FINAL REPORT

Hydrogeological Assessment

187 Byron Avenue
Dorchester, Municipality of Thames Centre, Ontario

Submitted to:

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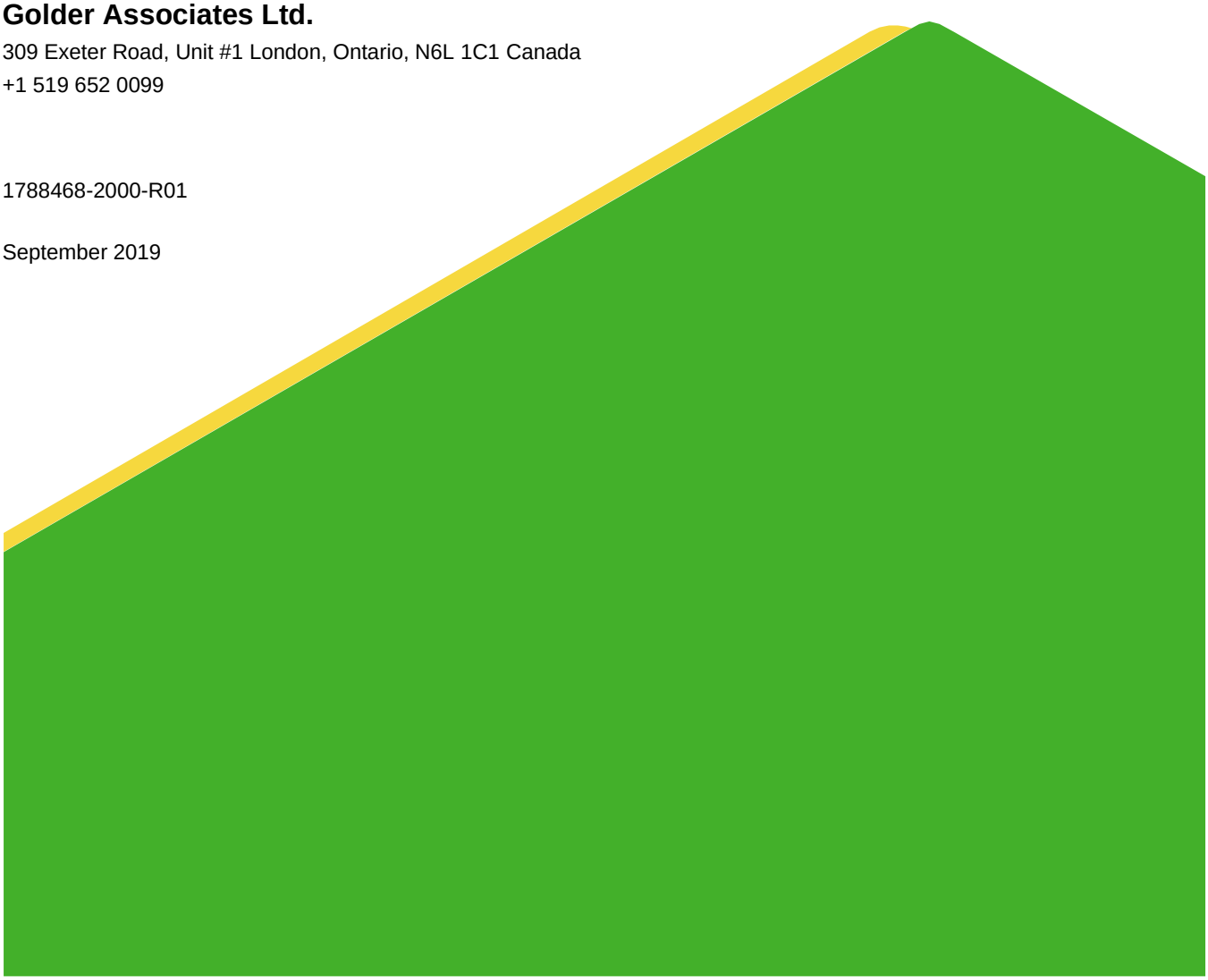

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1.0 INTRODUCTION

Golder Associates Ltd. ("Golder") was retained by Sifton Properties Limited ("Sifton") to carry out a hydrogeological assessment in support of a proposed development to be located at 187 Byron Avenue in Dorchester, Municipality of Thames Centre, Ontario (the "project"). The project is located on agricultural farmland located in the southwestern portion of Dorchester as shown in the Key Plan on Figure 1 and is hereinafter referred to as the "Site".

Based on the information provided to Golder, the approximately 21-hectare, irregularly shaped parcel of land is to be developed for residential, commercial, and parkland uses.

1.1 Scope of Work

As described in Golder proposal P1788468 (revised and issued on October 5, 2017), the scope of work for the hydrogeological assessment included data gathering and reporting to support a Permit to Take Water (PTTW or "Permit") application. The PTTW application will be submitted to the Ontario Ministry of the Environment, Conservation and Parks (MECP) on behalf of Sifton. The geotechnical exploration for the project and our review of design and construction details have indicated that proactive construction dewatering of excavations will likely be required to facilitate installation of the services associated with the proposed development. Based on expected extraction volumes and the duration of construction, a Category 3 PTTW application is required.

In accordance with MECP requirements, the objective of the hydrogeological assessment was to identify potential groundwater receptors and sources of groundwater contamination in the vicinity of the Site and to assess the potential hydrogeological impacts on these receptors as a result of the proposed construction dewatering.

Additional scope was approved by Sifton in October 2018 to satisfy requirements of the Upper Thames River Conservation Authority (UTRCA).

1.2 Previous Explorations

Golder previously completed a geotechnical exploration and testing program at the Site. Results of the geotechnical exploration were provided in the report listed below:

- Golder Report No. 1788468-R01 entitled "Geotechnical Exploration, Proposed Development, 187 Byron Avenue, Dorchester, Ontario", dated January 2018.

An aquifer testing program was completed at the Site by Lotowater Technical Services Inc. ("Lotowater") in 2007. Results of the testing program have been provided to Golder in the report listed below:

- Lotowater Report No. 297-003 entitled "Source Water Protection, Dorchester, Part 1. Aquifer Test", dated May 2, 2007.

Other pertinent reports are listed below:

- AECOM, 2019, Project # 60568894 Report prepared for Sifton Properties Limited, entitled "Conceptual Stormwater Management Report and Water Balance", dated July 2019 (AECOM, 2019a).
- AECOM, 2019, Project # 6071588 Report prepared for Sifton Properties Limited, entitled "187 Byron Avenue, Environmental Impact Study", dated August 2019 (AECOM, 2019b).

Borehole and monitoring well locations from the previous exploration and testing programs are shown on Figure 1. Relevant information from these explorations has been reviewed and incorporated into the current assessment, where appropriate.

2.0 SITE SETTING

The Site is currently agricultural farmland located to the south of Byron Avenue in Dorchester, Ontario. The property is bound to the north by Byron Avenue, to the west by Dorchester Road, to the east by Oakwood Drive, and to the south by Dorchester Creek. The Site is located within the Dorchester Wellfield and the south portion of the Site is protected by the UTRCA. The property slopes gently to the south from about elevation 258 metres (m) above mean sea level (amsl) at the north end of the Site to about elevation 255 m amsl at the south end of the Site. The topographic relief in the vicinity of the Site is shown on Figure 1.

2.1 Physiography and Drainage

The project is located within the physiographic region known as the Mount Elgin Ridges as indicated in "The Physiography of Southern Ontario" [1] by Chapman and Putnam (1984). The Mount Elgin Ridges are comprised of a series of moraines composed of pale brown calcareous clay or silty clay, while in the valleys it is common to find alluvium of gravels, sands or silts. Based on the Ontario Division of Mines Preliminary Map P.606 titled "Pleistocene Geology of the St. Thomas Area (East Half), Southern Ontario", the soils in the immediate area of the Site are valley train deposits consisting of gravel and gravelly sands.

The ground surface at the Site is generally flat with a slight downward slope to the south and Dorchester Creek, which is located about 50 m to the south of the Site. Dorchester Creek flows west towards Mill Pond located about 300 m west of the Site. Regionally, ground surface elevations slope gently downwards towards the north and the Thames River. At its closest approach, the south branch of the Thames River is located about 450 m northeast of the Site, flowing in a westerly direction.

2.2 Natural Environment Features

In summary, the existing natural features at the Site of relevance to the hydrogeological assessment include:

- The South Dorchester Swamp Provincially Significant Wetland (PSW) located to the south of the Site;
- Environmentally evaluated and protected areas in the vicinity of the southeast portion of the Site (AECOM, 2019b);
- Significant Ecologically Important Woodlands;
- MNRF Provincially Evaluated Wetlands; and
- Watercourses including the Lawton Drain and Big Swamp Drain (also known as Dorchester Pond Drain).

The proposed development is to be constructed predominantly outside of natural heritage features and their buffers (AECOM, 2019b).

[1] Chapman, L.J. and D.F. Putnam, *The Physiography of Southern Ontario*, Third Edition, Ontario Geological Survey, Special Volume 2, 1984.

2.3 Geological Setting

The surficial soils at the Site are mapped on Ontario Department of Mines Preliminary Map No. 238 entitled "Pleistocene Geology of the St. Thomas Area (East Half)" as gravel and gravelly sand valley train deposits of Late Wisconsin age. The Quaternary geology in the vicinity of the project is shown on Figure 2.

Geological Survey of Canada Map No. 1263A titled "Geology Toronto-Windsor Area", maps the bedrock underlying the project as Middle Devonian aged limestone of the Dundee Formation. The Dundee Formation is described by Armstrong and Carter (2010)[2] as grey to tan to brown, fossiliferous, medium to thickly bedded limestones and dolostones, with common bituminous partings and microstylolites. Based on the Ontario Department of Mines Preliminary Map No. 291 titled "Bedrock Topography Series, Lucan Sheet", the underlying bedrock surface in the area slopes gently downward towards the south. The bedrock surface elevation is estimated to be between about 246 and 236 m amsl, corresponding to depths of about 12 to 21 m below ground surface (bgs) at the Site.

2.4 Hydrogeological Setting

The shallow groundwater surface is generally a subdued replica of the local topography, with groundwater flow convergence and discharge in close proximity to surface water courses. Based on the topography in the vicinity of the Site and the results of groundwater monitoring, the shallow groundwater flow direction is anticipated to be southwest towards Dorchester Creek. Regional groundwater flow is inferred to travel in a northwesterly direction and towards the Thames River.

Based on mapping provided by Goff and Brown (1981)[3], there are four aquifers potentially present in the vicinity of the project alignment, as follows:

1) A shallow, generally unconfined, overburden aquifer consisting of surficial sand and/or sand and gravel deposits. This shallow aquifer may be overlain in some locations by thin deposits of lower permeability material such as silt, clay or till.

2) An intermediate depth, generally confined, overburden aquifer consisting of sands and/or gravels.

3) A deeply buried, generally confined, overburden aquifer consisting of sands and/or gravels.

4) A bedrock aquifer consisting of Middle Devonian age limestone of the Dundee Formation.

It is noted that the mapping provided by Goff and Brown (1981) relied on MECP water well records available as of September 1973. This information was supplemented with a review of the MECP water well records available as of February 2018.

The mapping provided by Goff and Brown (1981) indicates that the shallow overburden aquifer is present throughout the Site but is discontinuous to the south and west. The intermediate overburden aquifer is mapped throughout the Site but is discontinuous to the north and west. The deep overburden aquifer is not present at the Site according to the available mapping. The bedrock aquifer, which consists of the Dundee Formation limestones, is available throughout the region. No bedrock aquifer will be encountered during excavation for the

[2] Armstrong, D.K. and T.R. Carter, *The Subsurface Paleozoic Stratigraphy of Southern Ontario*, Ontario Geological Survey, Special Volume 7, 2010.

[3] Goff, K and D.R. Brown, *Thames River Basin Water Management Study Technical Report, Ground-Water Resources – Summary,* Ontario Ministry of the Environment - Water Resources Branch, Water Resources Report 14, 1981.

proposed construction and given their confined nature, are not expected to be impacted by the proposed temporary construction dewatering. Accordingly, the impact assessment as part of this report excludes the deep overburden and bedrock aquifers.

Based on mapping provided within the Upper Thames River Source Protection Area Assessment Report[4], the Site is located within an area of significant groundwater recharge. The vulnerability of the surficial aquifer to contamination from surface sources in the vicinity of the Site is reported to be high. Furthermore, Preliminary Map S116 titled "Susceptibility of Ground Water to Contamination, St. Thomas Sheet (East half)" indicates that the area of the Site is mapped as generally having a high susceptibility to contamination due to deposits of highly permeable glaciolacustrine and glaciofluvial sands and gravels.

The Site is located within a designated Wellhead Protection Area (WHPA) according to the Upper Thames River Source Protection Area Assessment Report. The municipal water supply wells for Dorchester are located to the south, adjacent to the Site.

3.0 SUBSURFACE CONDITIONS

Multiple geotechnical explorations and/or hydrogeological assessments to characterize the subsurface conditions have been completed at the Site. Relevant information from those projects has been reviewed and incorporated into this assessment. A detailed report summarizing the recent geotechnical exploration was delivered to Sifton as Golder Report No. 1788468-R01 entitled "Geotechnical Exploration, Proposed Development, 187 Byron Avenue, Dorchester, Ontario", dated January 2018.

3.1 Methodology

3.1.1 Groundwater

The field work for the geotechnical exploration was completed on October 23, 2017. A total of six boreholes, designated as BH-101 to BH-106, were drilled at the approximate locations shown on Figure 1. The boreholes were drilled using track-mounted drilling equipment supplied and operated by a specialist drilling contractor under the direction of a member of Golder's engineering staff. The soil stratigraphy encountered in the boreholes is shown on the Record of Borehole sheets provided in Appendix A. The ground surface elevations at the borehole locations are referenced to the top of casing elevation of MW6 surveyed in conjunction with a previous investigation conducted by others. The top of casing elevation is reportedly 256.9 m amsl and is assumed to have been referenced to geodetic datum. Grain size distribution curves for selected soils are provided in Appendix B.

Boreholes BH-101 to BH-106 were drilled to depths of about 4.7 to 5.0 m bgs, corresponding to elevations ranging from about 250.8 to 252.6 m amsl.

Boreholes BH-102 and BH-105 were completed as piezometers to depths of about 5.0 m bgs. Borehole BH-103 was completed as a monitoring well, designated MW-103, and extended to a depth of about 4.2 m bgs. The monitoring well was constructed with 1.5-metre long, 50-millimetre diameter, slot 10 polyvinyl chloride (PVC) well screens threaded to PVC riser pipes. A sand pack consisting of commercially available silica sand was used in the borehole annulus surrounding the well screen to a height of about 0.2 m above the screened interval. The

[4] Thames – Sydenham and Region Source Protection Committee, *Upper Thames River Source Protection Area, Assessment Report,* Approved September 16, 2015.

annulus above the sand pack was filled with bentonite to about 0.1 m bgs. The monitoring well was completed with a lockable protective monument. The well was developed using new polyethylene tubing equipped with a Waterra inertial foot valve and surge block. The well was purged of greater than 10 well volumes and field measurements of pH, temperature and electrical conductivity were collected at regular intervals during development.

Details of the piezometer and monitoring well installations are provided on the corresponding Record of Borehole sheets in Appendix A. A summary of the encountered and subsequently measured groundwater levels is provided in Table I.

Groundwater was sampled from MW-103 on November 14, 2017 and November 27, 2018. The samples were collected using dedicated peristaltic Geo-pump and polyethylene tubing. Prior to sampling, the well water quality parameters (temperature, pH, conductivity, dissolved oxygen and redox potential) had stabilized. Analytical results are summarized in Table II.

3.1.2 Surface Water

To aid in characterization of groundwater-surface water interaction at the Site, one staff gauge (SG-101) was installed on November 27, 2018 at the culvert. The location of the staff gauge is shown on Figure 1.

Surface water was sampled from two locations on November 27, 2018. The surface water samples were tested for a suite of water quality parameters, including temperature, pH, conductivity, dissolved oxygen and redox potential at the time of sampling. The surface water samples were analysed for a suite of water quality indicator parameters, including major anions and cations, nutrients, dissolved organic carbon (DOC), and metals. Analytical results are summarized in Table II.

3.2 Hydrogeological Findings

As indicated on the cross-sections provided on Figure 3, 4 and 5 and the borehole logs in Appendix A, the boreholes encountered variable unconsolidated materials including topsoil, sand and gravelly sand above silt, clay or sandy silt till.

As shown in Table I and on Figure 10, groundwater levels measured during the monitoring period range in depth from about 1.6 to 4.3 m bgs, corresponding to elevations of about 251.9 to 254.3 m amsl. There is seasonality to the water levels measured at BH-102, BH-105 and MW-103 with the winter months representing water level highs. Total daily precipitation does not appear to significantly affect the groundwater levels of any of the wells. In general, the hydrogeological regime at the Site is that of an unconfined (water table) aquifer consisting of variably saturated granular unconsolidated materials. Groundwater flow direction in the shallow aquifer is as anticipated (locally to the southwest towards Dorchester Creek) and shown on Figure 7. Based on the available information, groundwater levels are predominantly above the base of the required excavations for the proposed services (4 m bgs) for the entirety of the Site. Future levels may differ from those listed herein since groundwater levels are susceptible to seasonality and significant precipitation events. Hydrogeological conditions should be confirmed and monitored before, during and after construction and work plans modified as necessary.

3.3 Groundwater and Surface Water Quality

Groundwater samples were collected from MW-103 on November 14, 2017 and November 27, 2018. The samples were placed in coolers with ice and submitted with a chain of custody to the Maxxam Analytics (“Maxxam”) laboratory for chemical analysis of a general suite of parameters. Results of the analytical testing are presented in Table II (following the text of this report) and are compared to the City of London Storm Sewer Use

By-Law (“Storm By-Law”), the City of London Sanitary Sewer Use By-Law (“Sanitary By-Law”), and Ontario Provincial Water Quality Objectives (PWQO) standards. A copy of the laboratory certificate of analysis is provided in Appendix C.

The only parameter detected at a concentration exceeding the Sanitary By-Law standard was total suspended solids (TSS), which was detected at a concentration of 1,100 milligrams per litre (mg/L) as compared to the Sanitary By-Law standard of 350 mg/L. The following exceedances of the Storm By-Law standards were noted in the groundwater sample collected from MW-103 in November 2017 (there were no exceedances of any applicable standards noted in the groundwater sample collected from MW-103 in November 2018):

- TSS: 1,100 mg/L (standard at 15 mg/L);
- Total aluminum: 11 mg/L (standard at 1 mg/L);
- Total barium: 0.12 mg/L (standard at 0.1 mg/L);
- Total copper: 0.13 mg/L (standard at 0.04 mg/L);
- Total iron: 29 mg/L (standard at 1 mg/L);
- Total phosphorus: 0.7 mg/L (standard at 0.4 mg/L);
- Total zinc: 0.3 mg/L (standard at 0.05 mg/L).

There were no exceedances of any applicable standards noted in the surface water samples.

The above exceedances of the standards for metals are likely related to the elevated TSS value noted in the sample, rather than actual dissolved concentrations.

A Piper diagram is provided on Figure 8 and shows the concentrations of cations and anions in groundwater and surface water collected from the Site, as well as a historical rainwater sample (Rutherford, 1967) included for comparison purposes. The Piper diagram suggests that a magnesium-bicarbonate type water is present in the shallow aquifer at the Site.

A Schoeller diagram is provided on Figure 9 that shows the relative concentrations of anions and cations by sample. From the analysis of groundwater and surface water chemistry at the site and with subsequent comparison of the chemical signatures, it is likely that groundwater and surface water are from the same source; there is little variation between anion and cation concentrations observed from the one groundwater and two surface water samples collected from the Site.

Further discussion of the groundwater chemistry in the context of surface water at the Site is provided in Sections 5.3 and 6.2.

3.4 Estimate of Hydraulic Conductivity

A pumping test was conducted in a municipal supply well (designated as well “2PW-1”) located adjacent to the Site by Lotowater in 2006 to estimate the hydraulic conductivity (“K”) value of the granular deposits in the surrounding area. As summarized in the Lotowater report (2007), a constant pumping rate of 1,000 L/min was targeted for the testing period at supply well 2PW-1 and water levels were recorded in surrounding supply and monitoring wells to measure the effects of pumping on the aquifer.

The water level dataset collected during the pumping test was analyzed using the Jacob analytical method and a K value of 1.0 x 10^{-3} metres per second (m/s) was estimated for the aquifer.

For comparison purposes, the hydraulic conductivity of the granular aquifer material at the Site was also estimated with data taken from the grain size distribution curves for representative samples from recent boreholes using the Hazen approximation:

$$K = C{d_{10}}^2 \text{ (in Freeze and Cherry, 1979)}^5$$

where:

C = empirical constant (for K in centimeters per second (cm/s) and d_{10} in mm, C is equal to 1.0); and,

d_{10} = effective grain size at which 10 per cent by weight of the soil particles are finer.

Using the Hazen approximation and the grain size distribution curves compiled from the geotechnical exploration, the geometric mean hydraulic conductivity value for sand samples collected from the most recent boreholes (n = 3) is 5.1 x 10^{-4} m/s.

The hydraulic conductivity values estimated from the pumping test and Hazen approximation are consistent with values reported by Freeze and Cherry (1979)[6] for gravel and sand deposits.

4.0 PROPOSED DEWATERING PROGRAM

Based on construction details provided by Sifton and the inferred groundwater levels, it is anticipated that temporary construction dewatering will be required to complete the installation of services (anticipated to be new watermain, sewers and associated structures) for the proposed development. Construction will generally be completed through an open cut trench with trench boxes or temporary shoring in some of the deeper sections. Groundwater control by means of a well point system, deep wells and/or sumps and pumps will be required where the excavations extend below the groundwater level and into the saturated granular deposits.

The following sections provide a general assessment of the dewatering requirements for the proposed works for the purpose of supporting a PTTW application. It is recommended that an independent assessment of the subsurface conditions be undertaken by the selected contractor at the time of construction and the assessment refined during system installation.

If conditions are encountered that result in discharge rates that are higher than those estimated below, the length of the dewatering system and/or the area being dewatered will need to be reduced to remain within the permitted rates. In addition, the estimated drawdown values are based on measured groundwater levels at the time of field work. Seasonal and inter-annual variation should be anticipated and accounted for in the contractor's design of the dewatering system.

In the following sections, estimates of the radius of influence and dewatering discharge rates have been provided for two scenarios, as follows:

- a "typical" scenario, which is based on the average values estimated for the input parameters; and,

[5] Freeze, R., & Cherry, J. (1979). *Groundwater*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

- a “worst-case” scenario, which is based on the maximum values estimated for the input parameters.

4.1 Infrastructure Placement

The following assumptions, details and comments are provided in relation to the temporary dewatering program for infrastructure placement:

- Dewatering will be achieved using appropriately spaced, properly filtered well points, deep wells, eductors or a combination thereof, suitably installed along the project alignment. Due to the layering and heterogeneity of the soils, pumping from appropriately constructed and filtered sumps may also be necessary, particularly for the lower portions of granular units underlain by low-permeability strata;
- Groundwater levels within the granular deposits will be reduced to a level about equal to at least 0.5 m below the servicing pipe inverts, where possible;
- Excavation and dewatering will proceed in up to 100-m long sections of 5-m wide trench, such that adequate dewatering will be maintained for a 50-m section along which construction is progressing while the next 50-m section is dewatered to the target elevation;
- Pumped groundwater will be discharged to a municipal storm sewer, sanitary sewer, creek or roadside ditch, as available, with appropriate water quality sampling, sedimentation control measures and permits, as required; and,
- Assuming an approximate total servicing length of 2.3 kilometres, the estimated duration of dewatering is 60 days (including an initial 14 days for removal of aquifer storage). The actual duration of dewatering is dependent on the contractor’s staging and weather conditions.

Only limited design information was available at the time of preparation of this report; however, it is understood that typical new service inverts will be about 3.5 to 4.0 m below existing ground surface (corresponding to elevations of about 251.4 to 254.1 m amsl) and that about 2.3 kilometres of servicing is required to run continuously beneath the proposed roads. If necessary, this report should be revised, upon receipt of the detailed design drawing package. During the geotechnical and hydrogeological explorations, groundwater elevations measured in the granular deposits ranged from about 251.9 to 254.8 m amsl. Based on the available information, the groundwater level will need to be reduced by as much as 3.9 m to achieve adequate dewatering.

The lower 0.3 to 0.5 m of water-bearing strata above any underlying cohesive or comparatively low permeability material will be difficult to dewater by any means. Groundwater seepage should be expected at the interface of the sand deposits and the underlying cohesive deposits (silt, clay or till) if encountered. Supplementary groundwater and ground loss control will be required at, and near, such interfaces.

4.2 Estimate of Hydraulic Conductivity

As discussed in Section 3.4, the water level dataset collected during the pumping test was analyzed using the Jacob analytical method and a K value of 1.0×10^{-3} metres per second (m/s) was estimated for the aquifer.

Using the Hazen approximation and the grain size distribution curves compiled from the geotechnical exploration, the geometric mean hydraulic conductivity value for sand samples collected from the most recent boreholes (n = 3) is 5.1×10^{-4} m/s.

The hydraulic conductivity values estimated from the pumping test and Hazen approximation are consistent with values reported by Freeze and Cherry (1979)[6] for gravel and sand deposits. As a result, the Hazen

approximation K value is used as the “typical” scenario and the K value obtained from the pumping test is used for the “worst-case” scenario for the dewatering assessment described in the following sections.

4.3 Estimate of Dewatering Radius of Influence

The lateral extent of the zone of influence (R_o) was estimated by using an empirical relationship developed by Sichart and Kyrieleis. Using this method, the radius of influence is estimated as a function of drawdown and hydraulic conductivity as follows:

$$Ro = 3000\ (H - h)\sqrt{K}$$ (in Powers et al. 2007) [6]

Where:
R_o = radius of influence in metres;
H = aquifer thickness in metres;
h = dewatering height in metres; and,
K = hydraulic conductivity in metres per second.

Using the above relationship and either the average or maximum values for H, h and K, as appropriate for the two scenarios, the theoretical radius of influence for the proposed dewatering program for servicing is estimated to be about 176 m for the “typical” scenario and 366 m for the “worst-case” scenario.

A graph of drawdown versus distance included in the Lotowater report (2007) indicates that the theoretical edge of the drawdown cone for the pumping test occurred at a distance of about 600 m from the tested well, 2PW-1.

4.4 Estimate of Dewatering System Discharge

4.4.1 Steady-State

The theoretical discharge rate (Q) for the proposed dewatering system was estimated using Jacob’s modified non-equilibrium equation for an unconfined aquifer as follows:

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(R_o/r_s)} + 2\left(\frac{xK(H^2 - h^2)}{2L}\right)$$ (in Powers et al., 2007)

Where:

Q = theoretical discharge rate in cubic metres per day;

K = hydraulic conductivity in metres per day;

H = height of static water level above the inferred base of the groundwater flow system in metres;

h = height of dewatering above the inferred base of groundwater flow system in metres;

R_o = radius of influence from the center of the excavation in metres;

r_s = distance from well points to center of trench in metres;

x = excavation trench length in metres; and,

L = line source distance in metres.

[6] Powers, J. P., Corwin, A.B., Schmall, P.C., Kaeck, W.E. (2007) Construction Dewatering and Groundwater Control, New Methods and Applications, Third Edition. John Wiley and Sons Inc.

A summary of the values used in the above equation for each scenario are provided in Tables 1 and 2 below.

Table 1: Summary of input parameters for discharge - "Typical" scenario

Parameter	Values	Source
K	44.2 m/d	Geometric mean from hydraulic testing
H	6.1 m	Average inferred from boreholes
h	3.5 m	H less typical drawdown
R_o	176 m	Sichart and Kyrieleis relationship
r_s	8 m	Assumed based on excavation depth and probable side slopes
x	200 m	Assumed based on probable staging requirements and excavation progression
L	88 m	Equivalent to $R_o/2$

Using Jacob's modified non-equilibrium equation and the values listed in Table 1 above, a typical daily steady-state discharge of about 754,000 litres (L) is estimated for a 200-m long section of the alignment. This corresponds to a pumping rate of about 523 litres per minute (L/min) over a 24-hour period.

Table 2: Summary of input parameters for discharge - "Worst-case" scenario

Parameter	Values	Source
K	86.4 m/d	Maximum value from hydraulic testing
H	7.4 m	Maximum inferred from boreholes
h	3.5 m	H less maximum drawdown
R_o	366 m	Sichart and Kyrieleis relationship
r_s	8 m	Assumed based on excavation depth and probable side slopes
x	200 m	Assumed based on probable staging requirements and excavation progression
L	183 m	Equivalent to $R_o/2$

Using Jacob's modified non-equilibrium equation and the values listed in Table 2 above, the maximum daily steady-state discharge is estimated to be about 1,277,000 L for a 200-m long section of the alignment. This corresponds to a pumping rate of about 887 L/min over a 24-hour period.

4.4.2 Storage

The estimate of the total discharge from the proposed dewatering system must account for the volume of water to be removed from aquifer storage. The storage may be estimated as the product of the volume of the steady-state capture zone of the dewatering system and the specific yield (S_y) of the aquifer. The volume of the capture zone was estimated based on the difference between the pre-dewatering groundwater elevation and a hyperbolic (or

parabolic approximation) of the drawdown curve extended over the length of the trench and the volume of approximately semi-circular cones at the trench ends.

A summary of the values used to estimate aquifer storage is provided in Table 3 below.

Table 3: Summary of input parameters for storage estimate

Parameter	Values	Source
Drawdown, s	2.6 m	Average inferred from subsurface conditions
Width of trench excavation, w	5 m	Assumed based on construction requirements
Length of the trench, l	100 m	Assumed based on staging requirements and excavation progression
Radius of influence, R_o	176 m	Average from Sichart and Kyrieleis relationship
Specific Yield, S_y	0.25	Based on literature values

Using the values listed in Table 3 above, the aquifer storage was estimated to be about 28,469,000 L for a 100-m long section of the alignment. Assuming that the storage is removed over a 14-day period, this corresponds to a daily discharge of about 2,034,000 L and a pumping rate of about 1,413 L/min over a 24-hour period.

4.4.3 Direct Precipitation

The volume of water pumped by the dewatering system will also need to account for precipitation that falls directly into the excavation. It is assumed that during construction activities, the surrounding ground surface will be graded to direct any runoff away from open excavations. Using rainfall Intensity-Duration-Frequency data compiled by Environment Canada for the nearby London climate station over the period 1943 to 2007, about 108 millimetres of precipitation is anticipated for a storm event with a 24-hour duration and 100-year return period. Assuming a 100-year storm and an open excavation of about 500 square metres (m^2), an additional 55,000 L of water would be required to be removed, which corresponds to a pumping rate of about 38 L/min over a 24-hour period.

4.4.4 Findings

The various components of the estimated discharge are summarized in Tables 4 and 5 below.

Table 4: Dewatering discharge volume summary - "Typical" scenario

Parameter	"Typical" Steady-State	Storage	Direct Precipitation	Contingency Amount (100%)	Typical Discharge
Daily Volume (L)	754,000	2,034,000	55,000	2,842,000	5,685,000
Pumping Rate (L/min)	523	1,413	38	1,974	3,948

Table 5: Dewatering discharge volume summary - "Worst-case" scenario

Parameter	"Worst-Case" Steady-State	Storage	Direct Precipitation	Contingency Amount (100%)	Maximum Discharge
Daily Volume (L)	1,277,000	2,034,000	55,000	3,365,000	6,731,000
Pumping Rate (L/min)	886	1,413	38	2,337	4,674

As shown in Tables 4 and 5, a 100% contingency volume was applied to the total daily volume given by the sum of the estimated steady-state, storage and direct precipitation components for each scenario. The estimated daily discharge for each scenario is given by the sum of the daily volumes for the steady-state, storage, direct precipitation and the contingency amount components.

The above estimates assume that all storm and surface water runoff will be directed away from the excavation. Furthermore, the above estimates are based on the available subsurface information at the time of this assessment. The encountered subsurface conditions may vary between and beyond the borehole locations. Depending on the timing of construction, seasonal variation of local groundwater levels, and as a result, dewatering volumes, should be expected.

Based on the above values, we recommend applying for a PTTW with a maximum daily discharge of 6,731,000 L, corresponding to a pumping rate of about 4,674 L/min over a 24-hour period.

4.5 Groundwater Quality and Discharge

As discussed in Section 3.3, Groundwater samples were collected from MW-103 on November 14, 2017 and November 27, 2018. Copies of the laboratory certificates of analysis are provided in Appendix C.

Exceedances of the standards for metals are likely related to the elevated TSS value noted in the sample, rather than actual dissolved concentrations. Suitable treatment and performance criteria for the removal of suspended solids should be included as part of the tender specifications and monitored by the Contract Administrator throughout construction.

Recommendations for sampling the dewatering discharge to assess the ongoing groundwater quality during construction are provided in Appendix D. Based on the sampling results, the discharge will be directed to one of the following:

- The storm sewer system, with appropriate sedimentation control measures (e.g., Enviro-tanks, media filters, etc. to facilitate settling of suspended sediment prior to subsequent discharge) permits, and capacity confirmation as required; or
- A suitable municipal sanitary sewer manhole, with appropriate sedimentation control measures, permits and capacity confirmation, as required; or
- Dorchester Creek, with appropriate sedimentation control measures and permits as required; or
- A suitable roadside ditch, with appropriate sedimentation control measures and permits, as required.

It is our understanding that the discharge will initially be directed to the municipal storm sewer system and will be redirected if dictated by the results of the discharge sampling program (see Appendix D).

The contractor has several options to remove the suspended sediment from the discharge including, but not limited to, appropriately sized sedimentation tanks, weir or baffle systems, sand media filters, cartridge or bag filters, lamella plate clarification (e.g. Siltbuster), etc. The contractor should select an appropriate treatment system to achieve the required discharge criteria.

5.0 POTENTIAL RECEPTORS

5.1 Existing Water Wells

5.1.1 MECP Water Well Information System

Golder queried the MECP (formally known as the MOECC) water well information system for data for all wells located within a 500-m radius of the project alignment. Data for 45 wells was retrieved. The approximate locations of these wells, as indicated in the MECP water well records, are shown on Figure 6. A summary of the MECP query is provided in Table III.

For the 45 well records received from the MECP, 19 records correspond to wells that are used for monitoring, observation or test purposes. Six wells are reported abandoned, four have no status, and one is an unused dewatering well. The remaining fifteen records are water supply wells of which eight wells are reported to be for municipal use, five wells are for domestic use, and two are for commercial use. Based on the available information, it is inferred that the MECP wells present within a 500-m radius of the project alignment are active groundwater receptors that may be impacted by proposed construction dewatering activities.

5.1.2 Piped Municipal Supply

Golder contacted the Municipality of Thames Centre to inquire about the availability of a piped municipal water supply in the vicinity of the Site. Based on information provided, all properties located within 500 m of the Site have an available municipal supply connection.

5.1.3 Municipal Supply Wells

Correspondence from the Municipality of Thames Centre indicated that there are active municipal water supply wells within the theoretical radius of influence of the proposed construction dewatering activities.

Nine water supply wells are located across two well fields, designated as Well Field 2 (containing one well) and Well Field 3 (containing eight wells) at the Dorchester Water Treatment Facility located east of the Site. The locations of these wells are shown on Figure 7. Of the nine supply wells, seven are installed in the overburden aquifer and two are installed in the bedrock aquifer. Currently, the Dorchester Water Treatment Facility takes groundwater under Amended PTTW 4304-AABHQE, issued on May 25, 2016 which expires on May 21, 2021. The current PTTW has three sources and treats the overburden wells from Well Field 2 and Well Field 3 and the bedrock wells from Well Field 3 separately for the purposes of establishing the maximum amounts to be taken. Well Field 2 includes overburden well 2PW-1 and has a maximum water taking of 1,000 L/min. Well Field 3 contains overburden wells 3PW-1, 3PW-2B, 3PW-3, 3PW-4A, 3PW-7 and 3PW-8, which have a combined maximum water taking allowance of 2,556 L/min; Well Field 3 also contains bedrock wells 2PW-5 and 3PW-6, which have a combined maximum water taking allowance of 1,545 L/min.

Typical groundwater level fluctuations observed at the overburden monitoring wells across the Dorchester Water Treatment Facility are 0.7 and 1.0 m for the monitoring period of 2007 to 2014[7]. The lowest water levels measured across the site in the overburden monitoring wells range between 251.5 and 253.9 m amsl for the same time period.

Further recommendations related to groundwater receptors are provided in Section 8.0.

5.1.4 Door to Door Survey

A door-to door-survey of the municipal addresses within 500 m of the alignment was completed to confirm the presence or absence of water well users in the area of the Site. Results of the door-to-door survey are presented in Table IV.

5.2 Surface Water and Wetlands

The nearest surface water body of prominence to the Site is the Thames River. At its closest approach, the south branch of the Thames River is located about 450 m northeast of the Site, flowing in a northwesterly direction. Dorchester Creek is located about 50 m south of the Site, flowing in a westerly direction and draining to Mill Pond, which is located about 300 m west of the Site.

According to mapping provided by the Ministry of Natural Resources and Forestry (MNRF) for Natural Heritage Areas, a Provincially Significant Wetland (PSW) is located immediately adjacent and south of the Site. This PSW runs from the Dorchester Swamp, a 548-hectare area of natural and scientific interest (ANSI) about 1 kilometre southeast of the Site, along Dorchester Creek towards Mill Pond west of the Site.

5.3 Groundwater – Surface Water Interaction

As with most shallow granular aquifer systems, groundwater and surface water are found to interact at the Site. With consideration of the local topography and the unconfined nature of the shallow aquifer, the monitoring results suggest that shallow groundwater from the sand aquifer interacts with surface water at the Site, with groundwater moving through the saturated thickness of the aquifer and discharging to Dorchester Creek. The underlying low permeability layer appears to act as an aquitard. Also, it is expected that the sand aquifer receives direct recharge from infiltration and that the majority of precipitation would not runoff. Increased relative recharge from precipitation is demonstrated on the hydrograph (Figure 10). The hydrographs, when viewed in conjunction with precipitation events, indicate that the Site responds rapidly to meteoric water.

Based on water quality results and the presence of groundwater-fed indicator species such as skunk cabbage to the south of the Site, the surface water features (and thus, natural heritage features) at the Site exhibit some groundwater dependence. Chemical signatures of the majority of the groundwater (magnesium-bicarbonate type) and surface water (calcium-bicarbonate to sodium chloride type) samples indicate a different but transitional dominant water type, implying that the Site is largely runoff and surface water fed, with field observations, groundwater chemistry and water elevations indicating partial contribution of groundwater to the wetland areas south of the Site. Groundwater is inferred to flow south and west throughout the Site, to Dorchester Creek.

There will be a reduction in infiltration to the sand aquifer and a marked increase in runoff once the development is complete. The SWM strategy in the context of groundwater recharge and municipal supply wells is important to

[7] Stantec Consulting Ltd. (2016) Dorchester PTTW No. 3122 8H9KA6 – Amendment Request Municipality of Thames Centre".

maintain the current groundwater and surface water levels. Further discussion of the water balance is provided in Section 6.1.

It is inferred that surface water (and thus, via a short recharge-based time lag, groundwater) salt loading would be particularly elevated during winter months, with a significant decrease following spring. Salt management is also discussed in the SWM report and water balance for the Site (AECOM, 2019).

6.0 IMPACT ASSESSMENT

6.1 Stormwater Management and Water Balance

In order to assess the impact of the proposed Site development on the hydrologic/hydrogeologic regime, a water balance was completed as part of the stormwater management (SWM) report for the Site (AECOM, 2019). A summary water balance table is provided for reference in Appendix E of this report. Key points from the stormwater management plan and water balance discussed therein include:

- The regulatory (municipal and provincial) SWM criteria for the proposed development are as follows:
  - Water Quality: A treatment train approach must be designed for long-term treatment of suspended solids removal, as identified in Table 3.2 of the MOE Stormwater Management Practices Planning and Design Manual (March 2003). On-site water quality treatment is required for the proposed medium-density and commercial blocks;
  - Peak Flow Attenuation: Discharge the minor storm event (2-year City of London event) to the existing storm sewer, attenuate the 5 through 100-year events prior to discharging to the existing storm sewer and provide on-site attenuation for the medium-density and commercial blocks; and,
  - Water Balance: Provide adequate on-site water balance while limiting annual infiltration to existing levels in order to satisfy concerns related to the proximity of municipal water supply wellheads.
- Existing site drainage is split between three locations:
  - West towards the Dorchester Road east ditch and existing 600 millimetre (mm) diameter culvert;
  - 1,350 mm diameter storm sewer outlet; and,
  - South towards Dorchester Creek.
  - There is also an existing 825 mm diameter municipal drain that services lands north of Byron Avenue conveying drainage south across the site to an existing 1,350 mm diameter storm sewer, which services a SWM facility for a 26 ha parcel of land to the east.
- The conceptual SWM strategy incorporates several features with the aim of allowing the Site to meet both quantity, quality and water balance and is summarized as follows:
  - The Site is proposed to undergo an increase of 0 ha of impervious ground to 10 ha of impervious ground for a total ultimate site imperviousness of 49%;
  - Goss traps combined with catch basin inserts will provide pre-treatment of floating debris and coarse sediment;
  - Roof rainwater leaders / downspouts will be disconnected;

- Rear-yard infiltration will occur where grading permits, including overflow catch basins;
- Oil-grit separators will provide additional water quality treatment;
- There will be unrestricted conveyance for minor and major flows to external lands; and,
- Major overland flow will be directed to Dorchester Road and Dorchester Creek.
- The SWM strategy utilizes existing storm sewer capacity while infiltrating runoff in rear yards where possible.
- Proposed dry basin facilities will attenuate peak discharge from high-magnitude events that exceed sewer capacity.

The SWM and Water Balance report (AECOM, 2019) for the proposed development provides detailed calculations for existing and proposed conditions. With all mitigation measures in place, water balance calculations indicate that on an annual basis, there will be a 29 per cent decrease in evapotranspiration, a 9 per cent decrease in infiltration and a 137 per cent increase in runoff (refer to Appendix E).

The proposed development plan will result in the loss of 0.29 ha of Cultural Meadow (CUM1-1). None of the ecological communities at the Site containing groundwater indicator species (FOM2-1 and SWT3-5) will be directly impacted.

The EIS identifies that thermal impacts are an important consideration for stormwater management systems when discharge of stormwater is to be directed to a coolwater fish habitat watercourse. Since coolwater species, such as Northern Pike are found in Dorchester Pond Drain, stormwater discharge must maintain or improve the existing thermal regime. Rear-yard infiltration of stormwater is planned for the development, with overland sheet flow to local watercourses occurring only during high-magnitude rainfall events. Assuming the SWM plan for the Site is implemented effectively, thermal impacts to watercourses as a result of stormwater management are not anticipated (AECOM, 2019b).

The EIS further discusses that there could be loss of groundwater discharge to wetlands within the Dorchester Swamp PSW and to Dorchester Pond Drain as a result of development; both features rely on a combination of groundwater and surface water to maintain their hydrologic regime and function. If water supply is altered (either from construction dewatering or long-term changes to the water balance from development), wetland species could be altered (AECOM, 2019b).

The following sections discuss impacts on a temporal scale for groundwater and surface water at the Site.

6.2 Short-term Impacts (Construction Dewatering)

6.2.1 Groundwater Receptors and Quality

The proposed dewatering activities are expected to cause drawdown in the local shallow groundwater regime at distances of up to about 176 m surrounding the servicing trenches for the “typical” dewatering scenario. Based on the results of the MECP water well information system query and correspondence with the Municipality of Thames Centre, there are active municipal groundwater supply wells within the estimated radius of influence for the Site. The target depths of these wells are believed to be within the shallow granular (sand and gravel) deposits. Accordingly, well interference (a decrease in the available drawdown) may occur as a result of the proposed temporary dewatering. Should a water level decline greater than the typical fluctuation experienced at any active Dorchester Supply Wells, attributable to dewatering, temporary staggering or shift in supply well active pumping

may be required to adequately supply the town of Dorchester with suitable volume of water until dewatering is completed. The bedrock wells in Well Field 3 will not be significantly impacted by the proposed dewatering.

