%)	PT 'N' / RQD (%)	EPTH (m)	LEVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Sh	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa)	COV (LEL) ■ TOV (LEL)     COV (LEL) ■ TOV (LEL)     COV (ppm) □ TOV (ppm)     100 200 300 400     W <sub>p</sub> W W <sub>L</sub> Plastic Liquid	NSTRUMENTATION NSTALLATION	COMMEN & GRAIN SI DISTRIBUT (%)	ITS ZE FION	q
	Geodetic Ground Surface Elevation: 214.0 m about 110 mm ASPHA brown	1 LT 213.9 0.1	ss	0 1	<u>⊮</u> 89	ഗ 41		<u>ш</u>	20 40	60 80	20 40 60 80	0	IK SK	31	CL
	Sand and Gravel FIL moist	L 213.3						-							
	dark brown Silty Clay / Clayey Silt F	<u>213.3</u> 0.7 FILL			400		-	-							
	trace sand, trace gravi	ei		2	100	14		213 -			<b>S</b>				
					400		-	-							
****	END OF BOREHOLE	212.2 1.8	55	3	100	20	-				<b>8</b> 				
Woo	d E&IS, a Division of Wood ada Limited	$\frac{\nabla}{=}$ No freest	anding g	groundv	vater me	asured	in oper	n boreho	le on complet	ion of drilling.	I · · · · ·	<u>ı I</u>			
50 V Rich	ogell Road, Units 3 & 4 mond Hill Ontario 1 4B 3K6	_								-					
Can Tel. www	ada No.: (905) 415-2632 .woodplc.com	Borehole details a qualified Geote commissioned ar	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, bor /ing'Expla	itute a the rehole inf anation of	orough ormatio f Boreho	understa n should ble Log'.	nding of all pote be read in conju	ntial conditions pre Inction with the geo	esent and require interpretative as otechnical report for which it was	sistance from	P	Scale: 1	:53 of 1

RECORD OF BOREHOLE No. BH D35	wood
Project Number: TP115086 Drilling Location: Clarkway Drive E:604458 N:48524	62 Logged by: <u>MD</u>
Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers	Compiled by: SN
Project Name: Arterial Roads within Highway 427 Industrial Secondary Plan Drilling Machine: Track Mounted Drill Area (Area 47)	Reviewed by: SM
Project Location: Clarkway Drive, Brampton, Ontario Date Started: Feb 12, 2020 Date Completed: F	Teb 12, 2020 Revision No.: 0, 8/14/20
LITHOLOGY PROFILE SOIL SAMPLING FIELD TESTING LAB TESTING	
Penetration Testing $\land$ Cov (LEL) $\blacksquare$ TOV (LE) $\blacksquare$ T	
$\begin{bmatrix} \overleftarrow{b} \\ \overleftarrow{c} $	
$\begin{bmatrix} F \\ P \\$	(%)
E       Geodetic Ground Surface Elevation: 212.9 m       Geodetic Ground Surface El	GR SA SI CL
brown         0.1         SS         1         89         46         1         1         0         #0           Sand and Gravel FILL         0.1         SS         1         89         46         1         1         0         #0	
moist = = =	
grey 0.7	
trace to some sand, trace gravel, trace wood SS 2 100 11 - 1	
$\mathbf{x} \mathbf{x} \mathbf{y} \mathbf{y} \mathbf{z} \mathbf{z} \mathbf{z} \mathbf{z} \mathbf{z} \mathbf{z} \mathbf{z} z$	
SILTY CLAY / CLAYEY SILT TILL	
very stiff to stiff SS 5 89 16 0. 18 0.	
207.9 200 END OF BOREHOLE 5.0	-
Wood E&IS, a Division of Wood Canada Limited $\sum_{i=1}^{N}$ No freestanding groundwater measured in open borehole on completion of drilling.	
50 Vogell Road, Units 3 & 4 Richmond Hill, Ontario, L4B 3K6	
Capada Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative	esistanco from

R	ECORD OF BOREHO	LE No	о. <u>I</u>	BH	D36								WC	od.
Pro	ject Number: TP115086							Drilling	g Location:	Clarkway Dri	ive E:604437 N:4852462		Logged by:	MD
Pro	ject Client: City of Brampton							Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	<u>SN</u>
Pro	ject Name: Arterial Roads within Area (Area 47)	Highway 4	427 In	dustria	al Seco	ndary F	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ject Location: Clarkway Drive, Bram	pton, Onta	ario					Date S	Started:	Feb 12, 2020	Date Completed: Fe	b 12, 2020	Revision No.:	0, 8/14/20
	LITHOLOGY PROFILE		SO	IL SA	MPLI	NG			FIELD	TESTING				
ithology Plot	DESCRIPTION		ample Type	ample Number	tecovery (%)	PT 'N' / RQD (%)	EPTH (m)	:LEVATION (m)	Penetrai O SPT □ MTO Vane* △ Intact ▲ Remould	tionTesting PPT • DCPT Nilcon Vane* • Intact • Remould ear Strength (kPa)	Soli Vapour Reading     COV (LEL)     COV (LEL)     COV (ppm) □ TOV (ppm)     100 200 300 400     Wp W WL     Plastic     Cupulation     Cupulatio     Cupulation     Cupulation     Cupulation     Cupulation	NSTRUMENTATION NSTALLATION	COMMENT & GRAIN SIZ DISTRIBUTI (%)	rs ZE ION
	Geodetic Ground Surface Elevation: 211.9 m brown Sand and Gravel FILL moist		ss	1	75	34		_ <u> </u>		<u>60 80</u>	20 40 60 80			
		211.3					-	-						
	grey Silty Clay / Clayey Silt FILL trace to some sand, trace gravel	0.6	SS	2	83	13	- - - 1	211 -	0		g			
			SS	3	79	13	- - -	-	0		g			
***	END OF BOREHOLE	210.1 1.8												
Woo Can	nd E&IS, a Division of Wood ada Limited =	No freesta	Inding g	groundw	ater me	asured ir	n open	) boreho	le on completi	on of drilling.				
50 V Rich	ogell Road, Units 3 & 4 mond Hill, Ontario 1 4B 3K6													
Can Tel. www	ada Bore No.: (905) 415-2632 a qua .woodplc.com	hole details a alified Geotec missioned and	is preser hnical E d the acc	nted, do i ngineer. company	not const Also, bor ing'Expla	itute a tho rehole info anation of	rough o rmatio Boreho	understa n should ble Log'.	nding of all poter be read in conju	itial conditions pre nction with the geo	sent and require interpretative as technical report for which it was	istance from	S Pa	cale:1:53 ge:1 of 1

R	ECORD OF BOREHOLE N	<b>o</b>	BH	D37	I.						wood
Pro	ject Number: TP115086						Drilling	Location:	Clarkway Driv	re E:604335 N:4852470	Logged by: MD
Pro	ject Client: City of Brampton						Drilling	Method:	150 mm Soli	d Stem Augers	Compiled by: SN
Pro Pro	ject Name: Arterial Roads within Highway Area (Area 47) ject Location: Clarkway Drive, Brampton, On	427 In tario	dustria	al Seco	ondary	Plan	Drilling Date S	Machine: Started:	Track Mounte Feb 13, 2020	d DrillDate Completed: Feb 1;	Reviewed by: <u>SM</u> 3, 2020 Revision No.: <u>0, 8/14/20</u>
	LITHOLOGY PROFILE	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	
ithology Plot	DESCRIPTION	ample Type	ample Number	tecovery (%)	8PT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Sh	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa)	Soil Vapour Reading         COV (LEL)         TOV (LEL)           2         4         6         8           2         COV (ppm)         TOV (ppm)         100         200           100         200         300         400         40           Wp         W         W         40         60         60           Plastic         Liquid         20         90         90         70	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	deodetic Ground Surface Elevation: 214.5 m about 110 mm ASPHALT 214.3 brown 0.1	ss	1	LL.	17	-	_ <u> </u>	20 40			
	Sand and Gravel FILL moist					-	214 -				
						_	-				
	trace sand, trace gravel	SS	2	100	9	- 1 -	-	0	a a		
						-	213 -				
		SS	3	0	0	_	-				
						— 2 - -	-				
		SS	4	100	16	-	212 -	0			
	211.6_					_	-				
	brown 2.9 SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel					- 3	-				
X	very stiff 210.9	SS	5	22	27	_	211 -	0			
	END OF BOREHOLE 3.3										
Woo Can	ad E&IS, a Division of Wood $\frac{\nabla}{\Xi}$ No freest	anding g	groundv	vater me	asured	in oper	n boreho	le on completi	on of drilling.		
50 \ Rich	/ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6	as proce	nted do	not conc	itute a th	orough	underete	nding of all poto	ntial conditions proc	ant and require interpretative assister	nce from
Tel.	No.: (905) 415-2632 a qualified Geote woodplc.com	chnical E nd the ac	ingineer. company	Also, bo /ing'Expl	rehole infanation o	ormatio f Boreho	on should ble Log'.	be read in conju	inction with the geote	chnical report for which it was	Scale: 1 : 53 Page: 1 of 1

R	ECORD OF BOREH	OLE N	0.	BH	D38	I							WC	bod.
Pro	ect Number: TP115086							Drilling	Location:	Clarkway Dri	ive E:604336 N:4852567		Logged by:	MD
Pro	ect Client: City of Brampton							Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	<u>SN</u>
Pro	ject Name: Arterial Roads with Area (Area 47)	in Highway	427 In	dustria	al Seco	ondary I	Plan	Drilling	Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ect Location: Clarkway Drive, Bra	ampton, On	tario					Date S	Started:	Feb 13, 2020	Date Completed: Fe	b 13, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFILE		SC	IL SA	MPLI	NG			FIELD	TESTING				
thology Plot	DESCRIPTION		ample Type	ample Number	ecovery (%)	PT 'N' / RQD (%)	EPTH (m)	LEVATION (m)	Penetrai O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained She	tionTesting PPT • DCPT Nilcon Vane*	Soli vapour recading           COV (LEL)         ■ TOV (LEL)           2         4         6           Δ         COV (ppm)         □         TOV (ppm)           100         200         300         400           W <sub>p</sub> W         W <sub>L</sub> ■           ■         ●         ●         ●           Plastic         Liquid         ■         ■	NSTRUMENTATION NSTALLATION	COMMEN & GRAIN SIZ DISTRIBUT (%)	TS ZE ION
	Geodetic Ground Surface Elevation: 215.3 m brown Sand and Gravel FILL moist		ss	<u>თ</u> 1	75	ග 18		<u>ш</u> 215 —	20 40	60 80	20 40 60 80			
		214.7					-	-						
	grey / brown Silty Clay / Clayey Silt FILL trace to some sand, trace grav	0.6 vel	SS	2	83	12	- - 1	-	0		5			
			SS	3	75	9	-	214 -	0		3			
****	END OF BOREHOLE	<u>213.4</u> 1.8					-	-						
Woo Can	d E&IS, a Division of Wood ada Limited	$\frac{\nabla}{\overline{=}}$ No freest	anding g	groundw	vater me	asured in	n oper	n boreho	le on completi	on of drilling.				
50 V Rich Cana Tel.	ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6 ada Br No.: (905) 415-2632 a	orehole details qualified Geote	as prese chnical E	nted, do ngineer.	not const Also, bo	itute a tho	orough	understa n should	nding of all poter be read in conju	ntial conditions pre nction with the geo	esent and require interpretative as technical report for which it was	istance from	s	Scale: 1 : 53
www	.woodplc.com	ommissioned a	nd the ac	company	/ing'Expla	anation of	Boreho	bie Log'.					Pa	ige: 1 of 1