Depending on the location of the active dewatering, we anticipate transient drawdown impacts at the municipal well fields located east of the Site for the typical dewatering scenario. Any active wells within the estimated radius of influence for the Site may also be susceptible to temporary water quality impacts associated with intense vibrations from nearby heavy construction equipment. The vibrations may introduce suspended sediment to water wells, regardless of their installation depth. Wells that have not been adequately maintained will be more susceptible to water quality impacts related to nearby equipment vibration.

No visible evidence of contamination at the Site was observed during reconnaissance or monitoring events. No obvious visual or olfactory evidence of petroleum hydrocarbon or other chemical impacts were noted during drilling, purging or sampling of the boreholes/monitoring wells. Headspace screening for combustible organic vapours during the geotechnical exploration showed no detections for any of the soil samples recovered from the boreholes. Analytical testing of two soil samples conducted in conjunction with the geotechnical investigation carried out for the Site indicated no exceedances of the 2011 Table 1 MECP standards for metals and inorganics. Operation of the temporary dewatering system has the potential to mobilize existing contaminants from adjacent properties, if any are present.

The theoretical radius of influence of the proposed dewatering system does extend past Dorchester Creek to the south of the Site and to the associated PSW. As a result, dewatering may have a temporary and transient effect on shallow groundwater water levels.

As mentioned previously, since the shallow overburden aquifer is not protected by overlying low permeability confining deposits, it is considered highly vulnerable to contamination from land use activities. During construction, this could include spills associated with refuelling, hydraulics and equipment maintenance.

6.2.2 Surface Water

As mentioned above, the theoretical radius of influence of the proposed dewatering system does extend past Dorchester Creek to the south of the Site and to the associated PSW. As a result, groundwater level impacts on these features may have a temporary and transient effect on surface water levels and vegetation.

Related recommendations are provided in Section 8.0.

6.3 Long-term Impacts

6.3.1 Groundwater Receptors

Due to the stormwater management strategy of directing runoff from parking lots and road surfaces to the municipal pond, chloride-rich groundwater is not expected to infiltrate and reach the shallow aquifer. The mitigation measures proposed in the stormwater management strategy for the Site will also allow for treatment of suspended solids and thus, total metals, before moving treated water off the Site.

From a sourcewater protection perspective, correspondence with the project proponent and regulators resulted in agreement that the proposed development can occur in the WHPA due to the size of the proposed development being less than 100 ha. Further, it was acknowledged that oil-grit separators are allowed within the WHPA ‘B’ and that infiltration will assist with SWM controls (AECOM, 2019).

6.3.2 Surface Water Elevations, Baseflow and Quality

Based on the results of monitoring and site observations, surface water levels within and adjacent to the Site are not fully dependent on direct groundwater discharge. Assuming that all mitigation measures proposed in the stormwater management plan for the Site are implemented properly, there should be no net impact to surface water elevations and baseflow.

No parameters were detected at a concentration exceeding any applicable guidelines for the surface water samples collected as part of this assessment. With the alterations in flow paths proposed by the stormwater management plan for the Site development, surface water quality of the wetlands would be impacted if left unmitigated. On-site treatment of runoff using anticipated mitigation measures (AECOM, 2019) is required to maintain pre-development surface water quality at the receptor(s). Implementation of the salt management plan as described in the SWM Report and Water Balance (AECOM, 2019) should also be completed to mitigate potential chloride impacts to surface water.

7.0 CONCLUSIONS

Based on the results of our assessment, the following conclusions are provided:

- The Site is located in a Significant Groundwater Recharge Area (SGRA); it is also in a designated Wellhead Protection Area (WHPA) and the vulnerability of the surficial aquifer to contamination from surface sources in the vicinity of the Site is considered high according to applicable mapping and assessments.
- The excavations for servicing infrastructure related to the proposed development will encounter variably saturated granular deposits consisting primarily of sand and gravelly sand overlying clay, silt and till.
- The available groundwater elevation data suggest that proactive dewatering will be required to facilitate the construction of the proposed works; adequate groundwater control can likely be achieved using appropriately spaced, properly filtered well points, deep wells, eductors or a combination thereof, supplemented as necessary by pumping from properly filtered sumps.
- The estimated dewatering volumes indicate that a Category 3 application for a PTTW will be required for the project.
- Given that the area in the vicinity of the Site is fully serviced by municipal water, the proposed construction dewatering is not anticipated to result in significant impacts to any groundwater receptors provided that the recommendations and sampling protocol described in Section 8.0 and Appendix D are implemented.

These conclusions assume implementation of the recommendations provided in the following section and those proposed as part of the stormwater management plan for the Site.

8.0 RECOMMENDATIONS

The following recommendations are provided:

- Reduce the amount of impervious surface areas, where feasible, to reduce stormwater runoff volumes.
- Manual groundwater level measurements in monitoring wells MW-102, MW-103, MW-105, MW6, and MW8 at the Site should continue on at least a quarterly basis until the start of construction. Two weeks prior to

dewatering commencing, the frequency should increase to weekly. Groundwater level monitoring in the same five wells should continue until at least two weeks after dewatering has finished.

- If any well interference further afield is reported, it is recommended that one of the following mitigative options be implemented:
  - provide a suitable temporary potable water supply prior to the start of construction and maintain that supply until groundwater levels have sufficiently recovered following the completion of dewatering, as demonstrated by the measured water levels in a monitoring well installed within the road allowance adjacent to the property; or
  - provide a permanent service connection to the available piped municipal supply.
- The Municipality has confirmed that seven of the Dorchester Supply Wells target shallow saturated granular (sand) deposits and these wells should be equipped with data logging pressure transducers to monitor groundwater levels within the wells on an hourly basis throughout dewatering.
- Further information by Thames Centre regarding their well capacity, maximum usage rates and minimum shallow aquifer water levels should be requested. Should a water level decline in any active Dorchester Supply Wells attributable to dewatering, temporary staggering or shift in supply, well active pumping may be required to adequately supply the town of Dorchester with suitable volume of water.
- Vegetation stress surveys should be completed at the nearby PSW and Dorchester Creek by a qualified ecologist on a weekly basis commencing two weeks prior to the start of dewatering and continuing until dewatering is completed. The surveys should include observation of species that may indicate groundwater dependency. If surveys indicate that impacts to the hydrologic regime and, in turn, vegetation health are attributable to the dewatering, the discharge may be used for irrigation under the supervision of the ecologist.
- Construction should be scheduled to take advantage of a seasonal period of low groundwater levels and lower precipitation to potentially reduce the dewatering volumes required.
- Discharged water must be suitably directed, treated and monitored to meet the applicable criteria for the selected discharge location. Recommendations for discharge sampling are provided in Appendix D.
- The groundwater and surface water monitoring plan should be implemented as provided in Appendix D.
- Refuelling, equipment maintenance, and storage of all chemicals and hazardous materials should remain at least 30 m away from the dewatered sections of the project and a spill contingency plan should be put in place.
- Following completion of construction, the monitoring wells installed in conjunction with this assessment should be properly abandoned in accordance with Ontario Regulation (O. Reg.) 903, as amended.

9.0 LIMITATIONS

This report was prepared for Sifton Properties Limited to support an application to the MECP for a PTTW for temporary construction dewatering in conjunction with the proposed development at 187 Byron Avenue in Dorchester, Ontario. Information contained within this report is intended to support a PTTW application and is not intended to be used for the design of the dewatering system by any contractor. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the sole responsibility of any such party.

This report is based on data and information collected during geotechnical explorations conducted by Golder Associates Ltd. and is based solely on site conditions encountered at the time of the field work supplemented by historical information and geological data obtained by Golder Associates Ltd., as described in this report.

In evaluating the Site and potential dewatering impacts, Golder Associates Ltd. has relied in good faith on information provided by Sifton Properties Limited, Thames Centre and others. We accept no responsibility for any deficiency, misstatements or inaccuracies contained in this report as a result of errors, omissions, misinterpretations or fraudulent acts of the other parties engaged.

Golder Associates Ltd. accepts no responsibility for any reduction in property value, either real or perceived, as a result of the reporting of factual information herein.

Signature Page

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RM/STH/MAS/ly

TABLE I

SUMMARY OF GROUNDWATER LEVELS

Hydrogeological Assessment
Proposed Development
187 Byron Avenue
Dorchester, Ontario

GOLDER REPORT	BOREHOLE	GROUND SURFACE ELEVATION (m)	TOP OF PIPE ELEVATION (m)	DRILLING DATE	Installation	Encountered	GROUNDWATER ELEVATION (m amsl) Nov. 23, 2006	Oct. 31, 2017	Nov. 14, 2017	Dec. 21, 2017	Jan. 25, 2018	Feb. 1, 2018	Nov. 27, 2018	Jun. 4, 2019
1788468-2000	BH-101	257.62	-	Oct. 23, 2017	-	254.0	-	-	-	-	-	-	-	
(Current)	BH-102	255.92	257.33	Oct. 23, 2017	Piezometer	253.8	-	253.97	254.09	254.19	254.28	254.24	254.29	254.32
	BH-103	255.84	256.61	Oct. 23, 2017	Observation Well	253.4	-	253.52	253.62	253.63	253.90	253.78	253.80	253.81
	BH-104	255.44	-	Oct. 23, 2017	-	253.3	-	-	-	-	-	-		
	BH-105	256.55	257.70	Oct. 23, 2017	Piezometer	253.6	-	253.79	253.86	253.93	254.06	254.06	254.11	254.25
	BH-106	257.14	-	Oct. 23, 2017	-	254.1	-	-	-	-	-			
Lotowater Report	MW6	255.90	256.89	Aug 9, 2006	Observation Well	-	252.33	251.97	252.02	252.05	252.32	252.29	252.27	252.30
	MW8 (deep)	256.26	257.12	Aug 9, 2006	Observation Well	-	252.26	251.89	251.95	252.10	252.35	252.20	252.27	252.08
	MW8 (shallow)	256.26	257.16	Aug 9, 2006	Observation Well	-	252.27	251.89	251.95	252.10	252.36	252.20	252.27	252.09

NOTES:
1. For installation details, see Record of Borehole sheets and Appendix A.
2. For borehole locations, see Location Plan, Figure 1.
3. "-" Not applicable or not measured.
4. Table to be read in conjunction with accompanying report.

Prepared By: BT/MC
Checked By: DB/SG/STH

TABLE II

ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES

Hydrogeological Assessment
Proposed Development
187 Byron Avenue
Dorchester, Ontario

PARAMETER	UNITS	RDL	Sample ID: MW-103 Date: 14-Nov-17	MW-103 27-Nov-18	SW-101 27-Nov-18	SW-102 27-Nov-18	STANDARDS[1] City of London Storm Sewer Discharge	STANDARDS[2] City of London Sanitary Sewer Discharge	STANDARDS[3] PWQO
Inorganics									
Total BOD	mg/L	2.0	<2.0	<2	<2	<2	15	300	-
Total Chlorine	mg/L	0.1	<0.1 (1)	<0.1 (1)	<0.1 (1)	<0.1 (1)	1.0	-	0.002
Fluoride (F-)	mg/L	0.10	<0.10	<0.10	0.12	0.10	2.0	10	-
Phenols-4AAP	mg/L	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.02	1.0	0.001
Total Suspended Solids	mg/L	10	**1100**	11	<10	<10	15	350	-
Total Cyanide (CN)	mg/L	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.1	2	-
Dissolved Chloride (Cl-)	mg/L	1.0	130	130	60	59	1500	1500	-
Total Ammonia-N	mg/L		-	0.068	0.050	<0.050	-	50	-
Conductivity	umho/cm		-	1000	580	560	-	-	-
Dissolved Organic Carbon	mg/L		-	0.98	12	12	-	-	-
Total Organic Carbon (TOC)	mg/L		-	-	13	13	-	-	-
Total Phosphorus	mg/L		-	-	0.015	0.013	-	10	0.01
Turbidity	NTU		-	-	1.1	0.7	-	-	-
Orthophosphate (P)	mg/L		-	<0.010	<0.010	<0.010	-	-	-
pH	pH		7.88	7.94	7.98	8.00	6.0:10.5	6.0:10.5	6.5:8.5
Dissolved Sulphate (SO4)	mg/L	1.0	20	21	<1.0	<1.0	1500	1500	-
Alkalinity (Total as CaCO3)	mg/L		-	230	190	190	-	-	-
Nitrite (N)	mg/L		-	<0.010	<0.010	<0.010	-	-	-
Nitrate (N)	mg/L		-	11.6	0.34	<0.10	-	-	-
Nitrate + Nitrite (N)	mg/L		-	11.6	-	-	-	-	-
Calculated Parameters									
Anion Sum	me/L		-	9.61	5.54	5.41	-	-	-
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		-	230	190	190	-	-	-
Calculated TDS	mg/L		-	540	300	290	-	-	-
Carb. Alkalinity (calc. as CaCO3)	mg/L		-	1.9	1.7	1.8	-	-	-
Cation Sum	me/L		-	9.44	5.82	5.74	-	-	-
Hardness (CaCO3)	mg/L		-	290	210	200	-	-	-
Ion Balance (% Difference)	%		-	0.860	2.47	2.92	-	-	-
Langelier Index (@ 20C)	N/A		-	0.781	0.634	0.648	-	-	-
Langelier Index (@ 4C)	N/A		-	0.534	0.385	0.399	-	-	-
Saturation pH (@ 20C)	N/A		-	7.16	7.34	7.36	-	-	-
Saturation pH (@ 4C)	N/A		-	7.40	7.59	7.61	-	-	-
Total Animal/Vegetable Oil and Grease	mg/L	1.0	1.3	<0.50	<0.50	<0.50	15	100	-
Metals									
Mercury (Hg)	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	0.001	0.1	0.0002
Metals									
Dissolved Aluminum (Al)	mg/L		-	<0.0050	<0.0050	<0.0050	1.0	50	-
Dissolved Antimony (Sb)	mg/L		-	<0.00050	<0.00050	<0.00050	-	-	20
Dissolved Arsenic (As)	mg/L		-	<0.0010	<0.0010	<0.0010	0.2	1.0	100
Dissolved Barium (Ba)	mg/L		-	0.042	0.032	0.028	0.1	5	-
Dissolved Beryllium (Be)	mg/L		-	<0.00050	<0.00050	<0.00050	1	5	11
Dissolved Boron (B)	mg/L		-	0.045	0.011	0.012	-	-	200
Dissolved Cadmium (Cd)	mg/L		-	<0.00010	<0.00010	<0.00010	0.008	3	0.2
Dissolved Calcium (Ca)	mg/L		-	91	62	58	-	-	-
Dissolved Chromium (Cr)	mg/L		-	<0.0050	<0.0050	<0.0050	0.2	5	-
Dissolved Cobalt (Co)	mg/L		-	<0.00050	<0.00050	<0.00050	-	-	0.9
Dissolved Copper (Cu)	mg/L		-	0.0063	0.0051	0.0050	0.04	5	5
Dissolved Iron (Fe)	mg/L		-	<0.1	<0.1	<0.1	1.0	50	300
Dissolved Lead (Pb)	mg/L		-	<0.0050	<0.0050	<0.0050	0.12	5	5
Dissolved Magnesium (Mg)	mg/L		-	15	13	12	-	-	-
Dissolved Manganese (Mn)	mg/L		-	<0.0020	0.0059	0.0073	1.0	5	-
Dissolved Molybdenum (Mo)	mg/L		-	<0.00050	<0.00050	<0.00050	-	5	40
Dissolved Nickel (Ni)	mg/L		-	<0.0010	<0.0010	<0.0010	0.08	5	25
Dissolved Phosphorus (P)	mg/L		-	<0.1	<0.1	<0.1	0.4	10	-
Dissolved Potassium (K)	mg/L		-	2.1	2.2	2.1	-	-	-
Dissolved Selenium (Se)	mg/L		-	<0.0020	<0.0020	<0.0020	0.2	5	100
Dissolved Silicon (Si)	mg/L		-	3.8	3.7	3.5	-	-	-
Dissolved Silver (Ag)	mg/L		-	<0.00010	<0.00010	<0.00010	0.12	2	0.1
Dissolved Sodium (Na)	mg/L		-	83	38	35	-	-	-
Dissolved Strontium (Sr)	mg/L		-	0.18	0.17	0.16	-	-	-
Dissolved Thallium (Tl)	mg/L		-	<0.000050	<0.000050	<0.000050	-	-	0.3
Dissolved Titanium (Ti)	mg/L		-	<0.0050	<0.0050	<0.0050	-	-	-
Dissolved Uranium (U)	mg/L		-	0.00018	0.00049	0.00038	-	-	5
Dissolved Vanadium (V)	mg/L		-	<0.00050	<0.00050	<0.00050	-	-	6
Dissolved Zinc (Zn)	mg/L		-	0.011	0.0069	0.0083	0.05	5	30

Continued

Metals									
Total Aluminum (Al)	mg/L		**11**	0.27	0.04	0.015	1	50	-
Total Antimony (Sb)	mg/L		-	<0.0050	<0.0050	<0.0050	-	-	20
Total Arsenic (As)	mg/L		0.02	<0.0010	<0.0010	<0.0010	0.2	1	100
Total Barium (Ba)	mg/L		**0.12**	0.046	0.033	0.029	0.1	5	-
Total Beryllium (Be)	mg/L		0.0006	<0.00050	<0.00050	<0.00050	1	5	11
Total Boron (B)	mg/L		-	0.046	0.011	0.011	-	-	200
Total Cadmium (Cd)	mg/L		<0.002	<0.00010	<0.00010	<0.00010	0.008	3	0.2
Total Calcium (Ca)	mg/L		-	100	68	63	-	-	-
Total Chromium (Cr)	mg/L		0.02	<0.0050	<0.0050	<0.0050	0.2	5	-
Total Cobalt (Co)	mg/L		-	<0.00050	<0.00050	<0.00050	-	-	0.9
Total Copper (Cu)	mg/L		**0.13**	0.0042	<0.0010	<0.0010	0.04	5	5
Total Iron (Fe)	mg/L		**29**	0.77	0.14	0.17	1.0	50	300
Total Lead (Pb)	mg/L		0.04	0.00091	<0.0050	<0.0050	0.12	5	5
Total Magnesium (Mg)	mg/L		-	17	13	13	-	-	-
Total Manganese (Mn)	mg/L		0.95	0.02	0.0058	0.0068	1.0	5	-
Total Molybdenum (Mo)	mg/L		-	<0.00050	0.00050	<0.00050	-	5	40
Total Nickel (Ni)	mg/L		0.022	0.0014	<0.0010	<0.0010	0.08	5	25
Total Potassium (K)	mg/L		-	2.1	2.1	2.1	-	-	-
Total Selenium (Se)	mg/L		<0.02	<0.002	<0.002	<0.002	0.2	5	100
Total Silicon (Si)	mg/L		-	4.9	3.9	3.4	-	-	-
Total Silver (Ag)	mg/L		<0.01	<0.00010	<0.00010	<0.00010	0.12	2	0.1
Total Sodium (Na)	mg/L		-	83	39	37	-	-	-
Total Strontium (Sr)	mg/L		-	0.19	0.17	0.15	-	-	-
Total Thallium (Tl)	mg/L		-	<0.000050	<0.000050	<0.000050	-	-	0.3
Total Titanium (Ti)	mg/L		-	0.01	<0.0050	<0.0050	-	-	-
Total Vanadium (V)	mg/L		-	0.0011	<0.00050	0.00050	-	-	6
Total Zinc (Zn)	mg/L		**0.30**	0.0086	<0.0050	<0.0050	0.05	5	30
Total Phosphorus (P)	mg/L		**0.70**	-	-	-	0.4	10	10
Total Bismuth (Bi)	mg/L		-	<0.0010	-	-	-	-	-
Total Lithium (Li)	mg/L		-	<0.0050	-	-	-	-	-
Total Tellurium (Te)	mg/L		-	<0.0010	-	-	-	-	-
Total Tin (Sn)	mg/L		<0.02	<0.0010	-	-	1.0	5	-
Total Tungsten (W)	mg/L		-	<0.0010	-	-	-	-	30
Total Uranium (U)	mg/L		-	0.00024	-	-	-	-	5
Total Zirconium (Zr)	mg/L		-	<0.0010	-	-	-	-	4
Petroleum Hydrocarbons									
Total Oil & Grease	mg/L	0.5	1.3	<0.50	<0.50	<0.50	15	15	-
Total Oil & Grease Mineral/Synthetic	mg/L	0.5	<0.50	<0.50	<0.50	<0.50	15	15	0.5

NOTES:

1. City of London Storm Sewer Use By-Law (London Waste Discharge WM-16, November 28, 2017).
2. City of London Sanitary Sewer Use By-Law (London Waste Discharge WM-16, November 28, 2017).
3. Provincial Water Quality Objectives (PWQO) of the Ministry of the Environment, July 1994.
4. **Bold** indicates exceedance of Storm Sewer by-law.
5. *Italics* indicates exceedance of Sanitary Sewer by-law.
6. Underlined indicates exceedance of PWQO
7. "*" indicates RDL exceeds PWQO criteria
8. "-" Not applicable or not measured.
9. Table to be read in conjunction with accompanying report.

Prepared By: STH
Checked By: DB / SG

TABLE III

SUMMARY OF MECP WATER WELL RECORDS

Hydrogeological Assessment
Proposed Development
187 Byron Ave
Dorchester, Ontario

MECP	UTM Coordinates		Year	Casing	Drilling	Water	Well	Water	Water	Total	Static	Test Pumping			Stratigraphy					Aquifer
Well No.	Easting (NAD 83)	Northing (NAD 83)	Drilled	Diameter (centimetres)	Method	Quality	Status	Use	Found (metres)	Depth (metres)	Level (metres)	Level (metres)	Rate (L/min)	Duration (hours)	Depth to Unit Base (metres)	Material Colour	Material 1	Material 2	Material 3	Type
4102941	496092	4759169	19/09/1962	12.7	Rotary (Convent.)		Test Hole			11.28					0.30		TOPSOIL			Bedrock
															0.91		MEDIUM SAND			
															2.13		GRAVEL	BOULDERS		
															7.32		CLAY			
															10.67		CLAY	BOULDERS		
															11.28		ROCK			
4102942	496092	4759169	19/09/1962	12.7	Rotary (Convent.)		Test Hole			11.58					1.52		CLAY	MEDIUM SAND		Bedrock
															3.05		GRAVEL	BOULDERS		
															3.96	BROWN	CLAY			
															11.28	BLUE	CLAY	BOULDERS		
															11.58		ROCK			
4102943	496092	4759169	21/09/1962	12.7	Rotary (Convent.)		Test Hole			7.92					1.52		CLAY	MEDIUM SAND		Overburden
															2.44		GRAVEL	BOULDERS		
															4.27		CLAY	BOULDERS		
															7.92		CLAY	BOULDERS		
4103008	496134	4758263	01/04/1953	15.2	Rotary (Convent.)		Test Hole			13.72					0.30		TOPSOIL			Bedrock
															1.83		MEDIUM SAND			
															4.57		GRAVEL	MEDIUM SAND	BOULDERS	
															10.06	BLUE	CLAY	MEDIUM SAND	GRAVEL	
															11.58		MEDIUM SAND	GRAVEL		
															12.80	BLUE	CLAY	MEDIUM SAND	GRAVEL	
															13.41		MEDIUM SAND	GRAVEL		
															13.72		ROCK			
4103011	495594	4758023	24/04/1967	76.2	Boring	FRESH	Water Supply	Domestic	2.44	6.10	2.4	6.1	18.2	1	1.83		TOPSOIL			Overburden
															2.13	BROWN	MEDIUM SAND			
															6.10		GRAVEL			
4106214	495184	4758643	15/02/1957	25.4	Cable Tool	FRESH	Water Supply	Municipal	15.24	21.95	11.9	16.5	704.6	25	0.30		TOPSOIL			Overburden
															15.24		SAND			
															18.90		SAND	GRAVEL	STONES	
															20.42		SAND	GRAVEL	BOULDERS	
															21.95		CLAY			
4107073	495644	4758231	12/12/1974	2.5	Rotary (Convent.)	FRESH	Observation Wells	Domestic	3.05	16.76	3.0	3.7	272.8	25	5.49	BROWN	SAND			Bedrock
															11.58	BROWN	GRAVEL	SAND	BOULDERS	
															15.54	GREY	CLAY			
															16.46	GREY	CLAY	GRAVEL		
															16.76	GREY	LIMESTONE			
4107074	495631	4758224	14/12/1974	2.5	Rotary (Convent.)	FRESH	Observation Wells	Domestic	3.05	17.68	3.0				4.88	BROWN	SAND			Bedrock
															7.62	BROWN	GRAVEL	SAND		
															11.58	BROWN	GRAVEL	SAND	BOULDERS	
															14.63	BROWN	BOULDERS	GRAVEL		
															14.94	BROWN	GRAVEL	SAND		
															16.15	GREY	CLAY	SAND		
															17.37	GREY	CLAY	GRAVEL		
															17.68	GREY	LIMESTONE			

MECP	UTM Coordinates		Year	Casing	Drilling	Water	Well	Water	Water	Total	Static	Test Pumping			Stratigraphy					
															Depth to	Material				Aquifer
Well No.	Easting (NAD 83)	Northing (NAD 83)	Drilled	Diameter (centimetres)	Method	Quality	Status	Use	Found (metres)	Depth (metres)	Level (metres)	Level (metres)	Rate (L/min)	Duration (hours)	Unit Base (metres)	Colour	Material 1	Material 2	Material 3	Type
4107075	495635	4758213	16/12/1974	2.5	Rotary (Convent.)	FRESH	Observation Wells	Domestic	3.05	20.12	3.0				6.40	BROWN	SAND			Bedrock
															11.58	BROWN	GRAVEL	SAND		
															15.54	GREY	CLAY	GRAVEL		
															16.15	GREY	CLAY	SAND	GRAVEL	
															17.37	GREY	CLAY			
															19.81	GREY	CLAY	GRAVEL		
															20.12		LIMESTONE			
4107161	495594	4758203	09/05/1975	25.4	Cable Tool	FRESH	Water Supply	Municipal	3.05	12.19	3.7	4.9	1022.9	72	5.49	BROWN	MEDIUM SAND			Overburden
															12.19	GREY	SAND	GRAVEL		
4110391	495314	4757943	14/11/1985	5.1	Cable Tool	FRESH	Test Hole		11.58	12.19			90.9	2	0.30		TOPSOIL	SAND		Overburden
															4.27	BROWN	SAND		DIRTY	
															7.92	BROWN	SAND		SILTY	
															9.45	BROWN	SAND	GRAVEL		
															11.58	GREY	GRAVEL	SAND		
															12.19	GREY	CLAY	GRAVEL		
4110617	495214	4758003	05/03/1986	12.7	Cable Tool	FRESH	Test Hole		5.49	14.02	2.4		90.9	1	0.61		TOPSOIL			Overburden
															5.49	BROWN	FINE SAND		SILTY	
															7.92	BROWN	FINE SAND			
															10.67	BROWN	COARSE SAND	GRAVEL		
															13.41	GREY	GRAVEL	SAND		
															14.02		STONES	GRAVEL		
4110618	495194	4758003	04/03/1986	5.1	Cable Tool	FRESH	Test Hole		5.49	13.41	3.0		90.9	1	0.61		TOPSOIL			Overburden
															5.49	BROWN	SAND	SILT		
															7.92	BROWN	FINE SAND			
															10.67	BROWN	SAND	COARSE GRAVEL		
															13.41	GREY	GRAVEL	SAND		
4110619	495294	4758023	28/02/1986	5.1	Cable Tool	FRESH	Test Hole		7.62	12.80	2.1		90.9	1	0.61		TOPSOIL			Overburden
															5.49	BROWN	SAND	SILT		
															7.62	BROWN	GRAVEL	SAND		
															9.45	GREY	GRAVEL	SAND		
															12.80	GREY	CLAY	GRAVEL	CEMENTED	
4110620	495464	4758023	27/02/1986	5.1	Cable Tool	FRESH	Test Hole		9.45	13.72	4.0		90.9	1	0.61		TOPSOIL			Overburden
															5.18	BROWN	SAND	SILT		
															9.45	GREY	CLAY	GRAVEL	STONES	
															10.36		GRAVEL	SAND	STONES	
															13.72	GREY	CLAY	GRAVEL	SAND	
4110621	495434	4758163	25/02/1986	5.1	Cable Tool	FRESH	Test Hole		7.92	14.02	0.9		90.9	1	0.61		TOPSOIL			Overburden
															2.13	BROWN	SAND	SILT		
															5.18	GREY	CLAY	GRAVEL		
															6.71	GREY	STONES	GRAVEL	SAND	
															7.92	GREY	CLAY	GRAVEL		
															10.06	GREY	GRAVEL	STONES	SILT	
															14.02	GREY	CLAY	SAND	GRAVEL	
4110864	495009	4758573	24/06/1987	12.7	Cable Tool	FRESH	Water Supply	Domestic	15.54	15.85	8.5	12.5	22.7	4	6.71	BROWN	SAND			Overburden
															12.50	YELLOW	SAND			
															13.72		STONES	GRAVEL		
															14.33	BROWN	SAND		SILTY	
															15.54		SAND	GRAVEL		
															15.85		SAND	GRAVEL	CEMENTED	

MECP	UTM Coordinates		Year	Casing	Drilling	Water	Well	Water	Water	Total	Static	Test Pumping			Stratigraphy					
															Depth to	Material				Aquifer
Well No.	Easting (NAD 83)	Northing (NAD 83)	Drilled	Diameter (centimetres)	Method	Quality	Status	Use	Found (metres)	Depth (metres)	Level (metres)	Level (metres)	Rate (L/min)	Duration (hours)	Unit Base (metres)	Colour	Material 1	Material 2	Material 3	Type
4111336	496149	4757908	15/04/1988	20.3	Cable Tool	FRESH	Water Supply	Municipal	5.18	8.84	2.1	5.2		6	1.22	BROWN	SAND	GRAVEL	DIRTY	Overburden
															2.74	YELLOW	SAND	GRAVEL	DIRTY	
															5.18	YELLOW	SAND	GRAVEL	DIRTY	
															8.53	GREY	GRAVEL	SAND		
															8.84	GREY	GRAVEL	SAND	CEMENTED	
4111337	496019	4757958	17/03/1988	20.3	Cable Tool	FRESH	Water Supply	Commercial	5.18	9.14	2.1	4.3		72	1.22	BROWN	SAND		DIRTY	Overburden
															3.35	YELLOW	SAND		DIRTY	
															5.18	YELLOW	SAND	GRAVEL		
															7.62	GREY	SAND	GRAVEL		
															8.84	GREY	GRAVEL	SAND		
															9.14	GREY	GRAVEL	SAND	CEMENTED	
4111338	496034	4757843	15/03/1988	20.3	Cable Tool	FRESH	Water Supply	Municipal	5.18	9.14	2.4	5.2		72	1.52	BROWN	SAND		DIRTY	Overburden
															5.18	YELLOW	SAND	GRAVEL		
															7.62	GREY	SAND	GRAVEL		
															8.84	GREY	GRAVEL	SAND		
															9.14	GREY	GRAVEL	SAND	CEMENTED	
4111339	496104	4757988	07/03/1988		Cable Tool	FRESH	Abandoned-Supply	Municipal	5.18	9.45		4.9		72	1.22	BROWN	SAND	GRAVEL	DIRTY	Overburden
															2.74	YELLOW	SAND	GRAVEL	DIRTY	
															5.18	YELLOW	SAND	GRAVEL		
															8.53	GREY	GRAVEL	SAND		
															9.45	GREY	GRAVEL	SAND	CEMENTED	
4111340	496129	4757978	03/03/1988	20.3	Cable Tool	FRESH	Water Supply	Commercial	5.49	9.14	1.8	5.2		72	1.22	BROWN	SAND	GRAVEL	DIRTY	Overburden
															2.44	YELLOW	SAND	GRAVEL	DIRTY	
															5.49	YELLOW	SAND	GRAVEL		
															8.53	GREY	GRAVEL	SAND		
															9.14	GREY	GRAVEL	SAND	CEMENTED	
4111341	495934	4757748	24/02/1988	5.1	Cable Tool	FRESH	Observation Wells		7.92	8.23	1.2		272.8	30	1.83		SAND	TOPSOIL	DARK	Overburden
															7.92	GREY	SAND	GRAVEL		
															8.23	GREY	SAND	GRAVEL	CEMENTED	
4111342	496044	4757843	23/02/1988	5.1	Cable Tool	FRESH	Observation Wells		8.84	10.06	2.7		272.8	0	1.52	BROWN	SAND		DIRTY	Overburden
															5.18	YELLOW	SAND	GRAVEL		
															8.84	GREY	SAND	GRAVEL		
															10.06	GREY	CLAY	GRAVEL	CEMENTED	
4111343	496194	4757803	21/01/1988	5.1	TBD	FRESH	Test Hole		8.23	10.36	2.7		272.8	1	1.22	BROWN	SAND		DIRTY	Overburden
															3.35	BROWN	SAND			
															6.71	YELLOW	SAND	GRAVEL		
															8.23	GREY	GRAVEL	SAND		
															8.84	GREY	CLAY	GRAVEL	STONES	
															9.14	GREY	SAND	GRAVEL		
															10.36	GREY	CLAY	GRAVEL	STONES	
4111344	496139	4757993	20/01/1988	5.1	Cable Tool	FRESH	Test Hole		8.53	11.28	1.8		272.8	1	1.22	BROWN	SAND	GRAVEL	DIRTY	Overburden
															2.44	YELLOW	SAND	GRAVEL	DIRTY	
															4.88	YELLOW	SAND	GRAVEL		
															8.53	GREY	GRAVEL	SAND		
															11.28	GREY	CLAY	STONES	CEMENTED	
4111345	495974	4757943	19/01/1988	5.1	Cable Tool	FRESH	Test Hole		11.28	11.89	2.7		54.6	1	1.22	BROWN	SAND		DIRTY	Overburden
															2.74	YELLOW	SAND			
															5.49	YELLOW	SAND	GRAVEL		
															7.32	GREY	SAND	GRAVEL	HARD	
															11.28	GREY	GRAVEL	SAND	HARD	
															11.89	GREY	CLAY	GRAVEL	SAND	

MECP	UTM Coordinates		Year	Casing	Drilling	Water	Well	Water	Water	Total	Static	Test Pumping			Stratigraphy					Aquifer
															Depth to	Material				
Well No.	Easting (NAD 83)	Northing (NAD 83)	Drilled	Diameter (centimetres)	Method	Quality	Status	Use	Found (metres)	Depth (metres)	Level (metres)	Level (metres)	Rate (L/min)	Duration (hours)	Unit Base (metres)	Colour	Material 1	Material 2	Material 3	Type
4111346	495799	4757893	18/01/1988	5.1	TBD	FRESH	Test Hole		5.79	28.96	1.5		186.4	0.5	1.22	BROWN	SAND		DIRTY	Bedrock
															2.44	YELLOW	SAND			
															4.27	YELLOW	SAND	GRAVEL		
															5.79	GREY	GRAVEL	SAND		
															6.71	GREY	GRAVEL	SAND	DENSE	
															15.85	GREY	CLAY	GRAVEL		
															21.64	GREY	CLAY	SAND	GRAVEL	
															25.91	GREY	CLAY			
															26.82	GREY	SHALE		LIGHT	
															28.96	GREY	LIMESTONE		LIGHT	
4113017	495254	4757802	10/12/1993	10.2	Cable Tool	FRESH	Water Supply	Domestic	10.06	13.11	6.4	7.0	54.6	1.5	6.10	BROWN	SAND	PACKED		Overburden
															9.14	BROWN	SAND	PACKED		
															10.67	GREY	SAND	LOOSE		
															13.11	BROWN	SAND	LOOSE		
															6.10	BROWN	SAND	PACKED		
															9.14	BROWN	SAND	PACKED		
															10.67	GREY	SAND	LOOSE		
															13.11	BROWN	SAND	LOOSE		
4113635	495859	4757921	08/04/1997	10.2	Cable Tool	FRESH	Water Supply	Domestic	8.84	10.36	5.5	8.2	68.2	1.0	0.30	BLACK	TOPSOIL	POROUS		Overburden
															3.05	BROWN	SAND	DARK	PACKED	
															8.53	BROWN	SAND	PACKED		
															10.36	BROWN	FINE SAND	LOOSE		
4114468	495859	4757921	25/03/2000	25.4	Rotary (Air)	FRESH	Water Supply	Municipal	10.97	11.28	2.4	6.1	1322.9	5	0.30	BLACK	TOPSOIL	POROUS		Overburden
															2.13	BROWN	SAND	PACKED		
															2.74	BROWN	SAND	GRAVEL		
															4.27	BROWN	MEDIUM SAND			
															4.88	GREY	MEDIUM SAND	GRAVEL		
															6.10	GREY	COARSE SAND	GRAVEL		
															7.62	GREY	GRAVEL	SAND		
															9.45	GREY	GRAVEL	SAND	POROUS	
															10.97	GREY	GRAVEL	COARSE SAND	LOOSE	
															11.28	GREY	GRAVEL	SAND	CLAY	
4114514	495857	4757919	23/06/2000	10.2	Cable Tool	Not stated	Water Supply	Domestic	6.71	12.19	1.8	6.4	27.3	2	0.30	BLACK	TOPSOIL	POROUS		Overburden
															3.05	BROWN	SAND	PACKED		
															6.71	BROWN	SAND	LOOSE		
															12.19	GREY	CLAY	DENSE		
4114609	495586	4758096	26/01/2001	20.3	Not Known	SULPHUR														
4114696	496049	4757939	01/02/2001	25.4	Rotary (Air)	FRESH	Water Supply	Municipal	11.28	11.58	2.4	7.0	350.0	2	0.00	BLACK	TOPSOIL	POROUS		Overburden
															4.57	BROWN	SAND	PACKED		
															7.62	BROWN	SAND	STONES		
															8.53	GREY	SAND	GRAVEL	LOOSE	
															9.14	GREY	SAND	GRAVEL	LOOSE	
															9.45	GREY	GRAVEL	STONES	HARD	
															11.28	GREY	GRAVEL	POROUS	POROUS	
															11.58	GREY	GRAVEL	CLAY		
4116002	496161	4757883	21/10/2004				Abandoned-Other													

MECP Well No.	UTM Coordinates Easting (NAD 83)	UTM Coordinates Northing (NAD 83)	Year Drilled	Casing Diameter (centimetres)	Drilling Method	Water Quality	Well Status	Water Use	Water Found (metres)	Total Depth (metres)	Static Level (metres)	Test Pumping Level (metres)	Test Pumping Rate (L/min)	Test Pumping Duration (hours)	Stratigraphy Depth to Unit Base (metres)	Stratigraphy Material Colour	Stratigraphy Material Material 1	Stratigraphy Material Material 2	Stratigraphy Material Material 3	Aquifer Type
4116267	495934	4757976	21/07/2005	21.0	Rotary (Air)	FRESH	Water Supply	Municipal	7.01	10.97	4.1	6.1	727.4	24	2.13	BROWN	SAND	SILT		Overburden
															4.27	BROWN	MEDIUM SAND			
															4.88	BROWN	MEDIUM SAND	GRAVEL		
															6.10	GREY	SAND	GRAVEL		
															7.01	GREY	MEDIUM SAND			
															8.53	GREY	SAND	GRAVEL		
															10.67	GREY	GRAVEL	SAND		
															10.97	GREY	CLAY	GRAVEL		
4116565	495254	4758583	22/06/2006				Abandoned-Other										PREV. DRILLED			Overburden
4116613	496182	4758010	28/06/2006				Abandoned-Other													
7041932	495583	4758379	02/06/2006	5.0	Other Method					12.20					0.40	BROWN	TOPSOIL			Overburden
															9.60	BROWN	SAND			
															11.70	BROWN	SAND	GRAVEL		
															12.20	GREY	SAND	GRAVEL	CLAY	
7041933	495380	4758503	02/08/2006	5.0	Other Method					12.20					0.40	BROWN	TOPSOIL			Overburden
															9.60	BROWN	SAND			
															11.70	BROWN	SAND	GRAVEL		
															12.20	GREY	SAND	GRAVEL	CLAY	
7110768	496110	4758482	21/07/2008	3.5	Jetting		Dewatering	Not Used		5.00									COARSE-GRAINED	
															5.00	BROWN	SAND	GRAVEL	MEDIUM-GRAINED	
7110769	496110	4758482	26/08/2008	3.5			Abandoned-Other													
7119046	496039	4757970	30/10/2008				Abandoned-Other													
7128035	495922	4758040	05/03/2009	15.9	Rotary (Air)	FRESH	Water Supply	Municipal	5.18	13.11					1.52	BROWN	GRAVEL	SAND		
															5.18	BROWN	SAND	GRAVEL		
															10.67	GREY	COARSE SAND	GRAVEL		
															10.97	GREY	GRAVEL	CLAY		
															11.89	GREY	GRAVEL			
															12.80	GREY	GRAVEL	SAND		
															13.11	GREY	GRAVEL	SAND	CLAY	
7207864	496362	4758325	09/08/2013	3.2						5.79	2.7				5.79		SAND			

NOTES:
1. Well records provided electronically by the Ontario Ministry of the Environment, Conservation and Parks on February 7, 2018.
2. See Figure 6 for well locations.
3. Table to be read in conjunction with accompanying text.

Prepared By: MC
Checked By: RM

TABLE IV

SUMMARY OF DOOR-TO-DOOR WATER WELL SURVEY

Hydrogeological Assessment
Proposed Development
187 Byron Ave
Dorchester, Ontario

MN[1]	STREET	RESPONSE DATE	APPROXIMATE YEAR CONSTRUCTED	WELL TYPE	CASING TYPE	CASING DIAMETER (mm)	REPORTED WELL DEPTH (m)	REPORTED WATER QUALITY	CURRENT WATER USE	COMMENTS
49	Byron Avenue	01-Feb-18	2012	-	-	-	-	Good	Domestic	Uses a water softener Owner: Danielle Redner (519)-933-9005
2500	Dorchester Road	-	-	-	-	-	-	-	-	No response
2544	Dorchester Road	-	-	-	-	-	-	-	-	Declined to participate
2572	Dorchester Road	-	-	-	-	-	-	-	-	No response
2620	Dorchester Road	-	-	-	-	-	-	-	-	Dorechester Water Treatment Facility
2637	Dorchester Road	01-Feb-18	1969	Bored	Concrete	915	3	Good	Domestic	Owner: Katheryn Proulx (519) 268-3303

NOTES: 1. MN is Municipal Number / Emergency Response Number.
2. "-" indicates information not available or not applicable.
3. Initial site vist to complete the well survey occurred on January 25 with a follow up visit on February 1, 2018.
4. Table to be read in conjunction with accompanying text.