R	ECORD OF BORE		0.	BH	D39												1	NO	od	
Pro	ject Number: TP115086							Drilling	g Loca	ation:	Clar	kway Dr	ive E:6	604234	N:485265	9	Logged	by:	MD.	_
Pro	ject Client: City of Brampton							Drilling	g Meth	nod:	150	mm So	lid Sten	n Auge	ers		Compile	ed by: S	SN	_
Pro	ject Name: Arterial Roads wi Area (Area 47)	thin Highway	427 In	dustria	al Seco	ndary	Plan	Drilling	g Mac	hine:	Trac	k Moun	ed Drill				Review	ed by: <u></u>	SM	_
Pro	ject Location: Clarkway Drive, E	Brampton, On	tario					Date	Starte	d:	Feb	12, 2020	)Da	ate Cor	mpleted: Fe	eb 12, 2020	Revisio	n No.: <u>(</u>	), 8/14/20	<u> </u>
	LITHOLOGY PROFIL	E	SC	NL SA	MPLI	NG			F	IELD	TEST	ING	LA		STING Reading				•	
hology Plot	DESCRIPTION		mple Type	mple Number	covery (%)	т 'N' / RQD (%)	EPTH (m)	EVATION (m)	O SP MTC △ In ▲ R	Penetra T Vane* tact emould ained Sh	tionTes PPT Nilco ◇ Ir ◆ F ear Strer	DCPT     DCPT     Nane*     tact     temould     adth (kPa)	▲ COV 2 △ COV 100 W <sub>P</sub> Plast	/ (LEL) 4 / (ppm) 200 W O tic	■ TOV (LEL) 6 8 □ TOV (ppm) 300 400 WL ■	STRUMENTATION	GR/ DISTI	AIN SIZI RIBUTIO (%)	S E DN	
Lit	Geodetic Ground Surface Elevation: 213.0 m about 150 mm ASPHAL	T 212.9	Sa	Sa	Re	SF	-		2	0 40	60	80	20	40	60 80	ŽŽ	GR SA	A SI	CL	-
	brown Sand and Gravel FILL moist	0.1	SS	1	89	34	-		-	0			3							
	dark grey Sandy Silt FILL trace to some clay, trace g	212.3 0.7	SS	2	100	9	- - - -	212					5							
							-	212 -	-											
		211.0	SS	3	72	9	-	•	0				80 							
~~~~	END OF BOREHOLE	2.0																		
														-						
														-						
														-						
														-						
														-						
														-						
														-						
														-						
														-						
														-						
														-						
													-							
Woo	od E&IS, a Division of Wood	$\underline{\forall}$ No freest	anding g	l groundv	vater me	asured	in oper	n boreho	ble on c	complet	on of d	rilling.				<u>I I</u>				
50 V	/ogell Road, Units 3 & 4	-								-		-								
Can Tel. www	ada No.: (905) 415-2632 /.woodplc.com	Borehole details a qualified Geote commissioned ar	as prese chnical E nd the ac	nted, do Engineer. company	not const Also, bor ving'Expla	itute a th ehole inf anation of	orough ormatic f Boreh	understa on should ole Log'.	nding of be read	f all pote I in conju	ntial con Inction w	ditions pre vith the geo	esent and otechnical	require in report fo	nterpretative as or which it was	sistance from		Sc Paq	ale: 1 : 5 e: 1 of	3

R	ECORD OF BOREHO	LE N	0.	BH	D40								wood
Pro	ject Number: TP115086							Drilling	g Location:	Clarkway Dr	ive E:604138 N:4852764	ļ	_ Logged by: <u>MD</u>
Pro	ject Client: City of Brampton							Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by: SN
Pro	ject Name: Arterial Roads within H Area (Area 47)	Highway	427 In	dustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ted Drill		Reviewed by: SM
Pro	ject Location: Clarkway Drive, Bramp	oton, On	tario					Date	Started:	Feb 13, 2020	Date Completed: Fe	b 13, 2020	Revision No.: 0, 8/14/20
	LITHOLOGY PROFILE		SC	NL SA	MPLI	NG			FIELD	TESTING	LAB TESTING		
						(%)			Penetra	ationTesting	Soil Vapour Reading COV (LEL) TOV (LEL)	TION	
lot	DESCRIPTION		e	mber	(%	QD (9	-	L N	O SPT □ MTO Vane*	PPT • DCPT Nilcon Vane*		TION	GRAIN SIZE
ogy P			le Ty	le Nu	very (	N'/R	H.	ATIO	△ Intact ▲ Remould	<ul> <li>♦ Remould</li> </ul>	W <sub>P</sub> W W <sub>L</sub>	ALLA	(%)
Lithol	Geodetic Ground Surface Elevation: 212.9 m		Samp	Samp	Reco	SPT '	DEP1	ELEV	* Undrained Sh 20 40	ear Strength (kPa)	Plastic Liquid 20 40 60 80	INSTI NST/	GR SA SI CL
****	about 150 mm ASPHALT	212.8	SS	1	100	507 150mm				0 150 mm			
	Sand and Gravel FILL moist	0.1											
							-						
			SS	2	89	20	- 1	212 -	0		▲ · · · · · · · · · · · · · · · · · · ·		
		211 5					È						
		1.4					-						
	trace to some sand, trace gravel		SS	3	83	10	_		0		<b>a</b>		
							2	211 -					
							È		-				
			SS	4	56	7	-		0	•			
							Ē	210 -					
							- 3						
			SS	5	50	16	-		0	1			
		209.1					F						
Ŵ		3.8					- 4	209 -					
	trace to some sand, trace gravel firm to stiff						_		-				
							F						
			SS	6	94	8	-		0				
XX	END OF BOREHOLE	207.9 5.0					- 5	208 -					
L	<u> </u>												
Wo Car	ada Limited $\sum_{i=1}^{N}$	No freesta	anding g	groundv	vater me	easured	in ope	n boreho	ble on complet	ion of drilling.			
50 N Rich	/ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6												
Car Tel.	ada Boreh No.: (905) 415-2632 a qual comm	nole details lified Geote nissioned ar	as prese chnical E nd the ac	nted, do ngineer. compan	not cons Also, bo ying'Expl	titute a th rehole in anation o	orough formation f Boreh	understa on should ole Log'.	nding of all pote be read in conji	ntial conditions pre unction with the geo	esent and require interpretative ass otechnical report for which it was	sistance from	Scale: 1 : 53
www	v.woodpic.com												Page: 1 of 1

R	ECORD OF BORE	HOLE N	0.	BH	D41	ı										W	00	d.
Pro	ject Number: TP115086							Drilling	g Locatior	ו:	Clarkway	Dri	ve E:6041	41 N:4852766		Logged by:	MD	
Pro	ject Client: City of Brampton	n						Drilling	g Method:		150 mm \$	Soli	d Stem Au	igers		Compiled by	: <u>SN</u>	
Pro	ject Name: Arterial Roads w Area (Area 47)	ithin Highway/	427 in	dustria	al Seco	ondary	Plan	Drilling	g Machine	e:	Track Mou	inte	ed Drill			_ Reviewed by	: <u>SM</u>	
Pro	ject Location: Clarkway Drive,	Brampton, On	tario					Date	Started:		Feb 13, 20	20	Date C	Completed: Fel	b 13, 2020	_ Revision No.	: <u>0, 8/1</u>	4/20
	LITHOLOGY PROFI	LE	SC	IL SA	MPLI	NG			FIEL	D T	ESTING		LAB T	ESTING	_			
				er		(%)		(E)	Pen O SPT	etratio	onTesting PT ● DCF	-т	▲ COV (LEL) 2 4	) TOV (LEL)	IN			
/ Plot	DESCRIPTION		Type	dmuN	y (%)	/ RQD	Ē	NOL	MTO Var △ Intact	ne*	Nilcon Vane ◇ Intact	e* _	△ COV (ppm) 100 200	)	MEN	DISTRIBL	ITION	
holog			mple	mple	cover	N. T	PTH	EVAL	Remove * Undrained	uld d Shea	<ul> <li>Remould</li> <li>r Strength (kPa)</li> </ul>	a)	W <sub>P</sub> ■ Plastic		STAL	(%)		
Lit	Geodetic Ground Surface Elevation: 213.9 r about 110 mm ASPHA	n LT 213.8_	s SS	8 1	2 100	507	ä		20	4050	60 80	453	20 40	60 80		5 50	SI 13	CL 2
	brown Sand and Gravel FIL	0.1 L				150mm	-				150 mm		4					
	some silt, trace clay moist						-											
							-	213 -										
			SS	2	67	45	1 - -			0		8	°7					
	grey	$\frac{212.5}{1.4}$					_											
	trace to some sand, trace	gravel	00	0	75	40	-											
		211 7	88	3	/5	12	2	212 -				- 83	<sup>0</sup> 16					
CXXX	END OF BOREHOLE	2.1																
									-									
									-									
									-									
									-									
									-									
									-									
									-									
									-									
									-									
Wor	od F&IS, a Division of Wood								<u> </u>				: :					
Can	ada Limited	$\stackrel{\underline{\vee}}{=}$ No freest	anding g	groundw	/ater me	asured i	n ope	n boreho	le on com	oletio	n of drilling.							
50 \ Rich	/ogell Road, Units 3 & 4 hmond Hill, Ontario, L4B 3K6 ada	Borehole details	as prese	nted. do	not const	itute a the	orouah	understa	nding of all r	ootenti	al conditions	pres	ent and requir	e interpretative ass	istance from			
Tel.	No.: (905) 415-2632 v.woodplc.com	a qualified Geote commissioned ar	chnical E nd the ac	ngineer. company	Also, bo ring'Expl	rehole info	ormatio	on should ole Log'.	be read in c	onjun	ction with the	geote	echnical repor	t for which it was			Scale: 1 Page: 1	1:53 of 1

R	ECORD OF BOREH	IOLE N	o. <u>I</u>	BH	D43								WC	bod
Pro	ject Number: TP115086							Drilling	g Location:	Clarkway Driv	ve E:604009 N:4852887		Logged by:	MD
Pro	ject Client: City of Brampton							Drilling	g Method:	150 mm Soli	id Stem Augers		Compiled by:	<u>SN</u>
Pro	ject Name: Arterial Roads with Area (Area 47)	hin Highway	427 In	dustria	al Seco	ondary	Plan	Drilling	g Machine:	Track Mounte	ed Drill		Reviewed by:	<u>SM</u>
Pro	ject Location: Clarkway Drive, B	rampton, On	tario					Date	Started:	Feb 11, 2020	Date Completed: Fe	b 11, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFIL	Ε	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING	7		TO.
Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetrai O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained She 20 40	tionTesting PPT ● DCPT _ Nilcon Vane* ◇ Intact ◆ Remould tear Strength (kPa) 60 80	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>p</sub> W W W Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GRAIN SIZ GRAIN SIZ DISTRIBUT (%)	ZE ION SI CL
***	about 130 mm ASPHAL	T 217.3 219:2	SS	1	83	12	_		0		D			
	dark grey /brown	0.3					-	217 -			<b>.</b>			
	Silty Clay / Clayey Silt Fil trace sand, trace grave	LL					-							
		040.4	SS	2	100	12	- 1 - -				°17			
		<u>216.1</u> 1.4 TILL					-	216 -	-					
	trace to some sand, trace gover the stiff to hard	avel	SS	3	100	27	_		0	La L	<sup>1</sup> 0 15			
							_ 2 _	-						
			SS	4	100	44	-	215 -	c	) 8	0,,			
							-		-		14			
	grey						- 3							
grey         SS         5         89         44         -         -         O         B         0           214.0         214         -         -         -         -         15         -         -         -         15         -         -         -         -         -         -         15         -         -         -         -         -         15         -         -         -         -         -         15         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -														
SS         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S         S														
Woo Can	d E&IS, a Division of Wood ada Limited	$\frac{\nabla}{\overline{z}}$ No freest	anding g	groundv	vater me	asured	in ope	n boreho	le on completio	on of drilling.				
50 V Rich	ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6													
Can Tel. www	ada No.: (905) 415-2632 .woodplc.com	Borehole details a qualified Geote commissioned a	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, bo ying'Expl	titute a th rehole inf anation o	orough ormatio f Boreh	understa on should ole Log'.	nding of all poter be read in conju	ntial conditions pres nction with the geot	sent and require interpretative ass technical report for which it was	sistance from	S Pa	cale: 1 : 53 ge: 1 of 1

R	ECORD OF BOREHOLE	No.	BH	D44								WC	ood.
Pro	ject Number: TP115086						Drilling	g Location:	Clarkway Dr	ive E:604007 N:4852886	i	Logged by:	MD
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	<u>SN</u>
Pro	ject Name: Arterial Roads within Highw Area (Area 47)	ay 427 Ir	ndustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ject Location: Clarkway Drive, Brampton, o	Ontario					Date S	Started:	Feb 11, 2020	Date Completed: Fe	b 11, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFILE	SC	DIL SA	AMPLI	NG			FIELD	TESTING	LAB TESTING			
ology Plot	DESCRIPTION	nple Type	nple Number	overy (%)	'N' / RQD (%)	TH (m)	VATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould	PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould	Soli Vapour Reading           COV (LEL)         ■ TOV (LEL)           2         4         6           Δ         COV (ppm)         □ TOV (ppm)           100         200         300         400           W <sub>p</sub> W         W <sub>L</sub> ■	TRUMENTATION TALLATION	COMMEN & GRAIN SIZ DISTRIBUT (%)	rs Ze Ion
Litho	Geodetic Ground Surface Elevation: 216.8 m	Sarr	Sam	Rea	SPT	DEP	ELE	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80		r sa s	SI CL
	brown 216 Sand and Gravel FILL C moist	ss	1	83	8	-		0		<b>D</b>			
	brown / dark grey Silty Clay / Clayey Silt FILL trace to some sand trace gravel trace organics	<sup>-</sup>				-	-						
	race to some sand, trace graver, trace organics	.6 SS	2	75	16	- - 1 -	216 -	• • • • •	4	a			
	brown SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel very stiff	.2 .2 .2	3	88	27	-	-	0	····· 6	<b>3</b>			
XXX	END OF BOREHOLE 1	.0 .8				_	215		· · · · · · · · · · · · · · · · · · ·				
Woo Can	⊔ od E&IS, a Division of Wood ada Limited ⊐ No fre	estanding	ground	water me	easured	in oper	n boreho	le on complet	ion of drilling.		<u> </u>		
50 V Rich	/ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6												
50 Vogell Road, Units 3 & 4         Richmond Hill, Ontario, L4B 3K6         Canada         Tel. No.: (905) 415-2632         www.woodplc.com    Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was Page Page Page Page Page Page Page Page												cale:1:53 ge:1 of 1	

R	ECORD OF BOREHO	LE No	o.	BH	D45							WC	ood.	
Pro	ject Number: TP115086							Drilling	g Location:	Clarkway Dr	ive E:603917 N:4852984	•	Logged by:	MD
Pro	ject Client: City of Brampton							Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arterial Roads within Area (Area 47)	Highway	427 In	dustria	al Seco	ndary	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ject Location: Clarkway Drive, Bran	pton, Ont	ario					Date S	Started:	Feb 11, 2020	Date Completed: Fe	b 11, 2020	Revision No.:	0, 8/14/20
	LITHOLOGY PROFILE		SO	IL SA	MPLI	NG			FIELD	TESTING				
Lithology Plot	DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Sh 20 40	AtionTesting PPT • DCPT Nilcon Vane* • Intact • Remould tear Strength (kPa) 60 80	Solit Vapoul reading           ▲ COV (LEL)         ■ TOV (LEL)           2         4         6         8           △ COV (ppm)         □         □VV (ppm)         □         TOV (ppm)           100         200         300         400           Wp         W         WL         ■           ■         ■         ●         ■           Plastic         Liquid         ≥         20         40         60         80	INSTRUMENTATION INSTALLATION	COMMEN & GRAIN SI DISTRIBUT (%)	TS ZE 10N si cl
	about 130 mm ASPHALT brown Sand and Gravel FILL	218.7 218:5	SS	1	75	9	_		0		<b>3</b>			
	moist brown / grey Silty Clay / Clayey Silt FILL	]					-	-						
	trace sand, trace gravel	217.6	SS	2	83	14	- - 1 -	218	0	F	g			
	brown / grey SILTY CLAY / CLAYEY SILT TIL trace to some sand, trace gravel bard	1.2 L	SS	3	100	36	-	-	0		3			
XX	END OF BOREHOLE	217.0 1.8						217 —						
Woo Can	od E&IS, a Division of Wood	No freesta	anding g	groundv	vater me	asured	in oper	n boreho	le on complet	ion of drilling.				
50 V Rich	'ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6													
Sichmond Hill, Ontario, L4B       Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log'.       Scale         Page:       Page:												Scale: 1 : 53 age: 1 of 1		

R	ECORD	OF BOREHOL	LE No	o. <u>I</u>	BH	D47								WO	od
Pro	ject Number:	TP115086							Drilling	Location:	Clarkway Driv	ve E:603816 N:4853079	)	Logged by:	MD
Pro	ject Client:	City of Brampton							Drilling	Method:	150 mm Soli	d Stem Augers		Compiled by:	SN
Pro	ject Name:	Arterial Roads within H	lighway	427 In	dustri	al Seco	ndary	Plan	Drilling	Machine:	Track Mounte	ed Drill		Reviewed by:	SM
Pro	ject Location:	Clarkway Drive, Bramp	oton, Ont	ario					Date S	Started:	Feb 11, 2020	Date Completed: Fe	b 11, 2020	Revision No.:	0, 8/14/20
	LITH	OLOGY PROFILE		SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
nology Plot		DESCRIPTION		mple Type	mple Number	covery (%)	T 'N' / RQD (%)	PTH (m)	EVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Shi	tionTesting PPT ● DCPT Nilcon Vane* Ontact Remould ear Strength (kPa)	Soil Vapour Reading           COV (LEL)         ■         TOV (LEL)           2         4         6         8           △         COV (ppm)         □         TOV (ppm)         100         200         400           Wp         W         W_L         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●         ●	STRUMENTATION STALLATION	COMMENT & GRAIN SIZ DISTRIBUTI (%)	'S 'E ON
Lit	Geodetic Ground S ab	urface Elevation: 219.9 m oout 160 mm ASPHALT	219.8	Sa	Sa	Re	SP	Ö		20 40	60 80	20 40 60 80	<u>žž</u> g	R SA S	I CL
	7	brown Sand and Gravel FILL moist	219:6 0.3	SS	1	83	8		-	0	23	°21			
	Silt	dark brown / grey y Clay / Clayey Silt FILL ace sand, trace gravel		SS	2	89	12	- - - - 1	219 —	0		0 <sub>47</sub>			
		brown / grey	_ <u>218.5</u> 1.4						-						
	SILTY trace	CLAY / CLAYEY SILT TILL to some sand, trace gravel very stiff to hard		SS	3	100	18		218 —	0		°. 14			
				SS	4	100	41	-	-	Ō		0 <sub>11</sub>			
								- 3	217 -						
				SS	5	100	37	-	-	0	23	o 14			
		grey						- - - - - - -	216						
			214.9	SS	6	94	17		215 —	0	es.	0 17			
Woo	od E&IS, a Divisi ada Limited	on of Wood $\Xi$	No freesta	anding g	groundv	vater me	asured	in ope	n boreho	le on completi	on of drilling.		II		
50 V Rich Can Tel. www	Yogell Road, Unit mond Hill, Ontar ada No.: (905) 415-2 v.woodplc.com	s 3 & 4 io, L4B 3K6 632 Boreh a quali comm	ole details a ified Geotec issioned an	as presei chnical E id the ac	nted, do ingineer. company	not const Also, bor ying'Expla	itute a th ehole in anation c	orough formatio	understar on should ole Log'.	nding of all poter be read in conju	- ntial conditions pres nction with the geot	ent and require interpretative ass echnical report for which it was	sistance from	So	cale:1:53

R	ECORD OF BORE	HOLE N	0.	BH	D48								WC	bod.
Pro	iject Number: TP115086							Drilling	Location:	Clarkway Dr	ive E:603814 N:4853	78	_ Logged by:	MD
Pro	ject Client: City of Bramptor	1						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	<u>SN</u>
Pro	oject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ondary P	lan	Drilling	Machine:	Track Mount	ted Drill		_ Reviewed by:	SM
Pro	eject Location: Clarkway Drive,	Brampton, Ont	tario					Date S	Started:	Feb 11, 2020	Date Completed:	Feb 11, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFIL	.E	SC	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
iology Plot	DESCRIPTION		nple Type	nple Number	covery (%)	T 'N' / RQD (%)	РТН (m)	EVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould	tionTesting PPT • DCPT Nilcon Vane* • Intact • Remould	A COV (LEL) ■ TOV (LE 2 4 6 8 △ COV (ppm) □ TOV (pp 100 200 300 400 W <sub>P</sub> W W <sub>L</sub> ■ TOV (pp 100 200 300 400 W <sub>P</sub> W W <sub>L</sub>	3 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	COMMEN & GRAIN SI DISTRIBUT (%)	ts Ze 10n
Lith	Geodetic Ground Surface Elevation: 219.9 m brown	219 7	Sar	Sar	Rec	SP	DE		20 40	60 80	20 40 60 80	NN G	R SA	SI CL
	Sand and Gravel FILI	- 0.1	SS	1	75	4		-	0					
	Silty Clay / Clayey Silt F trace sand, trace grave	ILL el						-						
		218.6	SS	2	100	12	- 1	219 -	0					
	brown SILTY CLAY / CLAYEY SIL trace to some sand, trace overy stiff	1.2 T TILL gravel	SS	3	100	24		-	0	····· £	<b>a</b>			
XX	END OF BOREHOLE	218.0 1.8										-		
	nd F&IS a Division of Wood													
Woo Can	od E&IS, a Division of Wood ada Limited	$\frac{\nabla}{=}$ No freesta	anding g	groundw	ater me	asured in	oper	n boreho	le on completi	on of drilling.				
50 N Rich Can Tel. www	/ogell Road, Units 3 & 4 Imond Hill, Ontario, L4B 3K6 Iada No.: (905) 415-2632 v.woodplc.com	Borehole details a qualified Geotec commissioned ar	as prese chnical E nd the ac	nted, do Ingineer. company	not const Also, bor ring'Expla	itute a thor rehole infor anation of I	rough rmatio Boreho	understa on should ole Log'.	nding of all poter be read in conju	ntial conditions pre nction with the geo	esent and require interpretative otechnical report for which it w	assistance from Is	Pa	Scale: 1 : 53 age: 1 of 1

R	ECORD OF I	BOREHOL	EN	o. <u>I</u>	BH	D49								W	00	d
Pro	oject Number: TP115	086							Drillinç	Location:	Clarkway Dr	ive E:603698 N:4853200	)	_ Logged by:	MD	
Pro	oject Client: <u>City of</u>	f Brampton							Drilling	Method:	150 mm So	lid Stem Augers		_ Compiled by	: <u>SN</u>	
Pro	oject Name: Arteria	al Roads within Hig	ghway	427 In	dustria	al Seco	ondary	Plan	Drilling	Machine:	Track Mount	ted Drill		_ Reviewed by	/: <u>SM</u>	
Pro	oject Location: Clarky	vay Drive, Brampto	on, Ont	ario					Date S	Started:	Feb 12, 2020	Date Completed: Fe	b 12, 2020	_ Revision No.	.: <u>0, 8/1</u>	14/20
	LITHOLOG	Y PROFILE		SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING				
							(%		2	Penetr	ationTesting	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8	NOIL	COMME &	NTS	
lot	DESC	RIPTION		be	mber	(%	SD (°	Ê	L (L	O SPT □ MTO Vane	<ul> <li>PPT • DCPT</li> <li>Nilcon Vane*</li> </ul>		TION	GRAIN	SIZE	
ogy F				ole Ty	ole Nu	very (	N'.'R	ڪ ب	ATIC	△ Intact ▲ Remould	<ul> <li>♦ Intact</li> <li>♦ Remould</li> </ul>	W <sub>P</sub> W W <sub>L</sub>	ALLA	(%)	TION	
Lithol	Geodetic Ground Surface Elev	vation: 220.8 m		Sam	Sam	Reco	SPT	DEP.	ELEV	* Undrained S 20 4	hear Strength (kPa) 0 60 80	Plastic Liquid 20 40 60 80		SR SA	SI	CL
***	about 120	mm ASPHALT	220.6 228:4	SS	1	83	6	-	-	0						
	Sand and	d Gravel FILL moist	0.3					_	-			14				
	brov Silty Clay / Clay / Clay	vn / grey Clayey Silt FILL d. trace gravel	-					F	220 —							
		u, trace graver		SS	2	89	10	- 1	-	0		a o <sub>24</sub>				
			ŀ					_	-							
			ŀ					Ē	-							
				SS	3	100	8	F	219 -	0	1	a o <sub>16</sub>				
	~~~~		218.5					— 2 _	-							
			2.2					_ _	-							
	trace to some	sand, trace gravel ery stiff		SS	4	100	23	-	-	0		a o 14				
	-							- 3	218 -							
		grey		SS	5	100	28	-	-	0				2 19	48	31
X	END OF	BOREHOLE	217.3		-			-				13				
Wo	od E&IS, a Division of We	ood ⊻ N	lo freesta	anding g	groundv	vater me	asured i	in oper	n boreho	le on comple	tion of drilling.		I I			
50 Y	Vogell Road, Units 3 & 4															
Ric Car Tel.	nmond Hill, Ontario, L4B 3 nada No.: (905) 415-2632	Boreholo a qualific commission	e details a ed Geotec sioned an	as prese chnical E d the ac	nted, do ngineer. company	not cons Also, bo /ing'Expl	titute a the rehole inf anation of	orough ormatic f Boreh	understar on should ole Log'.	nding of all pot be read in conj	ential conditions pre unction with the geo	esent and require interpretative ass otechnical report for which it was	sistance from		Scale:	1:53