Prepared By: RM
Checked By: STH

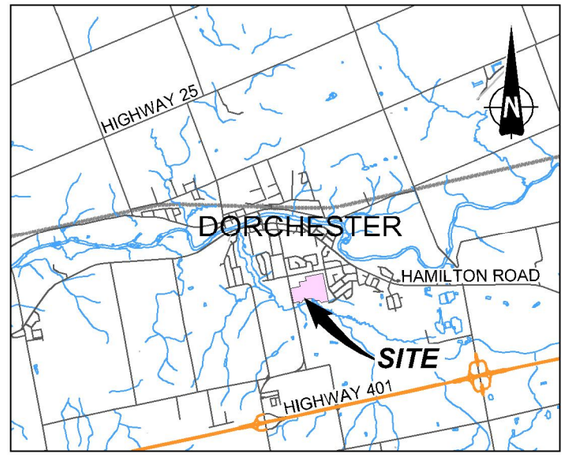
Client: Sifton Properties Limited

Original Format is Tabloid 279mm x 432mm

25mm 0

Aug 16, 2019 - 2:50pm

Drawing file: 1788468-2000-R01001.dwg



KEY PLAN

LEGEND

- BOREHOLE
- BOREHOLE / MONITORING WELL
- BOREHOLE/MONITORING WELL (LOTOWATER TECHNICAL SERVICES INC. 2006)
- STAFF GAUGE/SURFACE WATER SAMPLE
- SURFACE WATER SAMPLE
- MONITORING WELL NOT FOUND
- GROUND SURFACE CONTOUR (m amsl)
- SECTION LINE

REFERENCE

DRAWING BASED ON BING IMAGERY AS OF NOVEMBER 7, 2017 (IMAGE DATE UNKNOWN); "CONCEPTUAL LAYOUT D" PROVIDED BY SIFTON, AUTOCAD FILE "18-827 CONCEPT D JAN 17, 2018".DWG"; LOTOWATER TECHNICAL SERVICES INC, FIGURE 2, DORCHESTER PART 1 AQUIFER TEST FINAL, MAY 2007; AND CANMAP STREETFILES V2008.4.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

FOR CROSS SECTION LOCATION, REFER TO FIGURE 3-5

BING IMAGERY USED FOR ILLUSTRATION PURPOSES ONLY AND NOT TO BE USED FOR MEASUREMENTS.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

HYDROGEOLOGICAL ASSESSMENT
PROPOSED DEVELOPMENT
187 BYRON AVENUE
DORCHESTER, MUNICIPALITY OF THAMES CENTRE, ONTARIO

TITLE

LOCATION PLAN

GOLDER

PROJECT No.		1788468	FILE No.	1788468-2000-R01001
			SCALE AS SHOWN	REV.
CADD	LK/ZB/AS	Aug. 16/19		
CHECK	LM			

FIGURE 1

LEGEND

GROUND SURFACE CONTOUR (m amsl)

QUATERNARY GEOLOGY:

GEOLOGY ZONE LIMIT

6a — Gravel and gravelly sand: Valley trains

9 — Modern alluvium: gravel, sand, and silt, containing organic remains

REFERENCE

DRAWING BASED ON BING IMAGERY AS OF NOVEMBER 7, 2017 (IMAGE DATE UNKNOWN); AND QUATERNARY GEOLOGY OF ST THOMAS AREA (EAST HALF) ONTARIO DEPT OF MINES, PRELIMINARY GEOLOGICAL MAP NO. 238, 1964,

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT

HYDROGEOLOGICAL ASSESSMENT/
PROPOSED DEVELOPMENT
187 BYRON AVENUE
DORCHESTER, MUNICIPALITY OF THAMES CENTRE, ONTARIO

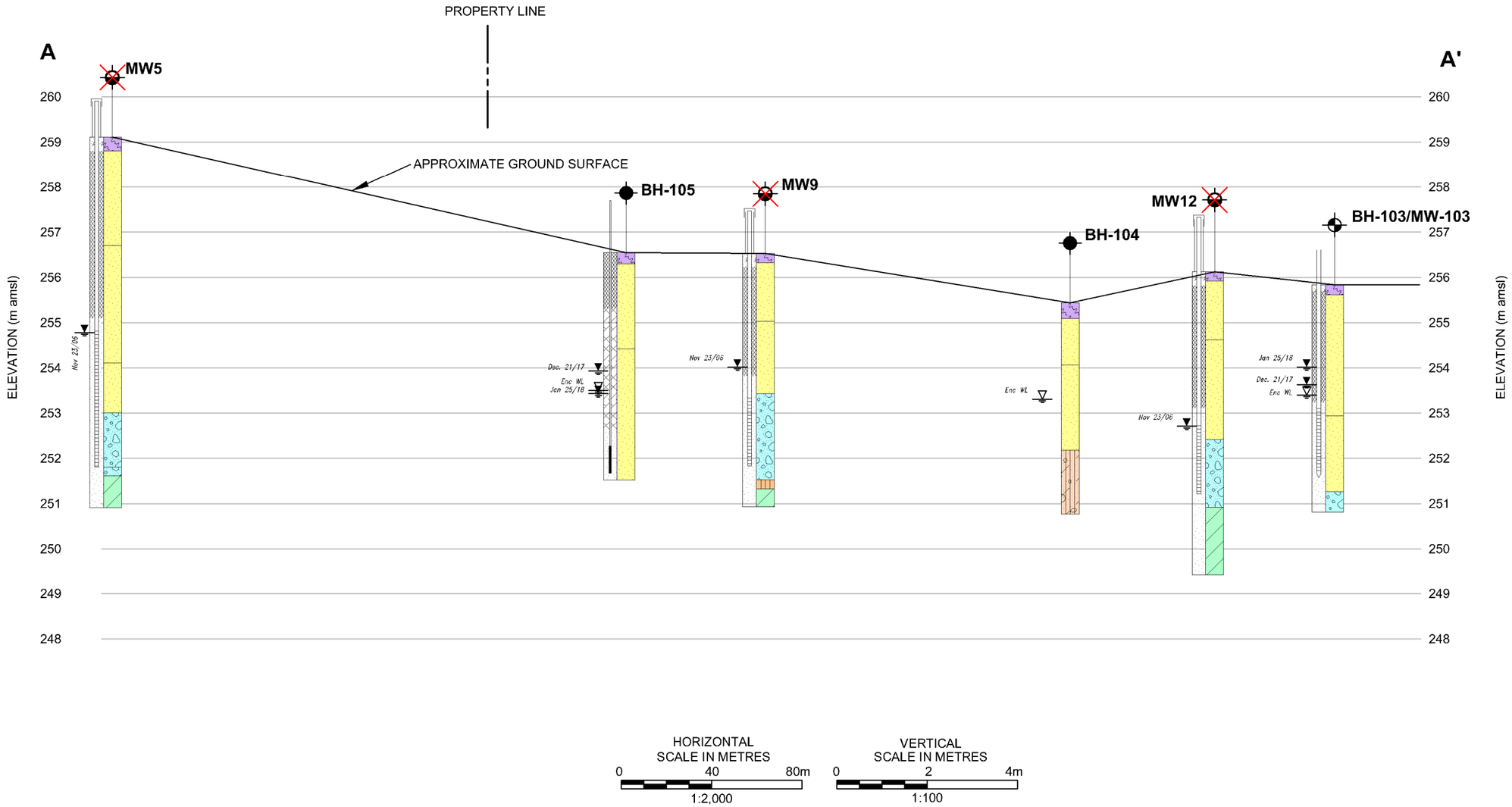
TITLE

QUATERNARY GEOLOGY

GOLDER

PROJECT No.		1788468	FILE No.	1788468-2000-R01002
			SCALE	AS SHOWN
CADD	LM/KZJB	Jan 25/19	REV.	
CHECK	LM			

FIGURE 2



HORIZONTAL SCALE IN METRES
0 40 80m
1:2,000

VERTICAL SCALE IN METRES
0 2 4m
1:100

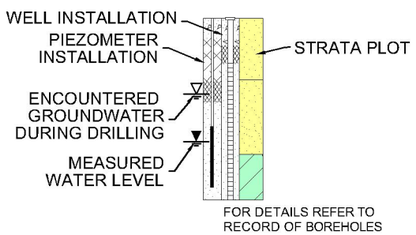
LEGEND

- BOREHOLE
- BOREHOLE / MONITORING WELL
- BOREHOLE/MONITORING WELL (LOTOWATER TECHNICAL SERVICES INC. 2006)
- MONITORING WELL NOT FOUND

SIMPLIFIED STRATIGRAPHY

- TOPSOIL
- SAND
- SAND AND GRAVEL
- SILT
- SANDY SILT TILL
- CLAY

INSTALLATION DETAILS



FOR DETAILS REFER TO RECORD OF BOREHOLES

REFERENCE

DRAWING BASED ON LOTOWATER TECHNICAL SERVICES INC, DORCHESTER PART 1 AQUIFER TEST FINAL, MAY 2007;

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.
FOR SECTION LOCATION, REFER TO FIGURE 1.
ALL LOCATIONS ARE APPROXIMATE.

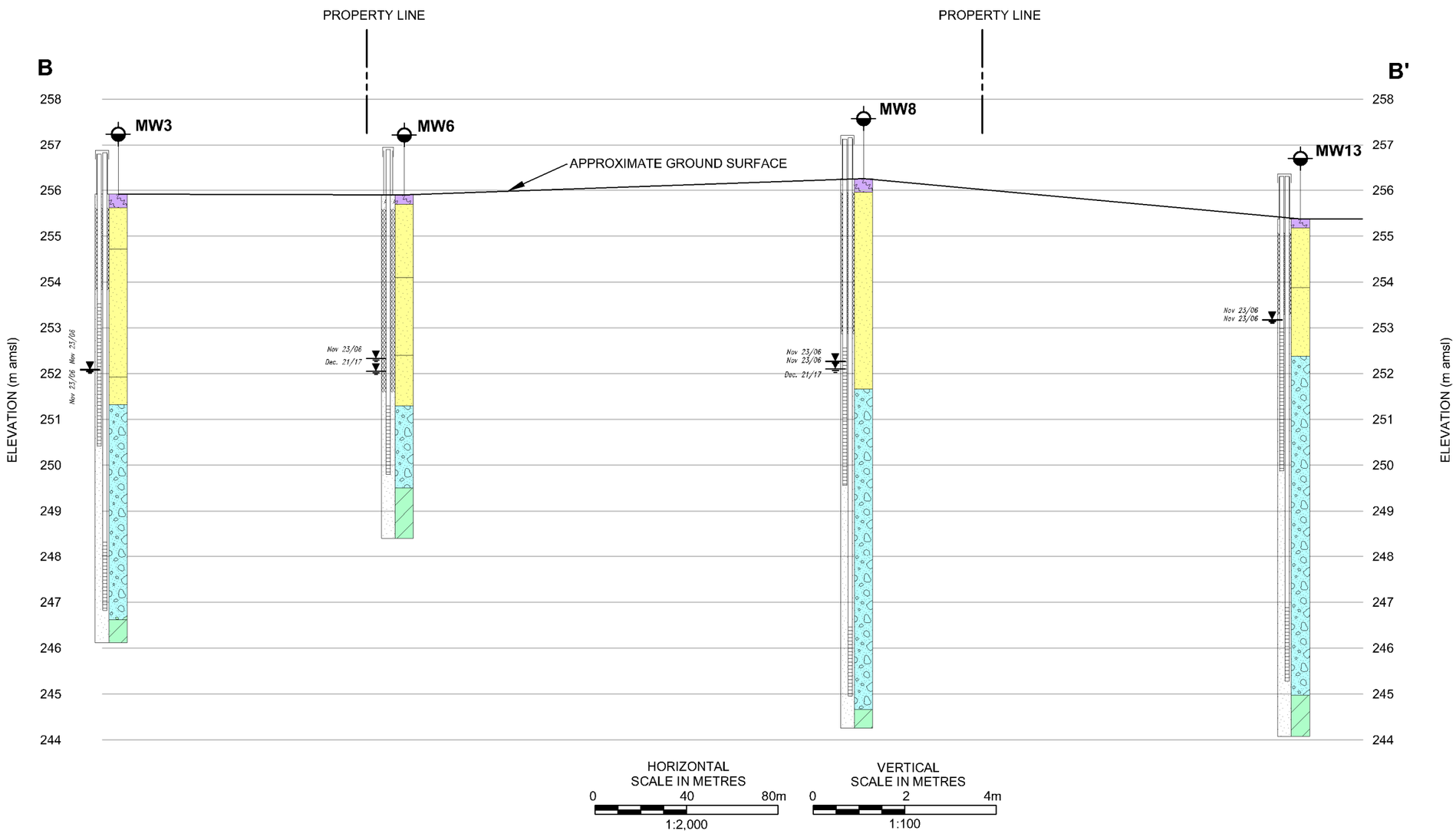
PROJECT
HYDROGEOLOGICAL ASSESSMENT/
PROPOSED DEVELOPMENT
187 BYRON AVENUE
DORCHESTER, MUNICIPALITY OF THAMES CENTRE, ONTARIO

TITLE
CROSS SECTION A - A'

GOLDER

PROJECT No.		1787806	FILE No.	1788468-2000-R01003
			SCALE	AS SHOWN REV.
CADD	ZJB	Jan 25/19		
CHECK	LM			

FIGURE 3



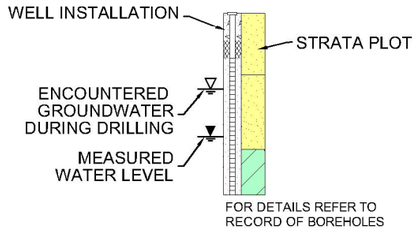
LEGEND

BOREHOLE/MONITORING WELL (LOTOWATER TECHNICAL SERVICES INC. 2006)

SIMPLIFIED STRATIGRAPHY

- TOPSOIL
- SAND
- SAND AND GRAVEL
- CLAY

INSTALLATION DETAILS



REFERENCE

DRAWING BASED ON LOTOWATER TECHNICAL SERVICES INC, DORCHESTER PART 1 AQUIFER TEST FINAL, MAY 2007;

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.
FOR SECTION LOCATION, REFER TO FIGURE 1.
ALL LOCATIONS ARE APPROXIMATE.

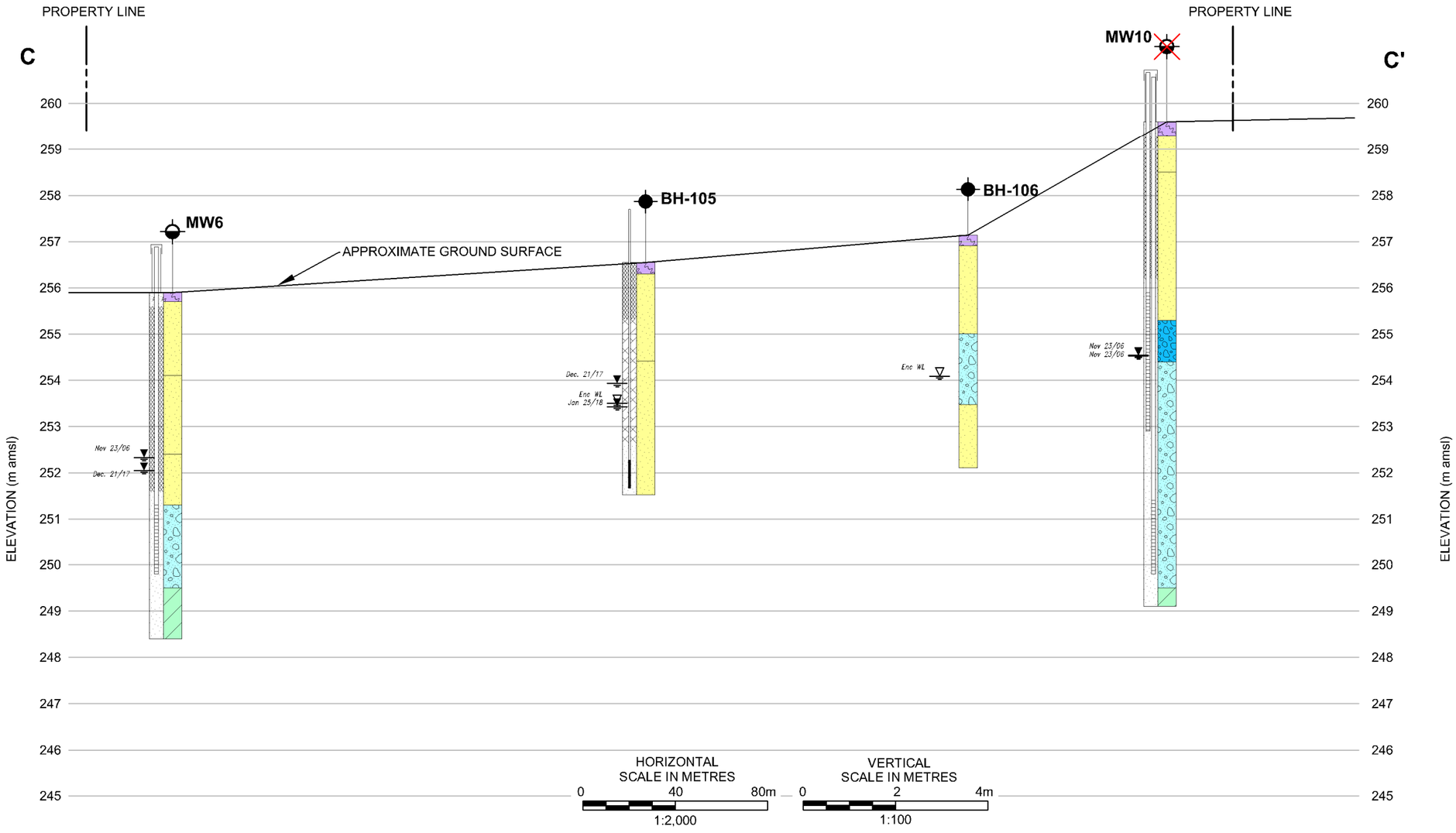
PROJECT: HYDROGEOLOGICAL ASSESSMENT/ PROPOSED DEVELOPMENT 187 BYRON AVENUE DORCHESTER, MUNICIPALITY OF THAMES CENTRE, ONTARIO

TITLE: **CROSS SECTION B - B'**

GOLDER

PROJECT No.	1787806	FILE No.	1788468-2000-R01003
		SCALE	AS SHOWN
CADD	ZJB	Jan 25/19	
CHECK	KM		

FIGURE 4



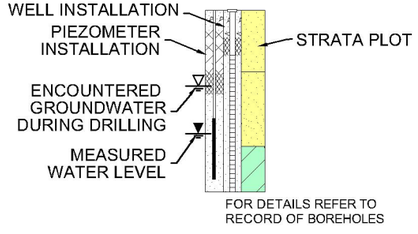
LEGEND

- BOREHOLE
- BOREHOLE/MONITORING WELL (LOTOWATER TECHNICAL SERVICES INC. 2006)
- MONITORING WELL NOT FOUND

SIMPLIFIED STRATIGRAPHY

- TOPSOIL
- SAND
- GRAVEL
- SAND AND GRAVEL
- CLAY

INSTALLATION DETAILS



REFERENCE

DRAWING BASED ON LOTOWATER TECHNICAL SERVICES INC, DORCHESTER PART 1 AQUIFER TEST FINAL, MAY 2007;

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.
FOR SECTION LOCATION, REFER TO FIGURE 1.
ALL LOCATIONS ARE APPROXIMATE.

PROJECT
HYDROGEOLOGICAL ASSESSMENT/
PROPOSED DEVELOPMENT
187 BYRON AVENUE
DORCHESTER, MUNICIPALITY OF THAMES CENTRE, ONTARIO

TITLE

CROSS SECTION C - C'

GOLDER

PROJECT No.		1787806	FILE No.	1788468-2000-R01003	
			SCALE	AS SHOWN	REV.
CADD	ZJB	Jan 25/19			
CHECK	KM				

FIGURE 5

LEGEND

- WATER WELL IDENTIFIED IN MOECC RECORDS
- 500m BUFFER FROM PROJECT ALIGNMENT

REFERENCE

DRAWING BASED ON BING IMAGERY AS OF NOVEMBER 7, 2017 (IMAGE DATE UNKNOWN); "CONCEPTUAL LAYOUT D" PROVIDED BY SIFTON, AUTOCAD FILE "18-827 CONCEPT D JAN 17, 2018".DWG"; AND LOTOWATER TECHNICAL SERVICES INC., FIGURE 2, DORCHESTER PART 1 AQUIFER TEST FINAL, MAY 2007.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

PROJECT
HYDROGEOLOGICAL ASSESSMENT/
PROPOSED DEVELOPMENT
187 BYRON AVENUE
DORCHESTER, MUNICIPALITY OF THAMES CENTRE, ONTARIO

TITLE
WATER WELL LOCATION PLAN

GOLDER

PROJECT No.		1788468	FILE No.	1788468-2000-R01006
			SCALE AS SHOWN	REV.
CADD	LMK/ZJB	Jan 25/19		
CHECK	DM			

FIGURE 6

Client: Sifton Properties Limited

Original Format is Tabloid 279mm x 432mm

25mm 0

Drawing file: 1788468-2000-R01006.dwg Jan 25, 2019 - 9:35am

LEGEND

- BOREHOLE
- BOREHOLE / MONITORING WELL
- BOREHOLE/MONITORING WELL (LOTOWATER TECHNICAL SERVICES INC. 2006)
- MONITORING WELL NOT FOUND
- *254.18m* MEASURED WATER LEVEL - m amsl
- INFERRED GROUNDWATER FLOW DIRECTION
- GROUNDWATER CONTOUR

REFERENCE

DRAWING BASED ON BING IMAGERY AS OF NOVEMBER 7, 2017 (IMAGE DATE UNKNOWN); "CONCEPTUAL LAYOUT D" PROVIDED BY SIFTON, AUTOCAD FILE "18-827 CONCEPT D JAN 17, 2018".DWG"; LOTOWATER TECHNICAL SERVICES INC, FIGURE 2, DORCHESTER PART 1 AQUIFER TEST FINAL, MAY 2007; AND CANMAP STREETFILES V2008.4.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

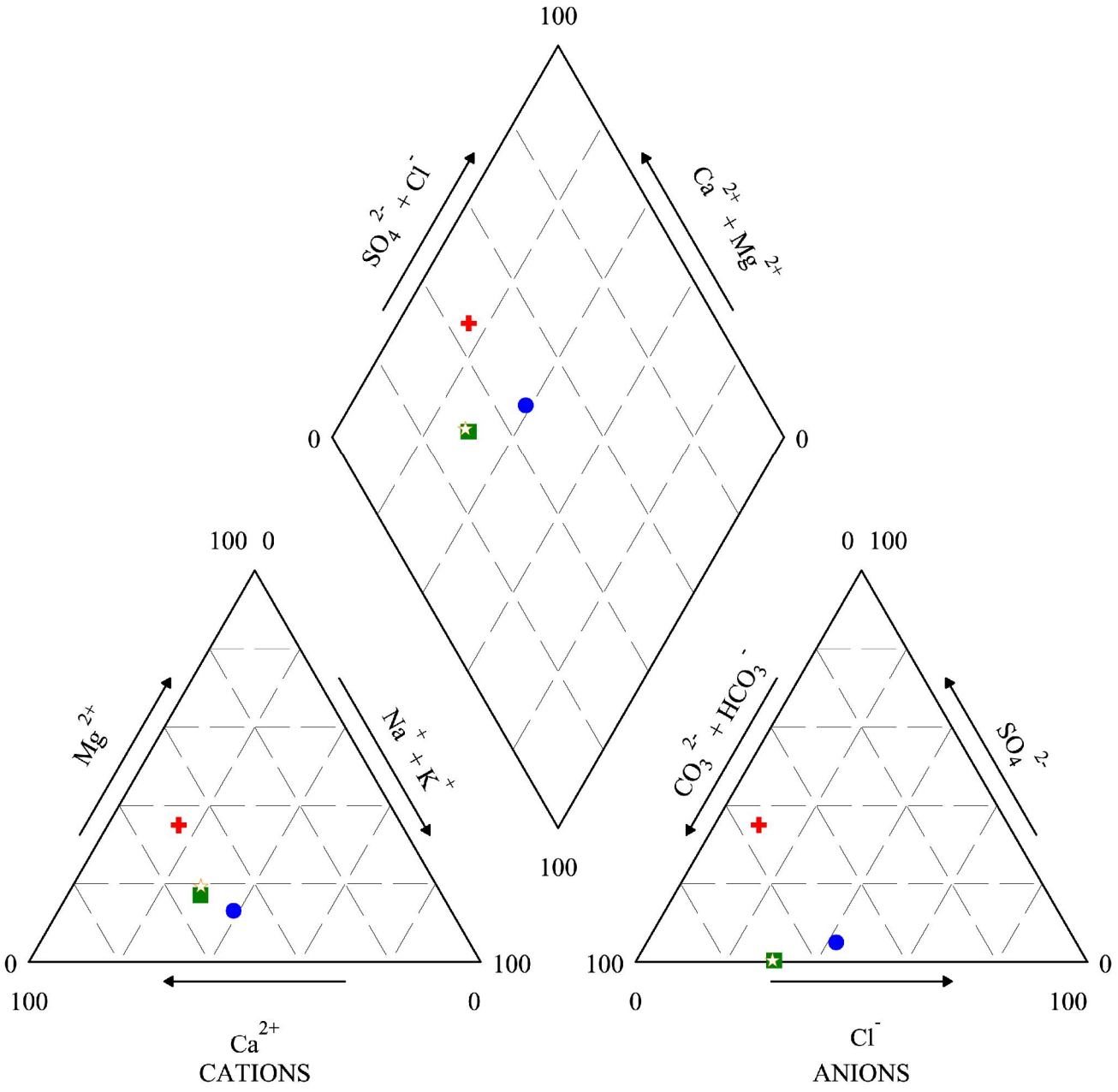
PROJECT
HYDROGEOLOGICAL ASSESSMENT
PROPOSED DEVELOPMENT
187 BYRON AVENUE
DORCHESTER, MUNICIPALITY OF THAMES CENTRE, ONTARIO

TITLE
GROUNDWATER CONTOURS

GOLDER

PROJECT No.		1788468	FILE No.	1788468-2000-R01007
			SCALE	AS SHOWN REV.
CADD	LMK/ZJB	July 4/19		
CHECK				

FIGURE 7



LEGEND

- MW-103
- SW-101
- SW-102
- RAIN WATER (RUTHERFORD, 1967)

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT: HYDROGEOLOGICAL ASSESSMENT
PROPOSED DEVELOPMENT
187 BYRON AVENUE
DORCHESTER, MUNICIPALITY OF THAMES CENTRE, ONTARIO

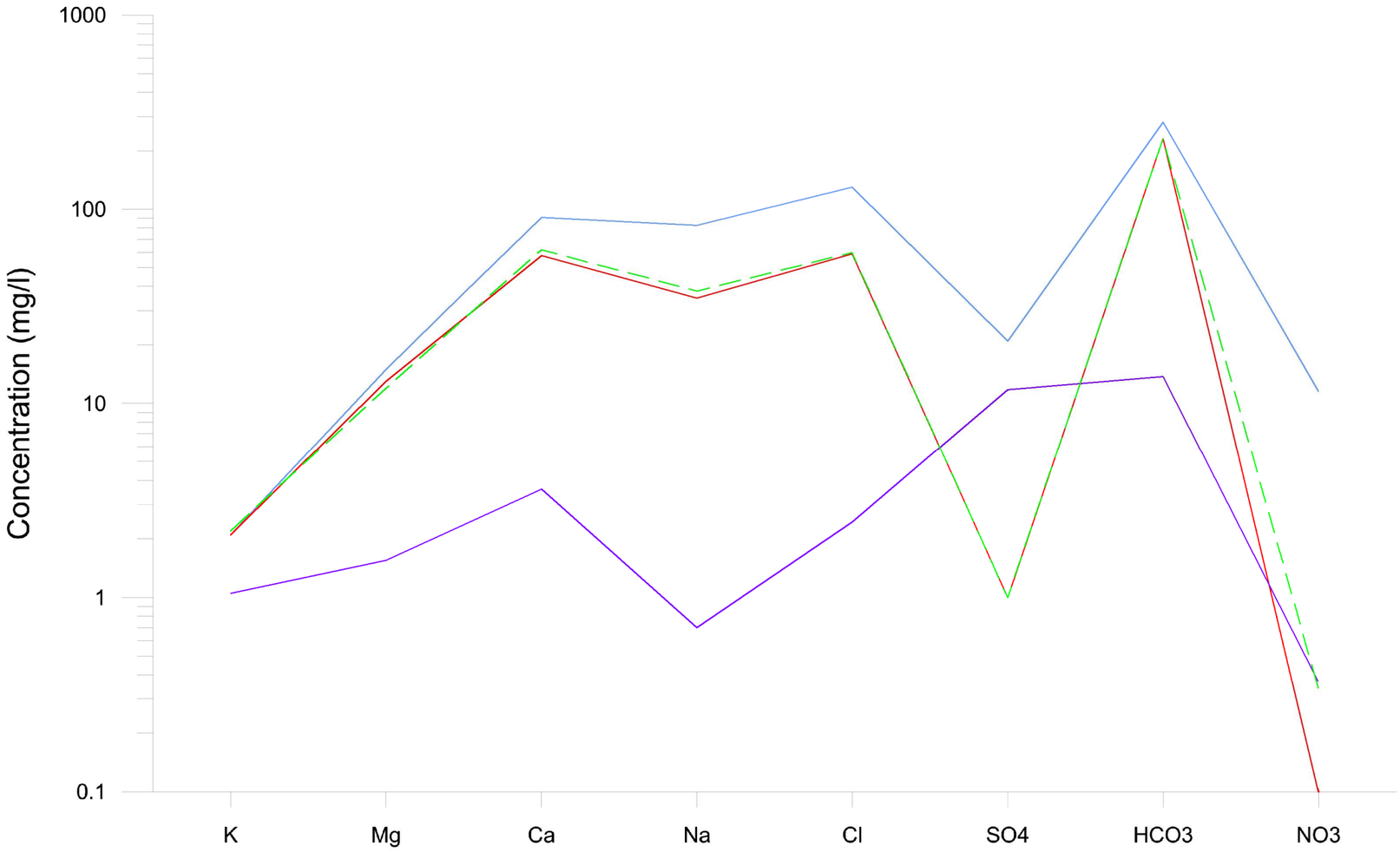
TITLE: **PIPER PLOT FOR SURFACE AND GROUNDWATER SAMPLES**

GOLDER

PROJECT No.			1788468
CADD	ZJB	Jan 25/19	
CHECK	RM		

FILE No. 1788468-2000-R01008
SCALE AS SHOWN REV.

FIGURE 8



LEGEND

- MW-103
- SW-101
- SW-102
- RAIN WATER (RUTHERFORD, 1967)

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

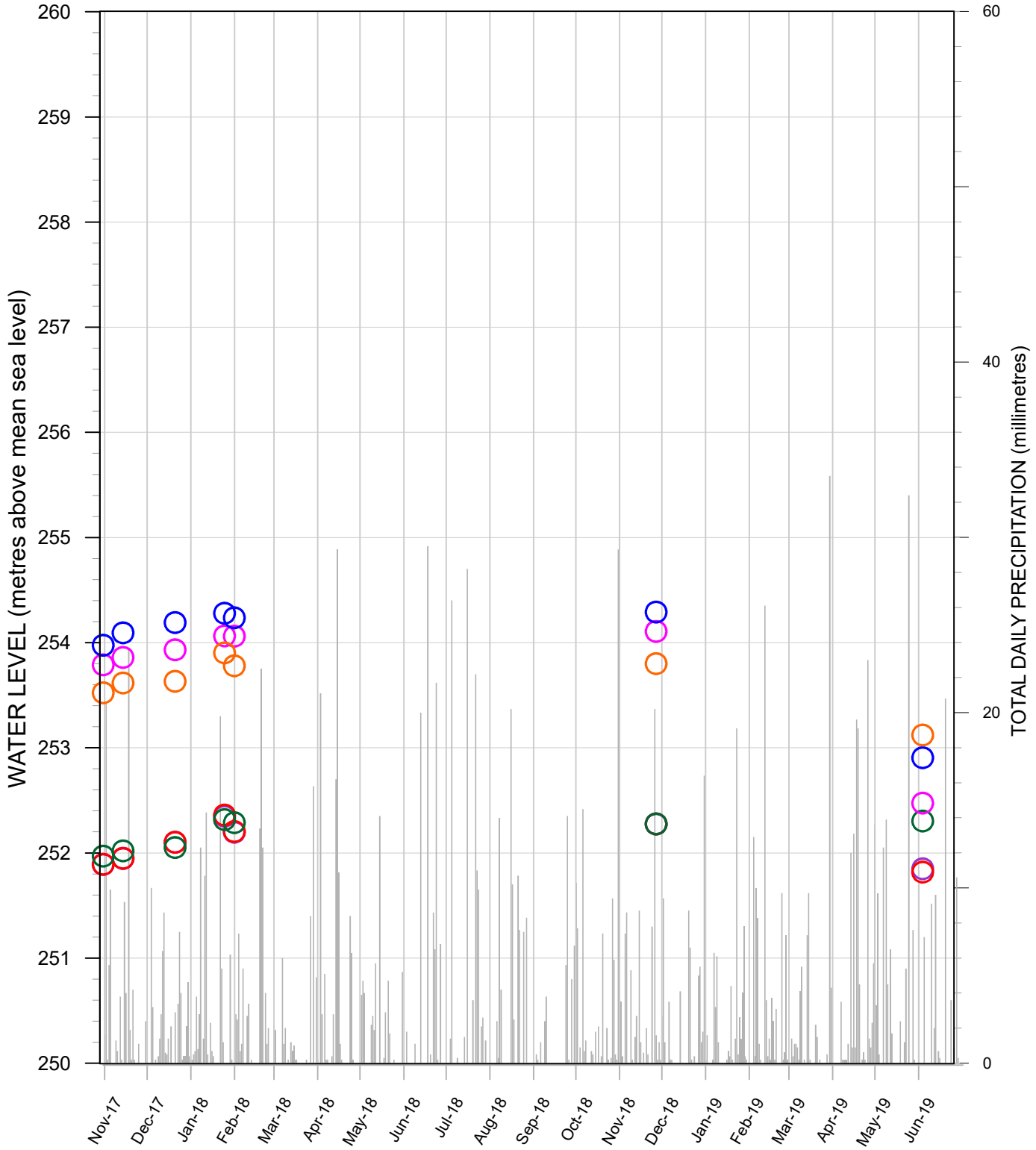
HYDROGEOLOGICAL ASSESSMENT
PROPOSED DEVELOPMENT
187 BYRON AVENUE
DORCHESTER, MUNICIPALITY OF THAMES CENTRE, ONTARIO

TITLE

SCHOELLER PLOT FOR SURFACE AND GROUNDWATER SAMPLES

GOLDER

PROJECT No. 1788468			FILE No. 1788468-2000-R01008	
			SCALE AS SHOWN	REV.
CADD	ZJB	Jan 25/19	FIGURE 9	
CHECK	KM			



Legend

- SG-101 Logger
- MW-103 Logger
- BH-102 Manual
- BH-105 Manual
- MW6 Manual
- MW8 (Shallow) Manual
- MW8 (Deep) Manual
- MW-103 Manual

Notes:
1) Historical weather data sourced from MECP-MCS for station London CS (I.D. 6144478).

PROJECT

HYDROGEOLOGICAL ASSESSMENT
187 BYRON AVENUE
DORCHESTER, MUNICIPALITY OF THAMES CENTRE, ONTARIO

TITLE

WATER LEVEL HYDROGRAPH

GOLDER

PROJECT No.		1788468	FILE No.	1788468-2000-R01
			SCALE AS SHOWN	REV. 0
DWN	SG	Aug 09/19		
CHK	KM			

FIGURE 10

APPENDIX A

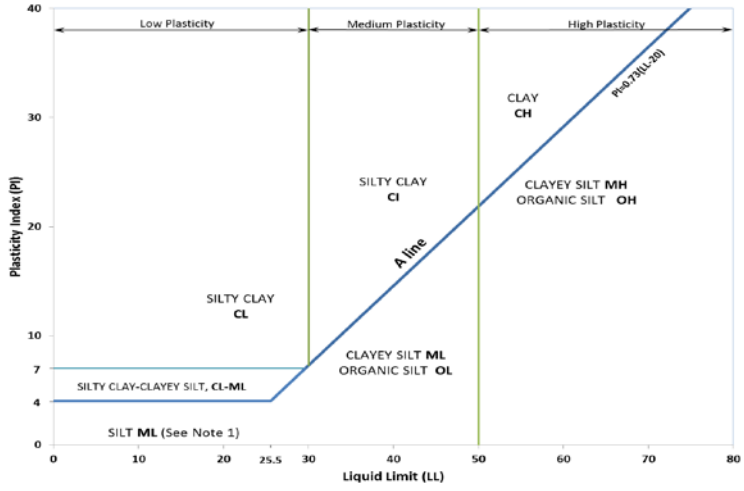
Record of Borehole Sheets

METHOD OF SOIL CLASSIFICATION

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content	USCS Group Symbol	Group Name
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4	≤1 or ≥3	≤30%	GP	GRAVEL
				Well Graded	≥4	1 to 3		GW	GRAVEL
			Gravels with >12% fines (by mass)	Below A Line	n/a			GM	SILTY GRAVEL
				Above A Line	n/a			GC	CLAYEY GRAVEL
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3		SP	SAND
				Well Graded	≥6	1 to 3		SW	SAND
			Sands with >12% fines (by mass)	Below A Line	n/a			SM	SILTY SAND
				Above A Line	n/a			SC	CLAYEY SAND

Organic or Inorganic	Soil Group	Type of Soil	Laboratory Tests	Field Indicators					Organic Content	USCS Group Symbol	Primary Name
				Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)			
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
				Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
				Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
			Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
				None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30% **(see Note 2)**	CL	SILTY CLAY
			Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
			Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures							30% to 75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat							75% to 100%		PEAT



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.
For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.
For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.
A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to indicate a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (*i.e.,* SAND and GRAVEL)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.).

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
FS	Foil sample
GS	Grab Sample
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size
TP	Thin-walled, piston – note size
WS	Wash sample

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 - 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects.
2. Definition of compactness terms are based on SPT-'N' ranges as provided in Terzaghi, Peck and Mesri (1996) and correspond to typical average N_{60} values. Many factors affect the recorded SPT-'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), groundwater conditions, and grainsize. As such, the recorded SPT-'N' value(s) should be considered only an approximate guide to the compactness term. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c'	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$

2 shear strength = (compressive strength)/2

PROJECT: 1788468

RECORD OF BOREHOLE BH-101

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: October 23, 2017
DRILLING CONTRACTOR: London Soil Test Ltd.

DATUM: GEODETIC

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 108mm ID HOLLOW STEM	GROUND SURFACE		257.62				258				
		TOPSOIL, sandy; brown		0.00 257.32					*Headspace Readings (PPM)*			
1		(SP) **SAND**, trace to some silt; brown; loose		0.30	1	SS	5	257	*0*	○		
2					2	SS	6	256	*0*	○		
					3	SS	6		*0*	○		
3		(SW) gravelly **SAND**, some silt; brown; compact		254.73 2.89	4	SS	28	255	*0*	○		
4					5	SS	12	254	*0*	○		*Enc WL* ▽ Groundwater encountered at about elev. 254.0m during drilling on October 23, 2017.
		(SW) **SAND**, some gravel, trace silt; brown; compact		253.20 4.42	6	SS	28	253	*0*	○		
5		END OF BOREHOLE		252.59 5.03				252				
6												
7												
8												
9												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: BT
CHECKED: DB

LDN_BHS_07 1788468.GPJ GLDR_LON.GDT 09/11/17 14:04 DATA INPUT: LMK

PROJECT: 1788468

RECORD OF BOREHOLE BH-102

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: October 23, 2017
DRILLING CONTRACTOR: London Soil Test Ltd.

DATUM: GEODETIC

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0		GROUND SURFACE		255.92				257				
	POWER AUGER 108mm ID HOLLOW STEM	**TOPSOIL**, sandy; brown		0.00				256	*Headspace Readings (PPM)*			Granular bentonite
1				255.49	1	SS	33	255	0	○		
				0.43								
2					2	SS	24	254	0	○		Jan 25/18 ▼ Nov. 14/17 ▼ Oct. 31/17 ▼ Enc WL ▽
												Cuttings
3		(SW) gravelly **SAND**, trace silt; brown; compact to dense			3	SS	16	253	0	○		
					4	SS	19		0	○	MH	
4					5	SS	19	252	0			Filter sand
												Piezometer
5				250.89	6	SS	31	251	0	○		
		END OF BOREHOLE		5.03								
6								250				
7												
8												

Groundwater encountered at about elev. 253.8m during drilling on October 23, 2017.

Water level measured in piezometer at elev. 253.97m on October 31, 2017.

Water level measured in piezometer at elev. 254.09m on November 14, 2017.

Water level measured in piezometer at elev. 254.28m on January 25, 2018.

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: BT
CHECKED: DB

LDN_BHS_07 1788468.GPJ GLDR_LON.GDT 29/01/18 14:53 DATA INPUT: LMK

PROJECT: 1788468

RECORD OF BOREHOLE BH-103

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: October 23, 2017
DRILLING CONTRACTOR: London Soil Test Ltd.

DATUM: GEODETIC

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI, 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
												MW-103
0	POWER AUGER 108mm ID HOLLOW STEM	GROUND SURFACE		255.84				256				Top of Pipe Elev. 256.61m
		TOPSOIL, sandy; brown		0.00 255.62					*Headspace Readings (PPM)*			Concrete
				0.22								
1		(SP) **SAND**, trace to some silt; brown; loose to compact			1	SS	8	255	*0*	○		Granular bentonite
					2	SS	11		*0*	○		*Jan 25/18*
2								254				*Nov. 14/17* *Oct. 31/17* *Enc WL*
					3	SS	4		*0*	○		Filter sand
				252.94				253				
3		(SW) **SAND**, trace to some gravel, trace silt; brown; loose to compact		2.90	4	SS	5		*0*	○		50mm Diam. Slot 10 Schedule 40 PVC Screen
								252				
4					5	SS	18		*0*	○	MH	
				251.27								
		(SW) gravelly **SAND**; trace silt; brown; compact		4.57	6	SS	23	251	*0*	○		
5				250.81								
		END OF BOREHOLE		5.03				250				
6												Groundwater encountered at about elev. 253.4m during drilling on October 23, 2017.
7												Water level measured in well at elev. 253.52m on October 31, 2017.
8												Water level measured in well at elev. 253.62m on November 14, 2017.
9												Water level measured in well at elev. 254.02m on January 25, 2018.

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: BT
CHECKED: DB

LDN_BHS_07 1788468.GPJ GLDR_LON.GDT 29/01/18 14:53 DATA INPUT: LMK

PROJECT: 1788468

RECORD OF BOREHOLE BH-104

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: October 23, 2017
DRILLING CONTRACTOR: London Soil Test Ltd.

DATUM: GEODETIC

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		255.44				256				
0	POWER AUGER 108mm ID HOLLOW STEM	**TOPSOIL**, sandy; brown		0.00 255.09					*Headspace Readings (PPM)*			
1		(SP) **SAND**, trace to some silt; brown; loose		0.35	1	SS	6	255	*0*	○		
				254.07				254				
2		(SW) **SAND**, trace gravel, trace silt; brown; compact		1.37	2	SS	10		*0*	○		*Enc WL* ▽ Groundwater encountered at about elev. 253.3m during drilling on October 23, 2017.
					3	SS	12	253	*0*	○		
3				252.18	4	SS	17		*0*	○		
		(ML) **CLAYEY SANDY SILT**, trace gravel, with cobbles; brown turning grey at about elev. 251.8m, **TILL**; compact to very dense		3.26				252				
4					5	SS	20		*0*	○		
				250.77	6	SS	50/100mm	251	*0*	○		
		END OF BOREHOLE		4.67								
5								250				
6												
7												
8												
9												

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: BT
CHECKED: DB

LDN_BHS_07 1788468.GPJ GLDR_LON.GDT 14/11/17 10:27 DATA INPUT: LMK

PROJECT: 1788468

RECORD OF BOREHOLE BH-105

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: October 23, 2017
DRILLING CONTRACTOR: London Soil Test Ltd.

DATUM: GEODETIC

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
0	POWER AUGER 108mm ID HOLLOW STEM	GROUND SURFACE		256.55				258				
		TOPSOIL, sandy; brown		0.00 256.30								
				0.25				257	*Headspace Readings (PPM)*			
1		(SP) **SAND**, trace gravel, trace silt; brown; loose			1	SS	6	256	*0*	○		Granular bentonite
					2	SS	7	255	*0*	○		Cuttings
2				254.42								*Nov. 14/17* *Oct. 31/17*
				2.13	3	SS	7	254	*0*	○		*Enc WL* *Jan 25/18*
3		(SW) **SAND**, trace to some gravel, trace silt; brown; loose to compact			4	SS	13	253	*0*	○		
4					5	SS	15		*0*	○	MH	Filter sand
					6	SS	24	252	*0*	○		Piezometer
5				251.52								
		END OF BOREHOLE		5.03				251				
6												
7												
8												

Groundwater encountered at about elev. 253.6m during drilling on October 23, 2017.

Water level measured in piezometer at elev. 253.79m on October 31, 2017.

Water level measured in piezometer at elev. 253.86m on November 14, 2017.

Water level measured in piezometer at elev. 253.43m on January 25, 2018.

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: BT
CHECKED: DB

LDN_BHS_07 1788468.GPJ GLDR_LON.GDT 29/01/18 14:53 DATA INPUT: LMK

PROJECT: 1788468

RECORD OF BOREHOLE BH-106

SHEET 1 OF 1

LOCATION: REFER TO LOCATION PLAN

BORING DATE: October 23, 2017
DRILLING CONTRACTOR: London Soil Test Ltd.

DATUM: GEODETIC

HAMMER TYPE: Auto Hammer

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ELEVATION	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	INSTALLATION AND GROUNDWATER OBSERVATIONS
		GROUND SURFACE		257.14				258				
0	POWER AUGER 108mm ID HOLLOW STEM	**TOPSOIL**, sandy; brown		0.00 256.91					*Headspace Readings (PPM)*			
				0.23				257				
1		(SP) **SAND**, trace to some silt; brown; very loose to loose			1	SS	4		*0*	○		
								256				
2					2	SS	3		*0*	○		
				255.01				255				
				2.13								
3		(SW) gravelly **SAND**, trace silt; brown; compact			3	SS	17		*0*	○		*Enc WL* ▽ Groundwater encountered at about elev. 254.1m during drilling on October 23, 2017.
								254				
					4	SS	12		*0*	○		
				253.48								
				3.66								
4					5	SS	16		*0*	○		
		(SW) **SAND**, some gravel, trace silt; brown; compact						253				
					6	SS	14		*0*	○		
5				252.11								
		END OF BOREHOLE		5.03				252				
6												
7												
8												
9												

DEPTH SCALE
1 : 50

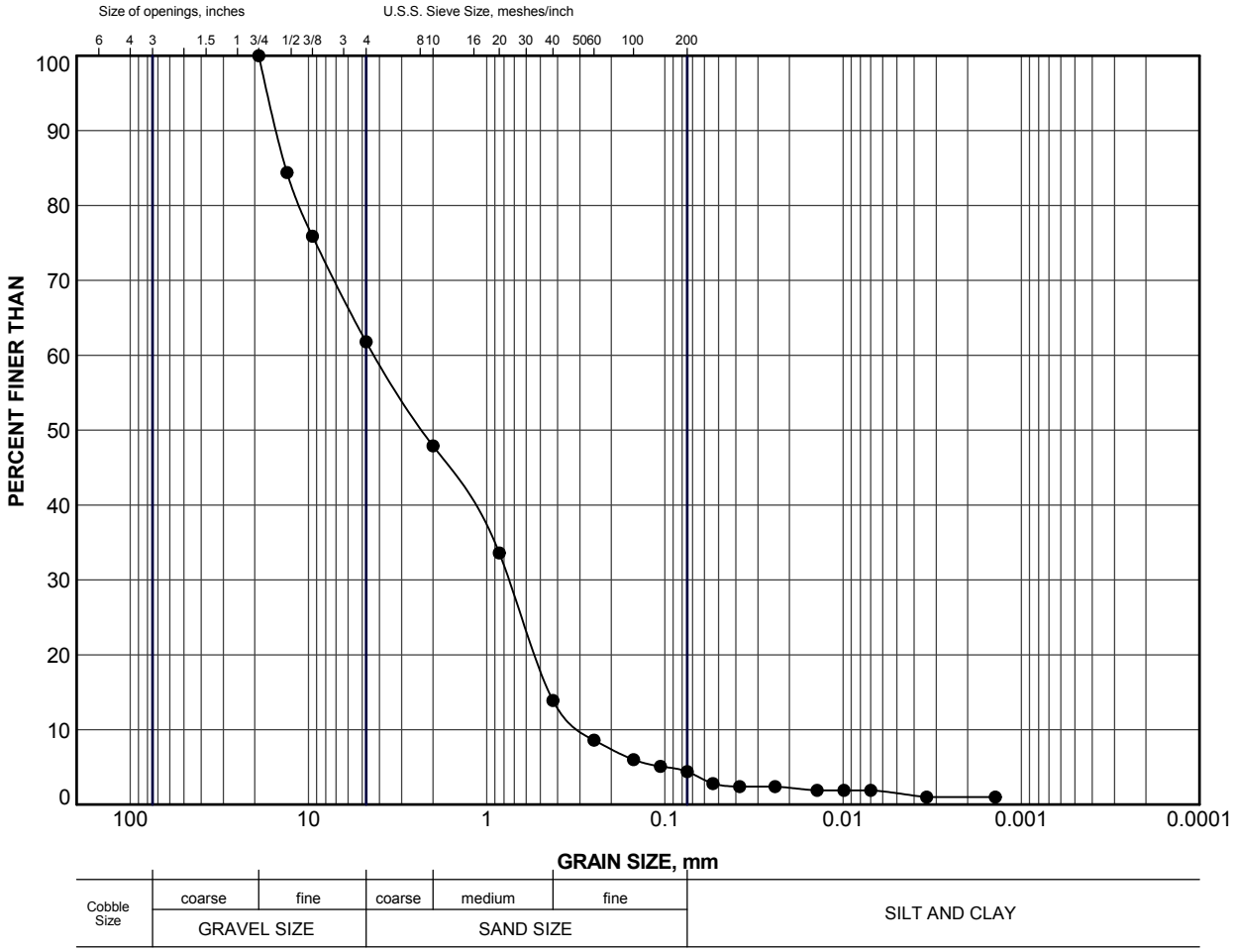
Golder Associates

LOGGED: BT
CHECKED: DB

LDN_BHS_07 1788468.GPJ GLDR_LON.GDT 09/11/17 14:04 DATA INPUT: LMK

APPENDIX B

Grain Size Distribution Curves



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BH-102	4	252.6

PROJECT

PROPOSED DEVELOPMENT
187 BYRON AVENUE
DORCHESTER, ONTARIO

TITLE

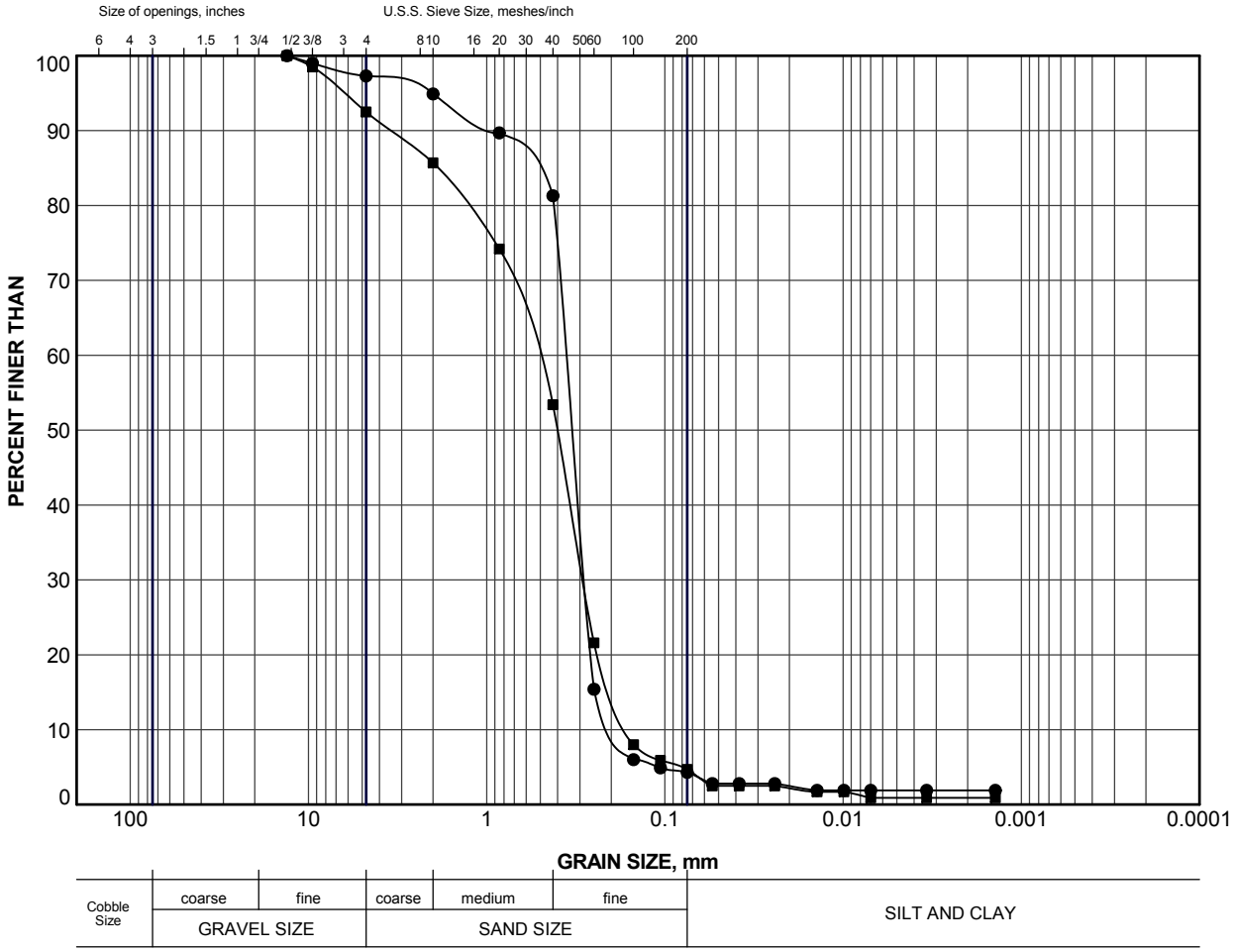
GRAIN SIZE DISTRIBUTION

gravelly SAND

Golder Associates

PROJECT No.			1788468	FILE No.	1788468-R01002
				SCALE N/A	REV.
DRAWN	LMK	Nov 09/17			
CHECK	DB			FIGURE	2

LDN_GSD GLDR_LDN.GDT 09/11/17 09:29



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEV (m)
●	BH-103	5	251.8
■	BH-105	5	252.5

PROJECT

PROPOSED DEVELOPMENT
187 BYRON AVENUE
DORCHESTER, ONTARIO

TITLE

GRAIN SIZE DISTRIBUTION

SAND

Golder Associates

PROJECT No.			1788468	FILE No.	1788468-R01003
				SCALE N/A	REV.
DRAWN	LMK	Nov 09/17			
CHECK	DB			**FIGURE 3**	

LDN_GSD GLDR_LDN.GDT 09/11/17 13:27

APPENDIX C

Laboratory Certificate of Analysis

Maxxam
A Bureau Veritas Group Company

Your Project #: 1788468
Your C.O.C. #: 638024-01-01

Attention:Steve Hales

Golder Associates Ltd
309 Exeter Rd
Unit 1
London, ON
N6L 1C1

Report Date: 2017/11/21
Report #: R4869920
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7P6030
Received: 2017/11/14, 11:40

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Biochemical Oxygen Demand (BOD)	1	2017/11/15	2017/11/20	CAM SOP-00427	SM 22 5210B m
Total Chlorine	1	2017/11/15	2017/11/15	CAM SOP 00425	SM 22 4500-CL G m
Chloride by Automated Colourimetry	1	N/A	2017/11/17	CAM SOP-00463	EPA 325.2 m
Total Cyanide	1	2017/11/16	2017/11/16	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2017/11/16	2017/11/17	CAM SOP-00449	SM 22 4500-F C m
Mercury in Water by CVAA	1	2017/11/16	2017/11/20	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by Axial ICP	1	2017/11/17	2017/11/17	CAM SOP-00408	EPA 6010D m
Animal and Vegetable Oil and Grease	1	N/A	2017/11/20	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2017/11/20	2017/11/20	CAM SOP-00326	EPA1664B m,SM5520A m
pH	1	N/A	2017/11/17	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2017/11/17	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2017/11/17	CAM SOP-00464	EPA 375.4 m
Mineral/Synthetic O & G (TPH Heavy Oil) (1)	1	2017/11/20	2017/11/20	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2017/11/15	2017/11/16	CAM SOP-00428	SM 22 2540D m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Your Project #: 1788468
Your C.O.C. #: 638024-01-01

Attention:Steve Hales

Golder Associates Ltd
309 Exeter Rd
Unit 1
London, ON
N6L 1C1

Report Date: 2017/11/21
Report #: R4869920
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7P6030
Received: 2017/11/14, 11:40

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Christine Gripton, Senior Project Manager
Email: CGripton@maxxam.ca
Phone# (800)268-7396 Ext:250

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B7P6030
Report Date: 2017/11/21

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: MC

LONDON STORM SEWER BYLAW (WM-16)

Maxxam ID		FOA120			FOA120		
Sampling Date		2017/11/14 10:50			2017/11/14 10:50		
COC Number		638024-01-01			638024-01-01		
	UNITS	MW-103	RDL	QC Batch	MW-103 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Total Animal/Vegetable Oil and Grease	mg/L	1.3	0.50	5264269			
Inorganics							
Total BOD	mg/L	<2.0	2.0	5266353			
Total Chlorine	mg/L	<0.1	0.1	5266268	<0.1	0.1	5266268
Fluoride (F-)	mg/L	<0.10	0.10	5270098			
pH	pH	7.88		5270102			
Phenols-4AAP	mg/L	<0.0010	0.0010	5271857			
Total Suspended Solids	mg/L	1100	10	5267277			
Dissolved Sulphate (SO4)	mg/L	20	1.0	5267544			
Total Cyanide (CN)	mg/L	<0.0050	0.0050	5268666			
Dissolved Chloride (Cl)	mg/L	130	1.0	5267530			
Petroleum Hydrocarbons							
Total Oil & Grease	mg/L	1.3	0.50	5274506			
Total Oil & Grease Mineral/Synthetic	mg/L	<0.50	0.50	5274509			
Metals							
Total Aluminum (Al)	mg/L	11	0.1	5270642			
Total Arsenic (As)	mg/L	0.02	0.01	5270642			
Total Barium (Ba)	mg/L	0.12	0.005	5270642			
Total Beryllium (Be)	mg/L	0.0006	0.0005	5270642			
Total Cadmium (Cd)	mg/L	<0.002	0.002	5270642			
Total Chromium (Cr)	mg/L	0.02	0.01	5270642			
Total Copper (Cu)	mg/L	0.13	0.01	5270642			
Total Iron (Fe)	mg/L	29	0.02	5270642			
Total Lead (Pb)	mg/L	0.04	0.01	5270642			
Total Manganese (Mn)	mg/L	0.95	0.001	5270642			
Mercury (Hg)	mg/L	<0.0001	0.0001	5269672			
Total Nickel (Ni)	mg/L	0.022	0.005	5270642			
Total Phosphorus (P)	mg/L	0.70	0.05	5270642			
Total Selenium (Se)	mg/L	<0.02	0.02	5270642			
Total Silver (Ag)	mg/L	<0.01	0.01	5270642			
Total Tin (Sn)	mg/L	<0.02	0.02	5270642			
Total Zinc (Zn)	mg/L	0.30	0.005	5270642			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Job #: B7P6030
Report Date: 2017/11/21

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: MC

TEST SUMMARY

Maxxam ID: FOA120
Sample ID: MW-103
Matrix: Water

Collected: 2017/11/14
Shipped:
Received: 2017/11/14

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5266353	2017/11/15	2017/11/20	Frank Zhang
Total Chlorine	SPEC	5266268	2017/11/15	2017/11/15	Neil Dassanayake
Chloride by Automated Colourimetry	KONE	5267530	N/A	2017/11/17	Deonarine Ramnarine
Total Cyanide	SKAL/CN	5268666	2017/11/16	2017/11/16	Xuanhong Qiu
Fluoride	ISE	5270098	2017/11/16	2017/11/17	Surinder Rai
Mercury in Water by CVAA	CV/AA	5269672	2017/11/16	2017/11/20	Ron Morrison
Total Metals Analysis by Axial ICP	ICPX	5270642	2017/11/17	2017/11/17	Archana Patel
Animal and Vegetable Oil and Grease	BAL	5264269	N/A	2017/11/20	Automated Statchk
Total Oil and Grease	BAL	5274506	2017/11/20	2017/11/20	Amjad Mir
pH	AT	5270102	N/A	2017/11/17	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5271857	N/A	2017/11/17	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5267544	N/A	2017/11/17	Deonarine Ramnarine
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	5274509	2017/11/20	2017/11/20	Amjad Mir
Total Suspended Solids	BAL	5267277	2017/11/15	2017/11/16	Fang Wang

Maxxam ID: FOA120 Dup
Sample ID: MW-103
Matrix: Water

Collected: 2017/11/14
Shipped:
Received: 2017/11/14

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Chlorine	SPEC	5266268	2017/11/15	2017/11/15	Neil Dassanayake

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7P6030
Report Date: 2017/11/21

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: MC

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.0°C

Results relate only to the items tested.

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Maxxam Job #: B7P6030
Report Date: 2017/11/21

QUALITY ASSURANCE REPORT

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: MC

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5266268	Total Chlorine	2017/11/15	87	85 - 115	95	85 - 115	<0.1	mg/L	NC	25		
5266353	Total BOD	2017/11/20					<2.0	mg/L	NC	25	103	80 - 120
5267277	Total Suspended Solids	2017/11/16					<10	mg/L	8.3	25	95	85 - 115
5267530	Dissolved Chloride (Cl)	2017/11/17	103	80 - 120	103	80 - 120	<1.0	mg/L	3.3	20		
5267544	Dissolved Sulphate (SO4)	2017/11/17	107	75 - 125	104	80 - 120	<1.0	mg/L	16	20		
5268666	Total Cyanide (CN)	2017/11/16	100	80 - 120	96	80 - 120	<0.0050	mg/L	NC	20		
5269672	Mercury (Hg)	2017/11/20	102	75 - 125	98	80 - 120	<0.0001	mg/L	NC	20		
5270098	Fluoride (F-)	2017/11/17	105	80 - 120	100	80 - 120	<0.10	mg/L	3.3	20		
5270102	pH	2017/11/17			101	98 - 103			0.073	N/A		
5270642	Total Aluminum (Al)	2017/11/17	104	80 - 120	91	80 - 120	<0.1	mg/L	NC	20		
5270642	Total Arsenic (As)	2017/11/17	96	80 - 120	91	80 - 120	<0.01	mg/L	NC	20		
5270642	Total Barium (Ba)	2017/11/17	93	80 - 120	91	80 - 120	<0.005	mg/L				
5270642	Total Beryllium (Be)	2017/11/17	94	80 - 120	89	80 - 120	<0.0005	mg/L				
5270642	Total Cadmium (Cd)	2017/11/17	99	80 - 120	94	80 - 120	<0.002	mg/L	NC	20		
5270642	Total Chromium (Cr)	2017/11/17	99	80 - 120	95	80 - 120	<0.01	mg/L	NC	20		
5270642	Total Copper (Cu)	2017/11/17	98	80 - 120	95	80 - 120	<0.01	mg/L	NC	20		
5270642	Total Iron (Fe)	2017/11/17	102	80 - 120	94	80 - 120	<0.02	mg/L				
5270642	Total Lead (Pb)	2017/11/17	90	80 - 120	88	80 - 120	<0.01	mg/L	NC	20		
5270642	Total Manganese (Mn)	2017/11/17	99	80 - 120	96	80 - 120	<0.001	mg/L	0.80	20		
5270642	Total Nickel (Ni)	2017/11/17	96	80 - 120	95	80 - 120	<0.005	mg/L	0.86	20		
5270642	Total Phosphorus (P)	2017/11/17	98	80 - 120	88	80 - 120	<0.05	mg/L	2.0	20		
5270642	Total Selenium (Se)	2017/11/17	95	80 - 120	90	80 - 120	<0.02	mg/L	NC	20		
5270642	Total Silver (Ag)	2017/11/17	94	80 - 120	90	80 - 120	<0.01	mg/L	NC	20		
5270642	Total Tin (Sn)	2017/11/17	97	80 - 120	94	80 - 120	<0.02	mg/L	NC	20		
5270642	Total Zinc (Zn)	2017/11/17	100	80 - 120	97	80 - 120	<0.005	mg/L	1.2	20		
5271857	Phenols-4AAP	2017/11/17	96	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20		
5274506	Total Oil & Grease	2017/11/20			96	85 - 115	<0.50	mg/L	5.4	25		

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Maxxam Job #: B7P6030
Report Date: 2017/11/21

QUALITY ASSURANCE REPORT(CONT'D)

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: MC

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5274509	Total Oil & Grease Mineral/Synthetic	2017/11/20			93	85 - 115	<0.50	mg/L	3.5	25		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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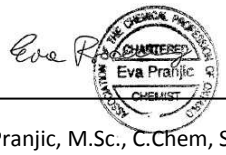
Maxxam Job #: B7P6030
Report Date: 2017/11/21

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: MC

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

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Maxxam
A Bureau Veritas Group Company

Your Project #: 1788468
Your C.O.C. #: 694584-01-01

Attention: Richard McCracken

Golder Associates Ltd
309 Exeter Rd
Unit 1
London, ON
CANADA N6L 1C1

Report Date: 2018/12/13
Report #: R5524292
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8V8443
Received: 2018/11/28, 09:05

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	3	N/A	2018/12/03	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	3	N/A	2018/12/04	CAM SOP-00102	APHA 4500-CO2 D
Biochemical Oxygen Demand (BOD)	3	2018/11/30	2018/12/05	CAM SOP-00427	SM 23 5210B m
Total Chlorine	3	2018/11/30	2018/11/30	CAM SOP 00425	SM 23 4500-CL G m
Chloride by Automated Colourimetry	3	N/A	2018/12/03	CAM SOP-00463	EPA 325.2 m
Conductivity	3	N/A	2018/12/03	CAM SOP-00414	SM 23 2510 m
Total Cyanide	3	2018/12/03	2018/12/03	CAM SOP-00457	OMOE E3015 5 m
Dissolved Organic Carbon (DOC) (1)	1	N/A	2018/12/03	CAM SOP-00446	SM 23 5310 B m
Dissolved Organic Carbon (DOC) (1)	2	N/A	2018/12/12	CAM SOP-00446	SM 23 5310 B m
Fluoride	3	2018/12/01	2018/12/03	CAM SOP-00449	SM 23 4500-F C m
Hardness (calculated as CaCO3)	3	N/A	2018/12/03	CAM SOP 00102/00408/00447	SM 2340 B
Mercury in Water by CVAA	3	2018/12/01	2018/12/03	CAM SOP-00453	EPA 7470A m
Lab Filtered Metals Analysis by ICP	2	2018/11/30	2018/12/03	CAM SOP-00408	EPA 6010D m
Dissolved Metals by ICPMS	1	N/A	2018/12/03	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	2	N/A	2018/12/13	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	3	N/A	2018/12/03	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	1	N/A	2018/12/04		
Ion Balance (% Difference)	2	N/A	2018/12/13		
Anion and Cation Sum	1	N/A	2018/12/04		
Anion and Cation Sum	2	N/A	2018/12/13		
Total Ammonia-N	3	N/A	2018/12/03	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	3	N/A	2018/11/30	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Animal and Vegetable Oil and Grease	3	N/A	2018/11/30	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	3	2018/11/30	2018/11/30	CAM SOP-00326	EPA1664B m,SM5520A m
pH	3	N/A	2018/12/03	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	3	N/A	2018/12/03	CAM SOP-00444	OMOE E3179 m
Orthophosphate	3	N/A	2018/12/03	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	3	N/A	2018/12/04		
Sat. pH and Langelier Index (@ 4C)	3	N/A	2018/12/04		
Sulphate by Automated Colourimetry	3	N/A	2018/12/03	CAM SOP-00464	EPA 375.4 m

Maxxam
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Your Project #: 1788468
Your C.O.C. #: 694584-01-01

Attention: Richard McCracken

Golder Associates Ltd
309 Exeter Rd
Unit 1
London, ON
CANADA N6L 1C1

Report Date: 2018/12/13
Report #: R5524292
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8V8443
Received: 2018/11/28, 09:05

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Total Dissolved Solids (TDS calc)	3	N/A	2018/12/04		
Total Organic Carbon (TOC) (3)	2	N/A	2018/11/30	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric)	2	2018/11/30	2018/12/03	CAM SOP-00407	SM 23 4500 P B H m
Mineral/Synthetic O & G (TPH Heavy Oil) (4)	3	2018/11/30	2018/11/30	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	3	2018/11/30	2018/12/03	CAM SOP-00428	SM 23 2540D m
Turbidity	2	N/A	2018/12/03	CAM SOP-00417	SM 23 2130 B m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(3) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.
(4) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Your Project #: 1788468
Your C.O.C. #: 694584-01-01

Attention: Richard McCracken

Golder Associates Ltd
309 Exeter Rd
Unit 1
London, ON
CANADA N6L 1C1

Report Date: 2018/12/13
Report #: R5524292
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8V8443
Received: 2018/11/28, 09:05
Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Christine Gripton, Senior Project Manager
Email: CGripton@maxxam.ca
Phone# (800)268-7396 Ext:250
==========
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Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

LONDON STORM SEWER BYLAW (WM-16)

Maxxam ID				IKL029			IKL029		
Sampling Date				2018/11/27 13:15			2018/11/27 13:15		
COC Number				694584-01-01			694584-01-01		
	UNITS	Criteria	Criteria-2	MW-103	RDL	QC Batch	MW-103 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Total Animal/Vegetable Oil and Grease	mg/L	15	-	<0.50	0.50	5863998			
Inorganics									
Total BOD	mg/L	15	-	<2	2	5864794	<2	2	5864794
Total Chlorine	mg/L	1.0	0.002	**<0.1 (1)**	0.1	5864929	**<0.1 (1)**	0.1	5864929
Fluoride (F-)	mg/L	2.0	-	<0.10	0.10	5866861			
Phenols-4AAP	mg/L	0.02	0.001	<0.0010	0.0010	5867567			
Total Suspended Solids	mg/L	15	-	11	10	5864873	12	10	5864873
Total Cyanide (CN)	mg/L	0.1	-	<0.0050	0.0050	5867667			
Dissolved Chloride (Cl-)	mg/L	1500	-	130	1.0	5866879			
Petroleum Hydrocarbons									
Total Oil & Grease	mg/L	-	-	<0.50	0.50	5864679			
Total Oil & Grease Mineral/Synthetic	mg/L	15	0.5	<0.50	0.50	5864680			
Metals									
Mercury (Hg)	mg/L	0.001	0.0002	<0.0001	0.0001	5866757			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999
(1) RDL exceeds criteria

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

LONDON STORM SEWER BYLAW (WM-16)

Maxxam ID				IKL030		IKL031		
Sampling Date				2018/11/27 13:45		2018/11/27 15:00		
COC Number				694584-01-01		694584-01-01		
	UNITS	Criteria	Criteria-2	SW-102	QC Batch	SW-101	RDL	QC Batch
Calculated Parameters								
Total Animal/Vegetable Oil and Grease	mg/L	15	-	<0.50	5863998	<0.50	0.50	5863998
Inorganics								
Total BOD	mg/L	15	-	<2	5864794	<2	2	5864794
Total Chlorine	mg/L	1.0	0.002	**<0.1 (1)**	5864929	**<0.1 (1)**	0.1	5864929
Fluoride (F-)	mg/L	2.0	-	0.10	5866861	0.12	0.10	5866861
Phenols-4AAP	mg/L	0.02	0.001	<0.0010	5867763	<0.0010	0.0010	5867567
Total Suspended Solids	mg/L	15	-	<10	5864873	<10	10	5864873
Total Cyanide (CN)	mg/L	0.1	-	<0.0050	5867667	<0.0050	0.0050	5867667
Petroleum Hydrocarbons								
Total Oil & Grease	mg/L	-	-	<0.50	5864679	<0.50	0.50	5864679
Total Oil & Grease Mineral/Synthetic	mg/L	15	0.5	<0.50	5864680	<0.50	0.50	5864680
Metals								
Mercury (Hg)	mg/L	0.001	0.0002	<0.0001	5866757	<0.0001	0.0001	5866757

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999
(1) RDL exceeds criteria

Maxxam ID				IKL031		
Sampling Date				2018/11/27 15:00		
COC Number				694584-01-01		
	UNITS	Criteria	Criteria-2	SW-101 Lab-Dup	RDL	QC Batch
Inorganics						
Fluoride (F-)	mg/L	2.0	-	0.11	0.10	5866861

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999

Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

RCAP - COMPREHENSIVE (WATER)

Maxxam ID				IKL029			IKL029		
Sampling Date				2018/11/27 13:15			2018/11/27 13:15		
COC Number				694584-01-01			694584-01-01		
	UNITS	Criteria	Criteria-2	MW-103	RDL	QC Batch	MW-103 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Anion Sum	me/L	-	-	9.61	N/A	5864312			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-	-	230	1.0	5862870			
Calculated TDS	mg/L	-	-	540	1.0	5864315			
Carb. Alkalinity (calc. as CaCO3)	mg/L	-	-	1.9	1.0	5862870			
Cation Sum	me/L	-	-	9.44	N/A	5864312			
Hardness (CaCO3)	mg/L	-	-	290	1.0	5862871			
Ion Balance (% Difference)	%	-	-	0.860	N/A	5863527			
Langelier Index (@ 20C)	N/A	-	-	0.781		5864313			
Langelier Index (@ 4C)	N/A	-	-	0.534		5864314			
Saturation pH (@ 20C)	N/A	-	-	7.16		5864313			
Saturation pH (@ 4C)	N/A	-	-	7.40		5864314			
Inorganics									
Total Ammonia-N	mg/L	-	-	0.068	0.050	5865086	<0.050	0.050	5865086
Conductivity	umho/cm	-	-	1000	1.0	5866865			
Dissolved Organic Carbon	mg/L	-	-	0.98	0.50	5864220			
Orthophosphate (P)	mg/L	-	-	<0.010	0.010	5866891			
pH	pH	6.0:10.5	6.5:8.5	7.94		5866867			
Dissolved Sulphate (SO4)	mg/L	1500	-	21	1.0	5866881			
Alkalinity (Total as CaCO3)	mg/L	-	-	230	1.0	5866863			
Nitrite (N)	mg/L	-	-	<0.010	0.010	5865119			
Nitrate (N)	mg/L	-	-	11.6	0.10	5865119			
Nitrate + Nitrite (N)	mg/L	-	-	11.6	0.10	5865119			
Metals									
Dissolved Aluminum (Al)	ug/L	-	-	<5.0	5.0	5867034			
Dissolved Antimony (Sb)	ug/L	-	20	<0.50	0.50	5867034			
Dissolved Arsenic (As)	ug/L	200	100	<1.0	1.0	5867034			
Dissolved Barium (Ba)	ug/L	100	-	42	2.0	5867034			
Dissolved Beryllium (Be)	ug/L	1000	11	<0.50	0.50	5867034			
Dissolved Boron (B)	ug/L	-	200	45	10	5867034			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999
N/A = Not Applicable

Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

RCAP - COMPREHENSIVE (WATER)

Maxxam ID				IKL029			IKL029		
Sampling Date				2018/11/27 13:15			2018/11/27 13:15		
COC Number				694584-01-01			694584-01-01		
	UNITS	Criteria	Criteria-2	MW-103	RDL	QC Batch	MW-103 Lab-Dup	RDL	QC Batch
Dissolved Cadmium (Cd)	ug/L	8	0.2	<0.10	0.10	5867034			
Dissolved Calcium (Ca)	ug/L	-	-	91000	200	5867034			
Dissolved Chromium (Cr)	ug/L	200	-	<5.0	5.0	5867034			
Dissolved Cobalt (Co)	ug/L	-	0.9	<0.50	0.50	5867034			
Dissolved Copper (Cu)	ug/L	40	5	6.3	1.0	5867034			
Dissolved Iron (Fe)	ug/L	1000	300	<100	100	5867034			
Dissolved Lead (Pb)	ug/L	120	5	<0.50	0.50	5867034			
Dissolved Magnesium (Mg)	ug/L	-	-	15000	50	5867034			
Dissolved Manganese (Mn)	ug/L	1000	-	<2.0	2.0	5867034			
Dissolved Molybdenum (Mo)	ug/L	-	40	<0.50	0.50	5867034			
Dissolved Nickel (Ni)	ug/L	80	25	<1.0	1.0	5867034			
Dissolved Phosphorus (P)	ug/L	-	-	<100	100	5867034			
Dissolved Potassium (K)	ug/L	-	-	2100	200	5867034			
Dissolved Selenium (Se)	ug/L	200	100	<2.0	2.0	5867034			
Dissolved Silicon (Si)	ug/L	-	-	3800	50	5867034			
Dissolved Silver (Ag)	ug/L	120	0.1	<0.10	0.10	5867034			
Dissolved Sodium (Na)	ug/L	-	-	83000	100	5867034			
Dissolved Strontium (Sr)	ug/L	-	-	180	1.0	5867034			
Dissolved Thallium (Tl)	ug/L	-	0.3	<0.050	0.050	5867034			
Dissolved Titanium (Ti)	ug/L	-	-	<5.0	5.0	5867034			
Dissolved Uranium (U)	ug/L	-	5	0.18	0.10	5867034			
Dissolved Vanadium (V)	ug/L	-	6	<0.50	0.50	5867034			
Dissolved Zinc (Zn)	ug/L	50	30	11	5.0	5867034			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

RCAP - COMPREHENSIVE (WATER)

Maxxam ID				IKL030	IKL031		
Sampling Date				2018/11/27 13:45	2018/11/27 15:00		
COC Number				694584-01-01	694584-01-01		
	UNITS	Criteria	Criteria-2	SW-102	SW-101	RDL	QC Batch
Calculated Parameters							
Anion Sum	me/L	-	-	5.41	5.54	N/A	5883879
Cation Sum	me/L	-	-	5.74	5.82	N/A	5883879
Ion Balance (% Difference)	%	-	-	2.92	2.47	N/A	5883878
Inorganics							
Dissolved Organic Carbon	mg/L	-	-	12	12	0.50	5883205
Metals							
Dissolved Aluminum (Al)	ug/L	-	-	<5.0	<5.0	5.0	5882244
Dissolved Antimony (Sb)	ug/L	-	20	<0.50	<0.50	0.50	5882244
Dissolved Arsenic (As)	ug/L	200	100	<1.0	<1.0	1.0	5882244
Dissolved Barium (Ba)	ug/L	100	-	28	32	2.0	5882244
Dissolved Beryllium (Be)	ug/L	1000	11	<0.50	<0.50	0.50	5882244
Dissolved Boron (B)	ug/L	-	200	12	11	10	5882244
Dissolved Cadmium (Cd)	ug/L	8	0.2	<0.10	<0.10	0.10	5882244
Dissolved Calcium (Ca)	ug/L	-	-	58000	62000	200	5882244
Dissolved Chromium (Cr)	ug/L	200	-	<5.0	<5.0	5.0	5882244
Dissolved Cobalt (Co)	ug/L	-	0.9	<0.50	<0.50	0.50	5882244
Dissolved Copper (Cu)	ug/L	40	5	5.0	5.1	1.0	5882244
Dissolved Iron (Fe)	ug/L	1000	300	<100	<100	100	5882244
Dissolved Lead (Pb)	ug/L	120	5	<0.50	<0.50	0.50	5882244
Dissolved Magnesium (Mg)	ug/L	-	-	12000	13000	50	5882244
Dissolved Manganese (Mn)	ug/L	1000	-	7.3	5.9	2.0	5882244
Dissolved Molybdenum (Mo)	ug/L	-	40	<0.50	<0.50	0.50	5882244
Dissolved Nickel (Ni)	ug/L	80	25	<1.0	<1.0	1.0	5882244
Dissolved Phosphorus (P)	ug/L	-	-	<100	<100	100	5882244
Dissolved Potassium (K)	ug/L	-	-	2100	2200	200	5882244
Dissolved Selenium (Se)	ug/L	200	100	<2.0	<2.0	2.0	5882244
Dissolved Silicon (Si)	ug/L	-	-	3500	3700	50	5882244
Dissolved Silver (Ag)	ug/L	120	0.1	<0.10	<0.10	0.10	5882244
Dissolved Sodium (Na)	ug/L	-	-	35000	38000	100	5882244
Dissolved Strontium (Sr)	ug/L	-	-	160	170	1.0	5882244

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999
N/A = Not Applicable

Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

RCAP - COMPREHENSIVE (WATER)

Maxxam ID				IKL030	IKL031		
Sampling Date				2018/11/27 13:45	2018/11/27 15:00		
COC Number				694584-01-01	694584-01-01		
	UNITS	**Criteria**	**Criteria-2**	**SW-102**	**SW-101**	**RDL**	**QC Batch**
Dissolved Thallium (Tl)	ug/L	-	0.3	<0.050	<0.050	0.050	5882244
Dissolved Titanium (Ti)	ug/L	-	-	<5.0	<5.0	5.0	5882244
Dissolved Uranium (U)	ug/L	-	5	0.38	0.49	0.10	5882244
Dissolved Vanadium (V)	ug/L	-	6	<0.50	<0.50	0.50	5882244
Dissolved Zinc (Zn)	ug/L	50	30	8.3	6.9	5.0	5882244

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999

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Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

RCAP - SURFACE WATER (WATER)

Maxxam ID				IKL030			IKL030		
Sampling Date				2018/11/27 13:45			2018/11/27 13:45		
COC Number				694584-01-01			694584-01-01		
	UNITS	Criteria	Criteria-2	SW-102	RDL	QC Batch	SW-102 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-	-	190	1.0	5862870			
Calculated TDS	mg/L	-	-	290	1.0	5864315			
Carb. Alkalinity (calc. as CaCO3)	mg/L	-	-	1.8	1.0	5862870			
Hardness (CaCO3)	mg/L	-	-	200	1.0	5862871			
Langelier Index (@ 20C)	N/A	-	-	0.648		5864313			
Langelier Index (@ 4C)	N/A	-	-	0.399		5864314			
Saturation pH (@ 20C)	N/A	-	-	7.36		5864313			
Saturation pH (@ 4C)	N/A	-	-	7.61		5864314			
Inorganics									
Total Ammonia-N	mg/L	-	-	<0.050	0.050	5865086			
Conductivity	umho/cm	-	-	560	1.0	5866865			
Total Organic Carbon (TOC)	mg/L	-	-	13	0.50	5863386			
Orthophosphate (P)	mg/L	-	-	<0.010	0.010	5866891			
pH	pH	6.0:10.5	6.5:8.5	8.00		5866867			
Total Phosphorus	mg/L	-	0.01	0.013	0.004	5865139			
Dissolved Sulphate (SO4)	mg/L	1500	-	<1.0	1.0	5866881			
Turbidity	NTU	-	-	0.7	0.1	5864980			
Alkalinity (Total as CaCO3)	mg/L	-	-	190	1.0	5866863			
Dissolved Chloride (Cl-)	mg/L	1500	-	59	1.0	5866879			
Nitrite (N)	mg/L	-	-	<0.010	0.010	5865119			
Nitrate (N)	mg/L	-	-	<0.10	0.10	5865119			
Metals									
Dissolved Calcium (Ca)	mg/L	-	-	61	0.05	5865703	61	0.05	5865703
Dissolved Magnesium (Mg)	mg/L	-	-	12	0.05	5865703	12	0.05	5865703
Dissolved Potassium (K)	mg/L	-	-	2	1	5865703	2	1	5865703
Dissolved Sodium (Na)	mg/L	-	-	37	0.5	5865703	37	0.5	5865703
Total Aluminum (Al)	ug/L	1000	-	15	5.0	5865078			
Total Antimony (Sb)	ug/L	-	20	<0.50	0.50	5865078			
Total Arsenic (As)	ug/L	200	100	<1.0	1.0	5865078			
Total Barium (Ba)	ug/L	100	-	29	2.0	5865078			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999

Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

RCAP - SURFACE WATER (WATER)

Maxxam ID				IKL030			IKL030		
Sampling Date				2018/11/27 13:45			2018/11/27 13:45		
COC Number				694584-01-01			694584-01-01		
	UNITS	Criteria	Criteria-2	SW-102	RDL	QC Batch	SW-102 Lab-Dup	RDL	QC Batch
Total Beryllium (Be)	ug/L	1000	11	<0.50	0.50	5865078			
Total Boron (B)	ug/L	-	200	11	10	5865078			
Total Cadmium (Cd)	ug/L	8	0.2	<0.10	0.10	5865078			
Total Calcium (Ca)	ug/L	-	-	63000	200	5865078			
Total Chromium (Cr)	ug/L	200	-	<5.0	5.0	5865078			
Total Cobalt (Co)	ug/L	-	0.9	<0.50	0.50	5865078			
Total Copper (Cu)	ug/L	40	5	<1.0	1.0	5865078			
Total Iron (Fe)	ug/L	1000	300	170	100	5865078			
Total Lead (Pb)	ug/L	120	5	<0.50	0.50	5865078			
Total Magnesium (Mg)	ug/L	-	-	13000	50	5865078			
Total Manganese (Mn)	ug/L	1000	-	6.8	2.0	5865078			
Total Molybdenum (Mo)	ug/L	-	40	<0.50	0.50	5865078			
Total Nickel (Ni)	ug/L	80	25	<1.0	1.0	5865078			
Total Potassium (K)	ug/L	-	-	2100	200	5865078			
Total Selenium (Se)	ug/L	200	100	<2.0	2.0	5865078			
Total Silicon (Si)	ug/L	-	-	3400	50	5865078			
Total Silver (Ag)	ug/L	120	0.1	<0.10	0.10	5865078			
Total Sodium (Na)	ug/L	-	-	37000	100	5865078			
Total Strontium (Sr)	ug/L	-	-	150	1.0	5865078			
Total Thallium (Tl)	ug/L	-	0.3	<0.050	0.050	5865078			
Total Titanium (Ti)	ug/L	-	-	<5.0	5.0	5865078			
Total Vanadium (V)	ug/L	-	6	0.50	0.50	5865078			
Total Zinc (Zn)	ug/L	50	30	<5.0	5.0	5865078			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999

Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

RCAP - SURFACE WATER (WATER)

Maxxam ID				IKL031			IKL031		
Sampling Date				2018/11/27 15:00			2018/11/27 15:00		
COC Number				694584-01-01			694584-01-01		
	UNITS	Criteria	Criteria-2	SW-101	RDL	QC Batch	SW-101 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	-	-	190	1.0	5862870			
Calculated TDS	mg/L	-	-	300	1.0	5864315			
Carb. Alkalinity (calc. as CaCO3)	mg/L	-	-	1.7	1.0	5862870			
Hardness (CaCO3)	mg/L	-	-	210	1.0	5862871			
Langelier Index (@ 20C)	N/A	-	-	0.634		5864313			
Langelier Index (@ 4C)	N/A	-	-	0.385		5864314			
Saturation pH (@ 20C)	N/A	-	-	7.34		5864313			
Saturation pH (@ 4C)	N/A	-	-	7.59		5864314			
Inorganics									
Total Ammonia-N	mg/L	-	-	0.050	0.050	5865086			
Conductivity	umho/cm	-	-	580	1.0	5866865	570	1.0	5866865
Total Organic Carbon (TOC)	mg/L	-	-	13	0.50	5863386			
Orthophosphate (P)	mg/L	-	-	<0.010	0.010	5866891			
pH	pH	6.0:10.5	6.5:8.5	7.98		5866867	8.04		5866867
Total Phosphorus	mg/L	-	0.01	0.015	0.004	5865139			
Dissolved Sulphate (SO4)	mg/L	1500	-	<1.0	1.0	5866881			
Turbidity	NTU	-	-	1.1	0.1	5864980	1.1	0.1	5864980
Alkalinity (Total as CaCO3)	mg/L	-	-	190	1.0	5866863	190	1.0	5866863
Dissolved Chloride (Cl-)	mg/L	1500	-	60	1.0	5866879			
Nitrite (N)	mg/L	-	-	<0.010	0.010	5865119			
Nitrate (N)	mg/L	-	-	0.34	0.10	5865119			
Metals									
Dissolved Calcium (Ca)	mg/L	-	-	63	0.05	5865703			
Dissolved Magnesium (Mg)	mg/L	-	-	12	0.05	5865703			
Dissolved Potassium (K)	mg/L	-	-	2	1	5865703			
Dissolved Sodium (Na)	mg/L	-	-	38	0.5	5865703			
Total Aluminum (Al)	ug/L	1000	-	40	5.0	5865078			
Total Antimony (Sb)	ug/L	-	20	<0.50	0.50	5865078			
Total Arsenic (As)	ug/L	200	100	<1.0	1.0	5865078			
Total Barium (Ba)	ug/L	100	-	33	2.0	5865078			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999

Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

RCAP - SURFACE WATER (WATER)