R	ECORD OF BOREH					WC	ood.							
Pro	ject Number: TP115086							Drilling	g Location:	Clarkway Dr	ive E:603700 N:4853201	l	Logged by:	MD
Pro	ject Client: City of Brampton							Drilling	g Method:	150 mm So	lid Stem Augers		Compiled by:	<u>SN</u>
Pro	oject Name: Arterial Roads wit Area (Area 47)	hin Highway	427 In	dustria	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ejject Location: Clarkway Drive, B	rampton, On	tario					Date S	Started:	Feb 12, 2020	Date Completed: Fe	b 12, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFILE	Ξ	SO	IL SA	MPLI	NG			FIELD	TESTING				
						(%)		Ê			▲ COV (LEL) ■ TOV (LEL) 2 4 6 8		COMMEN &	TS
Plot	DESCRIPTION		ype	umbei	(%)	Rad (	Ê	No	MTO Vane*	Nilcon Vane*	△ COV (ppm) □ TOV (ppm) 100 200 300 400	ATION	GRAIN SI	ZE 10N
logy			ple T	iple N	overy	N. 1	TH (I	VATIO	<ul> <li>△ Intact</li> <li>▲ Remould</li> </ul>	<ul> <li>Intact</li> <li>Remould</li> </ul>	W <sub>P</sub> W W <sub>L</sub>	TRUM TALL/	(%)	
Lithe	Geodetic Ground Surface Elevation: 220.8 m	000 7	San	San	Reo	SPT	DEF		* Undrained Sh 20 40	near Strength (kPa) 60 80	Plastic Liquid 20 40 60 80		r sa	SI CL
	Sand and Gravel FILL moist	220.7 0.1	SS	1	79	7	-		0		3			
	brown / grey Silty Clay / Clayey Silt FII	/		-			-							
	trace sand, trace gravel, trace o	organics	00		00	40	_	220 -						
		219.6	55	2	83	13	- 1				<b>y</b>			
Û	brown SILTY CLAY / CLAYEY SILT	1.2 TILL					-							
	trace to some sand, trace gr very stiff	avel	SS	3		24	_		0		9			
XX.	END OF BOREHOLE	219.0 1.8					_	219 -						
_														
Wo Car	od E&IS, a Division of Wood ada Limited	$\frac{\nabla}{\overline{=}}$ No freesta	anding g	groundv	vater me	easured	in oper	n boreho	le on complet	tion of drilling.				
50 N Rich	/ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6	Desite the second												
Car Tel.	ada No.: (905) 415-2632	Borehole details a qualified Geote commissioned ar	as prese chnical E nd the ac	nted, do ingineer. company	not cons Also, bo ying'Expl	titute a th rehole inf anation o	orough ormatio f Borehe	understa on should ole Log'.	nding of all pote be read in conji	ential conditions pre unction with the geo	sent and require interpretative as technical report for which it was	sistance from	5	Scale: 1 : 53
ww	v.wooupic.com							-					l Pa	ge: 1 of 1