Maxxam ID				IKL031			IKL031		
Sampling Date				2018/11/27 15:00			2018/11/27 15:00		
COC Number				694584-01-01			694584-01-01		
	UNITS	Criteria	Criteria-2	SW-101	RDL	QC Batch	SW-101 Lab-Dup	RDL	QC Batch
Total Beryllium (Be)	ug/L	1000	11	<0.50	0.50	5865078			
Total Boron (B)	ug/L	-	200	11	10	5865078			
Total Cadmium (Cd)	ug/L	8	0.2	<0.10	0.10	5865078			
Total Calcium (Ca)	ug/L	-	-	68000	200	5865078			
Total Chromium (Cr)	ug/L	200	-	<5.0	5.0	5865078			
Total Cobalt (Co)	ug/L	-	0.9	<0.50	0.50	5865078			
Total Copper (Cu)	ug/L	40	5	<1.0	1.0	5865078			
Total Iron (Fe)	ug/L	1000	300	140	100	5865078			
Total Lead (Pb)	ug/L	120	5	<0.50	0.50	5865078			
Total Magnesium (Mg)	ug/L	-	-	13000	50	5865078			
Total Manganese (Mn)	ug/L	1000	-	5.8	2.0	5865078			
Total Molybdenum (Mo)	ug/L	-	40	0.50	0.50	5865078			
Total Nickel (Ni)	ug/L	80	25	<1.0	1.0	5865078			
Total Potassium (K)	ug/L	-	-	2100	200	5865078			
Total Selenium (Se)	ug/L	200	100	<2.0	2.0	5865078			
Total Silicon (Si)	ug/L	-	-	3900	50	5865078			
Total Silver (Ag)	ug/L	120	0.1	<0.10	0.10	5865078			
Total Sodium (Na)	ug/L	-	-	39000	100	5865078			
Total Strontium (Sr)	ug/L	-	-	170	1.0	5865078			
Total Thallium (Tl)	ug/L	-	0.3	<0.050	0.050	5865078			
Total Titanium (Ti)	ug/L	-	-	<5.0	5.0	5865078			
Total Vanadium (V)	ug/L	-	6	<0.50	0.50	5865078			
Total Zinc (Zn)	ug/L	50	30	<5.0	5.0	5865078			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999

Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID				IKL029		
Sampling Date				2018/11/27 13:15		
COC Number				694584-01-01		
	UNITS	Criteria	Criteria-2	MW-103	RDL	QC Batch
Metals						
Total Aluminum (Al)	ug/L	1000	-	270	5.0	5865078
Total Antimony (Sb)	ug/L	-	20	<0.50	0.50	5865078
Total Arsenic (As)	ug/L	200	100	<1.0	1.0	5865078
Total Barium (Ba)	ug/L	100	-	46	2.0	5865078
Total Beryllium (Be)	ug/L	1000	11	<0.50	0.50	5865078
Total Bismuth (Bi)	ug/L	-	-	<1.0	1.0	5865078
Total Boron (B)	ug/L	-	200	46	10	5865078
Total Cadmium (Cd)	ug/L	8	0.2	<0.10	0.10	5865078
Total Calcium (Ca)	ug/L	-	-	100000	200	5865078
Total Chromium (Cr)	ug/L	200	-	<5.0	5.0	5865078
Total Cobalt (Co)	ug/L	-	0.9	<0.50	0.50	5865078
Total Copper (Cu)	ug/L	40	5	4.2	1.0	5865078
Total Iron (Fe)	ug/L	1000	300	770	100	5865078
Total Lead (Pb)	ug/L	120	5	0.91	0.50	5865078
Total Lithium (Li)	ug/L	-	-	<5.0	5.0	5865078
Total Magnesium (Mg)	ug/L	-	-	17000	50	5865078
Total Manganese (Mn)	ug/L	1000	-	20	2.0	5865078
Total Molybdenum (Mo)	ug/L	-	40	<0.50	0.50	5865078
Total Nickel (Ni)	ug/L	80	25	1.4	1.0	5865078
Total Potassium (K)	ug/L	-	-	2100	200	5865078
Total Selenium (Se)	ug/L	200	100	<2.0	2.0	5865078
Total Silicon (Si)	ug/L	-	-	4900	50	5865078
Total Silver (Ag)	ug/L	120	0.1	<0.10	0.10	5865078
Total Sodium (Na)	ug/L	-	-	83000	100	5865078
Total Strontium (Sr)	ug/L	-	-	190	1.0	5865078
Total Tellurium (Te)	ug/L	-	-	<1.0	1.0	5865078
Total Thallium (Tl)	ug/L	-	0.3	<0.050	0.050	5865078
Total Tin (Sn)	ug/L	1000	-	<1.0	1.0	5865078
Total Titanium (Ti)	ug/L	-	-	10	5.0	5865078
Total Tungsten (W)	ug/L	-	30	<1.0	1.0	5865078
Total Uranium (U)	ug/L	-	5	0.24	0.10	5865078

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999

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Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID				IKL029		
Sampling Date				2018/11/27 13:15		
COC Number				694584-01-01		
	UNITS	Criteria	Criteria-2	MW-103	RDL	QC Batch
Total Vanadium (V)	ug/L	-	6	1.1	0.50	5865078
Total Zinc (Zn)	ug/L	50	30	8.6	5.0	5865078
Total Zirconium (Zr)	ug/L	-	4	<1.0	1.0	5865078

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: The City of London Storm Sewer Use By-Law.
Ref. to London Waste Discharge WM-16 March 29, 2010.
Criteria-2: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999

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Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

TEST SUMMARY

Maxxam ID: IKL029
Sample ID: MW-103
Matrix: Water

Collected: 2018/11/27
Shipped:
Received: 2018/11/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5866863	N/A	2018/12/03	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5862870	N/A	2018/12/04	Automated Statchk
Biochemical Oxygen Demand (BOD)	DO	5864794	2018/11/30	2018/12/05	Nusrat Naz
Total Chlorine	SPEC	5864929	2018/11/30	2018/11/30	Barbara Kalbasi Esfahani
Chloride by Automated Colourimetry	KONE	5866879	N/A	2018/12/03	Alina Dobreanu
Conductivity	AT	5866865	N/A	2018/12/03	Surinder Rai
Total Cyanide	SKAL/CN	5867667	2018/12/03	2018/12/03	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5864220	N/A	2018/12/03	Nimarta Singh
Fluoride	ISE	5866861	2018/12/01	2018/12/03	Surinder Rai
Hardness (calculated as CaCO3)		5862871	N/A	2018/12/03	Automated Statchk
Mercury in Water by CVAA	CV/AA	5866757	2018/12/01	2018/12/03	Medhat Nasr
Dissolved Metals by ICPMS	ICP/MS	5867034	N/A	2018/12/03	Arefa Dabhad
Total Metals Analysis by ICPMS	ICP/MS	5865078	N/A	2018/12/03	Prempal Bhatti
Ion Balance (% Difference)	CALC	5863527	N/A	2018/12/04	Automated Statchk
Anion and Cation Sum	CALC	5864312	N/A	2018/12/04	Automated Statchk
Total Ammonia-N	LACH/NH4	5865086	N/A	2018/12/03	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5865119	N/A	2018/11/30	Chandra Nandlal
Animal and Vegetable Oil and Grease	BAL	5863998	N/A	2018/11/30	Automated Statchk
Total Oil and Grease	BAL	5864679	2018/11/30	2018/11/30	Amjad Mir
pH	AT	5866867	N/A	2018/12/03	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5867567	N/A	2018/12/03	Bramdeo Motiram
Orthophosphate	KONE	5866891	N/A	2018/12/03	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	5864313	N/A	2018/12/04	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	5864314	N/A	2018/12/04	Automated Statchk
Sulphate by Automated Colourimetry	KONE	5866881	N/A	2018/12/03	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	5864315	N/A	2018/12/04	Automated Statchk
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	5864680	2018/11/30	2018/11/30	Amjad Mir
Total Suspended Solids	BAL	5864873	2018/11/30	2018/12/03	Mandeep Kaur

Maxxam ID: IKL029 Dup
Sample ID: MW-103
Matrix: Water

Collected: 2018/11/27
Shipped:
Received: 2018/11/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5864794	2018/12/05	2018/12/05	Nusrat Naz
Total Chlorine	SPEC	5864929	2018/11/30	2018/11/30	Barbara Kalbasi Esfahani
Total Ammonia-N	LACH/NH4	5865086	N/A	2018/12/03	Charles Opoku-Ware
Total Suspended Solids	BAL	5864873	2018/11/30	2018/12/03	Mandeep Kaur

Maxxam ID: IKL030
Sample ID: SW-102
Matrix: Water

Collected: 2018/11/27
Shipped:
Received: 2018/11/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5866863	N/A	2018/12/03	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5862870	N/A	2018/12/04	Automated Statchk

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Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

TEST SUMMARY

Maxxam ID: IKL030
Sample ID: SW-102
Matrix: Water

Collected: 2018/11/27
Shipped:
Received: 2018/11/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Biochemical Oxygen Demand (BOD)	DO	5864794	2018/11/30	2018/12/05	Nusrat Naz
Total Chlorine	SPEC	5864929	2018/11/30	2018/11/30	Barbara Kalbasi Esfahani
Chloride by Automated Colourimetry	KONE	5866879	N/A	2018/12/03	Alina Dobreanu
Conductivity	AT	5866865	N/A	2018/12/03	Surinder Rai
Total Cyanide	SKAL/CN	5867667	2018/12/03	2018/12/03	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5883205	N/A	2018/12/12	Mandeep Kaur
Fluoride	ISE	5866861	2018/12/01	2018/12/03	Surinder Rai
Hardness (calculated as CaCO3)		5862871	N/A	2018/12/03	Automated Statchk
Mercury in Water by CVAA	CV/AA	5866757	2018/12/01	2018/12/03	Medhat Nasr
Lab Filtered Metals Analysis by ICP	ICP	5865703	2018/11/30	2018/12/03	Azita Fazaeli
Dissolved Metals by ICPMS	ICP/MS	5882244	N/A	2018/12/13	Arefa Dabhad
Total Metals Analysis by ICPMS	ICP/MS	5865078	N/A	2018/12/03	Prempal Bhatti
Ion Balance (% Difference)	CALC	5883878	N/A	2018/12/13	Automated Statchk
Anion and Cation Sum	CALC	5883879	N/A	2018/12/13	Automated Statchk
Total Ammonia-N	LACH/NH4	5865086	N/A	2018/12/03	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5865119	N/A	2018/11/30	Chandra Nandlal
Animal and Vegetable Oil and Grease	BAL	5863998	N/A	2018/11/30	Automated Statchk
Total Oil and Grease	BAL	5864679	2018/11/30	2018/11/30	Amjad Mir
pH	AT	5866867	N/A	2018/12/03	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5867763	N/A	2018/12/03	Bramdeo Motiram
Orthophosphate	KONE	5866891	N/A	2018/12/03	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	5864313	N/A	2018/12/04	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	5864314	N/A	2018/12/04	Automated Statchk
Sulphate by Automated Colourimetry	KONE	5866881	N/A	2018/12/03	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	5864315	N/A	2018/12/04	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	5863386	N/A	2018/11/30	Mandeep Kaur
Total Phosphorus (Colourimetric)	LACH/P	5865139	2018/11/30	2018/12/03	Amanpreet Sappal
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	5864680	2018/11/30	2018/11/30	Amjad Mir
Total Suspended Solids	BAL	5864873	2018/11/30	2018/12/03	Mandeep Kaur
Turbidity	AT	5864980	N/A	2018/12/03	Gnana Thomas

Maxxam ID: IKL030 Dup
Sample ID: SW-102
Matrix: Water

Collected: 2018/11/27
Shipped:
Received: 2018/11/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Lab Filtered Metals Analysis by ICP	ICP	5865703	2018/11/30	2018/12/03	Azita Fazaeli

Maxxam ID: IKL031
Sample ID: SW-101
Matrix: Water

Collected: 2018/11/27
Shipped:
Received: 2018/11/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5866863	N/A	2018/12/03	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	5862870	N/A	2018/12/04	Automated Statchk
Biochemical Oxygen Demand (BOD)	DO	5864794	2018/11/30	2018/12/05	Nusrat Naz

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Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

TEST SUMMARY

Maxxam ID: IKL031
Sample ID: SW-101
Matrix: Water

Collected: 2018/11/27
Shipped:
Received: 2018/11/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Chlorine	SPEC	5864929	2018/11/30	2018/11/30	Barbara Kalbasi Esfahani
Chloride by Automated Colourimetry	KONE	5866879	N/A	2018/12/03	Alina Dobreanu
Conductivity	AT	5866865	N/A	2018/12/03	Surinder Rai
Total Cyanide	SKAL/CN	5867667	2018/12/03	2018/12/03	Xuanhong Qiu
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5883205	N/A	2018/12/12	Mandeep Kaur
Fluoride	ISE	5866861	2018/12/01	2018/12/03	Surinder Rai
Hardness (calculated as CaCO3)		5862871	N/A	2018/12/03	Automated Statchk
Mercury in Water by CVAA	CV/AA	5866757	2018/12/01	2018/12/03	Medhat Nasr
Lab Filtered Metals Analysis by ICP	ICP	5865703	2018/11/30	2018/12/03	Azita Fazaeli
Dissolved Metals by ICPMS	ICP/MS	5882244	N/A	2018/12/13	Arefa Dabhad
Total Metals Analysis by ICPMS	ICP/MS	5865078	N/A	2018/12/03	Prempal Bhatti
Ion Balance (% Difference)	CALC	5883878	N/A	2018/12/13	Automated Statchk
Anion and Cation Sum	CALC	5883879	N/A	2018/12/13	Automated Statchk
Total Ammonia-N	LACH/NH4	5865086	N/A	2018/12/03	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5865119	N/A	2018/11/30	Chandra Nandlal
Animal and Vegetable Oil and Grease	BAL	5863998	N/A	2018/11/30	Automated Statchk
Total Oil and Grease	BAL	5864679	2018/11/30	2018/11/30	Amjad Mir
pH	AT	5866867	N/A	2018/12/03	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5867567	N/A	2018/12/03	Bramdeo Motiram
Orthophosphate	KONE	5866891	N/A	2018/12/03	Alina Dobreanu
Sat. pH and Langelier Index (@ 20C)	CALC	5864313	N/A	2018/12/04	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	5864314	N/A	2018/12/04	Automated Statchk
Sulphate by Automated Colourimetry	KONE	5866881	N/A	2018/12/03	Alina Dobreanu
Total Dissolved Solids (TDS calc)	CALC	5864315	N/A	2018/12/04	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	5863386	N/A	2018/11/30	Mandeep Kaur
Total Phosphorus (Colourimetric)	LACH/P	5865139	2018/11/30	2018/12/03	Amanpreet Sappal
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	5864680	2018/11/30	2018/11/30	Amjad Mir
Total Suspended Solids	BAL	5864873	2018/11/30	2018/12/03	Mandeep Kaur
Turbidity	AT	5864980	N/A	2018/12/03	Gnana Thomas

Maxxam ID: IKL031 Dup
Sample ID: SW-101
Matrix: Water

Collected: 2018/11/27
Shipped:
Received: 2018/11/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5866863	N/A	2018/12/03	Surinder Rai
Conductivity	AT	5866865	N/A	2018/12/03	Surinder Rai
Fluoride	ISE	5866861	2018/12/01	2018/12/03	Surinder Rai
pH	AT	5866867	N/A	2018/12/03	Surinder Rai
Turbidity	AT	5864980	N/A	2018/12/03	Gnana Thomas

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Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	1.3°C

Report Revised [2018/12/13]: RCAP Comprehensive reported for the surface water samples. DOC analyzed past hold time for the SW samples with client consent.

Results relate only to the items tested.

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Maxxam Job #: B8V8443
Report Date: 2018/12/13

QUALITY ASSURANCE REPORT

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5863386	Total Organic Carbon (TOC)	2018/11/30	97	80 - 120	98	80 - 120	<0.50	mg/L	0.24	20		
5864220	Dissolved Organic Carbon	2018/12/03	94	80 - 120	97	80 - 120	<0.50	mg/L	1.4	20		
5864679	Total Oil & Grease	2018/11/30	92	75 - 125	95	85 - 115	<0.50	mg/L	NC	25		
5864680	Total Oil & Grease Mineral/Synthetic	2018/11/30	88	75 - 125	92	85 - 115	<0.50	mg/L	NC	25		
5864794	Total BOD	2018/12/05					<2	mg/L	NC	30	102	80 - 120
5864873	Total Suspended Solids	2018/12/03					<10	mg/L	8.7	25	100	85 - 115
5864929	Total Chlorine	2018/11/30	82 (1)	85 - 115	99	85 - 115	<0.1	mg/L	NC	25		
5864980	Turbidity	2018/12/03			100	85 - 115	<0.1	NTU	0.95	20		
5865078	Total Aluminum (Al)	2018/12/03	108	80 - 120	103	80 - 120	<5.0	ug/L	3.0	20		
5865078	Total Antimony (Sb)	2018/12/03	106	80 - 120	101	80 - 120	<0.50	ug/L	4.3	20		
5865078	Total Arsenic (As)	2018/12/03	103	80 - 120	101	80 - 120	<1.0	ug/L	NC	20		
5865078	Total Barium (Ba)	2018/12/03	99	80 - 120	97	80 - 120	<2.0	ug/L	1.3	20		
5865078	Total Beryllium (Be)	2018/12/03	106	80 - 120	107	80 - 120	<0.50	ug/L	NC	20		
5865078	Total Bismuth (Bi)	2018/12/03	94	80 - 120	97	80 - 120	<1.0	ug/L	2.3	20		
5865078	Total Boron (B)	2018/12/03	101	80 - 120	100	80 - 120	<10	ug/L	5.0	20		
5865078	Total Cadmium (Cd)	2018/12/03	104	80 - 120	101	80 - 120	<0.10	ug/L	NC	20		
5865078	Total Calcium (Ca)	2018/12/03	NC	80 - 120	104	80 - 120	<200	ug/L	1.6	20		
5865078	Total Chromium (Cr)	2018/12/03	101	80 - 120	100	80 - 120	<5.0	ug/L	NC	20		
5865078	Total Cobalt (Co)	2018/12/03	104	80 - 120	102	80 - 120	<0.50	ug/L	NC	20		
5865078	Total Copper (Cu)	2018/12/03	105	80 - 120	99	80 - 120	<1.0	ug/L	0.93	20		
5865078	Total Iron (Fe)	2018/12/03	99	80 - 120	97	80 - 120	<100	ug/L	8.1	20		
5865078	Total Lead (Pb)	2018/12/03	100	80 - 120	101	80 - 120	<0.50	ug/L	5.5	20		
5865078	Total Lithium (Li)	2018/12/03	108	80 - 120	110	80 - 120	<5.0	ug/L				
5865078	Total Magnesium (Mg)	2018/12/03	99	80 - 120	98	80 - 120	<50	ug/L	6.2	20		
5865078	Total Manganese (Mn)	2018/12/03	94	80 - 120	92	80 - 120	<2.0	ug/L	3.0	20		
5865078	Total Molybdenum (Mo)	2018/12/03	104	80 - 120	96	80 - 120	<0.50	ug/L	8.1	20		
5865078	Total Nickel (Ni)	2018/12/03	101	80 - 120	99	80 - 120	<1.0	ug/L	2.4	20		
5865078	Total Potassium (K)	2018/12/03	NC	80 - 120	97	80 - 120	<200	ug/L	3.8	20		
5865078	Total Selenium (Se)	2018/12/03	110	80 - 120	111	80 - 120	<2.0	ug/L	NC	20		
5865078	Total Silicon (Si)	2018/12/03	102	80 - 120	101	80 - 120	<50	ug/L	3.3	20		
5865078	Total Silver (Ag)	2018/12/03	99	80 - 120	96	80 - 120	<0.10	ug/L	NC	20		
5865078	Total Sodium (Na)	2018/12/03	NC	80 - 120	97	80 - 120	<100	ug/L	4.5	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5865078	Total Strontium (Sr)	2018/12/03	NC	80 - 120	93	80 - 120	<1.0	ug/L	1.2	20		
5865078	Total Tellurium (Te)	2018/12/03	102	80 - 120	102	80 - 120	<1.0	ug/L				
5865078	Total Thallium (Tl)	2018/12/03	99	80 - 120	99	80 - 120	<0.050	ug/L	NC	20		
5865078	Total Tin (Sn)	2018/12/03	102	80 - 120	97	80 - 120	<1.0	ug/L	5.4	20		
5865078	Total Titanium (Ti)	2018/12/03	100	80 - 120	100	80 - 120	<5.0	ug/L	NC	20		
5865078	Total Tungsten (W)	2018/12/03	99	80 - 120	98	80 - 120	<1.0	ug/L				
5865078	Total Uranium (U)	2018/12/03	106	80 - 120	101	80 - 120	<0.10	ug/L				
5865078	Total Vanadium (V)	2018/12/03	98	80 - 120	95	80 - 120	<0.50	ug/L	17	20		
5865078	Total Zinc (Zn)	2018/12/03	104	80 - 120	104	80 - 120	<5.0	ug/L	3.7	20		
5865078	Total Zirconium (Zr)	2018/12/03	86	80 - 120	93	80 - 120	<1.0	ug/L	NC	20		
5865086	Total Ammonia-N	2018/12/03	98	75 - 125	104	80 - 120	<0.050	mg/L	NC	20		
5865119	Nitrate (N)	2018/11/30	98	80 - 120	99	80 - 120	<0.10	mg/L	NC	20		
5865119	Nitrite (N)	2018/11/30	99	80 - 120	100	80 - 120	<0.010	mg/L	NC	20		
5865139	Total Phosphorus	2018/12/03	96	80 - 120	83	80 - 120	<0.004	mg/L	0.62	20	81	80 - 120
5865703	Dissolved Calcium (Ca)	2018/12/03	NC	80 - 120	97	80 - 120	<0.05	mg/L	0.73	25		
5865703	Dissolved Magnesium (Mg)	2018/12/03	NC	80 - 120	95	80 - 120	<0.05	mg/L	0.50	25		
5865703	Dissolved Potassium (K)	2018/12/03	101	80 - 120	97	80 - 120	<1	mg/L	1.2	25		
5865703	Dissolved Sodium (Na)	2018/12/03	NC	80 - 120	98	80 - 120	<0.5	mg/L	0.68	25		
5866757	Mercury (Hg)	2018/12/03	93	75 - 125	92	80 - 120	<0.0001	mg/L	NC	20		
5866861	Fluoride (F-)	2018/12/03	104	80 - 120	100	80 - 120	<0.10	mg/L	8.0	20		
5866863	Alkalinity (Total as CaCO3)	2018/12/03			95	85 - 115	<1.0	mg/L	0.86	20		
5866865	Conductivity	2018/12/03			100	85 - 115	<1.0	umho/cm	0.34	25		
5866867	pH	2018/12/03			102	98 - 103			0.82	N/A		
5866879	Dissolved Chloride (Cl-)	2018/12/03	119	80 - 120	102	80 - 120	<1.0	mg/L	NC	20		
5866881	Dissolved Sulphate (SO4)	2018/12/03	107	75 - 125	97	80 - 120	<1.0	mg/L	NC	20		
5866891	Orthophosphate (P)	2018/12/03	99	75 - 125	101	80 - 120	<0.010	mg/L	NC	25		
5867034	Dissolved Aluminum (Al)	2018/12/03	111	80 - 120	101	80 - 120	<5.0	ug/L	NC	20		
5867034	Dissolved Antimony (Sb)	2018/12/03	107	80 - 120	100	80 - 120	<0.50	ug/L	NC	20		
5867034	Dissolved Arsenic (As)	2018/12/03	104	80 - 120	98	80 - 120	<1.0	ug/L	NC	20		
5867034	Dissolved Barium (Ba)	2018/12/03	99	80 - 120	97	80 - 120	<2.0	ug/L	2.8	20		
5867034	Dissolved Beryllium (Be)	2018/12/03	105	80 - 120	95	80 - 120	<0.50	ug/L	NC	20		

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Maxxam Job #: B8V8443
Report Date: 2018/12/13

QUALITY ASSURANCE REPORT(CONT'D)

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5867034	Dissolved Boron (B)	2018/12/03	101	80 - 120	91	80 - 120	<10	ug/L	0.80	20		
5867034	Dissolved Cadmium (Cd)	2018/12/03	102	80 - 120	101	80 - 120	<0.10	ug/L	NC	20		
5867034	Dissolved Calcium (Ca)	2018/12/03	NC	80 - 120	100	80 - 120	<200	ug/L	2.4	20		
5867034	Dissolved Chromium (Cr)	2018/12/03	103	80 - 120	98	80 - 120	<5.0	ug/L	NC	20		
5867034	Dissolved Cobalt (Co)	2018/12/03	102	80 - 120	100	80 - 120	<0.50	ug/L	3.2	20		
5867034	Dissolved Copper (Cu)	2018/12/03	101	80 - 120	100	80 - 120	<1.0	ug/L	NC	20		
5867034	Dissolved Iron (Fe)	2018/12/03	106	80 - 120	101	80 - 120	<100	ug/L	NC	20		
5867034	Dissolved Lead (Pb)	2018/12/03	95	80 - 120	96	80 - 120	<0.50	ug/L	NC	20		
5867034	Dissolved Magnesium (Mg)	2018/12/03	NC	80 - 120	101	80 - 120	<50	ug/L	3.9	20		
5867034	Dissolved Manganese (Mn)	2018/12/03	NC	80 - 120	98	80 - 120	<2.0	ug/L	2.8	20		
5867034	Dissolved Molybdenum (Mo)	2018/12/03	104	80 - 120	98	80 - 120	<0.50	ug/L	0.45	20		
5867034	Dissolved Nickel (Ni)	2018/12/03	101	80 - 120	100	80 - 120	<1.0	ug/L	0.89	20		
5867034	Dissolved Phosphorus (P)	2018/12/03	113	80 - 120	107	80 - 120	<100	ug/L	NC	20		
5867034	Dissolved Potassium (K)	2018/12/03	108	80 - 120	102	80 - 120	<200	ug/L	2.1	20		
5867034	Dissolved Selenium (Se)	2018/12/03	105	80 - 120	104	80 - 120	<2.0	ug/L	NC	20		
5867034	Dissolved Silicon (Si)	2018/12/03	101	80 - 120	95	80 - 120	<50	ug/L	3.6	20		
5867034	Dissolved Silver (Ag)	2018/12/03	81	80 - 120	98	80 - 120	<0.10	ug/L	NC	20		
5867034	Dissolved Sodium (Na)	2018/12/03	NC	80 - 120	101	80 - 120	<100	ug/L	1.1	20		
5867034	Dissolved Strontium (Sr)	2018/12/03	NC	80 - 120	100	80 - 120	<1.0	ug/L	1.8	20		
5867034	Dissolved Thallium (Tl)	2018/12/03	96	80 - 120	97	80 - 120	<0.050	ug/L	NC	20		
5867034	Dissolved Titanium (Ti)	2018/12/03	102	80 - 120	93	80 - 120	<5.0	ug/L	NC	20		
5867034	Dissolved Uranium (U)	2018/12/03	100	80 - 120	98	80 - 120	<0.10	ug/L	0.24	20		
5867034	Dissolved Vanadium (V)	2018/12/03	105	80 - 120	97	80 - 120	<0.50	ug/L	NC	20		
5867034	Dissolved Zinc (Zn)	2018/12/03	101	80 - 120	99	80 - 120	<5.0	ug/L	NC	20		
5867567	Phenols-4AAP	2018/12/03	99	80 - 120	101	80 - 120	<0.0010	mg/L	1.8	20		
5867667	Total Cyanide (CN)	2018/12/03	99	80 - 120	101	80 - 120	<0.0050	mg/L	NC	20		
5867763	Phenols-4AAP	2018/12/03	99	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20		
5882244	Dissolved Aluminum (Al)	2018/12/13	109	80 - 120	105	80 - 120	<5.0	ug/L	NC	20		
5882244	Dissolved Antimony (Sb)	2018/12/13	113	80 - 120	104	80 - 120	<0.50	ug/L				
5882244	Dissolved Arsenic (As)	2018/12/13	105	80 - 120	100	80 - 120	<1.0	ug/L				
5882244	Dissolved Barium (Ba)	2018/12/13	105	80 - 120	103	80 - 120	<2.0	ug/L				
5882244	Dissolved Beryllium (Be)	2018/12/13	101	80 - 120	100	80 - 120	<0.50	ug/L				

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5882244	Dissolved Boron (B)	2018/12/13	101	80 - 120	100	80 - 120	<10	ug/L				
5882244	Dissolved Cadmium (Cd)	2018/12/13	109	80 - 120	103	80 - 120	<0.10	ug/L				
5882244	Dissolved Calcium (Ca)	2018/12/13	NC	80 - 120	102	80 - 120	<200	ug/L				
5882244	Dissolved Chromium (Cr)	2018/12/13	102	80 - 120	98	80 - 120	<5.0	ug/L				
5882244	Dissolved Cobalt (Co)	2018/12/13	102	80 - 120	97	80 - 120	<0.50	ug/L				
5882244	Dissolved Copper (Cu)	2018/12/13	103	80 - 120	99	80 - 120	<1.0	ug/L				
5882244	Dissolved Iron (Fe)	2018/12/13	109	80 - 120	100	80 - 120	<100	ug/L	NC	20		
5882244	Dissolved Lead (Pb)	2018/12/13	102	80 - 120	98	80 - 120	<0.50	ug/L				
5882244	Dissolved Magnesium (Mg)	2018/12/13	NC	80 - 120	101	80 - 120	<50	ug/L				
5882244	Dissolved Manganese (Mn)	2018/12/13	107	80 - 120	101	80 - 120	<2.0	ug/L				
5882244	Dissolved Molybdenum (Mo)	2018/12/13	110	80 - 120	100	80 - 120	<0.50	ug/L				
5882244	Dissolved Nickel (Ni)	2018/12/13	101	80 - 120	96	80 - 120	<1.0	ug/L				
5882244	Dissolved Phosphorus (P)	2018/12/13	106	80 - 120	113	80 - 120	<100	ug/L				
5882244	Dissolved Potassium (K)	2018/12/13	110	80 - 120	105	80 - 120	<200	ug/L				
5882244	Dissolved Selenium (Se)	2018/12/13	108	80 - 120	101	80 - 120	<2.0	ug/L				
5882244	Dissolved Silicon (Si)	2018/12/13	108	80 - 120	106	80 - 120	<50	ug/L				
5882244	Dissolved Silver (Ag)	2018/12/13	93	80 - 120	99	80 - 120	<0.10	ug/L				
5882244	Dissolved Sodium (Na)	2018/12/13	108	80 - 120	101	80 - 120	<100	ug/L				
5882244	Dissolved Strontium (Sr)	2018/12/13	NC	80 - 120	102	80 - 120	<1.0	ug/L				
5882244	Dissolved Thallium (Tl)	2018/12/13	101	80 - 120	96	80 - 120	<0.050	ug/L				
5882244	Dissolved Titanium (Ti)	2018/12/13	106	80 - 120	101	80 - 120	<5.0	ug/L				
5882244	Dissolved Uranium (U)	2018/12/13	105	80 - 120	97	80 - 120	<0.10	ug/L				
5882244	Dissolved Vanadium (V)	2018/12/13	109	80 - 120	100	80 - 120	<0.50	ug/L				
5882244	Dissolved Zinc (Zn)	2018/12/13	101	80 - 120	100	80 - 120	<5.0	ug/L	NC	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5883205	Dissolved Organic Carbon	2018/12/12	95	80 - 120	97	80 - 120	<0.50	mg/L	0.81	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Maxxam Job #: B8V8443
Report Date: 2018/12/13

Golder Associates Ltd
Client Project #: 1788468
Sampler Initials: RM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Anastassia Hamanov, Scientific Specialist

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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APPENDIX D

Discharge Monitoring Plan

Groundwater and Surface Water Monitoring Plan

DISCHARGE MONITORING PLAN AND GROUNDWATER AND SURFACE WATER MONITORING PLAN (GSWMP)

Construction Period

Based on the results of chemical analysis of the groundwater samples collected from MW-103 at the Site, groundwater pumped during the proposed dewatering activities may require some form of treatment to remove suspended sediment and lower the associated total metals concentrations prior to discharge to the local storm sewer system, sanitary sewer system, creek or roadside ditch. Treatment options may include appropriately sized sedimentation tanks, weir or baffle systems, sand media filters, cartridge or bag filters, lamella plate clarification (e.g. Siltbuster©), other appropriate equipment, or a combination of these methods.

As part of the proponent's due diligence and to assess the effectiveness of treatment, it is recommended that the treated discharge be sampled on days 1, 3 and 7 of pumping to confirm that the water quality of the treated discharge consistently meets the appropriate criteria provided by the Municipality of Thames Centre (or by the City of London's Sewer Use By-law ("WM16")) and/or the PWQO. Following the first week of dewatering, weekly samples of the treated discharge should be collected. The discharge samples should be submitted with a chain of custody and analyzed for, at a minimum, the storm sewer parameters listed in Municipality of Thames Centre sewer discharge by-law (or WM16) with method detection limits adjusted appropriately to allow for comparison of results to PWQO. During each sampling event, field monitoring of turbidity should also be completed to develop a correlation with total suspended solids (TSS) and enable turbidity to be used as a surrogate for TSS. The results of the chemical analyses should be reviewed by a qualified professional following each sampling event, with the following actions to be implemented, when appropriate:

- Should the analytical results indicate that the concentrations of specific parameters have exceeded the applicable criteria (i.e., either the storm sewer, sanitary sewer criteria or PWQO) on two consecutive sampling events, pumping should be redirected or suspended until appropriate additional treatment is available.
- If the analytical results for any parameters are found to meet the applicable criteria and are consistent for at least two consecutive sampling events, the sampling frequency and parameter list may be reduced at the discretion of the qualified professional.

It is assumed that discharge will be initially directed to the storm sewer system. If storm sewer criteria are consistently exceeded and the sanitary sewer system is found to have capacity to accept the dewatering discharge volumes being produced, discharge will be redirected to the sanitary sewer system. If it is not suitable to discharge to either sewer system and Dorchester Creek or a roadside ditch is used to accept discharge, turbidity should be measured on a daily basis and should not exceed the equivalent of a TSS concentration of 15 mg/L or 10% of the background TSS in the creek or ditch, whichever is greater. If the turbidity monitoring indicates that the TSS thresholds may have been exceeded on two consecutive days, then pumping should be suspended until the contractor can demonstrate to the satisfaction of the contract administrator that performance requirements can be met.

The dewatering contractor and/or contract administrator should maintain a daily record of the pumping rate, discharge volume, and groundwater levels within the dewatering area to confirm and document efficient operation of the dewatering system and compliance with the PTTW.

As mentioned in Section 8.0 of this report, manual groundwater level measurements in monitoring wells MW-102, MW-103, MW-105, MW6, and MW8 at the Site should continue on at least a quarterly basis until the start of construction. Two weeks prior to dewatering commencing, the frequency should increase to weekly. Groundwater level monitoring in the same five wells should continue until at least two weeks after dewatering has finished.

The Dorchester Supply Wells should be equipped with data logging pressure transducers to monitor groundwater levels within the wells on an hourly basis throughout dewatering. A possible contingency plan for active wells that register impacts attributable to dewatering could be cycling the impacted well(s) through intermittent periods of operation. Municipal demand and individual well capacity should be confirmed, particularly for the closest well to the proposed subdivision (10 m adjacent).Post-construction Period

The objectives of the groundwater and surface water monitoring program (GSWMP) for the post-construction period are to:

- Mitigate the risk of the construction-related impacts of the proposed development; and
- Confirm that the performance of the as-built stormwater management system and water balance are similar to that predicted by the functional design.

The groundwater monitoring program described herein should be periodically reassessed and updated by the Qualified Professional (QP), as appropriate, to ensure that the objectives stated above are effectively and efficiently achieved.

Groundwater and surface water should be monitored twice annually for manual water levels and quality (once in the spring and once in the autumn) following the construction period at the six above-noted locations (MW-102, MW-103, MW-105, MW6, and MW8for groundwater and SG-101 for surface water) at the Site. The data loggers currently in place should remain until monitoring is no longer required with data downloads occurring during the spring and autumn visits. The water quality parameter suite should be similar to that completed for this hydrogeological assessment.

An annual summary report should be delivered to the Municipality of Thames Centre and the UTRCA following the first full year of monitoring with recommendations on future monitoring program requirements.

APPENDIX E

AECOM Conceptual Stormwater Management Report and Water Balance

DRAFT

AECOM Imagine it. Delivered.

Sifton Properties Limited

Conceptual Stormwater Management Report and Water Balance

187 Dorchester Road

Prepared by:

AECOM Canada Ltd.
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Canada

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Date: July , 2019

Project #: 60568894

Distribution List

# Hard Copies	PDF Required	Association / Company Name
3	✓	Sifton Properties Limited
-	✓	AECOM Canada Ltd.

Revision History

Rev #	Date	Revised By:	Revision Description

Statement of Qualifications and Limitations

The attached Report (the "Report") has been prepared by AECOM Canada Ltd. ("AECOM") for the benefit of the Client ("Client") in accordance with the agreement between AECOM and Client, including the scope of work detailed therein (the "Agreement").

The information, data, recommendations and conclusions contained in the Report (collectively, the "Information"):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations");
- represents AECOM's professional judgement in light of the Limitations and industry standards for the preparation of similar reports;
- may be based on information provided to AECOM which has not been independently verified;
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued;
- must be read as a whole and sections thereof should not be read out of such context;
- was prepared for the specific purposes described in the Report and the Agreement; and
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time.

AECOM shall be entitled to rely upon the accuracy and completeness of information that was provided to it and has no obligation to update such information. AECOM accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

AECOM agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but AECOM makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

Without in any way limiting the generality of the foregoing, any estimates or opinions regarding probable construction costs or construction schedule provided by AECOM represent AECOM's professional judgement in light of its experience and the knowledge and information available to it at the time of preparation. Since AECOM has no control over market or economic conditions, prices for construction labour, equipment or materials or bidding procedures, AECOM, its directors, officers and employees are not able to, nor do they, make any representations, warranties or guarantees whatsoever, whether express or implied, with respect to such estimates or opinions, or their variance from actual construction costs or schedules, and accept no responsibility for any loss or damage arising therefrom or in any way related thereto. Persons relying on such estimates or opinions do so at their own risk.

Except (1) as agreed to in writing by AECOM and Client; (2) as required by-law; or (3) to the extent used by governmental reviewing agencies for the purpose of obtaining permits or approvals, the Report and the Information may be used and relied upon only by Client.

AECOM accepts no responsibility, and denies any liability whatsoever, to parties other than Client who may obtain access to the Report or the Information for any injury, loss or damage suffered by such parties arising from their use of, reliance upon, or decisions or actions based on the Report or any of the Information ("improper use of the Report"), except to the extent those parties have obtained the prior written consent of AECOM to use and rely upon the Report and the Information. Any injury, loss or damages arising from improper use of the Report shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to and forms part of the Report and any use of the Report is subject to the terms hereof.

AECOM: 2015-04-13

Authors

Report Prepared By:

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Water Resources Engineer

Report Reviewed By:

Bill Trenouth, Ph.D., P.Eng., CAN-CISEC
Water Resources Engineer

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Appendices

1. Introduction

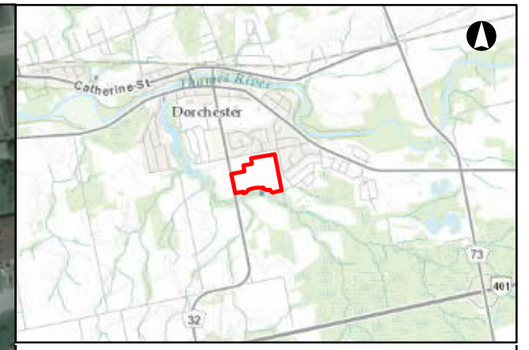
AECOM Canada Limited (AECOM) has been retained by Sifton Properties Limited (Client) to undertake a conceptual stormwater management (SWM) report prepared in support of the Draft Plan of Subdivision Approval process for the proposed Dorchester Subdivision. This report provides calculations and hydrological modelling to demonstrate the proposed development can meet both quantity and quality controls required by the Municipality of Thames Centre (Municipality) and the Ministry of the Environment, Conservation and Parks (MECP) for stormwater discharge.

1.1 Background Information

The Draft Plan of Subdivision document (July 2019) provides details on the proposed development. The site is approximately 20.1 ha with 191 single-family lots, one medium-density / multi-family block, and one commercial block. The proposed subdivision entrances are located off Dorchester Road and Byron Avenue South of Canterbury Drive. Together, the entrances will serve the single-family, multi-family and the commercial block. Refer to **Figure 1** and **Figure 2** for details regarding the study area and the conceptual draft plan of subdivision.

The subject site is located in a MECP Wellhead Protection Area (WHPA) 'A' and 'B'. The area of the site located in the WHPA-A is approximately 1.35 ha (southwest corner of the site, adjacent the municipal well) and 17.41 ha located within WHPA-B. On March 27, 2018, a meeting was held with the Client, AECOM and MECP staff at the MECP's London District Office to discuss development and servicing restrictions within the WHPA. It was noted that, as the proposed residential development is less than 100 ha in size, it is not considered a significant threat within the Source Water Protection Areas but that there may be some restrictions to the proposed commercial and medium-density multi-family blocks related to sanitary sewers which may require enhanced design or construction requirements. For details regarding the meeting minutes, refer to **Appendix B**.

The Municipality has also expressed concerns relating to the proposed design, as they would prefer a simple and maintainable system for the conveyance and treatment of stormwater runoff. The Municipality has agreed to infiltration of runoff volumes from 'clean' sources which is restricted to the rear yard areas. They have also expressed concerns relating to systems that would increase infiltration beyond existing conditions which may have a negative impact on the local groundwater levels, given the site's close proximity to the Municipal wellhead which provides drinking water for Dorchester.



Legend

- Contours (5 m)
- WHPA-A
- WHPA-B
- Flooding Hazard (UTRCA)
- Permanent Watercourse
- Property Line

0 25 50 100
Meters

187 Dorchester Road

Study Area

July 2019	1:2,700	Datum: NAD83 UTM17 Source: LIO, UTRCA
P#: 60568894	V#:	

AECOM

Figure 1

Map location: \\ation1\p001\Projects\60568894 Strm Dorchester Subdivision\400-Technical\431 Technical Area 1\SWM\GIS\MXD\MAP-2019-07-17-StudyArea-60568894.mxd
Date Saved: 7/18/2019 10:45:51 AM User Name: anna.wat

SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED _____ DAY OF _____, 20__, THIS DRAFT PLAN IS APPROVED UNDER SECTION 51 OF THE PLANNING ACT THIS _____ DAY OF _____, 20__.

DATE SIGNATURE

LEGEND
- SUBJECT LANDS
- NATURAL HAZARD BUFFER (AECOM)
- NATURAL HAZARD LIMIT (AECOM)
- PRELIM FLOOD HAZARD
- PRELIM EROSION HAZARD
- POTENTIAL TRAIL

BYRON AVE

CANTERBURY DR.

OAKWOOD DR.

TURNBERRY DR.

DORCHESTER ROAD (COUNTY ROAD 32)

SUBJECT LANDS
20.84 Ha

BLOCK 193
COMMERCIAL
1.32 Ha

BLOCK 198
SWM DRAINAGE
0.05 Ha

BLOCK 199
0.3m RESERVE

BLOCK 200
WIDENING
0.14 Ha

BLOCK 201
0.3m RESERVE

BLOCK 192
MEDIUM DENSITY
RESIDENTIAL
1.60 Ha

BLOCK 194
PARKLAND
WITH PATHWAY
0.72 Ha

BLOCK 202
ECO BUFFER
0.98 Ha

BLOCK 197
SWM BASIN
0.18 Ha

BLOCK 196
SWM BASIN
0.14 Ha

BLOCK 195
PARK
0.06 Ha

BLOCK 203
NATURAL
ENVIRONMENT
0.39 Ha

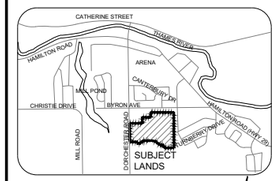
STREET 'A'
STREET 'B'
STREET 'C'
STREET 'D'
STREET 'E'

RESIDENTIAL
COMMERCIAL
AGRICULTURAL
SENIORS RESIDENCE
FOUR STOREY
SHOPPERS DRUGMART
MN# 2300
WOODED AREA
DORCHESTER CREEK
WELL# 2PW-1
NATURAL HERITAGE BUFFER (AECOM 2019)
POTENTIAL MULTI USE TRAIL
EX. 18m WIDE EASEMENT
1350mm STORM SEWER
LIMITS OF NATURAL HERITAGE (AECOM 2019)
EX. SWM POND
Ex. Gravel Path

mbpc
Monteith+Brown
planning consultants
610 PRINCESS AVENUE, LONDON, ONTARIO N6B 2B9
Tel.: (519) 686-1300 E-mail: mbpc@mbpc.ca

DRAFT PLAN OF SUBDIVISION

PART LOT 17 CONCESSION B, SOUTH OF THAMES RIVER, 33R-16963 PART 1
NORTH DORCHESTER
MUNICIPALITY OF THAMES CENTRE



KEY PLAN
N.T.S.