R	ECORD OF BOREH	OLE N	0.	BH	D51	ı													W	00	Р.
Pro	ject Number: TP115086							Drilling	g Locat	tion:	Clarkw	ay Dri	ve E:6	603599	N:48	53290		l	ogged by	: <u>MD</u>	
Pro	ject Client: City of Brampton							Drilling	g Metho	:bc	<u>150 m</u>	m Sol	id Sten	n Auge	ers			(	Compiled b	oy: <u>SN</u>	
Pro	ject Name: Arterial Roads with Area (Area 47)	in Highway	427 In	dustria	al Seco	ondary	Plan	Drilling	g Mach	ine:	Track I	Mount	ed Drill					F	Reviewed	by: <u>SM</u>	
Pro	ject Location: Clarkway Drive, Bra	impton, On	tario					Date S	Started	:	Feb 11	, 2020	Da	ite Cor	nplete	d: <u>Fe</u> l	b 11, 20	<b>20</b> F	Revision N	o.: <u>0, 8/</u>	14/20
	LITHOLOGY PROFILE		SC	IL SA	MPLI	NG			FI	ELD	TESTIN	IG	LA	BTE	STIN	G					
						(%		Ē	P	enetra	tionTestin	g	▲ COV	(LEL)	<ul> <li>Reading</li> <li>TO\</li> </ul>	) / (LEL) 8	TION		COMM 8		
olot	DESCRIPTION		be	umber	(%)	Rad (	ê	L NO	MTO	⊔ Vane*	Nilcon \	/ane*	△ COV 100	(ppm) 200	□ TO\ 300 4	(ppm)					
logy F			ple T)	ple N	very	ч.'.ч.	TH (n	VATIO	∆ Inta ▲ Re	act mould	<ul><li>♦ Intac</li><li>♦ Rem</li></ul>	t nould	W <sub>P</sub>	W		W <sub>L</sub>	RUM ALLA		(%	b)	
Litho	Geodetic Ground Surface Elevation: 221.5 m		Sam	Sam	Reco	SPT	DEP	ELEY	* Undra 20	ined She	ear Strength 60	n (kPa) 80	Plast 20	ic 40	Liq 60	uid 8 <u>0</u>	INST	GR	SA	SI	CL
***	about 100 mm ASPHALT	221.4 229:2	SS	1	89	9	-	-	0												
	Sand and Gravel FILL moist	0.2					_	221 -													
	dark brown Silty Clay / Clayey Silt FILL trace sand trace gravel						-	-													
	uace sand, uace graver		SS	2	100	7	- 1	-	0				3								
		220.1					-	-				- 									
	brown / grey SILTY CLAY / CLAYEY SILT T	1.4 ILL					Ē	220 -				: 									
	trace to some sand, trace grav	219.5	SS	3	100	27	-	-		0		ß	3								
~*^/	END OF BOREHOLE	2.0																			
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Woo Can	od E&IS, a Division of Wood ada Limited	$\frac{\nabla}{=}$ No freest	anding g	groundv	vater me	asured	in oper	n boreho	le on co	ompleti	on of drilli	ng.									
50 V	fogell Road, Units 3 & 4																				
Can Tel	ada Bo No.: (905) 415-2632 Bo	orehole details qualified Geote	as prese chnical E	nted, do ingineer.	not cons Also, bo	itute a th rehole inf	orough	understa on should	nding of a be read i	all poter in conju	ntial conditi	ions pres	sent and i technical	equire ir report fo	nterpreta	itive ass it was	istance fro	om		Scale:	1 : 53
Canada Tel. No: (905) 415-2632 www.woodplc.com												of 1									

RECORD OF BOREHOLE No. BH D53 Project Number 19115086 Drilling Location: Clarkway Drive E-503497 N:4853398 Located by MD													
Pro	ject Number: TP115086						_ Drilling	g Location:	Clarkway Di	rive E:603497 N:4853398	8	Logged by: MD	
Pro	ject Client: City of Brampton						_ Drilling	g Method:	150 mm Sc	olid Stem Augers		Compiled by: SN	
Pro	ject Name: Arterial Roads within Highway	427 In	ndustri	al Seco	ondary	Plan	_ Drilling	g Machine:	Track Moun	ted Drill		Reviewed by: SM	
Pro	ject Location: Clarkway Drive, Brampton, On	itario					_ Date S	Started:	Feb 12, 2020	Date Completed: Fe	b 12, 2020	Revision No.: <u>0, 8/14/20</u>	
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
						1		Penetral	tionTesting	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL)	NO	COMMENTS	
ŏ	DESCRIPTION	φ	nber	(%	%) QC		Ē		PPT • DCPT	2 4 6 8 △ COV (ppm) □ TOV (ppm)		GRAIN SIZE	
gy PI		e Typ	e Nur	ery (°	4' / R(	E H	ATIO	△ Intact ▲ Remould	<ul> <li>Nilcon Vane"</li> <li>♦ Intact</li> <li>♦ Remould</li> </ul>	100 200 300 400 W <sub>P</sub> W W <sub>L</sub>	ILLAT ILLAT	DISTRIBUTION (%)	
itholc		Sampl	Sampl	Secov	SPT '	DEPT		* Undrained She	ar Strength (kPa)	Plastic Liquid	NSTA NSTA	r sa si cl	
_	about 130 mm ASPHALT 221.9				12	-							
	Sand and Gravel FILL 221.7 moist 0.3		1	94	13	ŀ				<sup>₩0</sup> 6			
	brown / dark grey Silty Clay / Clayey Silt FILL												
	trace sand, trace gravel, trace organics	SS	2	100	10	Ē.							
			_			₽'.	221 -			13			
						F							
		SS	3	100	16			0		a o <sub>r</sub>			
						- 2	220 –			15			
X	<u>219.8</u> brown / grey <u>219.8</u>					Ę							
	SILTY CLAY / CLAYEY SILT TILL trace to some sand, trace gravel	SS	4	100	29	-		0		■ <sup>0</sup> 15			
	very sum to naro					ŧ							
	grey					- 3	219 -						
		SS	5	100	22	-		0		a o 16			
						ŧ							
						- 4	218 -						
						F	-						
						Ē	-						
	217.0	SS	6	100	36	-	-	0		₿ 0 13			
222	END OF BOREHOLE 5.0												
L	r												
Woo Can	rd E&IS, a Division of Wood $\frac{\nabla}{\Xi}$ No freest	tanding	ground	water me	easured	in ope	n boreho	le on completio	on of drilling.				
50 \ Rick	/ogell Road, Units 3 & 4												
Can	ada Borehole details No : (905) 415-2632 a qualified Geotr	as prese echnical E	ented, do Engineer	not cons . Also, bo	titute a th rehole in	horough Iformati	understa on should	nding of all poter be read in conju	tial conditions protection with the ge	esent and require interpretative associated as other the second s	sistance from	Scale: 1 : 53	
www	/.woodplc.com commissioned a	nd the ac	compan	ying'Expl	anation o	of Boreh	nole Log'.		2			Page: 1 of 1	

RECORD OF BOREHOLE No.       BH D54         Project Number:       TP115086         Drilling Location:       Clarkway Drive E:603499 N:4853399         Loaged by:       MD															00	0		
Pro	ject Number: TP115086							Drilling	g Locat	ion:	Clarkway D	ive E:60	)3499 N	1:4853399		Logged by	: <u>MD</u>	
Pro	ject Client: City of Brampton	1						Drilling	g Metho	od:	150 mm Sc	lid Stem	Augers			Compiled I	oy: <u>SN</u>	
Pro	ject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustri	al Seco	ondary	Plan	Drilling	g Mach	ine:	Track Moun	ted Drill				Reviewed	by: <u>SM</u>	
Pro	ject Location: Clarkway Drive, I	Brampton, On	tario					Date	Started	:	Feb 12, 2020	Date	e Comp	leted: Fe	b 12, 2020	Revision N	o.: <u>0, 8/1</u>	4/20
	LITHOLOGY PROFIL	.E	SC	NL SA	MPLI	NG			FI	ELD 1	TESTING	LAE	B TEST	ING				
						(%		e l	P	enetrat	tionTesting	▲ COV (L	LEL) 4 6	TOV (LEL)	NOIL	COMM 8		
olot	DESCRIPTION		be	umber	(%)	SQD (	Ê	NO NO	MTO	⊔ Vane*	Nilcon Vane*	△ COV (p 100	 ppm) □ 200 300	TOV (ppm) 0 400		GRAIN		
logy F			ple T)	ple N	very	N. / F	TH (r	VATIC	∆ Inta ▲ Re	act mould	<ul> <li>♦ Intact</li> <li>♦ Remould</li> </ul>	W <sub>P</sub>	w	WL	ALL <sup>A</sup>	(%	b)	
Litho	Geodetic Ground Surface Elevation: 221.7 m		Sam	Sam	Reco	SPT	DEP	ELE	* Undra 20	ined She 40	ear Strength (kPa) 60 80	Plastic 20	40 60	Liquid 80	LSNI	GR SA	SI	CL
	brown Sand and Gravel FILI	- 221.6 - 0.1	22	1	100	6	_											
	brown / dark brown	221.1	33	1	100	0	-											
	trace sand, trace grave	el 0.¢					-	221 -										
	SILTY CLAY / CLAYEY SIL trace to some sand, trace of firm to very stiff	T TILL gravel	SS	2	83	7	- - 1 -		0									
		219.9	SS	3	33	23	-	220 -		<b>)</b>		8						
	END OF BOREHOLE	1.8																
									-									
									-									
									-									
									-			-						
												-		-				
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														-				
Woo Can	od E&IS, a Division of Wood ada Limited	$\frac{\nabla}{\overline{z}}$ No freesta	anding g	groundv	water me	asured	in ope	n boreho	ole on co	ompletio	on of drilling.							
50 V Rich	/ogell Road, Units 3 & 4 Imond Hill, Ontario. L4B 3K6																	
Can Tel. www	ada No.: (905) 415-2632 /.woodplc.com	Borehole details a qualified Geote commissioned ar	as prese chnical E nd the ac	nted, do Engineer. company	not cons Also, bo ying'Expl	titute a th rehole inf anation o	orough formatio f Boreh	understa on should ole Log'.	nding of a be read i	all poten in conjur	ntial conditions pron Inction with the ge	esent and recontechnical re	quire inter port for w	pretative ass hich it was	istance from		Scale: Page: 1	1 : 53 of 1