OWNER'S CERTIFICATE

I hereby consent to the filing of this Plan in Draft Form.

Richard M. Sifton, President — Date

Wayne F. Reid, Vice President — Date

SURVEYOR'S CERTIFICATE

I hereby certify that the boundary of the lands to be subdivided as shown on this plan and their relationship to the adjacent lands are accurately and correctly shown.

Jason Wilband, O.L.S. AGM Plan, Survey , Engineer — Date

REQUIREMENTS UNDER SECTION 51 (17) OF THE PLANNING ACT, 1990

a) as shown on plan
b) as shown on plan
c) as shown on key plan
d) as shown on land use schedule
e) as shown on plan
f) as shown on plan
g) as shown on plan
h) municipal water
i) sandy silt, sand soils
j) as shown on plan
k) municipal sewers
l) as shown on plan

LAND USE SCHEDULE

LAND USE	AREA in Ha	PERCENT
SINGLE DETACHED RESIDENTIAL LOTS 1 to 191	11.00	52.8
MULTI UNIT RESIDENTIAL BLOCK 192	1.60	7.7
COMMERCIAL BLOCKS 193	1.32	6.3
OPEN SPACE - PARKLAND BLOCKS 194 &195	0.78	3.7
OPEN SPACE - SWM DRAINAGE BLOCKS 196 to 198	0.37	1.8
ROAD WIDENING RESERVES BLOCKS 199 to 201	0.14	0.7
STREETS A to E	4.26	20.4
OPEN SPACE - ECO BUFFER BLOCK 202	0.98	4.7
OPEN SPACE - NATURAL ENVIRONMENT BLOCK 203	0.39	1.9
TOTAL SITE AREA	20.84	100.00

No.	Revision	Date	Initial

CLIENT

Sifton
Experience. The Difference.™

BAR SCALE
1: 1,000
0 15 30 45 60m

ADDRESS
DRAFT PLAN
187 DORCHESTER ROAD

DRAWN BY:	CHECKED BY:	PROJECT No.:
BS	JMC	12-827
DESIGNED BY:	APPROVED BY:	DRAWING No.
BS	-	**Figure 2**
SCALE: on 24x36 1:1000	DATE: Jul 17, 2019	

1.2 Opportunities and Constraints

The proposed development of the subject lands provides several opportunities and constraints:

Constraints:

- Maintain existing minor/major conveyance from external areas through the site;
- Limit infiltration across the site to existing conditions due to the presence of the wellheads adjacent to the southwest corner of the subject property, as per request from the Municipality; and,
- Address the limited opportunity to provide conventional SWM solutions based on the size of the development and limited open-space, risk to nearby wellheads; and,
- Provide a simplified, streamlined SWM system to facilitate ease of future maintenance upon assumption by the Municipality.

Opportunities:

- Provide naturalized stormwater management controls, utilizing the existing sandy soil conditions to provide infiltration – rear-yard infiltration, disconnected rainwater leaders;
- Minimize the requirement for traditional SWM systems (i.e. SWM facilities);
- Utilize remaining capacity within the trunk storm sewer to convey the 2-year design event (minor system only);
- Maintain the existing infiltration across the subdivision lands; and,
- Provide allowable discharge rates for the future development of the medium-density / multi-family and commercial blocks;

2. Stormwater Management

2.1 SWM Criteria

The SWM criteria for the proposed development area are based on the following documents as well as outlined in **Section 3**:

- Ministry of the Environment Stormwater Management Planning and Design Manual (2003);
- City of London 2018 Design Specifications and Requirements Manual; and,

The following SWM criteria are required for the proposed development:

- *Water Quality:* A treatment train approach for the front yard and ROW areas must be designed to enhanced (Level 1) - 80% long-term treatment of suspended solids removal, as identified in Table 3.2 of the MOE Stormwater Management Practices Planning and Design Manual (March 2003). On-site water quality treatment is required for the proposed medium-density and commercial blocks;
- *Peak Flow Attenuation:* Discharge the minor storm event (2-year City of London) to the existing trunk storm sewer, attenuate 5-year through 100-year events prior to discharging to existing trunk storm sewer as well as providing on-site attenuation for the medium-density and commercial blocks; and,
- *Water Balance:* Provide adequate on-site water balance while limiting annual infiltration to existing (pre-development) levels in order to satisfy concerns related to the site's proximity to Municipal well-heads.

2.2 Existing Conditions

The 20.1 ha site is composed of an existing agricultural field that has development along both the Northern and Eastern boundaries, with Dorchester Road to the west and Dorchester Creek to the South. Based on the existing topography, the site drainage is split between three existing outfall locations:

- West towards the Dorchester Road east ditch and existing 600 mm CSP culvert;
- Existing 1,350 mm trunk storm sewer outlet, and,
- South towards the Dorchester Creek.

There is an existing 825 mm closed conduit Municipal Drain that services the lands north of Byron Avenue including the Dorchester Terrace Retirement Residence (approximately 21 ha) which conveys drainage south across the site and discharges to an existing 1,350 mm storm sewer which services the existing SWM facility to the east (approximately 26 ha). The existing 1,350 mm storm sewer conveys drainage beneath Dorchester Road through the Cromarty Lands, eventually discharging to the Mill Pond. The existing site does not currently have a storm sewer connection to either the storm sewer from Byron Avenue or the 1,350 mm trunk storm sewer. The entire site is a tributary to the South Branch of the Thames River.

2.3 Geotechnical and Hydrogeology

Golder Associates Limited (Golder) were retained to conduct the geotechnical (January 2018) and hydrogeological (March 2018) assessments for the subject site. A total of six boreholes were advanced during the site investigation. Based on the information provided by the borehole logs, it was determined the site soils are generally sand to gravely sand with trace amounts of silt. For the hydrogeological study, a total of five monitoring wells and two piezometers were utilized to measure the groundwater levels. It was determined that the groundwater levels fluctuated from 1.6 m to 4.3 m below ground surface.

Golder also calculated representative estimates of hydraulic conductivity for the sands and gravelly sands of $5x10^{-3}$ cm/s and $1x10^{-2}$ cm/s, respectively. Design infiltration rates for the sands and gravelly sands were estimated based on the assumption of 1 m of initial driving-head, a high potential for siltation and/or biofouling, and low-desired monitoring and maintenance. This yielded design infiltration rate estimates for the sands and gravelly sands on site of 5 cm/hr and 10 cm/hr, respectively. It was recommended to utilize a value of 5 cm/hr (50 mm/hr) for the design of infiltration swales, subsurface LID features, and SWM facilities, assuming LID SWM facility construction remained above the locally high-groundwater levels. For direct surface infiltration, Golder recommended a hydraulic conductivity of 36 mm/hr. Infiltration testing should be confirmed during detailed design.

The hydrogeological study also provided detailed groundwater contouring mapping. Based on the groundwater elevation monitoring, contours have been produced demonstrating the groundwater gradient flows in the southwest direction, towards the Municipal wellhead and Dorchester Creek, refer to **Figure 3** for details.

LEGEND

- BOREHOLE
- BOREHOLE / MONITORING WELL
- BOREHOLE/MONITORING WELL (LOTOWATER TECHNICAL SERVICES INC. 2006)
- MONITORING WELL NOT FOUND
- *254.18m* MEASURED WATER LEVEL - m amsl
- INFERRED GROUNDWATER FLOW DIRECTION
- GROUNDWATER CONTOUR

REFERENCE

DRAWING BASED ON BING IMAGERY AS OF NOVEMBER 7, 2017 (IMAGE DATE UNKNOWN); "CONCEPTUAL LAYOUT D" PROVIDED BY SIFTON, AUTOCAD FILE "18-827 CONCEPT D JAN 17, 2018".DWG"; LOTOWATER TECHNICAL SERVICES INC, FIGURE 2, DORCHESTER PART 1 AQUIFER TEST FINAL, MAY 2007; AND CANMAP STREETFILES V2008.4.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

BING IMAGERY USED FOR ILLUSTRATION PURPOSES ONLY AND NOT TO BE USED FOR MEASUREMENTS.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT
HYDROGEOLOGICAL ASSESSMENT
PROPOSED DEVELOPMENT
187 BYRON AVENUE
DORCHESTER, MUNICIPALITY OF THAMES CENTRE, ONTARIO

TITLE
GROUNDWATER CONTOURS

GOLDER

PROJECT No.		1788468	FILE No.	1788468-2000-R01007
			SCALE	AS SHOWN REV.
CADD	LMK/ZJB	July 4/19		
CHECK				

Figure 3

Client: Sifton Properties Limited

Original Format is Tabloid 279mm x 432mm

25mm 0

Drawing file: 1788468-2000-R01007.dwg Jul 04, 2019 - 4:05pm

3. Conceptual Stormwater Strategy

The proposed SWM strategy for the residential development at 187 Dorchester Road incorporates several features that will allow the site to meet both quantity and quality control objectives while providing water balance across the site. The total site area is approximately 20.1 ha, which is proposed to increase from 0 ha of imperviousness to 10 ha of imperviousness for an ultimate site imperviousness of approximately 49%.

The proposed SWM controls have been designed using published guidelines from City of London Design Specifications and Requirements Manual (July 2018), and the MOE Stormwater Management Planning and Design Manual (March 2003), as well as input from Thames Centre, MECP, and UTRCA.

The SWM strategy for the proposed residential development is as follows:

- Goss traps combined with catchbasin inserts such as LittaTrap providing pre-treatment of floatables, coarse sediments, and other debris;
- Disconnected building rainwater leaders;
- Rear-yard infiltration where practical and where grading permits, complete with overflow catchbasins and an overflow route to the ROW;
- Water quality treatment for the proposed ROWs provided via oil-grit separators (OGS) units;
- On-site quantity/quality controls for the proposed commercial and medium-density/multi-family blocks;
- Unrestricted conveyance for both minor and major flows for the external lands; and,
- Major overland flow directed to Dorchester Road and Dorchester Creek.

Refer to **Appendix A** for the conceptual storm sewer and grading drawings, and **Table 1** below for a general summary of the conceptual subdivision SWM design.

Table 1: Subdivision SWM Systems Summary

Characteristics	Value
Service Catchment Area (ha)	20.82
Level of Water Quality Protection	2 x OGS Units Level 1 - 80% Long-Term S.S. Removal Goss Traps LittaTrap Insert
Impervious Area (ha)	10.19
Total Imperviousness (%)	49
Water Quality Protection	OGS Unit x 2
Minor Storm Sewer Outlet West	
Service Area (ha)	3.51
Impervious Area (ha)	1.76
Imperviousness (%)	50
2-Year Peak Inflow (m^3/s)	0.36
Minor Storm Sewer Outlet East	
Service Area (ha)	4.79
Impervious Area (ha)	2.43
Imperviousness (%)	51
2-Year Peak Inflow (m^3/s)	0.54
Major Overland Flow Attenuation Basin West	
Service Area (ha)	28.30
Impervious Area (ha)	15.64
Imperviousness (%)	55
Depth (m)	1.30
Volume (m^3)	919
Outlet Configuration	250 mm Circular Orifice Plate
100-Year Peak Inflow (m^3/s)	0.5
100-Year Peak Attenuation Volume (m^3)	613
250-Year Major Overland Inflow - 2-Year Discharge (m^3/s)	1.81
Major Overland Flow Attenuation Basin East	
Service Area (ha)	5.49
Impervious Area (ha)	2.81
Imperviousness (%)	51
Depth (m)	0.80
Volume (m^3)	480
Outlet Configuration	150 mm Circular Orifice Plate
100-Year Peak Inflow (m^3/s)	0.5
100-Year Peak Attenuation Volume (m^3)	316
250-Year Major Overland Inflow - 2-Year Discharge (m^3/s)	0.47

3.1 Source Water Protection

As noted previously in **Section 1.1**, the majority of the subject lands are located within a WHPA 'A' and 'B'. As per the meeting with the MECP (then MOECC), it was agreed that the proposed development can occur in the WHPAs as it is a residential development and does not exceed 100 ha. It was acknowledged that OGS units would be allowed within the WHPA 'B', and that infiltration can be utilized to assist with SWM controls.

3.2 Subdivision SWM Systems

3.2.1 Quantity Control

3.2.1.1 Rear-Yards

It is proposed to direct the clean runoff from the rear portion of the residential buildings (grading and disconnected rainwater leaders) toward the rear-yard areas to be infiltrated by topsoil and the existing sandy soils. This assists with limiting discharge to the existing trunk storm sewer and improves the subdivision water balance. It is proposed to allow for only 0.30 m of ponding depth in the rear-yards before overflowing to the ROW. By limiting the ponding depth to 0.30 m, it provides for more useable rear-yard space and virtually reduces nuisance ponding. The design of the rear-yard ponding areas has been calculated based on preliminary grading design and a design surface infiltration rate of 36 mm/hr, as per the recommendations provided by Golder. The rear-yards should be graded during detailed design to provide approximately 2,200 m^3 of surface storage to facilitate the infiltration of clean runoff volumes. A catchbasin inlet set at the top of the proposed ponding elevation will be required to capture any excessive ponding volume and to redirect excess volumes to the storm sewer network within the ROW. An overland flow route should also be designed to provide relief in the event of a catchbasin blockage or during a major storm event producing excessive volumes of runoff; this volume will be directed to the subdivision ROW and follow the proposed overland flow route.

3.2.1.2 Right-of-Way

The existing storm sewer providing conveyance from the Byron Avenue area north of the proposed development through the site outletting to the existing 1,350 mm trunk storm sewer is required to be rerouted as a result of the proposed subdivision layout. This storm sewer will continue to service the upstream areas unimpeded; however, it will be required to convey drainage from a small area of the proposed subdivision ROW, which includes restricted discharge from the proposed commercial and medium-density development blocks. Due to the additional length of the sewer and the slight increase in tributary area, the proposed storm sewer diameter has been increased to provide the necessary conveyance capacity. Refer to **Appendix A** to reference the preliminary engineering drawings.

The minor system for the subdivision is proposed to discharge to the existing 1,350 mm trunk storm sewer uncontrolled for the 2-year design storm. Limiting the discharge to the 2-year event can be achieved via orifice plates or reduced pipe-diameter. It could also be controlled via inlet capacity restrictions through the design of the catchbasin inlets. Details regarding flow limitation/restriction should be discussed with the Municipality during detailed design to determine the most practical design for ease of operation and maintenance by the Municipality. For storm events exceeding the 2-year (minor system) event, the discharge will be conveyed via the overland flow route (ROW) and discharged into two separate dry-basin facilities located along the south portion of the development. These dry-basins will attenuate the drainage via orifice plates to limit discharge to the 1,350 mm trunk sewer, ultimately reducing the peak discharge to the drain until adequate conveyance capacity is recovered. The block sizes require a minimum block area of 0.14 ha and 0.18 ha for Blocks 196 and 197, respectively. It should be noted the intent of these basins is not to infiltrate the major event volume and the detailed design should incorporate features to prevent infiltration.

Refer to **Appendix C** for more detailed calculations. Details regarding the capacity of this trunk storm sewer are summarized in **Section 3.2.8** of this report.

3.2.2 Quality Control

3.2.2.1 Goss Traps and LittaTraps

To mitigate against excess amounts of coarse sediment buildup within sewers and downstream SWM features, it is proposed to provide a treatment-train approach which includes catchbasin inserts as well as extended catchbasin sumps (900 mm as opposed to 600 mm sump depth), complete with a goss trap in each catchbasin within the ROW. The catchbasin inserts, similar to that of the LittaTrap product highlighted in **Figure 4,** are designed to capture the large floatables and coarse debris (greater than 5 mm diameter) that may bypass the goss trap. The maintenance of these inserts are simple and entails lifting them out of the catchbasin and safely disposing of the captured contents.

The goss traps function by providing a submerged outlet design that prevents floatables and larger particles and debris from discharging to the local storm sewer, thereby helping to protect against the buildup of sediments and debris within the pipe network and the downstream facilities. They will provide additional support for floatables that are less than 5 mm that the catchbasin insert cannot effectively remove from the system. The extended catchbasin sumps will also provide additional sediment storage capacity, thereby reducing the requirement maintenance frequency of the inlets devices.

There are several manufacturers who produce such products that can be installed after purchase, and others that can be ordered directly installed from the manufacturer such as the unit produced by Forterra and LittaTrap, as noted in **Figure 4**.

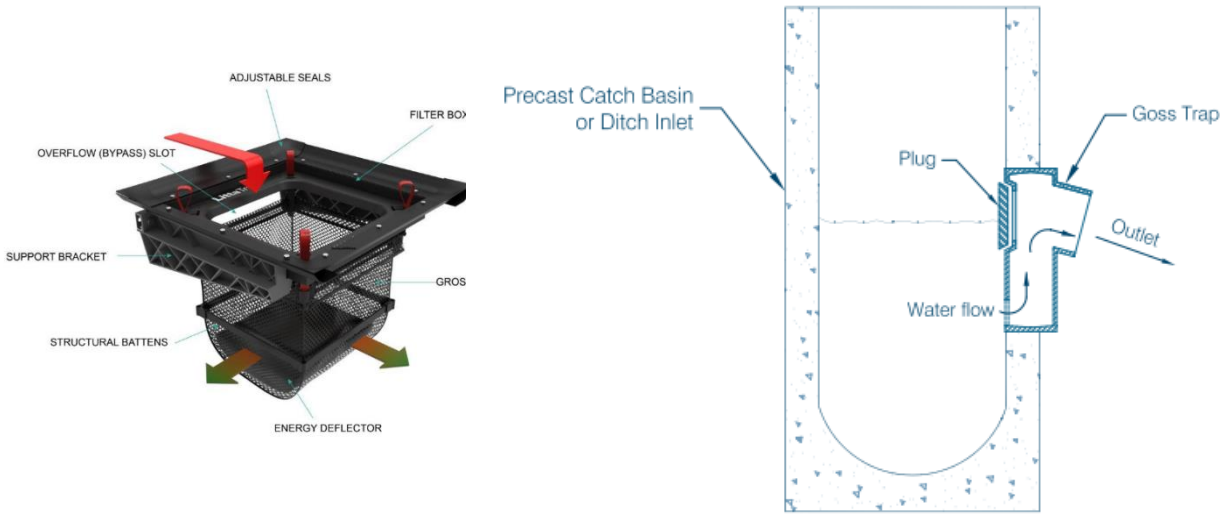


Figure 4: LittaTrap and Goss Trap (Typical)

3.2.2.2 Oil-Grit Separators

Enhanced water quality treatment (i.e. 80% long-term TSS removal) will be provided by oil-grit separator (OGS) units that treat the discharge from the ROW after the coarse sediment removal afforded by the goss traps. It is proposed to provide two strategically-placed units to treat drainage prior to discharging to the existing 1,350 mm trunk storm sewer. The drainage from lands north of the proposed development are not to be treated as it is an existing condition; drainage will be re-routed to the existing 1,350 mm trunk storm sewer as per the existing conditions. The units were sized based on the continuously deflective separators developed by Contech; however, alternatives may be considered but are subject to approval by the design engineer. Refer to **Table 2** for a Contech unit summary, and **Appendix C** for detailed unit sizing calculations.

Table 2: OGS Unit Sizing

Parameters	OGS Unit #1	OGS Unit #2
Tributary Area (ha)	3.21	4.78
Imperviousness (%)	50	51
MOE (2003) Treatment Level	Level 1 "Enhanced" Treatment (80% Annual TSS Removal)	Level 1 "Enhanced" Treatment (80% Annual TSS Removal)
Model	CDS 3030_6	CDS 3035_6ES
Structure Size (mm)	1829	1829
Particle Size Distribution	Fine	Fine
Treatment Flow Rate (L/s)	85	108
Annual Load Removal Efficiency (%)	82.1	80.2
Predicted Annual Rainfall Treated (%)	97.4	96.3
Hydrocarbon Storage (L)	895	994
Sediment Storage (L)	2,402	3,203
Total Holding Capacity (L)	5,284	6,476
Estimated Cleanout Frequency (months)	18-24	18-24

3.2.3 Commercial and Medium-Density Blocks

The proposed commercial and medium-density / multi-family blocks are to have on-site quantity/quality control systems to treat stormwater drainage prior to outletting to the subdivision storm sewer network. The proposed discharge restrictions for the blocks have been determined through the detailed modeling are required to reduce peak discharge and time-to-peak to the receiving storm sewer network. Refer to **Table 3** for details regarding the peak discharge requirements.

Table 3: Peak Discharge Restrictions for Private Blocks

Block	2-Year Discharge (L/s/ha)	100-Year Discharge (L/s/ha)
Commercial	6	10
Medium-Density / Multi-Family	6	14

The quality control systems that are to be provided are to meet MOE (2003) Level 1 "Enhanced" treatment (80% annual TSS removal) prior to discharging to the subdivision storm sewer network. The Engineer of Record for the design of both blocks should consider systems that will not have a negative impact on the groundwater systems, as

the commercial and medium-density / multi-family blocks are located in WHPA-'A' and WHPA-'B' locations. It has been proposed to limit excess infiltration from the proposed impervious areas within these blocks due to their proximity to the WHPA areas, as runoff from impervious areas is typically of a lower quality and often associated with contaminants like roads salts.

3.2.4 SWM Hydrologic Modeling

PCSWMM was used to model the minor and major conveyance system including the functionality of both the existing conditions and the proposed on-site SWM systems. The hydraulic component of the model is comprised of nodes and 1-dimensional flow links which define both the street network and underground storm sewer conveyance system.

3.2.5 Conveyance

As part of the overland SWM strategy, conveyance of stormwater runoff is to be safely conveyed through the proposed development to the proposed storm sewer network. Both minor and major systems have been designed to adequately convey the discharge to the minor and major inlets to either the trunk storm sewer or Dorchester Creek.

3.2.5.1 Minor System

The 20.1 ha subdivision is to be serviced via storm sewer networks to convey drainage from the proposed ROW to the existing trunk storm sewer along the south portion of the site. The rear-yards are to be provided with an overflow catchbasin to intercept excessive volumes and conveyed to the storm sewer network. The rear-yards are also to be provided with overflow locations in the event of frozen ground and / or major storm events in which the drainage will be conveyed by the ROW.

The minor system is to convey runoff from front yards and the ROW to be treated by downstream quality control units prior to discharging to the existing trunk storm sewer. Approximately 11.3 ha of area directly contributes runoff to the storm sewer network across the site. Refer to **Appendix A** for the preliminary engineering drawings for details regarding tributary area draining to the proposed storm sewer network.

3.2.5.2 Major System

Proposed internal roadways are assumed to have the following typical cross section parameters:

- 20.0 m ROW width;
- 10 m pavement width;
- 2.0% roadway cross slope;
- 0.15 m curb height;
- 0.5% longitudinal slope (shallowest); and,
- 2.0% boulevard cross slope.

Table 4 provides the conveyance flow rate for the typical road cross-sections at various longitudinal slopes, assuming maximum road depth of 0.30 m (at the gutter). Further details related these calculations are provided in **Appendix C**. Overland flow and ROW slopes should be confirmed during detailed design.

Table 4: Road Conveyance.

Slope (%)	Flow Rate (10 m Pavement Width) (m^3/s)	Velocity-Flow Depth Product (m^2/s)	Safe for Pedestrians?
0.25	4.0	0.02	Yes
0.50	5.6	0.03	Yes
0.75	6.9	0.04	Yes
1.00	7.9	0.04	Yes

The largest expected major overland peak flow rate through the subdivision ROW is approximately 2.3 m^3/s and can be conveyed through a standard 20 m cross-section with a minimum longitudinal slope of 0.25%, but a minimum slope of 0.50% is recommended. The velocity-flow depth product is required to be less than 0.80 m^2/s as per Section WC-13, 3.2.2 of the MTO Highway Drainage Design Standards.

3.2.6 Existing Conditions

3.2.6.1 Existing Land Use

As discussed in **Section 2.2**, the existing land-use is agricultural, with the entire property being under cultivation as an agricultural field.

3.2.6.2 Soil Conditions

The Golder study concluded the existing on-site soils are underlain by glaciolacustrine derived sandy to gravelly sands, and massive fine textured silt deposits. Based on these findings, a conservative SCS curve number of 74 was applied to the open field areas, whereas curve numbers of 60, 70, and 75 were applied to the woodlot, existing residential, and commercial areas, respectively. A CN of 69 was applied to the existing residential subdivision to the southeast, as per the Quail Run Subdivision, Dorchester Stormwater Management Plan (Stantec, 2003). These curve numbers were corrected to a CN III* number based on initial abstractions then converted to CN II* to be inputted into the PCSWMM modeling software.

The curve numbers were based on SCS runoff curve numbers for agricultural lands in "*Hydrology", suppl. A to Sec 4, Engineering Handbook, USDA, Soil Conservation Service, 1968*, and MTO Drainage Manual Design Chart 1.09. Refer to **Appendix C** for details regarding the subcatchment CN values. The modified CN II* calculations were calculated utilizing the equation listed in the Otthymo Manual:

$$CN\ III^* = \frac{25400}{S^* + 254}$$

$$CN\ II^* = \frac{10CN\ III^*}{23 - 0.13CN\ III^*}$$

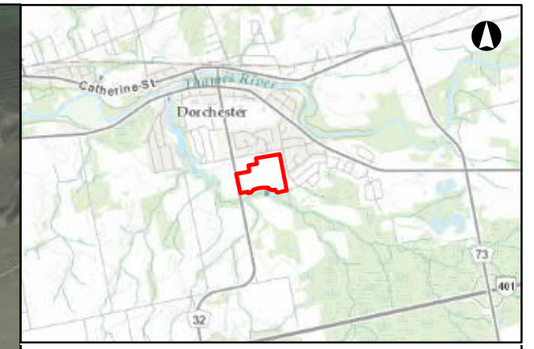
Where: CN II* = Modified SCS soil Curve Number
S* = Soil Storage(mm)

3.2.6.3 Existing Catchments

Catchment parameters were based on the City of London Design Specifications and Requirements Manual (Updated: 2019), as the Municipality of Thames Centre does not have published values. This was utilized to address site specific drainage conditions as determined by soil survey maps, topographic contours and historical aerial photos. Catchment drainage areas were delineated using historical 0.5 m and 1.0 m contours and detailed topographic survey, where the external lands tributary areas were derived from existing record drawings. Soil curve numbers (CN) were determined based on soil survey maps and land cover. The CN parameters were adjusted to CN II* (modified curve number) to correlate with the applied initial abstraction (IA); refer to **Section 3.2.6.2** above for further details. Refer to **Table 5** for details regarding the existing conditions catchment areas and **Figure 5** for the existing conditions catchments.

Table 5: Existing Conditions Catchment Input Parameters.

Catchment ID	Area	TIMP	Pervious IA	Impervious IA	Catchment Length	CN II*
	(ha)	(%)	(mm)	(mm)	(m)	
A1	15.55	0	5	2	180	71
A2	5.29	0	5	2	75	69
Total Subdivision Lands	**20.82**	**0**	**-**	**-**	**-**	**-**
External Lands						
EXT1	20.02	55	5	2	370	65
EXT2	25.80	55	5	2	410	65
EXT3	3.24	75	5	2	150	72
EXT4	1.29	88	5	2	90	72
EXT5	0.72	55	5	2	25	65
EXT6	0.49	50	5	2	60	65
EXT7	0.89	55	5	2	20	65
EXT8	16.26	55	5	2	330	64
Total External Lands	**68.71**	**57**	**-**	**-**	**-**	**-**
Total Tributary Area	**89.53**	**43**	**-**	**-**	**-**	**-**



Legend

- Outfall
- Contours (5 m)
- WHPA-A
- WHPA-B
- Flooding Hazard (UTRCA)
- Intermittent Watercourse
- Permanent Watercourse
- Waterbody
- Property Line

Proposed Catchments

- Field
- External

0 55 110 220
Meters

187 Dorchester Road

Existing Conditions

July 2019	1:5,500	Datum: NAD83 UTM17 Source: LIO, UTRCA
P#: 60568894	V#:	

AECOM

Figure 5

Map location: \\aton1\p01\Projects\60568894 Sifton Dorchester Subdivision\400-Technical\431 Technical Area 1\SWM\GIS\MXD\MAP-2019-07-16-ExistingConditions-60568894.mxd
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3.2.6.4 Existing Model Results

The results produced from the existing conditions PCSWMM model have been summarized according to outfall location in **Table 6**, below. Refer to **Appendix D** for details regarding outfall locations, detailed model schematic, input, and output.

Table 6: Existing Conditions Peak Outfall Discharge.

Outfall ID	Peak Flow (m^3/s)								
	25 mm 24-hr SCS	2-Yr 3-hr Chc	5-Yr 3-hr Chc	10-Yr 3-hr Chc	25-Yr 3-hr Chc	50-Yr 3-hr Chc	100-Yr 3-hr Chc	250-Yr 3-hr Chc	250-Yr 24-hr Chc
Dorchester Creek	0.00	0.02	0.02	0.04	0.08	0.18	0.25	0.32	0.40
Existing Ditch / Culvert	0.34	0.66	0.68	0.82	1.03	1.19	1.37	2.13	2.77
Existing Sewer Outlet	1.67	3.08	3.12	3.28	3.53	3.69	3.80	3.86	3.90

3.2.7 Proposed Conditions

The proposed development is to include 20 m right-of-ways complete with storm sewers, sanitary sewers, and watermains. The subdivision grading is to be split east and west to provide adequate sanitary sewer design, utilizing existing capacity at the facility located along Oakwood Drive. As discussed in **Section 3.2.1.2**, a small portion of the ROW on the west portion of the site will be a tributary to the proposed realigned storm sewer servicing the Byron Avenue area north of the proposed development, as providing dual storm sewer networks would not be possible or practical through the subdivision ROW. For details regarding the proposed conditions, refer to **Appendix A** to reference the proposed preliminary engineering drawings.

3.2.7.1 Proposed Land-Use

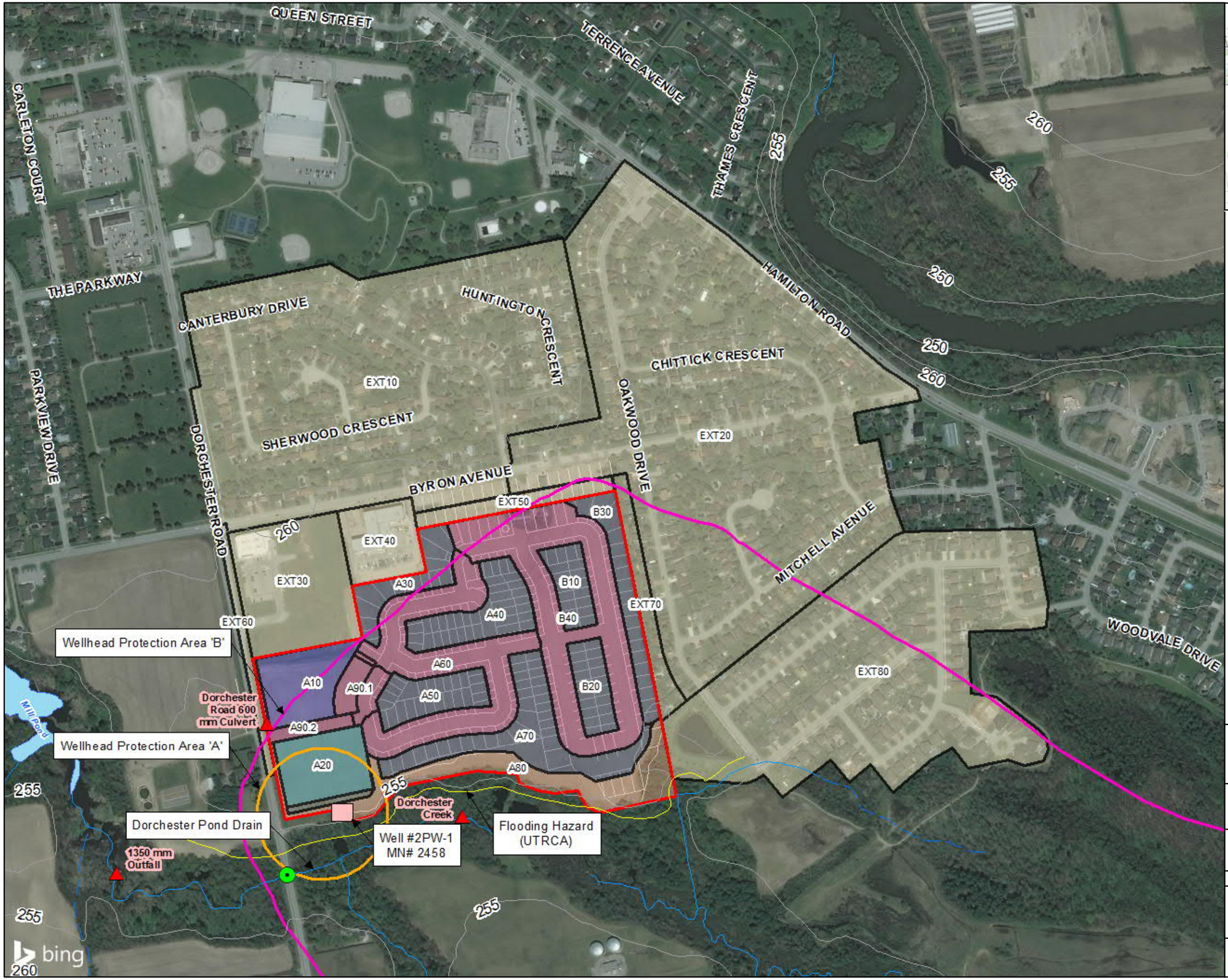
The proposed land-use for the development is to include 191 single-family residential homes, a 1.60 ha medium-density, multi-family block, and a 1.32 ha commercial block. The assigned imperviousness for the single-family residential, medium-density, commercial blocks are, 55%, 65%, and 75%, respectively.

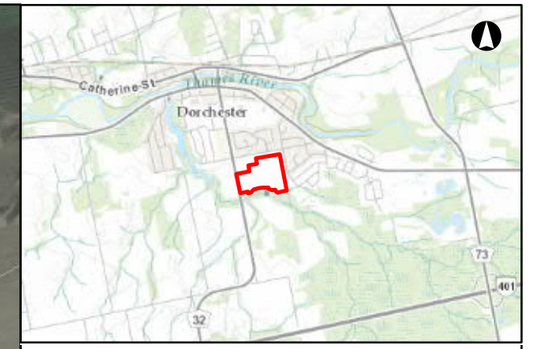
3.2.7.2 Proposed Catchments

Catchment parameters were based on the City of London Design Specifications and Requirements Manual (Updated: 2019), as the Municipality of Thames Centre does not have published values. This was utilized to address the proposed site drainage conditions as determined by both the pervious surfaces (land-use) and existing underlying soils. Catchment areas were delineated based on preliminary grading and storm area plan, while routing surface runoff to the appropriate outlet locations. Utilizing the same outfalls as the existing conditions will assist with comparing the post-development and existing conditions. The curve number for the subdivision lands was set to CN = 74, which was corrected to a CN III* number based on initial abstractions then converted to CN II* to be inputted into the PCSWMM modeling software; a CN II* of 65 was applied to residential areas. The curve number was selected to reflect a thicker 0.6 m topsoil depth which is intended to enhance the abstraction of runoff. Refer to **Table 7** for details regarding the proposed conditions catchment areas and **Figure 6** for the proposed conditions catchments.

Table 7: Proposed Conditions Catchment Input Parameters.

Catchment Number	Area	TIMP	Pervious IA	Impervious IA	Catchment Length	CN II*
	(ha)	(%)	(mm)	(mm)	(m)	
A10	1.32	75	2	5	90	65
A20	1.60	65	2	5	100	65
A30	0.92	55	2	5	30	65
A40	1.33	55	2	5	30	65
A50	0.98	55	2	5	30	65
A60	3.21	55	2	5	150	65
A70	2.11	50	2	5	120	65
A80	2.01	55	2	5	45	65
A90.1	0.55	0	2	5	60	65
A90.2	0.32	50	2	5	50	65
B10	0.67	55	2	5	30	65
B20	0.71	55	2	5	30	65
B30	1.05	55	2	5	30	65
B40	4.06	50	2	5	160	65
Total Subdivision Lands	**20.82**	**49**	**-**	**-**	**-**	**-**
External Lands						
EXT10	20.02	55	2	5	370	65
EXT20	25.80	55	2	5	410	65
EXT30	3.24	75	2	5	150	72
EXT40	1.29	75	2	5	90	72
EXT50	0.72	55	2	5	25	65
EXT60	0.49	50	2	5	60	65
EXT70	0.89	55	2	5	20	65
EXT80	16.26	55	2	5	330	64
Total External Lands	**68.71**	**56**	**-**	**-**	**-**	**-**
Total Tributary Area	**89.53**	**55**	**-**	**-**	**-**	**-**





Legend

- Outfall
- Contours (5 m)
- WHPA-A
- WHPA-B
- Flooding Hazard (UTRCA)
- Intermittent Watercourse
- Permanent Watercourse
- Waterbody
- Property Line

Proposed Catchments

- Buffer
- Commercial
- External
- Medium-Density
- Right-of-Way
- Rear Yard

0 55 110 220
Meters

187 Dorchester Road

Proposed Conditions

July 2019	1:5,500	Datum: NAD83 UTM17 Source: LIO, UTRCA
P#: 60568894	V#:	

AECOM

Figure 6

Map location: \\aton1\p01\Projects\60568894 Sifton Dorchester Subdivision\400-Technical\431 Technical Area 1\SWM\GIS\MXD\MAP-2019-07-18-ProposedConditions-60568894.mxd
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3.3.3.3 Proposed Conditions Model Results

A systems approach was used to analyze the peak inflow, attenuation, infiltration volume, and discharge from the proposed SWM system. The design of the proposed SWM system utilizes the pre-existing capacity of the 1,350 mm trunk storm sewer while attenuating runoff volumes which exceed the 2-year to 100-year (inclusive) City of London design storm event prior to overflowing to the south buffer and, ultimately, to the Dorchester Creek and Mill Pond. Refer to **Table 8** and **Table 9** for proposed conditions summary details.

Table 8: Proposed Conditions Peak Outfall Discharge.

Outfall ID	Peak Flow (m^3/s)								
	25 mm 24-hr Chc	2-Yr 3-hr Chc	5-Yr 3-hr Chc	10-Yr 3-hr Chc	25-Yr 3-hr Chc	50-Yr 3-hr Chc	100-Yr 3-hr Chc	250-Yr 3-hr Chc	250-Yr 24-hr Chc
Dorchester Creek	0.00	0.01	0.01	0.03	0.05	0.08	0.20	1.48	2.40
Existing Ditch / Culvert	0.33	0.64	0.65	0.78	0.94	1.06	1.19	1.43	1.50
Existing Sewer	1.95	3.52	3.60	4.09	4.43	4.56	4.68	4.83	4.90

Table 9: Proposed Conditions SWM Modeling Results (Reduction/Increase).

Outfall ID	Peak Flow Increase/Decrease (%)								
	25 mm 24-hr Chc	2-Yr 3-hr Chc	5-Yr 3-hr Chc	10-Yr 3-hr Chc	25-Yr 3-hr Chc	50-Yr 3-hr Chc	100-Yr 3-hr Chc	250-Yr 3-hr Chc	250-Yr 24-hr Chc
Dorchester Creek	0%	-37%	-36%	-28%	-37%	-57%	-19%	367%	502%
Existing Ditch / Culvert	-3%	-4%	-5%	-6%	-8%	-11%	-13%	-33%	-46%
Existing Sewer	17%	14%	15%	24%	26%	23%	23%	25%	26%

3.2.8 Trunk Storm Sewer Capacity

As discussed in **Section 3.2.1.2**, it is proposed to discharge the front-yards and ROWs of the single-family portion of the subdivision to the existing 1,350 mm trunk storm sewer to take advantage of the available capacity remaining in the trunk storm sewer. Based on the results of the existing conditions model, the trunk sewer is operating at approximately 80% of it's available full-flow capacity during the 2-year storm event with minor surcharging in one portion of sewer length. With the additional uncontrolled discharge from the proposed front yards and ROW during the 2-year event, the trunk storm sewer is operating near full-flow capacity during the 2-year design storm event with an average 90% of the available full-flow depth being utilized. There is minor surcharging of approximately 0.15 m at the approximate connection points for the subdivision storm sewer. The surcharging is negligible as the timing of the surcharge spans less than 10 minutes over the course of the 3-hour event, as per model simulations. Due to the additional volume provided by the re-routed 975 mm sewer to Dorchester Road, the hydraulic head at Byron Avenue has been reduced by approximately 0.30 m. During detailed design, the outlet velocities of the trunk storm sewer should be evaluated, and a determination made as to whether or not increased riprap protection or other materials should be used if the existing protection is deemed inadequate. Refer to **Figure 7** and **Figure 8** for details regarding the hydraulic grade line in the 1,350 mm trunk storm sewer for the 2-year event.