R	ECORD OF BORE	HOLE N	o. <u> </u>	BH	D55								WC	bod
Pro	ject Number: TP115086							Drilling	Location:	Clarkway Dri	ive E:603388 N:4853502	2	Logged by:	MD
Pro	ject Client: City of Bramptor	1						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	SN
Pro	ject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ondary	Plan	Drilling	Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	ject Location: Clarkway Drive,	Brampton, On	tario					Date S	Started:	Feb 11, 2020	Date Completed: Fe	b 11, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFIL	.E	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING Soil Vapour Reading	7	COMMEN	TO
hology Plot	DESCRIPTION		mple Type	mple Number	covery (%)	T 'N' / RQD (%)	EPTH (m)	EVATION (m)	Penetra ○ SPT □ MTO Vane* △ Intact ▲ Remould * Undrained She	tionTesting PPT • DCPT Nilcon Vane* • Intact • Remould par Strength (kPa)	▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>p</sub> W W <sub>L</sub> Plastic liquid	STALLATION STALLATION	GRAIN SI DISTRIBUT (%)	ZE ION
Lit	Geodetic Ground Surface Elevation: 222.5 m about 150 mm ASPHA	LT 222.4	Sa	Sa	Re	SP	DE		20 40	60 80	20 40 60 80	<u>ŽŽ</u> GF	R SA	SI CL
	brown Sand and Gravel FILI moist	- 22 <b>2</b> : <b>2</b> - 0.3	SS	1	89	12	-	222	0	Ē	<sup>30</sup> 5			
	brown / grey Silty Clay / Clayey Silt F trace sand, trace grave	T <b>LL</b> el	~~~	2	04	24		-						
		221.1		2	94	24		-			<sup>1</sup> 15			
	SILTY CLAY / CLAYEY SIL trace to some sand, trace o hard	T TILL gravel	SS	3	100	30	-	221 -	0	E	<u>ه</u> و 15			
							2	-						
			SS	4	100	59	-	220 -		O E	<sup>s o</sup> 10			
							- 3	-						
SS 5 100 38 0 18 0 18 0 18 0 18 0 18 0 18 0														
SS         5         100         38         -         -         O         #a         o           219.0         -														
Woo	d E&IS, a Division of Wood ada Limited	$\frac{\nabla}{\underline{\nabla}}$ No freest	anding g	groundv	vater me	easured	in opei	n boreha	le on completi	on of drilling.		<u> </u>		
50 V	ogell Road, Units 3 & 4	_								-				
Can Tel. www	ada No.: (905) 415-2632 woodplc.com	Borehole details a qualified Geote commissioned a	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, boi /ing'Expla	titute a th rehole inf anation o	orough ormatic f Boreh	understa on should ole Log'.	nding of all poter be read in conju	ntial conditions pre nction with the geo	sent and require interpretative as technical report for which it was	sistance from	e Pa	Scale: 1 : 53 ige: 1 of 1

R	ECORD OF BORE	HOLE No	). <u>I</u>	BH I	D56	I							WC	bod.
Pro	iject Number: TP115086							Drilling	Location:	Clarkway Dri	ive E:603380 N:4853532		Logged by:	MD
Pro	ject Client: City of Brampton	1						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	<u>SN</u>
Pro	oject Name: Arterial Roads w Area (Area 47)	ithin Highway 4	27 In	dustria	al Seco	ondary I	Plan	Drilling	Machine:	Track Mount	ed Drill		Reviewed by:	SM
Pro	eject Location: Clarkway Drive,	Brampton, Onta	ario					Date S	Started:	Feb 11, 2020	Date Completed: Fe	b 11, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFIL	E	SO	IL SA	MPLI	NG			FIELD	TESTING				
y Plot	DESCRIPTION		Type	Number	ry (%)	/ RQD (%)	( <b>L</b> )	TION (m)	Penetrai ○ SPT □ MTO Vane* △ Intact	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact	A COV (LEL) ■ TOV (LEL)     2 4 6 8     △ COV (ppm) □ TOV (ppm)     100 200 300 400     W W	JMENTATION LATION	COMMEN & GRAIN SI DISTRIBUT	TS ZE 10N
Litholog	Geodetic Ground Surface Elevation: 222.0 n	1	Sample	Sample	Recove	SPT 'N'	DEPTH	ELEVA.	<ul> <li>Remould</li> <li>* Undrained She</li> <li>20 40</li> </ul>	<ul> <li>Remould</li> <li>ear Strength (kPa)</li> <li>60 80</li> </ul>	Wp         W         WL           ●         ●         ●           Plastic         Liquid           20         40         60         80	INSTRL INSTAL	(%) R SA	SI CL
	Sand and Gravel FIL moist	221.9 L 0.2	SS	1	75	8	-	-	0		<b>3</b>			
	Silty Clay / Clayey Silt F trace sand, trace gravel, trace brown	ILL 221.4 organics 0.6	00			45	-	-						
	SILTY CLAY / CLAYEY SIL trace to some sand, trace stiff to very stiff	T TILL gravel	SS	2	92	15	- 1 -	221 —	0					
		220.2	SS	3	46	26	-	-	0		3			
<u>~</u>	END OF BOREHOLE	1.8								· · · · · · · · · · · · · · · · · · ·				
Woo	od E&IS, a Division of Wood ada Limited	∑_ No freestar	nding g	groundw	vater me	asured i	n oper	n boreho	le on completi	on of drilling.				
50 \ Rich Can Tel. www	/ogell Road, Units 3 & 4 mmond Hill, Ontario, L4B 3K6 iada No.: (905) 415-2632 v.woodplc.com	Borehole details as a qualified Geotech commissioned and	s preser nnical E I the acc	nted, do r ngineer. company	not const Also, bor ing'Expla	itute a tho rehole info anation of	orough ormatio Boreho	understar on should ole Log'.	nding of all poter be read in conju	ntial conditions pre nction with the geo	sent and require interpretative ass technical report for which it was	istance from	Pa	Scale: 1 : 53 ige: 1 of 1

R	ECORD OF BORE	HOLE N	o. <u> </u>	BH	D57	1							W	000	0
Pro	ject Number: TP115086							Drilling	Location:	Clarkway Dr	ive E:603286 N:4853614	l .	Logged by:	MD	
Pro	ject Client: City of Brampton	n						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by:	SN	
Pro	ject Name: Arterial Roads w Area (Area 47)	ithin Highway	427 In	dustria	al Seco	ondary	Plan	Drilling	Machine:	Track Mount	ted Drill		Reviewed by:	SM	
Pro	ject Location: Clarkway Drive,	Brampton, On	ario					Date S	Started:	Feb 12, 2020	Date Completed: Fe	b 12, 2020	Revision No.:	<u>0, 8/14</u>	/20
	LITHOLOGY PROFIL	LE	SO	IL SA	MPLI	NG			FIELD	TESTING	LAB TESTING				
						(%)		Ê.			COV (LEL) ■ TOV (LEL) 2 4 6 8		COMMEN &	TS	
Plot	DESCRIPTION		ype	umbe	(%)	30D (	Ê	No	MTO Vane*	Nilcon Vane*	A COV (ppm) □ TOV (ppm) Nilcon Vane*			ZE 10N	
logy			T ald	ple N	overy	, z	TH (n	VATI	<ul> <li>△ Intact</li> <li>▲ Remould</li> </ul>	<ul> <li>Intact</li> <li>Remould</li> </ul>	W <sub>P</sub> W W <sub>L</sub>	TALL	(%)		
Lithe	Geodetic Ground Surface Elevation: 223.6 n	n I <b>T</b> 000 5	Sam	San	Reo	SPT	DEF		* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80	SN G	R SA	SI	CL
=_ 	about 85 min ASPHAL about 180 mm CONCRI	ETE 223:4	SS	1	94	6	-	-	0		<b>8</b> • • • • • • • • • • • • • • • • • • •				
	dark grey Silty Clay / Clayey Silt F trace sand trace gray	FILL 200.0					_	-							
Ì	brown / grey	<u> </u>					-	- 223							
	trace to some sand, trace stiff to very stiff	gravel	SS	2	100	13	- 1	-	0		8				
	,						-	-							
							_	222 —							
		221.6	SS	3	89	20	_	-	0	1	<b>a</b>				
	END OF BOREHOLE	E 2.0													
Wee	d F&IS a Division of Wood														
Can	ada Limited	$\stackrel{\text{V}}{=}$ No freesta	anding g	groundv	vater me	asured	in oper	n boreho	le on complet	ion of drilling.					
50 V Rich	ogell Road, Units 3 & 4 mond Hill, Ontario, L4B 3K6	Borehole dotaile	as press	nted do	not cone	itute e th	orouse	undereter	nding of all note	ntial conditions pro	sent and require interpretative on	sistance from	1		
Tel.	No.: (905) 415-2632	a qualified Geote commissioned ar	chnical E	ingineer. company	Also, bo ying'Expla	rehole infanation o	ormatio f Boreho	n should ble Log'.	be read in conju	unction with the geo	otechnical report for which it was	Journe II UIII		Scale: 1	:53
Can Tel. www	ada No.: (905) 415-2632 .woodplc.com	Borehole details a qualified Geote commissioned ar	as prese chnical E nd the ac	nted, do ingineer. company	not const Also, bo /ing'Expla	itute a th rehole inf anation o	orough ormatio f Boreho	understar n should ole Log'.	nding of all pote be read in conji	ntial conditions pre unction with the geo	esent and require interpretative as otechnical report for which it was	sistance from	Pa	Scale: 1 age: 1 d	:53 of1

Project Number:     TP115086     Drilling Location:     Culvert at Clarkway Drive E:604621 N:4852286       Project Client:     City of Brampton     Drilling Method:     150 mm Solid Stem Augers	Logged by: <u>M</u> Compiled by: <u>S</u>										
Project Client: City of Brampton Drilling Method: 150 mm Solid Stem Augers	Compiled by: S	N									
	Reviewed by: S										
Project Name: Arterial Roads within Highway 427 Industrial Secondary Plan Drilling Machine: Track Mounted Drill Area (Area 47)		м									
Project Location: Clarkway Drive, Brampton, Ontario Date Started: Feb 25, 2020 Date Completed: Feb 25, 2020	Revision No.: 0,	, 8/14/20									
LITHOLOGY PROFILE SOIL SAMPLING FIELD TESTING LAB TESTING	0000000000										
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	GRAIN SIZE	S E DN									
$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 $	(70) R SA SI	CI									
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		UL									
Sand and Gravel FILL trace to some silt moist											
209.2     greyish brown     1.0       Sitty Clay / Clayey Sitt FILL     SS     2       trace to some sand, trace to some gravel, trace     o											
SS 3 100 15 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2											
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$											
SS         5         100         7         3         207											
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	3 16 50	31									
trace gravel, cobbles/boulders loose to very dense moist to wet     -<											
SS 8 100 9 8 100 18 18 100 18 100 18 100 18 100 100											
END OF BOREHOLE         9.3         130mm         130mm         130mm         14         1.000											
Wood E&IS, a Division of Wood Canada Limited Groundwater encountered on completion of drilling on 2/25/2020 at a depth of: <u>4.3 m</u> .											
Canada Limiteu         -           50 Vogell Road, Units 3 & 4         -           Richmond Hill, Ontario, L4B 3K6         Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying Explanation of Borehole Log'.         Source Commissioned and the accompanying Explanation of Borehole Log'.											

## RECORD OF BOREHOLE No. <u>BH S13</u>

Project Number: TP115086

Project Name: Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)

Project Location: Clarkway Drive, Brampton, Ontario

	LITHOLOGY PROFILE	SO	IL SA	MPLI	NG			FIELD TESTING	LAB TESTING		
-ithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting O SPT PPT DCPT MTO Vane* Nilcon Vane* A Intact Remould Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soli Vapour Reading           ▲ COV (LEL)         ■ TOV (LEL)           2         4         6           Δ         COV (ppm)         □ TOV (ppm)           100         200         300         400           ₩ <sub>p</sub> ₩         W <sub>L</sub> ■           Plastic         Liquid         20         40         60	NSTRUMENTATION NSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground Sand: 0.0 - 0.6 m Bentonite: 0.6 - 4.0 m Sand Filter: 4.0 - 7.6 m Screen: 4.6										
	Borehole details a qualified Geote commissioned a	as prese chnical E nd the ac	nted, do i ngineer. company	not const Also, bor ing'Expla	itute a the rehole inf	orough u ormation f Borehol	nderstar should le Log'.	iding of all potential conditions pre be read in conjunction with the geo	sent and require interpretative ass stechnical report for which it was	istance fro	Scale: 1 : 53

WOO

R	ECORD OF BOREHOLE N	<b>o.</b>	BH	<u>S14</u>								WOO	d
Pro	ect Number: TP115086						Drilling	Location:	Culvert at Cl	arkway Drive E:604618	N:4852293	Logged by: MM	
Pro	ect Client: City of Brampton						Drilling	Method:	150 mm So	lid Stem Augers		Compiled by: SN	
Pro	ect Name: Arterial Roads within Highway	427 In	dustri	al Seco	ondary	Plan	Drilling	Machine:	Track Mount	ed Drill		Reviewed by: SM	
Pro	ect Location: Clarkway Drive, Brampton, Or	itario					Date	Started:	Feb 25, 2020	Date Completed: Fe	b 25, 2020	Revision No.: 0, 8/14	/20
	LITHOLOGY PROFILE	SC	NL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
					()			Penetra	tionTesting	Soil Vapour Reading COV (LEL) TOV (LEL)	NOIL		
ot	DESCRIPTION	e	mber	(%	QD (9	_	E z		PPT   DCPT  Nilcon Vane*	2 4 6 8 △ COV (ppm) □ TOV (ppm)	LION	GRAIN SIZE	
ogy P		le Typ	le Nu	/ery (	N'/ R	ш) Н	ATIO	△ Intact ▲ Remould	<ul> <li>Intact</li> <li>Remould</li> </ul>	W <sub>P</sub> W W <sub>L</sub>	RUME ALLA <sup>-</sup>	UISTRIBUTION (%)	
Lithol	Geodetic Ground Surface Elevation: 210.0 m	Samp	Samp	Reco	SPT '	DEPT	ELEV	* Undrained Sh 20 40	ear Strength (kPa) 60 80	Plastic Liquid 20 40 60 80	ILSNI G	R SA SI	CL
***	about 90 mm ASPHALT 209.9	ss	1	100	67	-			0	D			
	Sand and Gravel FILL trace to some silt					È				4			
	moist					Ę							
			2	63	30	- 1	209 -			a			
	208.7 brown to grey 1.2		2	05	50	-				o 4 0			
	Silty Clay / Clayey Silt FILL trace to some sand, trace to some gravel					ł				11			
		SS	3	92	14	-		0					
						_ 2	208 -			15			
						-							
		SS	4	63	6	-		0	E	<sup>8</sup> 0 <sub>14</sub>			
						Ę	207						
						- 3	207 -						
		SS	5	100	10	-		0		12 · · ·			
						Ē		-					
	205.0					- 4 -	206 -						
Ũ													
	trace to some sand, trace gravel soft to stiff					F							
						-							
		SS	6	83	3	- 5	205 -			16			
						ŀ							
						-							
						-							
						- 6	204 -		· · · · · · · · · · · · · · · · · · ·				
		SS	7	133	13	-		0		°22			
						Ē							
						- - - 7	203 -						
	grey <u>202.8</u> 7.2	1				-							
	SILTY SAND / SANDY SILT trace to some clay, trace gravel					-							
	moist to wet					Ē							
		SS	8	67	31	- 8	202 -	0		o. 21		51 47	2
						F							
						_							
						-							
				400	60/	- 9 -	201 -		60				
	200.7 END OF BOREHOLE 9.3	55	9	100	150mn	<u> </u>			150 mm	13 13			
Woo Can	d E&IS, a Division of Wood ada Limited Ground	vater en	counter	ed on co	ompletic	n of dri	illing on	2/25/2020 at a	depth of: <u>4.1 m</u> .		_		
50 \ Rict	ogell Road, Units 3 & 4 mond Hill Ontario J 4B 3K6												
Can Tel.	ada Borehole details No.: (905) 415-2632 Borehole details a qualified Geot	as prese echnical E	nted, do Ingineer.	not const Also, bo	titute a ti rehole in	formatic	understa	nding of all poter be read in conju	ntial conditions pre Inction with the geo	esent and require interpretative ass technical report for which it was	istance from	Scale: 1	: 53
www	woodplc.com	ind the ac	company	yıng Expl	ariation o	n Boreh	uie Log'.					Page: 1 o	of 1

R	ECORD OF BOREHOLE N	0.	BH	S15								W	000	
Pro	ject Number: TP115086						Drilling	g Location:	Culvert at Cl	arkway Drive E:604169 N:48	<b>2729</b> L	ogged by:	MS	
Pro	ject Client: City of Brampton						Drilling	g Method:	150 mm So	lid Stem Augers	C	ompiled by:	SN	
Pro	ject Name: Arterial Roads within Highway Area (Area 47)	427 In	dustri	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ed Drill	R	eviewed by:	SM	
Pro	ject Location: Clarkway Drive, Brampton, On	tario					Date	Started:	Feb 24, 2020	Date Completed: Feb 24,	<u>2020</u> R	evision No.:	<u>0, 8/14/</u>	/20
	LITHOLOGY PROFILE	SC	DIL SA	MPLI	NG			FIELD	TESTING					
					(%)		Ê	Penetra	tionTesting	▲ COV (LEL) ■ TOV (LEL) 0 2 4 6 8		COMMEN &	ITS	
Plot	DESCRIPTION	ype	lumbe	(%)	RQD	Ê	NO	MTO Vane*	Nilcon Vane*	△ COV (ppm) □ TOV (ppm) 100 200 300 400		GRAIN SI	IZE FION	
ology		nple T	nple N	povery	/.N. J	PTH (	EVATI	△ Intact ▲ Remould	Intact     Remould			(%)		
Lith	Geodetic Ground Surface Elevation: 212.7 m about 100 mm ASPHALT 212.6	Sar	Sar	Rec	SP	DEI	ELE	20 40	60 80	Plastic Liquid (7) (7 20 40 60 80 $\Xi$	GR	SA	SI	CL
	Comparison of the second sec					F								
	trace to some silt moist	SS	1	79	37	Ē				۵a				
	211.8					Ē.	212 -			3				
	Silty Clay / Clayey Silt FILL trace to some sand, trace to some gravel	ss	2	42	14					3				
						-				10				
		ss	3	100	8	_	211 -			<b>3</b> O				
	210.5					2				20				
Ŵ			4	195	25					1				
	trace sand to sandy, trace gravel, cobbles/boulders		-	105	23		210 -			20				
	very sun to hard													
		SS	5	100	68 / 180mm				68 0 180 mm	16				
						È								
							209 -							
		ss	6	46	20	- 4		0		≥ o 11				
						Ł								
		ss	7	100	67/	E	208 -		67		6	31	46	17
					250mm	- 5			250 mm	10		•••		
						-			· · · · · · · · · · · · · · · · · · ·					
						_	207							
						-	207 -							
				100	92/	- 6			92					
		ss	8	100	250mm				25	0 mm18				
							206 -							
						- 7								
		<u> </u>					205 -	· · · · · · · · · · · · · · · · · · ·						
		SS	9	89	94	- 8			Oe	22 ·····				
						-	204 -							
		<u> </u>			E0 /	9			59					
Ø	203.2 END OF BORFHOLE	SS	10	100	150mm	i i	8		150 mm	19 19				
We	d E&IS, a Division of Wood			<u> </u>										
Car	Wood Exits, a Division of Wood Canada Limited													
Rick	amond Hill, Ontario, L4B 3K6 ada Borehole details	as prese	nted, do	not cons	titute a th	orough	understa	nding of all poter	ntial conditions pre	sent and require interpretative assistance	from		Scale: 1 ·	. 53
Tel. www	No.: (905) 415-2632 a quaimed Geote wwoodplc.com a commissioned a	nd the ac	compan	ying'Expl	anation o	of Boreh	ole Log'.	ve redu iri Conju	neuon with the geo	Rechance report for which it was		Pa	age: 1 o	of 1

RE	ECORD OF BOREHOLE N	<b>o.</b>	BH	<u>S16</u>								WC	bod
Proj	ect Number: TP115086					Drilling Location:		Culvert at Cla	arkway Drive E:604158	Logged by:	MS		
Proj	ect Client: City of Brampton						Drilling	g Method:	150 mm Sol	id Stem Augers		Compiled by:	SN
Proj	ect Name: Arterial Roads within Highway Area (Area 47)	427 In	dustria	al Seco	ondary	Plan	Drilling	g Machine:	Track Mount	ed Drill		Reviewed by:	SM
Proj	ect Location: Clarkway Drive, Brampton, On	tario					Date	Started:	Feb 24, 2020	Date Completed: Fe	b 24, 2020	Revision No.:	<u>0, 8/14/20</u>
	LITHOLOGY PROFILE	SC	NL SA	MPLI	NG			FIELD	TESTING	LAB TESTING			
nology Plot	DESCRIPTION	mple Type	mple Number	covery (%)	T 'N' / RQD (%)	:РТН (m)	EVATION (m)	Penetra O SPT □ MTO Vane* △ Intact ▲ Remould * Undrained Shi	tionTesting PPT ● DCPT Nilcon Vane* ◇ Intact ◆ Remould ear Strength (kPa)	Soll Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W <sub>p</sub> W W, ■ 0 W, Plastic Linuid	STRUMENTATION	COMMEN & GRAIN SI DISTRIBUT (%)	ts Ze Ion
Ë,	Geodetic Ground Surface Elevation: 213.0 m about 90 mm ASPHALT 213.0-	Sai	Sai	Re	SP	DE		20 40	60 80	20 40 60 80	<u> </u>	ir sa	SI CL
	grey grey Sand and Gravel FILL trace to some silt moist 212.1	SS	1	100	32			0		1 <sup>-0</sup> 11			
	dark grey 0.9 Silty Clay / Clayey Silt FILL trace to some sand, trace to some gravel	SS	2	83	14	1   	212 -	0		1· 0 <sub>1</sub> 2			
	210.8	SS	3	100	8	- 2	211 -	0		<sup>3</sup> 24			
	SILTY CLAYY / CLAYEY SILT TILL trace to some sand, trace gravel, cobbles/boulders very stiff to hard	SS	4	100	22			0		<sup>a o</sup> 16			
		SS	5	100	37	- 3	210 -	0		1 · · 0 <sub>14</sub>			
		SS	6	100	29	- - - - -	209 -	0		a o <sub>12</sub>			
	grey	SS	7	100	62		208 -		0 4	i o <sub>9</sub>			
						-							
		SS	8	100	50 /	- 6	207 -	5	50 O	10,			
					1001111				100 mm				
						- - 7 - -	206 -						
		SS	9	100	70 / 150mm		205 -		70 150 mm	10 <sub>8</sub>			
						-	200						
		SS	10	100	71	9	204 -		····· ©····· #	1 o. 16			
	203.3 END OF BOREHOLE 98					-							
Was	TE&IS a Division of Wood									: : : :			
Cana	da Limited $\sum_{i=1}^{N}$ No freest	anding	groundv	vater me	easured	in ope	n boreho	ble on completi	on of drilling.				
Richr Cana Tel. N www.	Mond Hill, Ontario, L4B 3K6 da Borehole details. 40.: (905) 415-2632 commissioned ar woodplc.com	as prese chnical E nd the ac	nted, do Ingineer. company	not cons Also, bo ying'Expl	titute a th rehole in anation c	orough formation f Boreh	understa on should ole Log'.	nding of all pote be read in conju	ntial conditions prea Inction with the geo	sent and require interpretative as technical report for which it was	sistance from	S Pa	Scale: 1 : 53

## RECORD OF BOREHOLE No. BH S16

Project Number: TP115086

Project Name: Arterial Roads within Highway 427 Industrial Secondary Plan Area (Area 47)