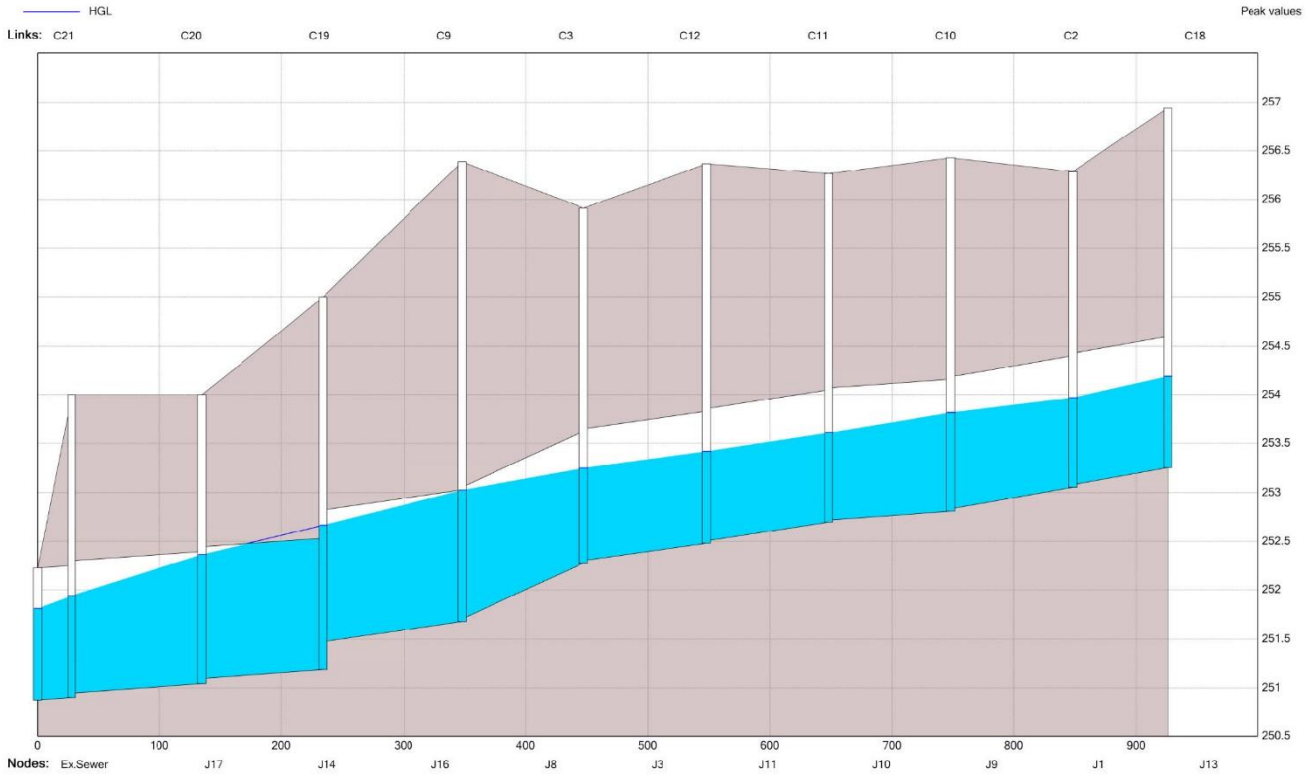

Figure 7: Existing Hydraulic Grade Line - 1,350 mm Trunk Storm Sewer (2-Year)

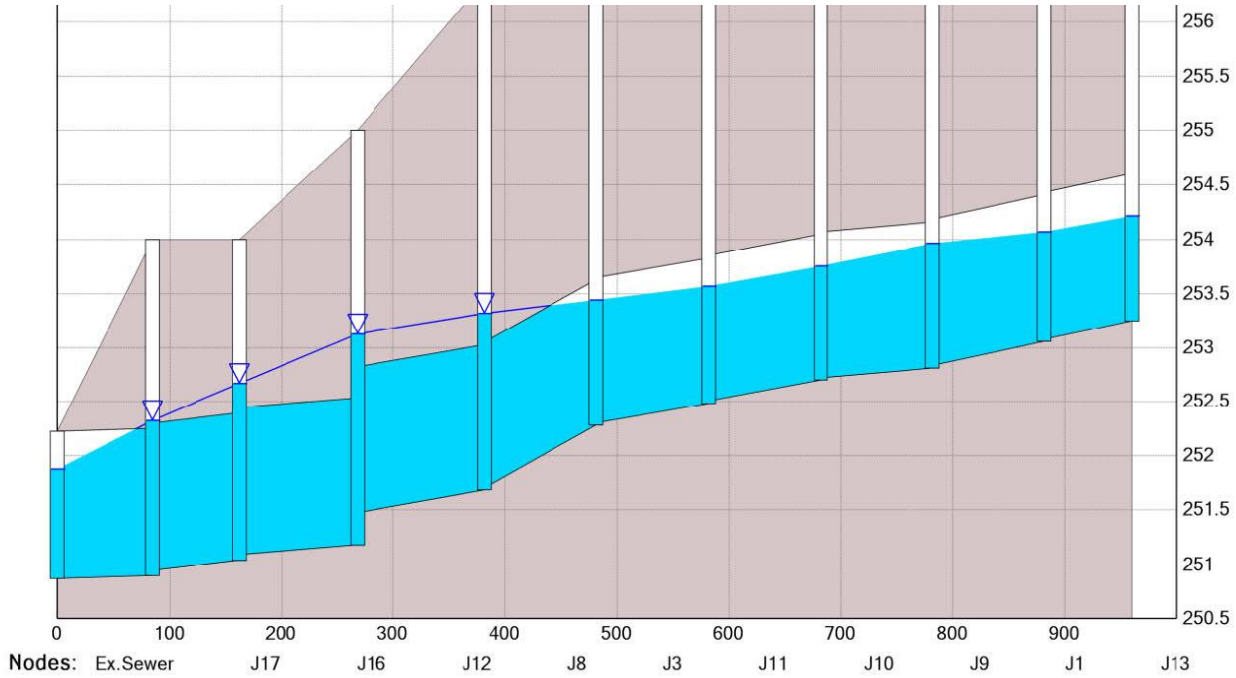

Figure 8: Proposed Hydraulic Grade Line - 1,350 mm Trunk Storm Sewer (2-Year)

3.3 Summary of Results

The conceptual SWM strategy utilizes both the remaining conveyance capacity in the 1,350 mm trunk storm sewer to convey the minor storm event (2-year City of London) as well as on-site controls for the medium-density and commercial blocks, while infiltrating 'clean' runoff in the rear-yard areas. Peak discharge from the subdivision decreased to Dorchester Road as well as Dorchester Creek as compared to the existing conditions. A minor (14%) increase in peak discharge at the 1,350 mm trunk storm sewer outlet occurs during the 2-year event with a minor surcharge increase (0.15 m depth) at the locations of the proposed subdivision storm sewer connection. Rerouting of the existing storm sewer from Byron Avenue results in a net overall improvement to conveyance capacity; thereby reducing hydraulic impacts to the external storm sewer network. The rear-yard swales effectively store and infiltrate the runoff from the rear portion of the buildings and landscaped area eliminating discharge during the majority of storm events and reducing the overall peak discharge to the existing trunk storm sewer system while promoting infiltration for water balance. The proposed dry-basin facilities effectively attenuate peak discharge from the events which exceed the capacity of the proposed local storm sewer network and dampen the discharge to the existing trunk storm sewer.

4. Water Balance

4.1 Introduction

To address UTRCA requirements, AECOM completed a water balance analysis to demonstrate that no adverse impact to the overall site water balance will occur as a result of the development, and also to demonstrate that adequate controls are in place to promote infiltration across the site. This was completed for each of the existing site outfalls identified in **Figure 4** and **Figure 5**.

The water balance can be expressed in terms of inputs (precipitation (P)) and outputs (evapotranspiration (ET), runoff (R), and infiltration (I)).

$$P = ET + R + I$$

A monthly average water balance approach was developed, utilizing monthly average climate information for London, ON (1981-2010), from the Federal Ministry of the Environment and Climate Change. Parameters such as average monthly temperature and total monthly precipitation were utilized to estimate the monthly heat index, potential evapotranspiration, daylight correction value, and the surplus and deficit potential based on the Thornthwaite and Mather method (1957). If precipitation exceeds evapotranspiration and the excess is not used by plants, there is a surplus of water in soil moisture conditions. When evapotranspiration exceeds precipitation, there is a deficit of moisture, and recharge occurs until this deficit is recovered. There is typically a water surplus in the winter months which results in runoff and infiltration when melting and thaw occurs. From this information, it was determined that the annual water budget (based on average monthly data) results in 1,012 mm of precipitation, 596 mm of evapotranspiration (adjusted), including a surplus and deficit of 502 mm and 67 mm, respectively. This equates to a total water surplus of 415 mm annually (which includes both total annual infiltration + runoff). Furthermore, both the existing and proposed subdivision catchments were analyzed using on the MOE Stormwater Management Planning and Design Manual (2003) Table 3.1: Hydrological Cycle Component Values; the relative infiltration and runoff split is consistent with the values in this table.

Only the subdivision catchment areas were included in this assessment according to both the existing and proposed conditions. For details regarding the existing and proposed conditions water balance assessment, refer to **Appendix F.**

4.2 Existing Conditions

Using the climate information and derived parameters identified in **Section 4.1** above, the existing conditions water balance was evaluated, refer to **Table 10** for details. Based on the calculations, it was determined that approximately 22,600 m^3 of annual runoff volume is directed to the existing 600 mm CSP that crosses beneath Dorchester Road, and 7,700 m^3 to Dorchester Creek (total of 30,300 m^3). Annual infiltration volume was estimated to be approximately 56,300 m^3. When considered in conjunction with the groundwater contour information produced by the hydrogeology study, this suggests that there will be some discharge to Dorchester Creek and the wellhead location. Refer to **Table 11** for details pertaining to the peak discharge to each outlet.

Table 10: Existing Conditions Annual Water Budget for the Subdivision.

Parameter	Volume (m^3/year)	Depth (mm/year)
Precipitation	210,800	1,012
Evapotranspiration	124,300	596
Infiltration	56,200	270
Runoff	30,300	145

Table 11:Existing Conditions Annual Discharge.

Parameter	Existing 600 mm Culvert (m^3/year)	Dorchester Creek (m^3/year)
Precipitation	157,300	53,500
Evapotranspiration	92,700	31,600
Infiltration	-	56,300
Runoff	22,600	7,700

4.3 Proposed Conditions

The location of the existing municipal wellhead in relation to the subject site imposes considerable design constraints with respect to meeting the water balance targets within the proposed development lands. The Municipality of Thames Centre has expressed concerns regarding the maintenance of infiltration across the site. While the Municipality does not want net infiltration to decrease, it is equally as important not to increase infiltration in such a way that it may negatively affect groundwater quantity and quality. Infiltration measures have been proposed in locations where 'clean' runoff sources exist. This includes the infiltration of runoff from portions of the impervious building areas and rear-yards, whereas the ROW drainage is to be treated through the more conventional use of a treatment train approach with catchbasin inserts, goss traps, extended sumps, and OGS units prior to discharge to the trunk storm sewer. The net result of these constraints is that it leaves limited opportunities to increase infiltration capacity, and to reduce the resultant increase in runoff volume to the trunk storm sewer discharging to the Mill Pond to the west. However, an increase in treated runoff volume from the site to the Mill Pond should have little affect as the subject site accounts for only approximately 0.9% of the total Mill Pond tributary area (~2,191 ha, MTO OFAT).

The proposed conditions analysis utilized the same approach as existing, based on a total tributary area of 20.1 ha (subdivision only). Based on the analysis of the proposed subdivision area, the water balance analysis indicates there will be a 29% decrease in evapotranspiration due to the creation of new impervious area; a 9% decrease in infiltration across the site (considered to be a relatively minor deviation from existing conditions), and a 137% increase in annual runoff volumes, which are directed to the trunk storm sewer. As stated previously, the increase in runoff volume to the trunk storm sewer is due to the impervious area of the subdivision and limitations on the annual infiltration volume the Municipality would be comfortable with due to the proximity of the wellhead. Furthermore, no additional infiltration of runoff from the proposed impervious areas in either the commercial or medium-density blocks has been explored due to their location within or adjacent to the WHPA-'A', and this has been done deliberately in order to reduce the risk of impacting the wellhead, as per Municipal request. Further refinements to the water balance can be explored during detailed design. Refer to **Table 12** and **Table 13** for further details, and **Appendix F** for detail calculations.

Table 12: Proposed Conditions Annual Water Budget for Subdivision.

Parameter	Volume (m^3/year)	Depth (mm/year)
Precipitation	210,800 **(unchanged)**	1,012
Evapotranspiration	87,900 **(29% decrease)**	422
Infiltration	51,100 **(9% decrease)**	245
Runoff	71,900 **(137% increase)**	345

Table 13: Proposed Conditions Annual Discharge.

Parameter	Existing Sewer / Dorchester Road (m^3/year)	Dorchester Creek (m^3/year)
Precipitation	111,900	989,000
Evapotranspiration	29,600	58,300
Infiltration	-	51,100
Runoff	68,900	2,900

5. Salt Management

Chloride loading to receiving watercourse and groundwater may increase because of urban development and associated winter salt application. Chloride concentrations commonly increase with increasing salt application and decreasing streamflow as less dilution is provided during low flows. Chloride loading will be higher during the de-icing season but receiving watercourses will still be subject to elevated salt loadings during the non-de-icing season due to the baseflow augmentation of chloride-impacted shallow groundwater system, which as a reservoir for salt which slowly discharges into streams throughout the year. A salt management plan is therefore necessary to control chloride concentration from an “at-source” perspective. It is understood from discussions with the Municipality of Thames Centre that winter salting applications occur throughout the Municipality, including in close proximity to the Municipal wellhead and Mill Pond. The Municipality’s winter sand/salt operations are limited due to the Municipality’s size and available funds. It is our recommendation that winter sanding and salt operations be coordinated between the Municipality and UTRCA to develop a salt management plan using the principles outlined in the Transportation Association of Canada’s “Best Management Practices of Road Salt Management”.

6. Conclusions and Recommendations

A conceptual SWM strategy has been prepared in accordance with appropriate guidelines for submission of the proposed Draft Plan of Subdivision for 187 Dorchester Road.

The following design elements should be implemented as part of the overarching SWM strategy for the site:

- *Water Quality:* A treatment train approach for the front yard and ROW areas must be designed to enhanced (Level 1) - 80% long-term treatment of suspended solids removal, as identified in Table 3.2 of the MOE Stormwater Management Practices Planning and Design Manual (March 2003). On-site water quality treatment is required for the proposed medium-density and commercial blocks;
- *Peak Flow Attenuation:* Discharge the minor storm event (2-year City of London) to the existing trunk storm sewer, attenuate 5-year through 100-year events prior to discharging to existing trunk storm sewer as well as providing on-site attenuation for the medium-density and commercial blocks; and,
- *Water Balance:* Provide adequate on-site water balance while limiting annual infiltration to existing (pre-development) levels in order to satisfy concerns related to the site's proximity to Municipal well-heads.

Water quality is met via treatment train approach, providing catchbasin inserts, goss traps, and an extended sump along with OGS units to treat the front yard and ROW areas. On-site quality controls are to be provided for the medium-density and commercial blocks as part of detailed design.

Detailed hydrologic/hydraulic models were created to evaluate both the existing and proposed conditions for the subdivision lands and to assess the affect the development will have on the existing infrastructure servicing the upstream external lands. The model results indicate that a reduction in peak discharge to both the Dorchester Road ditch and culvert as well as Dorchester Creek for the 2-year through 100-year design events is expected. The model also indicated that there will be a slight increase in peak discharge to the existing 1,350 mm trunk storm sewer along the Southern boundary of the proposed development, with a 14% increase in peak discharge to the outlet at Mill Pond. The additional volume in the trunk storm sewer increases surcharging by 0.15 m during the 2-year event, which is not expected to have a negative impact on the upstream areas. The proposed re-routing and increased diameter of the existing storm sewer servicing Byron Avenue provides a benefit by reducing the surcharging at Byron Avenue by approximately 0.30 m.

The proposed rear-yard ponding areas adequately capture and infiltrate isolated rear-yard runoff volumes for the majority of the storm events. The proposed dry-basin facilities adequately attenuate and discharge runoff volumes in exceedance of the 2-year design storm event up to and including the 100-year design storm event, with overflow directed to Dorchester Creek.

The water balance for the site generally matches that of the existing conditions, with only a 9% decrease in annual infiltration. The annual runoff volume demonstrates that a net increase will result due to the creation of impervious areas proposed as part of the development. Increasing the infiltration within the subdivision lands was not explored due to the Municipality's concerns regarding the site's close proximity to the Municipal wellhead protection areas.

7. References

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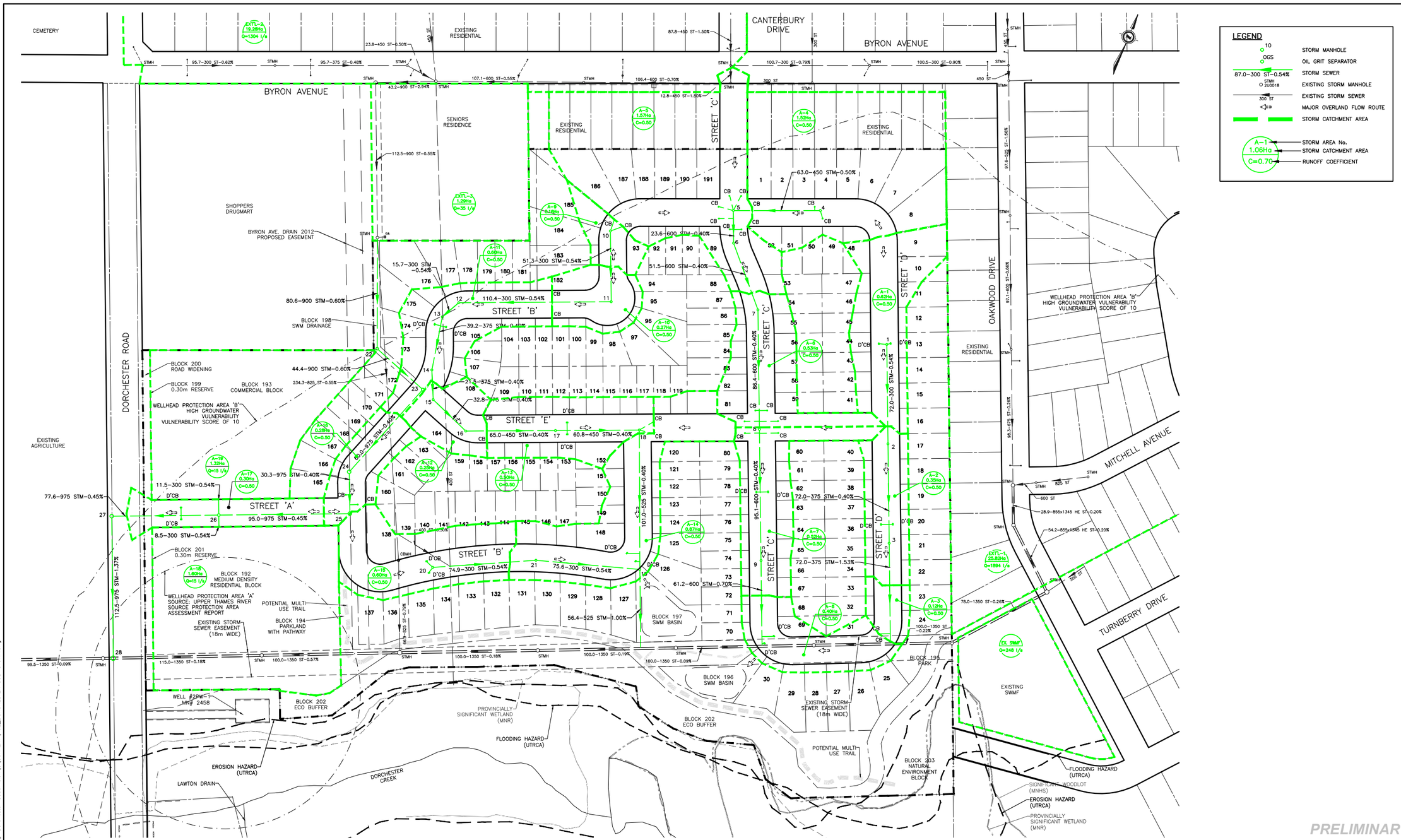
Appendix A

Conceptual Engineering Drawings



EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION	DETAILS	No.	REVISIONS	DATE	CONSULTANT
					DESIGN RJG/JCB				
					DRAWN BY RJG				
					CHECKED PAM				
					APPROVED JCB				
					DATE OCT. 2018				

CONSULTANT OR DIVISION

AECOM
London, Ontario
519.673.0510

ENGINEER'S STAMP

MUNICIPALITY OF Thames Centre

SCALE

SCALE – 1 : 1250
10 0 25m

DORCHESTER SUBDIVISION
SIFTON PROPERTIES LIMITED

STORM AREA PLAN

PROJECT No. 60568894

SHEET No. 2

PLAN FILE No.

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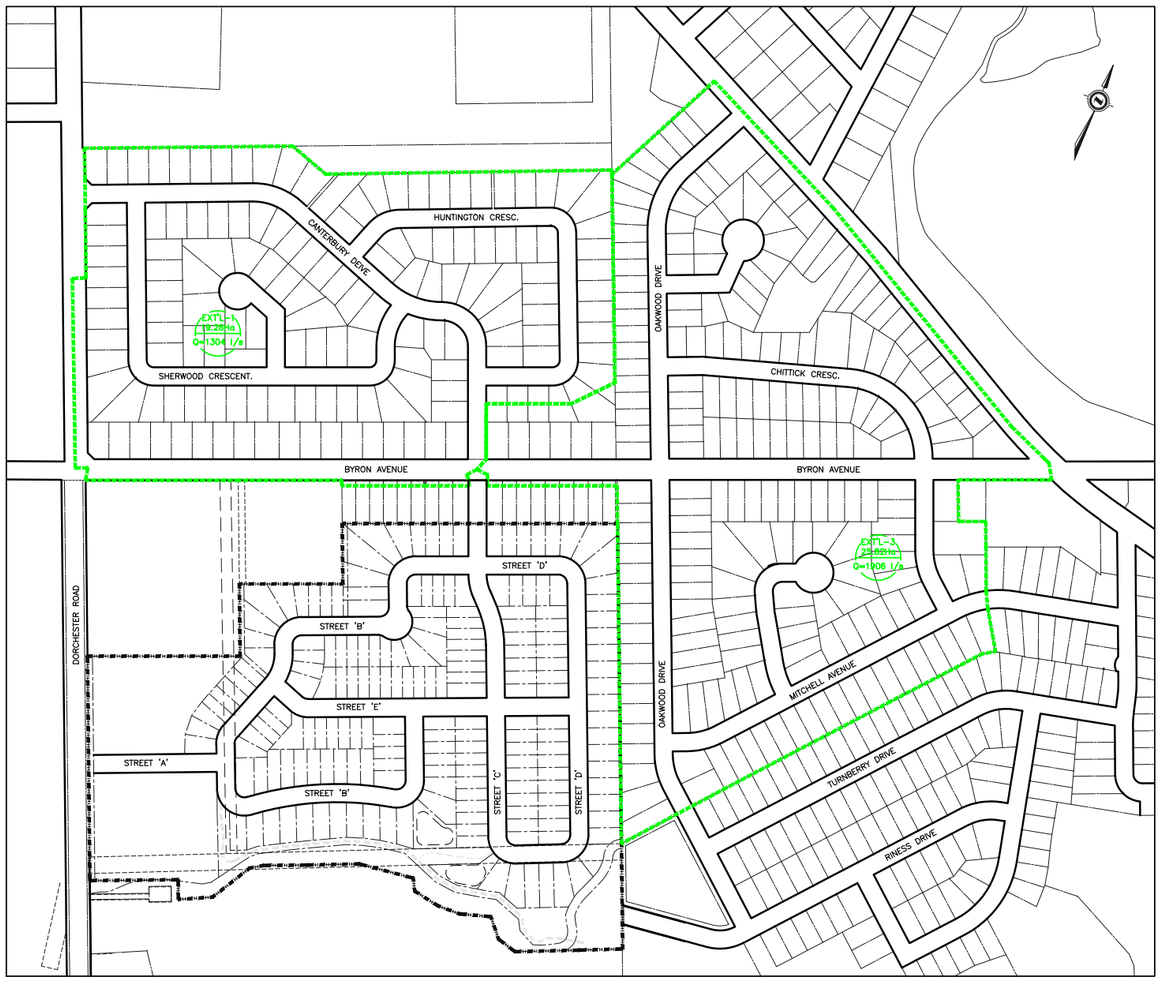

EXTERNAL STORM AREA PLAN
SCALE 1:3000

LEGEND

- 10 — STORM MANHOLE
- OGS — OIL GRIT SEPARATOR
- 87.0–300 ST–0.54% — STORM SEWER
- STMH 2U/00/18 — EXISTING STORM MANHOLE
- 300 ST — EXISTING STORM SEWER
- STORM CATCHMENT AREA
- A–1 / 1.06Ha / C=0.70 — STORM AREA No. / STORM CATCHMENT AREA / RUNOFF COEFFICIENT

RUNOFF COEFFICIENT 'C'

PARKS & PLAYGROUNDS	- 0.20
RESIDENTIAL- SINGLE & DUPLEX	- 0.50
- ROWHOUSING	- 0.65
- APARTMENTS	- 0.65 to 0.70
COMMERCIAL & INDUSTRIAL	- 0.90 & 0.70
DENSELY BUILT, PAVED	- 0.90

FLOW, Q = 2.78 CiA
WHERE Q = PEAK FLOW IN LITRES PER SECOND (L/s)
C = RUNOFF COEFFICIENT (See Above)
I = RAINFALL INTENSITY (mm/hr), RETURN PERIOD = 2 years
A = AREA IN HECTARES (ha)

STORM SEWER DESIGN SHEET
(BASED ON CITY OF LONDON 2-YR STORM)

PROJECT Dorchester Subd.
PROJECT NO. \JECT NO. 60568894
DRAINAGE AREA \GE AREA
DESIGNED BY IGNED BY RJG
CHECKED BY ΣCKED BY JB
DATE DATE 07/17/19

DORCHESTER SUBDIVISION

SEWER LOCATION				AREA		A X C				RAINFALL INTENSITY			Q								PROFILE				
AREA NO.	STREET	MH	TO MH	AREA ha.	TOT. AREA ha.	RUNOFF COEFF. (above)	INCR AxC	TOTAL SECT. AxC A X C	TOTAL LAT. A X C	CUM. SEWER (2.78 x) A x C	TIME ENT. SECT. min.	ACCUM. min.	INTENSITY 'I' mm/hr		"n"	NOM. PIPE D mm	STORM SLOPE %	CAPACITY Q l/s	VELOCITY m./s. (min. 1.0 m/s	LENGTH m	FLOW TIME minutes	SEWER FALL m	HEADLOSS m	DROP IN MANHOLE m	INVERT ELEVATION U.S. m	D.S. m
EXT'L-1	*OAKWOOD DRIVE*	*EX. STMH*	*EX. STMH*	*25.82*	*25.82*	*0.45*	*11.62*			*32.30*		*27.89*	*58.63*	*1893.91*	*0.013*	*1350*	*0.26*	*2839.59*	*1.98*	*78.0*	*0.66*	*0.203*				
	Ex. SWMF													248.00												
A-1	STREET 'D'	1	2	0.62	0.62	0.50	0.31			0.86		19.00	74.60	64.29	0.013	300	0.54	74.14	1.05	72.0	1.14	0.389				
A-2	STREET 'D'	2	3	0.35	0.97	0.50	0.18	0.31		1.35	1.14	20.14	72.03	97.12	0.013	375	0.40	115.70	1.05	72.0	1.15	0.288				
A-3	STREET 'D'	3	*EX. 1350 ST*	0.12	1.09	0.50	0.06	0.49		1.52	1.15	21.29	69.65	105.52	0.013	375	1.50	224.05	2.03	72.0	0.59	1.080				
	EX. 1350 ST	*EX. 1350 ST*	*EX. STMH*	*0.00*	*26.91*	*0.50*	*0.00*	*12.16*		*33.82*	*0.66*	*28.55*	*57.74*	*2200.55*	*0.013*	*1350*	*0.22*	*2612.05*	*1.82*	*100.0*	*0.91*	*0.220*				
A-4	STREET 'D'	4	5	1.52	1.52	0.50	0.76			2.11		19.00	74.60	157.62	0.013	450	0.50	210.34	1.32	63.0	0.79	0.315				
A-5	STREET 'C'	5	6	1.57	3.09	0.50	0.79	0.76		4.30	0.79	19.79	72.80	312.68	0.013	600	0.40	405.18	1.43	23.6	0.27	0.094				
	STREET 'C'	6	7	0.00	3.09	0.50	0.00	1.55		4.30	0.27	20.07	72.20	310.10	0.013	600	0.40	405.18	1.43	51.5	0.60	0.206				
A-6	STREET 'C'	7	8	0.53	3.62	0.50	0.27	1.55		5.03	0.60	20.67	70.92	356.86	0.013	600	0.40	405.18	1.43	86.4	1.00	0.346				
A-7	STREET 'C'	8	9	0.52	4.14	0.50	0.26	1.81		5.75	1.00	21.67	68.89	396.41	0.013	600	0.40	405.18	1.43	95.1	1.11	0.380				
A-8	STREET 'C'	9	*EX. 1350 ST*	0.40	4.54	0.50	0.20	2.07		6.31	1.11	22.78	66.79	421.46	0.013	600	0.70	536.00	1.90	61.2	0.54	0.428				
	EX. 1350 ST	*EX. STMH*	*EX. STMH*	*0.00*	*31.45*	*0.50*	*0.00*	*14.43*		*40.13*	*0.91*	*29.46*	*56.54*	*2516.91*	*0.013*	*1350*	*0.09*	1670.67	*1.17*	*100.0*	*1.43*	*0.090*				
A-9	STREET 'B'	10	11	0.16	0.16	0.50	0.08			0.22		19.00	74.60	16.59	0.013	300	0.54	74.14	1.05	51.3	0.82	0.277				
A-10	STREET 'B'	11	12	0.27	0.43	0.50	0.14	0.08		0.60	0.82	19.82	72.75	43.48	0.013	300	0.54	74.14	1.05	110.4	1.75	0.596				
	STREET 'B'	12	13	0.00	0.43	0.50	0.00	0.22		0.60	1.75	21.57	69.09	41.29	0.013	300	0.54	74.14	1.05	15.7	0.25	0.085				
A-11	STREET 'B'	13	14	0.60	1.03	0.50	0.30	0.22		1.43	0.25	21.82	68.60	98.21	0.013	375	0.40	115.70	1.05	39.2	0.62	0.157				
	STREET 'B'	14	15	0.00	1.03	0.50	0.00	0.52		1.43	0.62	22.44	67.41	96.51	0.013	375	0.40	115.70	1.05	21.5	0.34	0.088				
	STREET 'E'	15	16	0.00	1.03	0.50	0.00	0.52		1.43	0.34	22.78	66.77	95.60	0.013	375	0.40	115.70	1.05	32.8	0.52	0.131				
A-12	STREET 'E'	16	17	0.25	1.28	0.50	0.13	0.52		1.78	0.52	23.31	65.83	117.13	0.013	450	0.40	188.14	1.18	65.0	0.92	0.260				
A-13	STREET 'E'	17	18	0.50	1.78	0.50	0.25	0.64		2.47	0.92	24.22	64.24	158.95	0.013	450	0.40	188.14	1.18	60.8	0.86	0.243				
A-14	STREET 'B'	18	19	0.87	2.65	0.50	0.44	0.89		3.68	0.86	25.08	62.83	231.44	0.013	525	0.40	283.79	1.31	101.0	1.28	0.404				
A-15	STREET 'B'	20	21	0.80	0.80	0.50	0.30			0.83		19.00	74.60	82.22	0.013	300	0.54	74.14	1.05	74.9	1.19	0.404				
	STREET 'B'	21	19	0.00	0.80	0.50	0.00	0.30		0.83	1.19	20.19	71.93	59.99	0.013	300	0.54	74.14	1.05	75.6	1.20	0.408				
		19	*EX. 1350 ST*	0.00	3.25	0.50	0.00	1.63		4.52	1.28	26.36	60.84	274.83	0.013	525	1.00	448.72	2.07	56.4	0.45	0.564				
	EX. 1350 ST	*EX. 1350 ST*	*EX. STMH*	*0.00*	*34.70*	*0.50*	*0.00*	*16.06*		*44.64*	*1.43*	*30.89*	*54.78*	*2693.44*	*0.013*	*1350*	*0.19*	2427.43	*1.70*	*100.0*	*0.98*	*0.190*				
	EX. 1350 ST	*EX. STMH*	*EX. STMH*	*0.00*	*34.70*	*0.50*	*0.00*	*16.06*		*44.64*	*0.98*	*31.87*	*53.63*	*2642.15*	*0.013*	*1350*	*0.18*	2362.68	*1.65*	*100.0*	*1.01*	*0.180*				
	EX. 1350 ST	*EX. STMH*	*EX. STMH*	*0.00*	*34.70*	*0.50*	*0.00*	*16.06*		*44.64*	*1.01*	*32.88*	*52.50*	*2591.82*	*0.013*	*1350*	*0.57*	*4204.43*	*2.94*	*100.0*	*0.57*	*0.570*				
	EX. 1350 ST	*EX. STMH*	*EX. STMH*	*0.00*	*34.70*	*0.50*	*0.00*	*16.06*		*44.64*	*0.57*	*33.45*	*51.89*	*2564.53*	*0.013*	*1350*	*0.18*	2362.68	*1.65*	*115.0*	*1.16*	*0.207*				
EXT'L-2	*BYRON AVE*	*EX. STMH*	*EX. STMH*	*19.26*	*19.26*	*0.45*	*8.67*			*24.09*		*30.87*	*54.16*	*1304.95*	*0.013*	*900*	*0.55*	*1400.79*	*2.20*	*112.5*	*0.85*	*0.619*				
EXT'L-3	*SENIORS RESIDENCE*	*EX. CB*	*EX. STMH*											35.00												
		EX. STMH	22	0.00	19.26	0.50	0.00	8.67		24.09	0.85	31.72	53.80	1331.19	0.013	900	0.60	1463.08	2.30	80.6	0.58	0.484				
		22	23	0.00	19.26	0.50	0.00	8.67		24.09	0.58	32.31	53.13	1315.22	0.013	900	0.60	1463.08	2.30	44.4	0.32	0.288				
	STREET 'B'	23	24	0.00	19.26	0.50	0.00	8.67		24.09	0.32	32.63	52.78	1306.60	0.013	975	0.40	1478.84	1.98	80.0	0.67	0.320				
A-16	STREET 'B'	24	25	0.28	19.54	0.50	0.14	8.67		24.48	0.67	33.30	52.04	1309.23	0.013	975	0.40	1478.84	1.98	30.3	0.25	0.121				
A-17	STREET 'A'	25	26	0.00	19.54	0.50	0.00	8.81		24.48	0.25	33.56	51.77	1302.58	0.013	975	0.45	1568.55	2.10	95.0	0.75	0.428				
A-18	M.D. RESIDENTIAL	PLUG	1350 ST	1.60	2.20									15.00	0.013	300	0.54	74.14	1.05	8.5	0.14	0.046				
A-19	COMMERCIAL	PLUG	1350 ST	1.32	1.32									15.00	0.013	300	0.54	74.14	1.05	11.5	0.18	0.062				
	STREET 'A'	26	27	0.30	19.84	0.90	0.27	8.81		25.23	0.75	34.31	50.99	1351.64	0.013	975	0.45	1568.55	2.10	83.5	0.66	0.376				
	DORCHESTER ROAD	27	28	0.00	19.84	0.50	0.00	9.08		25.23	0.66	34.97	50.32	1334.77	0.013	975	1.37	2736.86	3.67	112.5	0.51	1.541				
		28	*EX. STMH*	*0.00*	*54.54*	*0.50*	*0.00*	*25.14*		*69.88*	*0.51*	*35.48*	*49.82*	*3794.04*	*0.013*	*1350*	*0.09*	1670.67	*1.17*	*99.5*	*1.42*	*0.090*				
		EX. STMH	*EX. STMH*	*0.00*	*54.54*	*0.50*	*0.00*	*25.14*		*69.88*	*1.42*	*36.90*	*48.47*	*3700.15*	*0.013*	*1350*	*0.09*	1670.67	*1.17*	*106.5*	*1.52*	*0.096*				
		EX. STMH	*EX. HW*	*0.00*	*54.54*	*0.50*	*0.00*	*25.14*		*69.88*	*1.52*	*38.42*	*47.12*	*3605.53*	*0.013*	*1350*	*0.09*	1670.67	*1.17*	*51.5*	*0.74*	*0.046*				

PRELIMINARY

EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS		No.	REVISIONS	DATE	CONSULTANT
DESIGN	RJG/JCB				
DRAWN BY	RJG				
CHECKED	PAM				
APPROVED	JCB				
DATE	OCT. 2018				

CONSULTANT OR DIVISION

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London, Ontario
519.673.0510

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MUNICIPALITY OF Thames Centre

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DORCHESTER SUBDIVISION
SIFTON PROPERTIES LIMITED

EXTERNAL STORM AREA PLAN & STORM SEWER DESIGN SHEET

PROJECT No. 60568894
SHEET No. 2A
PLAN FILE No.

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GRADING NOTES

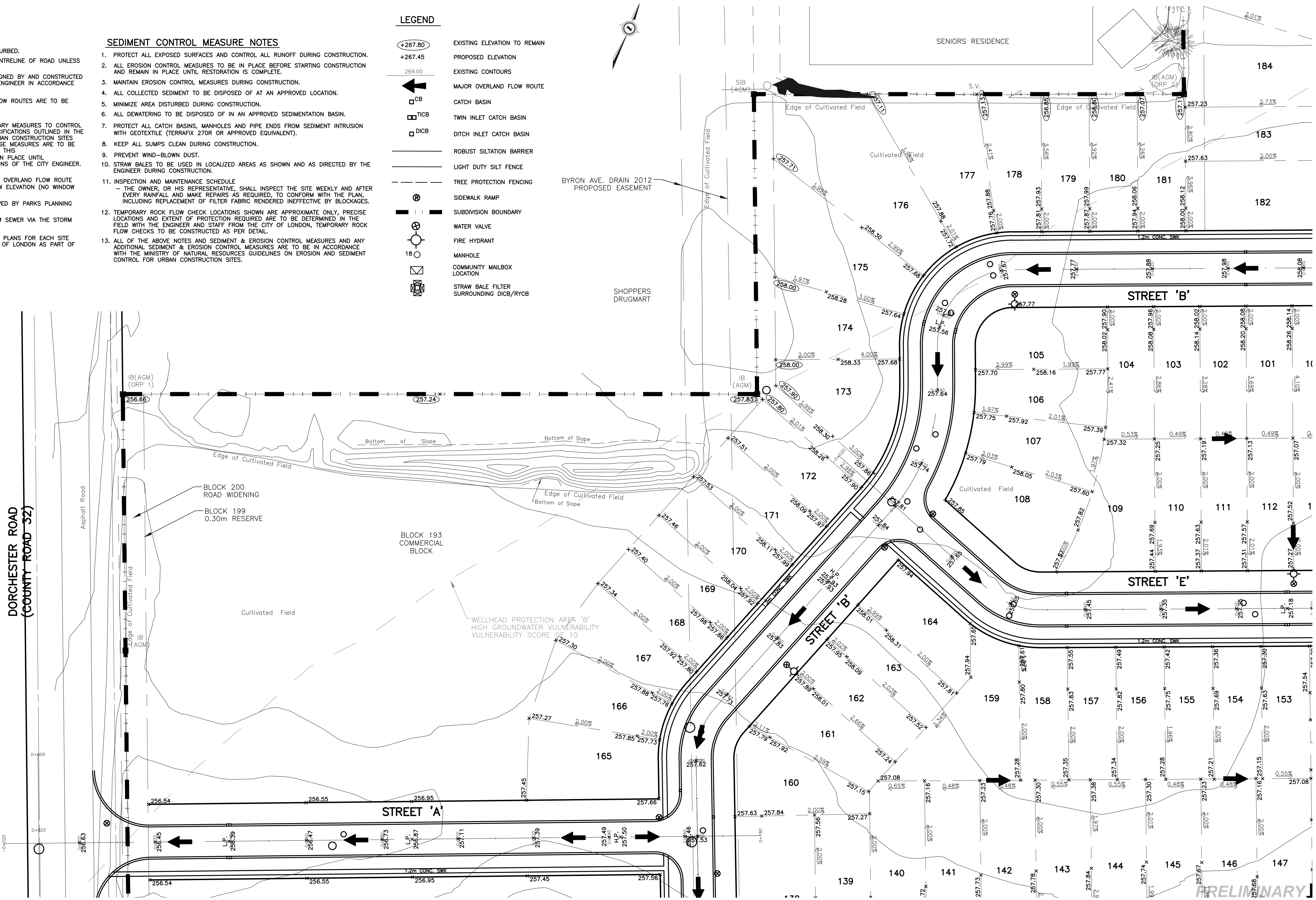
1. EXISTING DRAINAGE OF ABUTTING LAND IS NOT TO BE DISTURBED.
2. BASEMENT OPENINGS TO BE A MINIMUM 300mm ABOVE CENTRELINE OF ROAD UNLESS OTHERWISE APPROVED BY THE CITY ENGINEER.
3. RETAINING WALLS, 1m HIGH OR GREATER, ARE TO BE DESIGNED BY AND CONSTRUCTED TO THE SPECIFICATIONS OF A REGISTERED PROFESSIONAL ENGINEER IN ACCORDANCE WITH THE ONTARIO BUILDING CODE.
4. GROUND ELEVATIONS AT BUILDINGS ABUTTING OVERLAND FLOW ROUTES ARE TO BE 225mm ABOVE OVERLAND FLOW ROUTE ELEVATIONS.
5. ALL BLOCK DRAINAGE TO BE SELF CONTAINED.
6. THE SUBDIVIDER / DEVELOPER SHALL CONSTRUCT TEMPORARY MEASURES TO CONTROL SILT ENTERING THE STORM DRAINAGE SYSTEM TO THE SPECIFICATIONS OUTLINED IN THE GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES PREPARED BY THE MINISTRY OF NATURAL RESOURCES. THESE MEASURES ARE TO BE INSTALLED PRIOR TO COMMENCING ANY CONSTRUCTION FOR THIS SUBDIVISION/DEVELOPMENT/PROJECT AND ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION HAS BEEN COMPLETED TO THE SPECIFICATIONS OF THE CITY ENGINEER.
7. OPENINGS IN ANY BUILDING ON THE SIDE ADJACENT TO AN OVERLAND FLOW ROUTE ARE TO BE A MIN. OF 450mm ABOVE THE OVERLAND FLOW ELEVATION (NO WINDOW WELLS).
8. EXISTING TREES ARE NOT TO BE REMOVED UNLESS APPROVED BY PARKS PLANNING AND CITY ENGINEERS DEPARTMENT.
9. SUMP PUMP DISCHARGE MUST BE DIRECTED TO THE STORM SEWER VIA THE STORM PDC.
10. INDIVIDUAL SITE GRADING/SEDIMENT AND EROSION CONTROL PLANS FOR EACH SITE WILL NEED TO BE PREPARED AND SUBMITTED TO THE CITY OF LONDON AS PART OF THE TYPICAL SITE PLAN APPROVAL PROCESS.
11. ALL LOTS TO BE RESTORED WITH 300mm TOPSOIL.

SEDIMENT CONTROL MEASURE NOTES

1. PROTECT ALL EXPOSED SURFACES AND CONTROL ALL RUNOFF DURING CONSTRUCTION.
2. ALL EROSION CONTROL MEASURES TO BE IN PLACE BEFORE STARTING CONSTRUCTION AND REMAIN IN PLACE UNTIL RESTORATION IS COMPLETE.
3. MAINTAIN EROSION CONTROL MEASURES DURING CONSTRUCTION.
4. ALL COLLECTED SEDIMENT TO BE DISPOSED OF AT AN APPROVED LOCATION.
5. MINIMIZE AREA DISTURBED DURING CONSTRUCTION.
6. ALL DEWATERING TO BE DISPOSED OF IN AN APPROVED SEDIMENTATION BASIN.
7. PROTECT ALL CATCH BASINS, MANHOLES AND PIPE ENDS FROM SEDIMENT INTRUSION WITH GEOTEXTILE (TERRAFIX 270R OR APPROVED EQUIVALENT).
8. KEEP ALL SUMPS CLEAN DURING CONSTRUCTION.
9. PREVENT WIND-BLOWN DUST.
10. STRAW BALES TO BE USED IN LOCALIZED AREAS AS SHOWN AND AS DIRECTED BY THE ENGINEER DURING CONSTRUCTION.
11. INSPECTION AND MAINTENANCE SCHEDULE
    – THE OWNER, OR HIS REPRESENTATIVE, SHALL INSPECT THE SITE WEEKLY AND AFTER EVERY RAINFALL AND MAKE REPAIRS AS REQUIRED, TO CONFORM WITH THE PLAN, INCLUDING REPLACEMENT OF FILTER FABRIC RENDERED INEFFECTIVE BY BLOCKAGES.
12. TEMPORARY ROCK FLOW CHECK LOCATIONS SHOWN ARE APPROXIMATE ONLY, PRECISE LOCATIONS AND EXTENT OF PROTECTION REQUIRED ARE TO BE DETERMINED IN THE FIELD WITH THE ENGINEER AND STAFF FROM THE CITY OF LONDON, TEMPORARY ROCK FLOW CHECKS TO BE CONSTRUCTED AS PER DETAIL.
13. ALL OF THE ABOVE NOTES AND SEDIMENT & EROSION CONTROL MEASURES AND ANY ADDITIONAL SEDIMENT & EROSION CONTROL MEASURES ARE TO BE IN ACCORDANCE WITH THE MINISTRY OF NATURAL RESOURCES GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES.

LEGEND

Symbol	Description
(+267.80)	EXISTING ELEVATION TO REMAIN
+267.45	PROPOSED ELEVATION
269.00	EXISTING CONTOURS
◀	MAJOR OVERLAND FLOW ROUTE
□CB	CATCH BASIN
□□TICB	TWIN INLET CATCH BASIN
□DICB	DITCH INLET CATCH BASIN
———	ROBUST SILTATION BARRIER
———	LIGHT DUTY SILT FENCE
— — —	TREE PROTECTION FENCING
®	SIDEWALK RAMP
▬ ¦ ▬	SUBDIVISION BOUNDARY
⊗	WATER VALVE
⌖	FIRE HYDRANT
18○	MANHOLE
✉	COMMUNITY MAILBOX LOCATION
⊠	STRAW BALE FILTER SURROUNDING DICB/RYCB



EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION	DETAILS		No.	REVISIONS	DATE	CONSULTANT
					DESIGN	RJG/JCB				
					DRAWN BY	RJG				
					CHECKED	PAM				
					APPROVED	JCB				
					DATE	OCT. 2018				

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DORCHESTER SUBDIVISION
SIFTON PROPERTIES LIMITED

GRADING AND EROSION CONTROL PLAN No. 4

PROJECT No. 60568894

SHEET No. 5

PLAN FILE No.