Project Location: Clarkway Drive, Brampton, Ontario

WOO





## APPROVED SOURCE PROTECTION PLAN: CTC Source Protection Region



Map 3.4: York-Durham – Future Significant Groundwater Quantity Threat Areas

## Appendix B: Supporting Calculations

Catchment	Subcatchments	NHYD	Area (ha)	TIMP (ha)	XIMP (ha)	TIMP (%)	XIMP (%)	100-Year 6-Hour AES (Bloor, TRCA) PKFW (m3/s)	100-Year 12-Hour AES (Bloor, TRCA) PKFW (m3/s)	Regional - Hazel PKFW (m3/s)	100-Year Rational Method (City's IDF) PKFW (m3/s)
C6	CL1	201	1.07	0.49	0.30	0.46	0.28	0.179	0.102	0.151	0.417
G8	CL2	202	4.20	2.04	1.36	0.49	0.32	0.712	0.405	0.594	1.695
C4	CL3	203	3.35	1.86	1.26	0.56	0.38	0.586	0.332	0.477	1.449
C3	CL4	204	2.46	1.15	0.66	0.47	0.27	0.413	0.235	0.348	0.976
R1	CL5	205	1.98	1.22	0.88	0.62	0.45	0.356	0.200	0.284	0.905
R1	CL6	206	1.95	1.43	1.17	0.74	0.60	0.367	0.205	0.282	0.984
C2	CL7	207	1.93	1.49	1.22	0.77	0.63	0.367	0.205	0.280	1.003
G7	CS10 & CS11	208	0.73	0.49	0.37	0.67	0.50	0.134	0.075	0.105	0.351
G6	CS12	209	0.49	0.33	0.25	0.67	0.51	0.090	0.050	0.070	0.235
G4	CS13 & CS14	210	0.74	0.49	0.37	0.67	0.50	0.136	0.076	0.106	0.352
C5a	CS9	211	0.88	0.63	0.49	0.71	0.55	0.164	0.092	0.127	0.438
R3	EW1	212	2.33	1.65	1.29	0.71	0.55	0.434	0.242	0.336	1.154
G5a	EW2	213	1.55	0.93	0.66	0.60	0.42	0.276	0.156	0.222	0.699
G3	EW3	214	1.47	1.00	0.76	0.68	0.52	0.270	0.151	0.212	0.708
C1	EW4	215	1.22	0.82	0.62	0.67	0.51	0.224	0.125	0.175	0.584
G1	EW5	216	0.27	0.18	0.14	0.67	0.50	0.049	0.028	0.039	0.130
G2	EW6	217	0.98	0.67	0.51	0.68	0.52	0.180	0.101	0.141	0.475
R8	CS1 & CS2	218	1.77	1.35	1.06	0.76	0.60	0.336	0.187	0.257	0.916
R6	CS3	219	0.98	0.78	0.61	0.79	0.62	0.188	0.105	0.142	0.518
R7a	CS5	220	1.54	1.14	0.89	0.74	0.58	0.290	0.162	0.223	0.782
R4b	CS6	221	0.34	0.26	0.22	0.78	0.64	0.065	0.036	0.049	0.178
R5	CS7	222	1.01	0.77	0.60	0.76	0.59	0.192	0.107	0.146	0.521

Cubestshment	Tatal Area (ha)	Pervious	Area (ha)	Imj	pervious Area (h	ia)	27 mm Runoff Volume (m <sup>3</sup> )		
Subcatchment	Total Area (na)	Proposed	Existing	Proposed	Existing	Net	Total Imp Area	Net Increase	
Countryside Drive									
CS1	1.46	0.34	1.19	1.13	0.27	0.85	304.3	230.3	
CS2	0.30	0.08	0.18	0.23	0.12	0.10	60.9	28.0	
CS3	0.98	0.21	0.60	0.77	0.38	0.40	209.2	107.1	
CS5	1.54	0.40	1.40	1.14	0.15	0.99	307.7	268.4	
CS6	0.34	0.08	0.34	0.26	0.00	0.26	71.5	71.0	
CS7	1.01	0.24	1.00	0.77	0.01	0.76	207.1	204.6	
CS9	0.88	0.26	0.53	0.63	0.35	0.28	169.7	74.3	
CS10	0.54	0.18	0.31	0.36	0.23	0.13	97.2	36.2	
CS11	0.19	0.06	0.10	0.13	0.09	0.04	35.3	10.4	
CS12	0.49	0.16	0.48	0.33	0.01	0.32	88.6	86.2	
CS13	0.54	0.18	0.54	0.36	0.00	0.36	97.2	97.2	
CS14	0.20	0.07	0.20	0.13	0.00	0.13	35.8	35.8	
Clarkway Drive									
CL1	1.07	0.58	1.06	0.49	0.00	0.48	131.2	130.1	
CL2	4.20	2.16	3.13	2.04	1.07	0.97	550.5	261.6	
CL3	3.35	1.49	2.75	1.86	0.60	1.26	503.1	340.9	
CL4	2.46	1.31	1.79	1.15	0.67	0.48	310.6	129.4	
CL5	1.98	0.76	1.81	1.22	0.17	1.05	329.4	284.1	
CL6	1.95	0.51	1.28	1.43	0.67	0.76	386.3	206.5	
CL7	1.93	0.44	1.48	1.49	0.45	1.04	401.6	279.7	
E-W Arterial A2									
EW1	2.33	0.68	2.33	1.65	0.00	1.65	445.9	445.9	
EW2	1.55	0.62	1.43	0.93	0.12	0.81	251.2	218.0	
EW3	1.47	0.47	1.45	1.00	0.02	0.98	268.7	263.7	
EW4	1.22	0.40	1.18	0.82	0.03	0.79	220.8	212.3	
EW5	0.27	0.09	0.27	0.18	0.00	0.18	49.0	49.0	
EW6	0.98	0.31	0.96	0.67	0.02	0.65	180.8	175.7	
<b>Runoff Generated</b>	from a 5mm	Rainfall	Event						
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Subcatchment	Impervious Area (ha)	5 mm Runoff Volume (m³)	
Countryside Drive			
CS1	1.13	56.35	
CS2	0.23	11.27	
CS3	0.77	38.75	
CS5	1.14	56.98	
CS6	0.26	13.24	
CS7	0.77	38.35	
CS9	0.63	31.44	
CS10	0.36	18.00	
CS11	0.13	6.53	
CS12	0.33	16.41	
CS13	0.36	18.00	
CS14	0.13	6.64	
Clarkway Drive			
CL1	0.49	24.30	
CL2	2.04	101.95	
CL3	1.86	93.17	
CL4	1.15	57.51	
CL5	1.22	61.00	
CL6	1.43	71.53	
CL7	1.49	74.37	
E-W Arterial A2			
EW1	1.65	82.58	
EW2	0.93	46.52	
EW3	1.00	49.77	
EW4	0.82	40.88	
EW5	0.18	9.07	
EW6	0.67	33.48	

#### Pre-Development Water Balance Volume Calculations - Countryside Drive

Notes: Ratios of runoff, evapotranspiration, and infiltration as per Table 3.1 of MOE SWMPDM 2003

	Drainage Area Table (ha)												
		Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment							
Land Cover	Soil Group	CS1	CS2	CS3	CS5	CS6	CS7	CS9	CS10	CS11	CS12	CS13	CS14
		Contributing Area	<b>Contributing Area</b>	Contributing Area	Contributing Area	Contributing Area	Contributing Area						
		(ha)	(ha)	(ha)	(ha)	(ha)							
	A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Borvious Aroa	В	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pervious Area	С	1.19	0.18	0.60	1.40	0.34	1.00	0.53	0.31	0.10	0.48	0.54	0.20
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Impervious Area	N/A	0.27	0.12	0.38	0.15	0.00	0.01	0.35	0.23	0.09	0.01	0.00	0.00
	Totals	1.47	0.30	0.98	1.54	0.34	1.01	0.88	0.54	0.20	0.49	0.54	0.20

Soil Group Weighting (per Table 3.1 of SWMPDM 2003)										
Soil Group	Runoff	Infiltration	Evapotranspiration	Precipitation						
A	149	276	515	940						
В	187	228	525	940						
С	222	182	536	940						
D	270	145	525	940						
A	16%	29%	55%	100%						
В	20%	24%	56%	100%						
C	24%	19%	57%	100%						
D	29%	15%	56%	100%						

Annual Soil Infiltration (mm)								
Year Range	Average Annual Precipitation	Soil A Infiltration	Soil B Infiltration	Soil C Infiltration	Soil D Infiltration			
	(mm)	(mm)	(mm)	(mm)	(mm)			
1995 - 2019	797.6	234.19	193.46	154.43	123.03			

	Annual Subcatchment Infiltration (m <sup>3</sup> )											
Subcatchmor	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment
Subcatchiller	CS1	CS2	CS3	CS5	CS6	CS7	CS9	CS10	CS11	CS12	CS13	CS14
Vol	ime: 1839.23	281.06	929.65	2154.26	523.51	1544.27	820.01	481.81	159.06	742.80	830.82	305.77

	Daily Subcatchment Infiltration (m <sup>3</sup> )											
Subcatchmont #	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment	Subcatchment
Subcatchment #:	CS1	CS2	CS3	CS5	CS6	CS7	CS9	CS10	CS11	CS12	CS13	CS14
Volume:	5.04	0.77	2.55	5.90	1.43	4.23	2.25	1.32	0.44	2.04	2.28	0.84

## Pre-Development Water Balance Volume Calculations - Clarkway Drive

Notes: Ratios of runoff, evapotranspiration, and infiltration as per Table 3.1 of MOE SWMPDM 2003

	Drainage Area Table (ha)											
		Subcatchment Subcatchment Subcatchment		Subcatchment	ubcatchment Subcatchment		Subcatchment					
Land Cover	Soil Group	CL1	CL2	CL3	CL4	CL5	CL6	CL7				
		Contributing Area	Contributing Area	Contributing Area	Contributing Area	<b>Contributing Area</b>	Contributing Area	<b>Contributing Area</b>				
		(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)				
Pervious Area	A	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
	В	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
	С	1.06	3.13	2.75	1.79	1.81	1.28	1.48				
	D	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
Impervious Area	N/A	0.00	1.07	0.60	0.67	0.17	0.67	0.45				
	Totals	1.07	4.20	3.35	2.47	1.98	1.95	1.93				

Soil Group Weighting (per Table 3.1 of SWMPDM 2003)										
Soil Group	Runoff	Infiltration	Evapotranspiration	Precipitation						
A	149	276	515	940						
В	187	228	525	940						
С	222	182	536	940						
D	270	145	525	940						
A	16%	29%	55%	100%						
В	20%	24%	56%	100%						
C	24%	19%	57%	100%						
D	29%	15%	56%	100%						

Annual Soil Infiltration (mm)									
Year Range	Average Annual Precipitation (mm)	Soil A Infiltration (mm)	Soil B Infiltration (mm)	Soil C Infiltration (mm)	Soil D Infiltration (mm)				
1995 - 2019	797.6	234.19	193.46	154.43	123.03				

	Annual Subcatchment Infiltration (m <sup>3</sup> )											
Subcatchment #: Subcatchment   Subcatchment   Subcatchment   Subcatchment   Subcatchment   Subcatchment	Subcatchment											
CL1 CL2 CL3 CL4 CL5 CL6	CL7											
Volume:   1641.56   4836.67   4245.21   2770.43   2798.22   1976.67	2277.80											

Daily Subcatchment Infiltration (m <sup>3</sup> )											
Subcatchment #:	Subcatchment										
	CL1	CL2	CL3	CL4	CL5	CL6	CL7				
Volume:	4.50	13.25	11.63	7.59	7.67	5.42	6.24				

## Pre-Development Water Balance Volume Calculations - E-W Arterial A2

Notes: Ratios of runoff, evapotranspiration, and infiltration as per Table 3.1 of MOE SWMPDM 2003

	Drainage Area Table (ha)							
Land Cover	Soil Group	Subcatchment EW1	Subcatchment EW2	Subcatchment EW3	Subcatchment EW4	Subcatchment EW5	Subcatchment EW6	
		Contributing Area						
		(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	
	A	0.00	0.00	0.00	0.00	0.00	0.00	
Borvious Area	В	0.00	0.00	0.00	0.00	0.00	0.00	
Pervious Area	С	2.33	1.43	1.45	1.19	0.27	0.96	
	D	0.00	0.00	0.00	0.00	0.00	0.00	
Impervious Area	N/A	0.00	0.12	0.02	0.03	0.00	0.02	
	Totals	2.33	1.56	1.47	1.22	0.27	0.98	

Soil Group We	eighting (pe	er Table 3.1	of SWMPD	M 2003)
Soil Group	Runoff	Infiltration	Evapotranspiration	Precipitation
А	149	276	515	940
В	187	228	525	940
С	222	182	536	940
D	270	145	525	940
А	16%	29%	55%	100%
В	20%	24%	56%	100%
С	24%	19%	57%	100%
D	29%	15%	56%	100%

Annual Soil Infiltration (mm)						
Year Range	Average Annual Precipitation (mm)	Soil A Infiltration (mm)	Soil B Infiltration (mm)	Soil C Infiltration (mm)	Soil D Infiltration (mm)	
1995 - 2019	797.6	234.19	193.46	154.43	123.03	

Annual Subcatchment Infiltration (m <sup>3</sup> )						
Subcatchment #:	Subcatchment EW1	Subcatchment EW2	Subcatchment EW3	Subcatchment EW4	Subcatchment EW5	
Volume:	3604.34	2211.40	2239.20	1829.96	418.50	

Daily Subcatchment Infiltration (m <sup>3</sup> )						
Subcatchment #:	Subcatchment EW1	Subcatchment EW2	Subcatchment EW3	Subcatchment EW4	Subcatchment EW5	
Volume:	9.87	6.06	6.13	5.01	1.15	



Subcatchment EW6 4.07

Borehole Log ID	BH Plan Station	Road Profile Station	Ground Surface Elevation (m)	End of Borehole Elevation (m)	GW Depth (m)	GW Level Elev. (m)	Proposed Road Surface Elevation (m)	GW Depth from Proposed Road Surface (m)
Countryside Drive								
C1	0+000	10+20	215.8	212.8	(Dry)	-	215.7	>2.9
C2	0+000	10+20	215.1	213.2	(Dry)	-	215.7	>2.5
C3	0+150	10+170	216.5	215.0	(Dry)	-	216.4	>1.4
C5	0+300	10+320	214.6	209.7	3	211.6	215.5	3.9
C6	0+300	10+320	214.6	213.0	(Dry)	-	215.5	>2.5
\$11	0+330	10+350	213.2	204.0	2.1	211.1	215.6	4.5
\$12	0+344	10+364	213.5	207.7	(Dry)	-	215.7	>8
C7	0+450	10+470	216.5	213.5	(Dry)	-	216.2	>2.7
C8	0+450	10+470	216.6	214.8	(Dry)	-	216.2	>1.4
С9	0+600	10+620	218.3	216.8	(Dry)	-	217.0	>0.2
S9	0+693	10+713	214.4	205.0	(Dry)	-	217.5	>12.5
S10	0+705	10+725	213.8	204.4	8.2	205.6	217.5	11.9
C11	0+750	10+770	215.2	210.0	4.9	210.3	217.8	7.5
C12	0+750	10+770	213.6	212.4	(Dry)	-	217.8	>5.4
C13	0+900	10+920	219.0	215.9	(Dry)	-	218.5	>2.6
C15	1+050	11+70	219.7	218.2	(Dry)	-	219.3	>1.1
C17	1+200	11+220	219.9	214.9	(Dry)	-	220.1	>5.2
C18	1+200	11+220	219.9	218.1	(Dry)	-	220.1	>2
C20	1+350	11+370	220.2	219.0	(Dry)	-	220.8	>1.8
C21	1+500	11+520	221.3	219.7	(Dry)	-	221.6	>1.9
C23	1+650	11+670	221.3	220.4	(Dry)	-	222.2	>1.8
C24	1+650	11+670	220.9	219.1	(Dry)	-	222.2	>3.1
C25	1+800	11+820	220.9	217.8	(Dry)	-	222.5	>4.7
S8	1+945	11+965	219.5	209.9	2.4	217.1	222.3	5.2
C27	1+950	11+970	217.8	208.0	2.7	215.1	222.3	7.2
C29	2+100	12+120	221.4	216.5	(Dry)	-	221.6	>5.1
C30	2+100	12+120	221.0	219.2	(Dry)	-	221.6	>2.4
C31	2+250	12+270	221.7	218.7	1.5	220.2	220.9	0.7
C32	2+250	12+270	221.7	219.8	(Dry)	-	220.9	>1.1
C33	2+400	12+420	221.8	220.2	(Dry)	-	220.1	-
C35	2+550	12+570	220.6	219.1	(Dry)	-	219.4	>0.3
C37	2+700	12+720	220.0	218.5	(Dry)	-	218.6	>0.1

Borehole Log ID	BH Plan Station	Road Profile Station	Ground Surface Elevation (m)	End of Borehole Elevation (m)	GW Depth (m)	GW Level Elev. (m)	Proposed Road Surface Elevation (m)	GW Depth from Proposed Road Surface (m)	
	Clarkway Drive								
D1	0+000	14+310	205.6	202.6	(Dry)	-	205.6	>3	
D2	0+000	14+310	206.0	204.1	(Dry)	-	206.0	>1.9	
D3	0+150	14+160	206.0	204.4	(Dry)	-	206.3	>1.9	
D5	0+300	14+10	205.7	200.7	(Dry)	-	206.3	>5.6	
D6	0+300	14+10	206.1	204.3	(Dry)	-	206.3	>2	
D7	0+450	13+860	205.9	202.9	(Dry)	-	206.0	>3.1	
D8	0+450	13+860	205.6	204.7	(Dry)	-	206.0	>1.3	
D9	0+600	13+710	207.0	205.5	(Dry)	-	206.9	>1.4	
D11	0+750	13+560	207.9	202.9	(Dry)	-	207.8	>4.9	
D13	0+900	13+410	209.3	206.2	(Dry)	-	208.8	>2.6	
D15	1+050	13+260	209.5	208.0	(Dry)	-	209.8	>1.8	
D17	1+200	13+110	210.5	205.3	(Dry)	-	210.7	>5.4	
D18	1+200	13+110	210.1	208.2	(Dry)	-	210.7	>2.5	
D19	1+350	12+960	210.6	207.6	(Dry)	-	211.4	>3.8	
D21	1+500	12+810	209.0	207.5	(Dry)	-	210.9	>3.4	
D23	1+650	12+660	209.2	204.2	(Dry)	-	210.0	>5.8	
D25	1+800	12+510	209.1	206.0	(Dry)	-	209.2	>3.2	
D27	1+950	12+360	208.6	207.1	(Dry)	-	208.9	>1.8	
D29	2+100	12+210	211.7	209.9	(Dry)	-	210.1	>0.2	
D31	2+250	12+60	210.0	206.5	(Dry)	-	211.5	>4.9	
D32	2+250	12+60	208.3	206.4	(Dry)	-	211.5	>5	
D33	2+400	11+910	214.0	212.2	(Dry)	-	212.6	>0.4	
D35	2+550	11+760	212.9	207.9	(Dry)	-	213.7	>5.8	
D36	2+550	11+760	211.9	210.1	(Dry)	-	213.7	>3.6	
D37	2+700	11+610	214.5	210.9	(Dry)	-	214.8	>3.9	
D38	2+700	11+610	215.3	213.4	(Dry)	-	214.8	>1.4	
D39	2+850	11+460	213	211	(Dry)	-	215.8	>4.8	
D40	2+850	11+460	212.9	207.9	(Dry)	-	215.8	>7.9	
D41	3+000	11+310	213.9	211.7	(Dry)	-	216.9	>5.2	
D43	3+150	11+160	217.5	214	(Dry)	-	217.9	>3.9	
D44	3+150	11+160	216.8	215	(Dry)	-	217.9	>2.9	
D45	3+300	11+10	218.8	217	(Dry)	-	219.0	>2	
D47	3+450	10+860	219.9	214.9	(Dry)	-	220.1	>5.2	
D48	3+450	10+860	219.9	218	(Dry)	-	220.1	>2.1	
D49	3+600	10+710	220.8	217.3	(Dry)	-	221.1	>3.8	
D50	3+600	10+710	220.8	219	(Dry)	-	221.1	>2.1	
D51	3+750	10+560	221.5	219.5	(Dry)	-	222.2	>2.7	
D53	3+900	10+410	222	217	(Dry)	-	223.2	>6.2	
D54	3+900	10+410	221.7	219.9	(Dry)	-	223.2	>3.3	
D55	4+050	10+260	222.5	219	(Dry)	-	224.3	>5.3	
D56	4+050	10+260	222	220.2	(Dry)	-	224.3	>4.1	
D57	4+200	10+110	223.6	221.6	(Dry)	-	225.4	>3.8	

# Appendix C: Plans

TP115086 | 10/31/2022

wood



Plotted: 2021-11-05 Plotted By: richard.bartc .ast Saved: 2021-11-05 Last Saved By: richard.bartc

	LEGEND   EXISTING ROADWAY   WATERCOURSE   CONTOUR (0.5m)   ROAD DRAINAGE 'PART A'   SUBCATCHMENT BOUNDARY   ROAD DRAINAGE 'PART B'   SUBCATCHMENT BOUNDARY   MESP DEVELOPMENT DRAINAGE   SUBCATCHMENT BOUNDARY   Image: SUBCATCHMENT AREA
The R	44.0ha SUBCATCHMENT AREA SCALE VALID ONLY FOR 24"x36" VERSION
JBCATCHMENT DUNDARY PLAN STING CONDITION)	wood.   Scale 1:1000 0 100 200 400     Consultant File No. TP115086     Plan No.     1







Plotted By: Last Saved -05 2021 2021



\TD11508&\ 0.6 PES\_ENC\ 0.1 \_CAD\ 0.2 \_DWC\$\ 0.6 \_WB\ 0.1 \_BDO \\ 2021\_D6/PHD\\ E-2-6 \_C42444444-

otted: 2021-11-05 Plotted By: richard.t st Saved: 2021-11-05 Last Saved By: richard.t



Path: I:\TP115086\06\_DES-ENG\01\_CAD\02\_DWGS\05\_WR\01\_PR0J\2021-06(PtB)\Fig2-6 Catchment-Exs(PtB).dr

otted: 2021-11-05 Plotted By: richard. ist Saved: 2021-11-05 Last Saved By: richard.



:: !:\TP115086\06\_DFS=ENC\01\_C4D\02\_DWSS\05\_WE\01\_PP0.I\2021=06(P+B)\En2=6\_CF6\_C4++++++=====

lotted: 2021-11-05 Plotted By: richard. ast Saved: 2021-11-05 Last Saved By: richard.





SCALE VALID ONLY FOR 24"x36" VERSION

1:6000 50 100

TP115086

5

200



th: :\TP115086\06\_PES-ENC\01\_C40\02\_DWCS\05\_WP\01\_PP0\\3031-08/Pt4-Revi\\End=&\_Crichment-Ent\_dw

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Borte: 11 TD1150861 06 DES-ENC) 01 CAD 02 DWCS) 05 WD101 DD01208(DHA-Dwi)) Ere6-8 Catabumort-Er

Notted: 2021-11-05 Plotted By: richard.bartol ast Saved: 2021-11-05 Last Saved By: richard.bartol



itted: 2021–11–05 Plotted By: richard.bart st Saved: 2021–11–05 Last Saved By: richard.bart





#### LEGEND

	EXISTI	IG ROADWAY			
	WATER	COURSE			
	CONTO	UR (0.5m)			
ROAD DRAINA	GE 'PA	<u>RT A'</u>			
	SUBCA	TCHMENT BOUNDARY			
+	MAJOR/MINOR SYSTEM FLOW DIRECTION				
ROAD DRAINA	GE 'PA	<u>RT B'</u>			
	SUBCATCHMENT BOUNDARY				
<b>→</b>	➡ MAJOR/MINOR SYSTEM FLOW DIRECTION				
MESP DEVELO	OPMENT	DRAINAGE			
	SUBCA	TCHMENT BOUNDARY			
R3	- SUBCA	TCHMENT ID#			
44.0ha	– SUBCA	TCHMENT AREA			
R6	R6 STORMWATER MANAGEMENT FACILITY AND REFERENCE ID#				
		SCALE VALID ONLY FOR 24"x36" VERSION			
		Scale 1:6000			
woo	d.	Consultant File No. TP115086			
		Plan No. <b>7</b>			



BY: Plott \_ast 20212021



\TP115086\06 PES-ENG\01 CAD\02 DWGS\05 WR\01 PBO.N.2021-06(PHB)\Engl-12 Crichment-E

otted: 2021-11-05 Plotted By: richard.bartol st Saved: 2021-11-05 Last Saved By: richard.bartol



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alatted: 2021–11–05 Plotted By: richard.bartol .ast Saved: 2021–11–05 Last Saved By: richard.bartol