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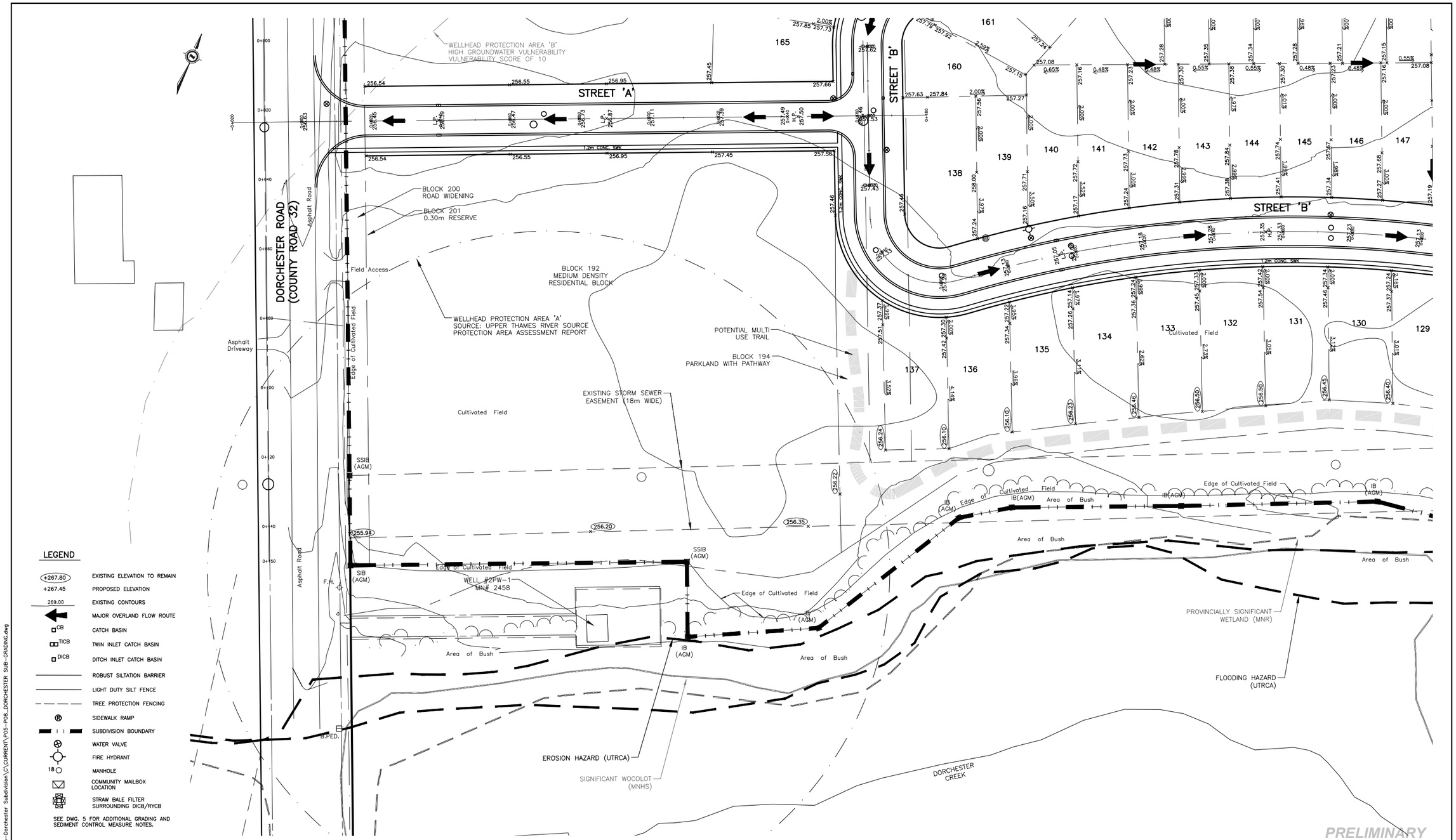

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					APPROVED JCB				
					DATE OCT. 2018				

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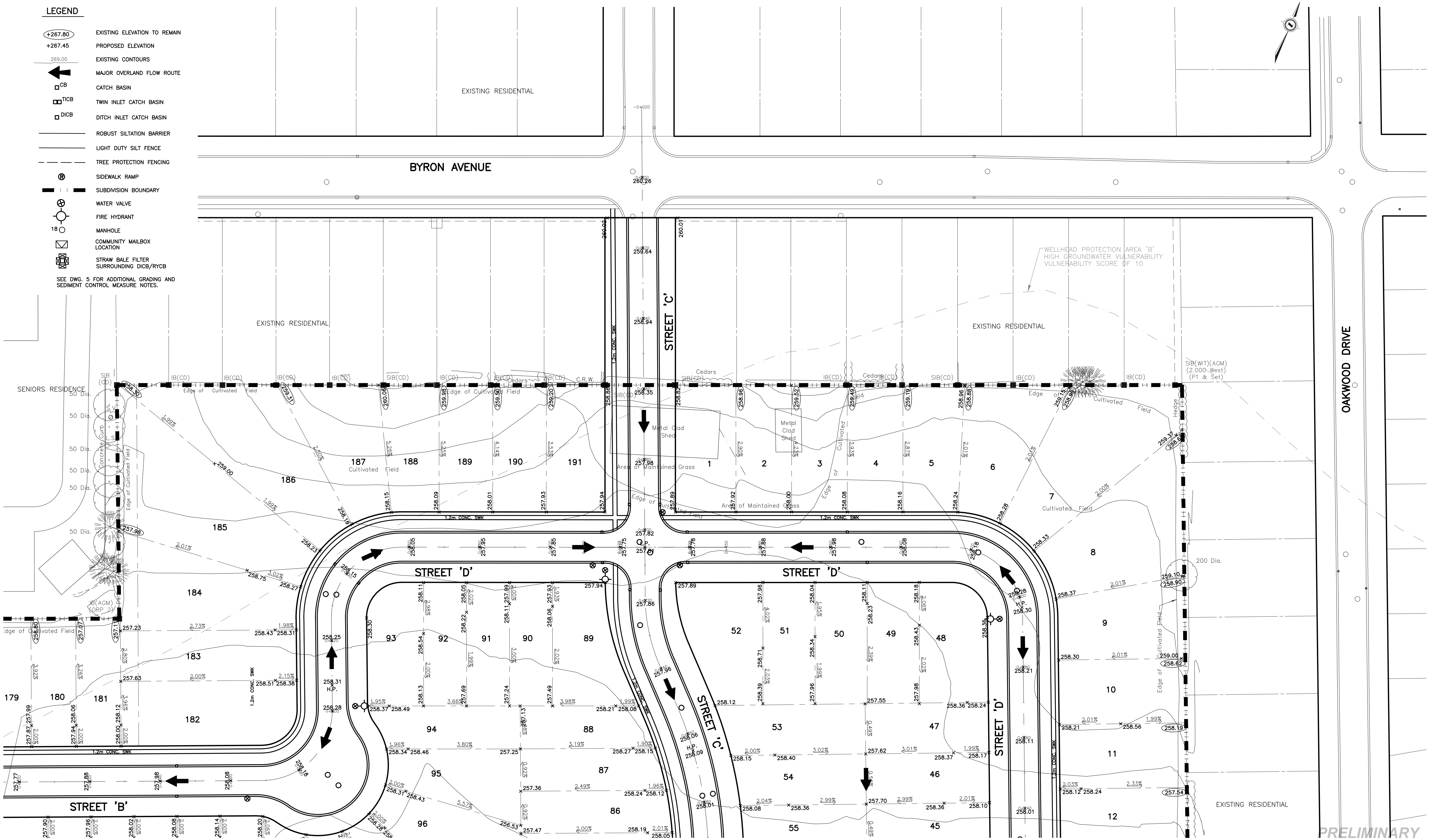
GRADING AND EROSION CONTROL PLAN No. 5

PROJECT No. 60568894
SHEET No. 6
PLAN FILE No.



EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION	DETAILS	No.	REVISIONS	DATE	CONSULTANT
					DESIGN RJG/JCB				
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GRADING AND EROSION CONTROL PLAN No. 1

PROJECT No. 60568894
SHEET No. 7
PLAN FILE No.

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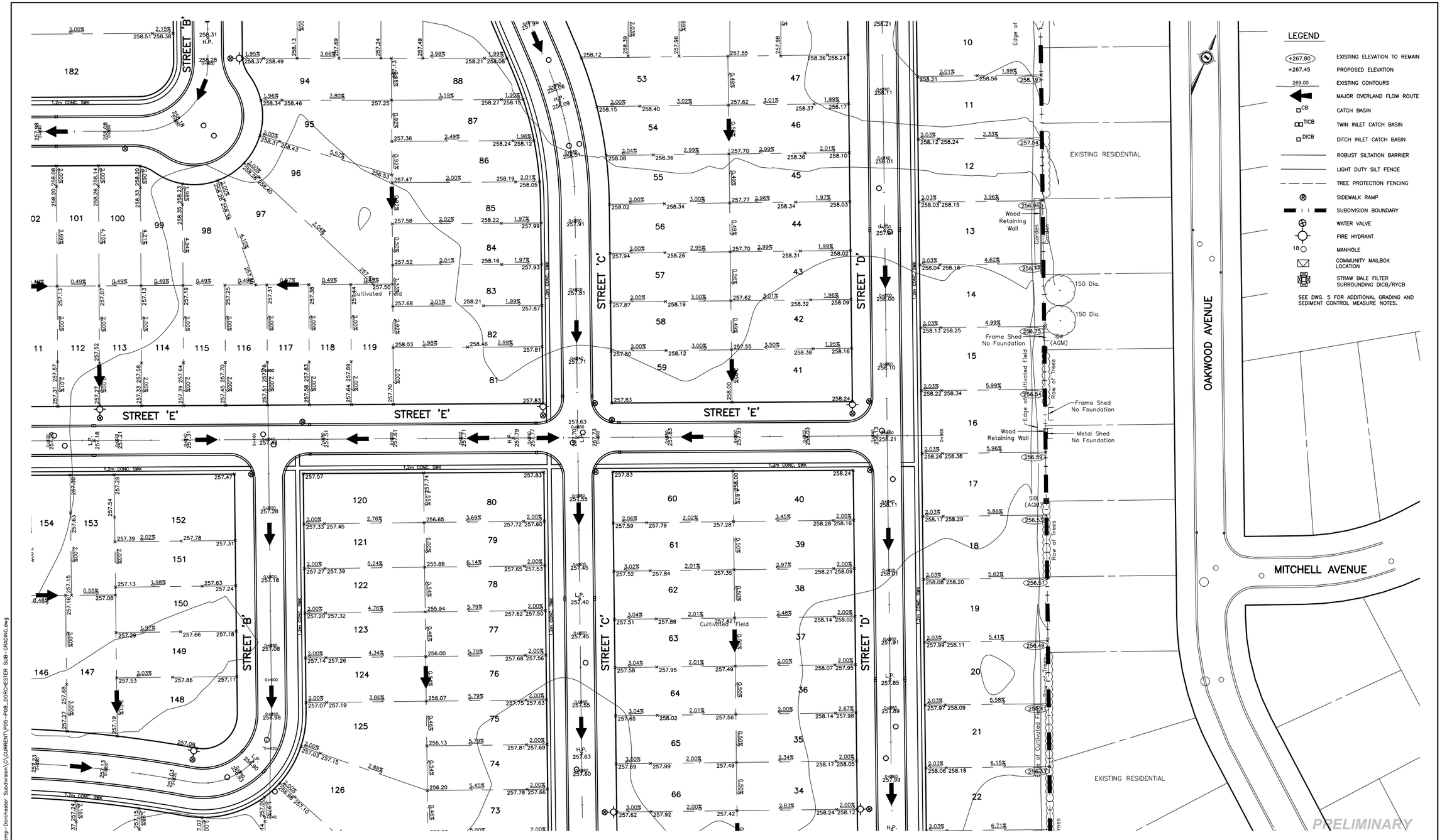

LEGEND

- +267.80 — EXISTING ELEVATION TO REMAIN
- +267.45 — PROPOSED ELEVATION
- 269.00 — EXISTING CONTOURS
- MAJOR OVERLAND FLOW ROUTE
- CB — CATCH BASIN
- TICB — TWIN INLET CATCH BASIN
- DICB — DITCH INLET CATCH BASIN
- ROBUST SILTATION BARRIER
- LIGHT DUTY SILT FENCE
- TREE PROTECTION FENCING
- SIDEWALK RAMP
- SUBDIVISION BOUNDARY
- WATER VALVE
- FIRE HYDRANT
- 18 — MANHOLE
- COMMUNITY MAILBOX LOCATION
- STRAW BALE FILTER SURROUNDING DICB/RYCB

SEE DWG. 5 FOR ADDITIONAL GRADING AND SEDIMENT CONTROL MEASURE NOTES.

EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS	
DESIGN	RJG/JCB
DRAWN BY	RJG
CHECKED	PAM
APPROVED	JCB
DATE	OCT. 2018

No.	REVISIONS	DATE	CONSULTANT

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DORCHESTER SUBDIVISION
SIFTON PROPERTIES LIMITED

GRADING AND EROSION CONTROL PLAN No. 2

PROJECT No. 60568894
SHEET No. 8
PLAN FILE No.

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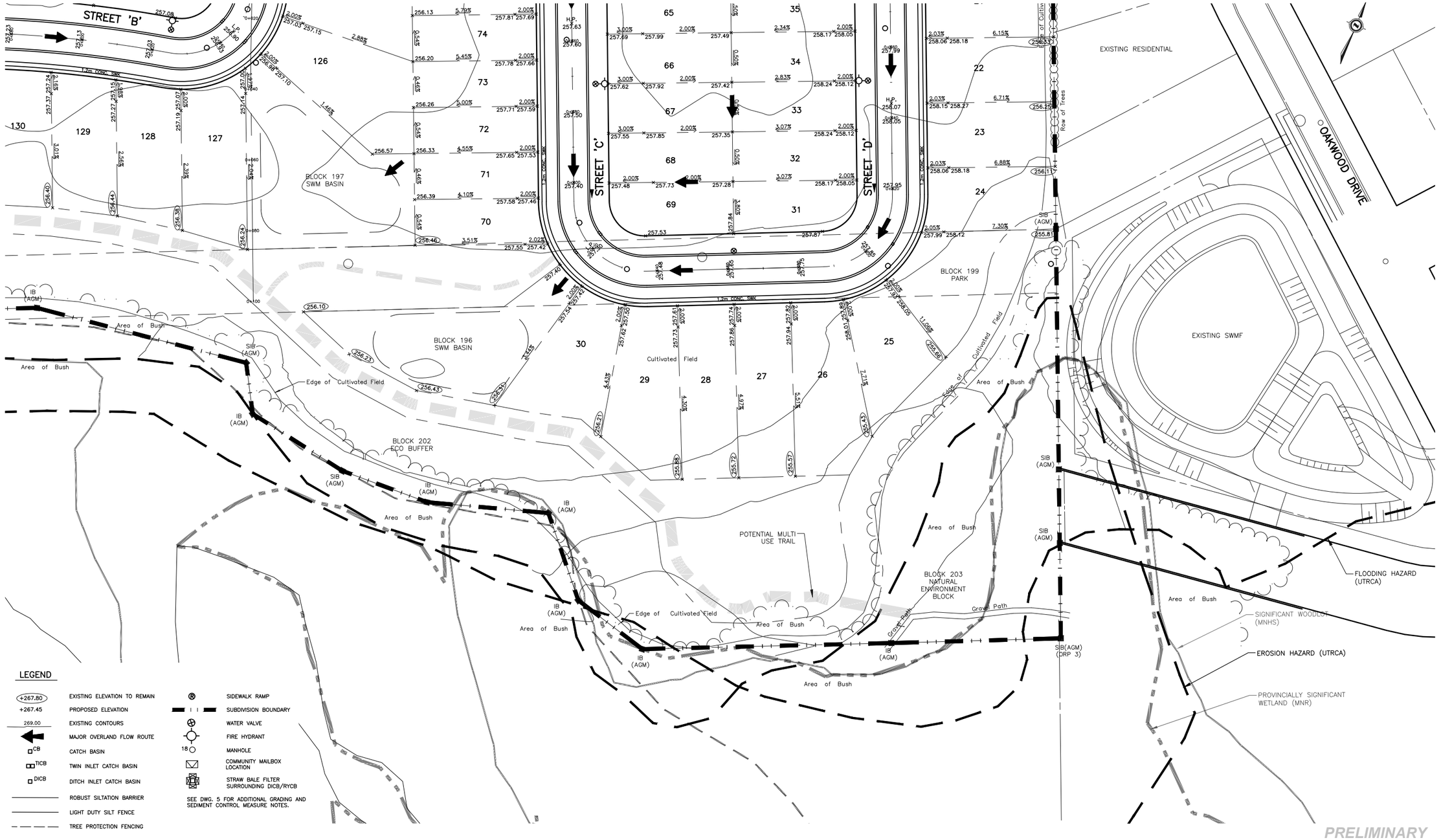

LEGEND

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- COMMUNITY MAILBOX LOCATION
- STRAW BALE FILTER SURROUNDING DICB/RYCB

SEE DWG. 5 FOR ADDITIONAL GRADING AND SEDIMENT CONTROL MEASURE NOTES.

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EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS	
DESIGN	RJG/JCB
DRAWN BY	RJG
CHECKED	PAM
APPROVED	JCB
DATE	OCT. 2018

No.	REVISIONS	DATE	CONSULTANT

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SIFTON PROPERTIES LIMITED

GRADING AND EROSION CONTROL PLAN No. 3

PROJECT No. 60568894
SHEET No. 9
PLAN FILE No.

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Appendix B

Background Information

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Minutes of Meeting

Date of Meeting	March 27, 2018	Start Time	1:30 pm	Project Number	60568894
Project Name	Dorchester Subdivision (Byron Ave.)				
Location	MOECC Office (733 Exeter Road)				
Regarding	Project Introduction and Preliminary SWM Servicing Strategy Review				
Attendees	Craig Newton, MOECC Scott Abernathy, MOECC Angelune DesLauriers, MOECC Mark Sinden, Sifton Properties Limited Jay McGuffin, MBPC Jack Brand, AECOM Peter McAllister, AECOM				
Distribution	All present				
Minutes Prepared By	Jack Brand				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

		Action
1	**Introductions**	
	• Everyone introduced themselves and noted their role within the project. • The purpose of the meeting was to present the upcoming proposed development project and to discuss any potential impacts or restrictions since the development falls within the Well Head Protection Area for wells located south of the development next to Dorchester Road. The intent is to identify any special considerations or restrictions related to Source Water Protection.	Info.
2	**Development Plan Overview**	
	• AECOM/Sifton/MBPC provided an overview of the proposed development, located south of Byron Ave., and east of Dorchester Road, consisting largely of single-family residential lots (approximately 200) and small commercial and medium density blocks fronting Dorchester Road. • The overall subdivision plan is still being finalized, subject to MOECC comments, and coordination with the proposed sanitary servicing outlet on the west side of Dorchester Road and associated development. • It is proposed to submit the plan for Draft Plan Approval with the Municipality and County as soon as any final revisions are resolved, including submission of all applicable servicing reports.	Info.

	SWM EA • Further to discussions with the Municipality, it was unclear whether the Stormwater EA completed for the surrounding area was completed, and filed. It is Sifton/AECOM understanding that the EA was never fully completed. • Craig Newton indicated that he will review his files to confirm whether the EA was completed and has status. • AECOM noted that it is proposed to develop the site using SWM measures that do not rely on an external SWM facility. The intent is to utilize an OGS and LID measures for quality control, along with potential oversized ("superpipe") pipe storage for quantity control. **Source Water Protection** • The proposed development is located within the WHPA, both A and B, with a proposed medium density residential block being located in WHPA-A, and the majority of the remainder of the site within WHPA-B. • Angelune DesLauriers confirmed that since the proposed subdivision is less than 100ha it is not considered a significant threat within the Source Water Protection areas, therefore generally no restrictions. • Some restrictions will apply to the commercial and medium density blocks, related to sanitary sewers, which may require enhanced design or construction methods.	Info. MOECC Info. MOECC
3	**Preliminary Servicing Strategy**	
	Sanitary • Proposed sanitary servicing strategy will rely on an external sanitary pumping station to be constructed on a proposed development to the west of Dorchester Road. Sifton is coordinating with the adjacent developers to confirm alignments and overall construction timing. • A portion of the proposed development is permitted to outlet to the east, connecting to Oakwood Drive, with the final limits and routing to be determined during detailed design. Thames Centre has confirmed that the outlet is available and has encouraged Sifton/AECOM to maximize the area that outlets to Oakwood Drive where possible. • AECOM will be preparing a sanitary servicing memo for submission with the Draft Plan. Water • Water servicing will connect to the local watermain system within Dorchester, connecting at Byron Ave. and Dorchester Road. • Thames Centre has indicated that there are no capacity or quality concerns. • AECOM to prepare a watermain distribution analysis report for submission with the Draft Plan. Roads • All local streets within the proposed subdivision, consisting of standard road cross section with curbs and sidewalks. • Connections at Byron Ave. and Dorchester Road.	Info. Info. Info.

	SWM • Proposed SWM strategy will include local storm sewers to collect road drainage, conveying flows to an outlet on Dorchester Road. • Dorchester Road outlet will either be open ditch or piped, connecting to the existing 1050mm storm sewer that crosses along the south limit of the proposed development. This sewer will be maintained across the development, which presently provides an outlet for the existing SWM facility located northeast of the proposed subdivision. • There are no plans to convey any storm sewer flows to the existing SWM facility. • The majority of the lots will use LID measures, by conveying roof, sumps, and rear yard drainage to the rear of the lots. The whole site consists of free-draining sand, therefore is very conducive to infiltration. • Local storm sewers will generally accommodate roads and front yards (driveways, sidewalks). • Additional quality control measures will be provided by used an OGS (oil/grit separator) unit to treat the road drainage. Storm sewers throughout the site will generally only be conveying road drainage. The OGS unit would be placed prior to outletting at Dorchester Road. • MOECC confirmed that an OGS unit can be located within the WHPA-B area, therefore there is no restriction on where the unit needs to be placed on site. • Oversized storm sewers along Street 'A', prior to outletting to Dorchester Road, are proposed to provide quantity control storage. • MOECC suggested considering utilizing perforated storm sewers as an option, subject to groundwater elevations. AECOM to review further and to discuss with Thames Centre and UTRCA. • Medium-density and commercial blocks will require permanent private systems (PPS) to meet quality and quantity control targets. • AECOM will be prepared a functional SWM Report including detailed quality and quantity control calculations as part of the Draft Plan submission. MOECC will be consulted at that time for further review prior to any ECA applications or submissions.	Info. MOECC MOECC/AECOM AECOM/MOECC
4	**Next Steps**	
	• MBPC to coordinate meeting with Thames Centre and other stakeholders as necessary. • AECOM will be preparing various supporting documentation to be included with the Draft Plan Submission. • AECOM will consult with the MOECC as part of the Functional Servicing Report and in advance of the ECA application preparation, which is a newer requirement to address. • Any questions related to Source Water Protection to be directed through Craig Newton, to forward to Angelune DesLauriers as needed.	Sifton AECOM AECOM/MOECC

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Appendix C

SWM Design Calculations

Land Use

Existing Conditions - Land Use																	
Catchment Number	Total Area	Park / Open Space	Undeveloped	Single Family Residential	Medium Density Residential	High Density Residential	Commercial	SWM	Road ROW Existing	Road ROW Proposed	Paved	Net % XImp	Net % TImp	Drainage Length	Drainage Width	Percentage Routed	Routing Type
	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)			(m)	(m)	(%)	(-)
TIMP		0.20	0.00	0.55	0.65	0.88	0.75	0.20	0.50	0.90	0.99						
XIMP		0.05	0.00	0.45	0.50	0.88	0.70	0.85	0.50	0.85	0.99						
A1	15.55		15.55									0%	0%	180	864	100%	Pervious
A2	5.29		5.29									0%	0%	75	706	100%	Pervious
EXT1	20.02			20.02								45%	55%	370	541	50%	Pervious
EXT2	25.80			25.80								45%	55%	410	629	50%	Pervious
EXT3	3.24						3.24					70%	75%	150	216	100%	Impervious
EXT4	1.29					1.29						88%	88%	90	143	100%	Impervious
EXT5	0.72			0.72								45%	55%	25	288	100%	Pervious
EXT6	0.49								0.49			50%	50%	60	82	100%	Pervious
EXT7	0.89			0.89								45%	55%	20	445	100%	Pervious
EXT8	16.26			16.26								45%	55%	330	493	100%	Impervious
Totals	89.55	0.00	20.84	63.69	0.00	1.29	3.24	0.00	0.49	0.00	0.00	-	-	-	-	-	-

Proposed Conditions - Land Use																	
Catchment Number	Total Area	Park / Open Space	Undeveloped	Single Family Residential	Medium Density Residential	High Density Residential	Commercial	SWM	Road ROW Existing	Road ROW Proposed[1]	Paved[2]	Net % XImp	Net % TImp	Drainage Length	Drainage Width	% Routed	Routing Type
	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)			(m)	(m)	(%)	(-)
TIMP		0.20	0.00	0.55	0.65	0.75	0.75	0.20	0.50	0.50	0.99						
XIMP		0.05	0.00	0.45	0.50	0.55	0.70	0.85	0.50	0.50	0.99						
A10	1.32						1.32					70%	75%	90	147	100%	Impervious
A20	1.60				1.60							50%	65%	100	160	100%	Impervious
A30	0.92			0.92								45%	55%	30	306	100%	Pervious
A40	1.33			1.33								45%	55%	30	442	100%	Pervious
A50	0.98			0.98								45%	55%	30	328	100%	Pervious
A60	3.21									3.21		50%	50%	150	214	30%	Pervious
A70	2.11			2.11								45%	55%	120	176	100%	Impervious
A80	2.01		2.01									0%	0%	45	447	100%	Pervious
A90.1	0.55									0.55		50%	50%	60	92	30%	Pervious
A90.2	0.32									0.32		50%	50%	50	64	30%	Pervious
B10	0.67			0.67								45%	55%	30	223	100%	Pervious
B20	0.71			0.71								45%	55%	30	236	100%	Pervious
B30	1.05			1.05								45%	55%	30	351	100%	Pervious
B40	4.06									4.06		50%	50%	160	254	30%	Impervious
EXT10	20.02			20.02								45%	55%	370	541	50%	Pervious
EXT20	25.80			25.80								45%	55%	410	629	50%	Pervious
EXT30	3.24						3.24					70%	75%	150	216	31%	Impervious
EXT40	1.29					1.29						55%	75%	90	143	27%	Impervious
EXT50	0.72			0.72								45%	55%	25	288	100%	Pervious
EXT60	0.49								0.49			50%	50%	60	82	100%	Pervious
EXT70	0.89			0.89								45%	55%	20	445	100%	Pervious
EXT80	16.26			16.26								45%	55%	330	493	100%	Impervious
Totals	89.55	0.03	2.04	71.49	1.63	1.32	4.59	0.03	0.52	8.17	0.03	-	-	-	-	-	-

Notes:

1. Imperviousness and routing for EXT8 and EXT80 calibrated to discharge peak flows per Quail Run Subdivision, Dorchester Stormwater Management Plan (Stantec, 2003).

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Existing Catchment Conditions							CN Calculation									
							CN II	CN III	P*	IA Perv	S	IA (0.2 S)	Q	S*	CN III*	CN II*
Catchment	Hydrologic Soil Group	Area		Soil and Landuse	CN	Weighted Average CN			(mm)	(mm)	(mm)	(mm)	(mm)	(mm)		
A1	B	15.55	7.91	Field	74	74	74	87	72	5	38.8	7.8	40.0	45.1	85	71
A2	B	5.29	0.44	Woodlot	60	73	73	86	72	5	41.2	8.2	38.7	48.9	84	69
	B		4.85	Field	74											
EXT1	B	20.02	20.02	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
EXT2	B	25.80	25.80	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
EXT3	B	3.24	3.24	Commercial	75	75	75	87	72	5	36.8	7.4	41.2	42.0	86	72
EXT4	B	1.29	1.29	High-Density	75	75	75	87	72	5	36.8	7.4	41.2	42.0	86	72
EXT5	B	0.72	0.72	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
EXT6	B	0.49	0.49	ROW	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
EXT7	B	0.89	0.89	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
EXT8	B	16.26	16.26	Residential	69	69	69	84	72	5	49.6	9.9	34.5	63.1	80	64

Proposed Catchment Conditions - Interim Conditions							CN Calculation									
							CN II	CN III	P*	IA Perv	S	IA (0.2 S)	Q	S*	CN III*	CN II*
Catchment	Hydrologic Soil Group	Area		Soil and Landuse	CN	Weighted Average CN			(mm)	(mm)	(mm)	(mm)	(mm)	(mm)		
A10	B	1.3	1.3	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
A20	B	1.6	1.6	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
A30	B	0.9	0.9	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
A40	B	1.3	1.3	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
A50	B	1.0	1.0	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
A60	B	3.2	3.2	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
A70	B	2.1	2.1	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
A80	B	2.0	1.6	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
A90.1	B	0.6	0.6	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
A90.2	B	0.3	0.3	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
B10	B	0.7	0.7	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
B20	B	0.7	0.7	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
B30	B	1.1	1.1	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
B40	B	4.1	2.0	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
EXT10	B	20.0	20.0	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
EXT20	B	25.8	25.8	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
EXT30	B	3.2	3.2	Commercial	75	75	75	87	72	5	36.8	7.4	41.2	42.0	86	72
EXT40	B	1.3	1.3	High-Density	75	75	75	87	72	5	36.8	7.4	41.2	42.0	86	72
EXT50	B	0.7	0.7	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
EXT60	B	0.5	0.5	ROW	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
EXT70	B	0.9	0.9	Residential	70	70	70	84	72	5	47.3	9.5	35.6	59.1	81	65
EXT80	B	16.3	16.3	Residential	69	69	69	84	72	5	49.6	9.9	34.5	63.1	80	64

1. Curve number based on "Hydrology", suppl. A to Sec 4, Engineering Handbook, USDA, Soil Conservation Service, 1968, and MTO Drainage Manual Design Chart 1.09.
2. Curve number for EXT8 and EXT80 based on calculations from Quail Run Subdivision, Dorchester Stormwater Management Plan (Stantec, 2003).

*100-year 3-hour storm
S = 25400/CN - 254
Q = (P - IA)^2 / (P - IA + S)

0

Catchment Summary

Existing Conditions														
Catchment Number	Area	TIMP	Total Imp. Area	CNII*	Length	Width	Pervious			Impervious			Percentage Routed	Routing Type
							IA	Slope	Manning's n	IA	Slope	Manning's n		
	(ha)	(%)	(ha)		(m)	(m)	(mm)	(%)		(mm)	(%)		(%)	
Subject Site														
A1	15.55	0	0.00	71	180	864	5	0.8	0.250	2	0.8	0.013	100	Pervious
A2	5.29	0	0.00	69	75	706	5	1.4	0.250	2	1.4	0.013	100	Pervious
Total Site Area	**20.82**	**0.0**	**0.00**	-	-	-	-	-	-	-	-	-	-	-
External Lands														
EXT1	20.02	55	11.01	65	370	541	5	2.0	0.250	2	2.0	0.013	50	Pervious
EXT2	25.80	55	14.19	65	410	629	5	2.0	0.250	2	2.0	0.013	50	Pervious
EXT3	3.24	75	2.43	72	150	216	5	2.0	0.250	2	2.0	0.013	100	Impervious
EXT4	1.29	88	1.14	72	90	143	5	2.0	0.250	2	2.0	0.013	100	Impervious
EXT5	0.72	55	0.40	65	25	288	5	2.0	0.250	2	2.0	0.013	100	Pervious
EXT6	0.49	50	0.25	65	60	82	5	2.0	0.250	2	2.0	0.013	100	Pervious
EXT7	0.89	55	0.49	65	20	445	5	2.0	0.250	2	2.0	0.013	100	Pervious
EXT8	16.26	55	8.94	64	330	493	5	2.0	0.250	2	2.0	0.013	100	Impervious
Total External Lands	**68.71**	**56.5**	**38.84**	-	-	-	-	-	-	-	-	-	-	-
Total Tributary Area	**89.53**	**43.4**	**38.84**	-	-	-	-	-	-	-	-	-	-	-

Proposed Conditions														
Catchment Number	Area	TIMP	Total Imp. Area	CNII*	Length	Width	Pervious			Impervious			Percentage Routed	Routing Type
							IA	Slope	Manning's n	IA	Slope	Manning's n		
	(ha)	(%)	(ha)		(m)	(m)	(mm)	(%)		(mm)	(%)		(%)	
Subject Site														
A10	1.32	75	0.99	65	90	147	5	2	0.250	2	2	0.013	100	Impervious
A20	1.60	65	1.04	65	100	160	5	2	0.250	2	2	0.013	100	Impervious
A30	0.92	55	0.50	65	30	306	5	2	0.250	2	2	0.013	100	Pervious
A40	1.33	55	0.73	65	30	442	5	2	0.250	2	2	0.013	100	Pervious
A50	0.98	55	0.54	65	30	328	5	2	0.250	2	2	0.013	100	Pervious
A60	3.21	50	1.61	65	150	214	5	2	0.250	2	2	0.013	30	Pervious
A70	2.11	55	1.16	65	120	176	5	2	0.250	2	2	0.013	100	Impervious
A80	2.01	0	0.00	65	45	447	5	2	0.250	2	2	0.013	100	Pervious
A90.1	0.55	50	0.28	65	60	92	5	2	0.250	2	2	0.013	30	Pervious
A90.2	0.32	50	0.16	65	50	64	5	2	0.250	2	2	0.013	30	Pervious
B10	0.67	55	0.37	65	30	223	5	2	0.250	2	2	0.013	100	Pervious
B20	0.71	55	0.39	65	30	236	5	2	0.250	2	2	0.013	100	Pervious
B30	1.05	55	0.58	65	30	351	5	2	0.250	2	2	0.013	100	Pervious
B40	4.06	50	2.03	65	160	254	5	2	0.250	2	2	0.013	30	Impervious
Total Site Area	**20.82**	**49.8**	**10.37**	-	-	-	-	-	-	-	-	-	-	-
External Lands														
EXT10	20.02	55	11.01	65	370	541	5	2	0.250	2	2	0.013	50	Pervious
EXT20	25.80	55	14.19	65	410	629	5	2	0.250	2	2	0.013	50	Pervious
EXT30	3.24	75	2.43	72	150	216	5	2	0.250	2	2	0.013	31	Impervious
EXT40	1.29	75	0.97	72	90	143	5	2	0.250	2	2	0.013	27	Impervious
EXT50	0.72	55	0.40	65	25	288	5	2	0.250	2	2	0.013	100	Pervious
EXT60	0.49	50	0.25	65	60	82	5	2	0.250	2	2	0.013	100	Pervious
EXT70	0.89	55	0.49	65	20	445	5	2	0.250	2	2	0.013	100	Pervious
EXT80	16.26	55	8.94	64	330	493	5	2	0.250	2	2	0.013	100	Impervious
Total External Lands	**68.71**	**56.3**	**38.67**	-	-	-	-	-	-	-	-	-	-	-
Total Tributary Area	**89.53**	**54.8**	**49.05**	-	-	-	-	-	-	-	-	-	-	-

Location	Catchment ID	Tributary Area	Impervious Area	% Imperviousness	Depth	Total Volume	Infiltrated Volume	Infiltration Drawdown Time[1]
		(ha)	(ha)	(%)	(m)	(m^3)	(m^3)	(hrs)
Rear Yard - 1	A40	1.33	0.73	55	0.30	391	391	8
Rear Yard - 2	A50	0.98	0.54	55	0.30	302	302	8
Rear Yard - 3	B10	0.67	0.37	55	0.30	279	279	8
Rear Yard - 4	B20	0.71	0.39	55	0.30	280	280	8
Rear Yard - 5	B30	1.05	0.58	55	0.30	280	280	8
Rear Yard - 6	A30	0.92	0.50	55	0.30	209	209	8
Rear Yard - 7	A70	2.11	1.16	55	0.30	377	377	8

Notes:
1. Drawdown time based on hydraulic conductivity of 36 mm/hr (Golder, 2018).

Overflow Dry-Basin (East)														
Component	Elevation	Overall Basin Depth	Stage Volume	Cumulative Storage Volume	Side Slope	Area	Orifice Plate Flow	Overflow Weir			Total Flow	Drawdown Time		
								Top Width	Average Width	Highflow/ Emergency Outlet Flow		Cumulative	Cumulative	Cumulative
	(m)	(m)	(m^3)	(m^3)	(H:V)	(m^2)	(m^3/s)	(m)	(m)	(m^3/s)	(m^3/s)	(min)	(hr)	(Days)
	256.60	0.00	0	0	4	450	0.00				0.00	0	0	0.0
	256.70	0.10	47	47	4	485	0.02				0.02	97	2	0.1
	256.80	0.20	50	97	4	520	0.02				0.02	140	2	0.1
	256.90	0.30	54	151	4	558	0.03				0.03	176	3	0.1
	257.00	0.40	58	209	4	596	0.03				0.03	208	3	0.1
	257.10	0.50	62	270	4	636	0.04				0.04	238	4	0.2
Overflow	257.10	0.50	0	270	4	636	0.04	3.00	3.00	0.00	0.04	238	4	0.2
	257.20	0.60	66	336	4	677	0.04	3.30	3.15	0.18	0.22	246	4	0.2
	257.30	0.70	70	406	4	719	0.04	3.60	3.30	0.52	0.56	249	4	0.2
	257.40	0.80	74	480	4	762	0.05	3.90	3.45	1.00	1.05	251	4	0.2

Volume		Orifice Size		Overflow Weir	
Total Quality Volume Required (m^3)=	n/a	Dia (m) =	0.15	Inside Width (m) =	3.0
Total Quality Volume Provided (m^3)=	n/a	Area (m^2) =	0.02	Side Slope (x:1) =	3.0
Total Quantity Volume Provided (m^3)=	480	Invert (m) =	256.60	Invert (m) =	257.10
		Discharge Coeff, Cd =	0.65	Weir Coefficient, Cw =	1.77

SWM Facility Outlet Sizing						
Outlet	Peak Discharge	Manning's 'n'	Pipe Dia.	Storm Slope	Full-Flow Capacity	Full-Flow Velocity
	(m^3/s)	1.6	(mm)	(%)	(m^3/s)	(m/s)
Minor Outlet	0.05	0.013	300	2.00	0.14	1.93
Major Overflow Outlet	1.00	-	-	-	1.00	0.97

Note:

1. Basin elevations to be determined during detailed design. 2.0125

Overflow Dry-Basin (West)														
Component	Elevation	Overall Basin Depth	Stage Volume	Cumulative Storage Volume	Side Slope	Area	Orifice Plate Flow	Overflow Weir			Total Flow	Drawdown Time		
								Top Width	Average Width	Highflow/ Emergency Outlet Flow		Cumulative	Cumulative	Cumulative
	(m)	(m)	(m^3)	(m^3)	(H:V)	(m^2)	(m^3/s)	(m)	(m)	(m^3/s)	(m^3/s)	(min)	(hr)	(Days)
	255.60	0.00	0	0	4	450	0.00				0.00	0	0	0.0
	255.70	0.10	47	47	4	485	0.04				0.04	35	1	0.0
	255.80	0.20	50	97	4	520	0.06				0.06	50	1	0.0
	255.90	0.30	54	151	4	558	0.08				0.08	63	1	0.0
	256.00	0.40	58	209	4	596	0.09				0.09	75	1	0.1
	256.10	0.50	62	270	4	636	0.10				0.10	86	1	0.1
	256.20	0.60	66	336	4	677	0.11				0.11	96	2	0.1
	256.30	0.70	70	406	4	719	0.12				0.12	106	2	0.1
	256.40	0.80	74	480	4	762	0.13				0.13	116	2	0.1
	256.50	0.90	78	558	4	807	0.13				0.13	126	2	0.1
	256.60	1.00	83	641	4	853	0.14				0.14	136	2	0.1
Overflow	256.60	1.00	0	641	4	853	0.14	3.00	3.00	0.00	0.14	136	2	0.1
	256.70	1.10	88	729	4	901	0.15	3.30	3.15	0.18	0.32	143	2	0.1
	256.80	1.20	93	821	4	949	0.15	3.60	3.30	0.52	0.68	146	2	0.1
	256.90	1.30	97	919	4	999	0.16	3.90	3.45	1.00	1.16	148	2	0.1

Volume		Orifice Size		Overflow Weir	
Total Quality Volume Required (m^3)=	n/a	Dia (m) =	0.25	Inside Width (m) =	3.0
Total Quality Volume Provided (m^3)=	n/a	Area (m^2) =	0.05	Side Slope (x:1) =	3.0
Total Quantity Volume Provided (m^3)=	919	Invert (m) =	255.60	Invert (m) =	256.60
		1.6	0.65	Weir Coefficient, Cw =	1.77

SWM Facility Outlet Sizing						
Outlet	Peak Discharge	Manning's 'n'	Pipe Dia.	Storm Slope	Full-Flow Capacity	Full-Flow Velocity
	(m^3/s)	(-)	(mm)	(%)	(m^3/s)	(m/s)
Minor Outlet	0.16	2.0125	375	2.00	0.00	0.01
Major Overflow Outlet	1.00	-	-	-	1.00	0.97

Note:

1. Basin elevations to be determined during detailed design.

Subdivision Attenuation Summary

Subdivision Storage and Attenuation Volumes										
Model	Attenuation Location	Peak Attenuation Volume (m^3) (1)								
		25mm 4-hr Chc	2-Year 3-hr Chc	5-Year 3-hr Chc	10-Year 3-hr Chc	25-Year 3-hr Chc	50-Year 3-hr Chc	100-Year 3-hr Chc	250-Year 3-hr Chc	250-Year 24-hr Chc
Proposed Conditions	Rear-Yards	414	1,098	1,144	1,462	1,845	2,159	2,496	3,010	3,500

SWM Facility Peak Summary - East						SWM Facility Peak Summary - West				
Design Storm	**Peak Inflow Rate (m^3/s)**	**Peak Outflow Rate (m^3/s)**	**Peak Storage Volume (m^3)**	**Approximate SWMF Stage Elevation (m)**	**Depth (m)**	**Peak Inflow Rate (m^3/s)**	**Peak Outflow Rate (m^3/s)**	**Peak Storage Volume (m^3)**	**Approximate SWMF Stage Elevation (m)**	**Depth (m)**
25 mm 24-Hr Chc	-	-	-	-	-	-	-	-	-	-
2-Year 3-Hr Chc	-	-	-	-	-	-	-	-	-	-
5-Year 3-Hr Chc	-	-	-	-	-	-	-	-	-	-
10-Year 3-Hr Chc	0.1	0.00	2	256.64	0.04	0.06	0.00	11	255.62	0.02
25-Year 3-Hr Chc	0.3	0.02	102	256.81	0.21	0.2	0.03	79	255.77	0.17
50-Year 3-Hr Chc	0.5	0.03	219	257.02	0.42	0.3	0.08	224	256.03	0.43
100-Year 3-Hr Chc	0.5	0.14	316	257.17	0.57	0.5	0.13	613	256.57	0.97
250-Year 3-Hr Chc	0.7	0.36	373	257.25	0.65	1.3	1.19	743	256.72	1.12
250-Year 24-Hr Chc	0.9	0.52	406	257.30	0.70	2.1	1.91	787	256.76	1.16

Note:

1. Volume exceedance due to overland flow weir spill elevation.

Outfall Peak Discharge										
Model	Outfall ID	Peak Flow (m^3/s)								
		25mm 4-hr SCS	2-Year 3-hr Chc	5-Year 3-hr Chc	10-Year 3-hr Chc	25-Year 3-hr Chc	50-Year 3-hr Chc	100-Year 3-hr Chc	250-Year 3-hr Chc	250-Year 24-hr Chc
Existing Conditions	Dorchester Creek	0.00	0.02	0.02	0.04	0.08	0.18	0.25	0.32	0.40
	Existing Ditch / Culvert	0.34	0.66	0.68	0.82	1.03	1.19	1.37	2.13	2.77
	Existing Sewer	1.67	3.08	3.12	3.28	3.53	3.69	3.80	3.86	3.90
Proposed Conditions	Dorchester Creek	0.00	0.01	0.01	0.03	0.05	0.08	0.20	1.48	2.40
	Existing Ditch / Culvert	0.33	0.64	0.65	0.78	0.94	1.06	1.19	1.43	1.50
	Existing Sewer	1.95	3.52	3.60	4.09	4.43	4.56	4.68	4.83	4.90

Outfall ID	Peak Discharge Reduction (m^3/s)								
	25mm 4-hr SCS	2-Year 3-hr Chc	5-Year 3-hr Chc	10-Year 3-hr Chc	25-Year 3-hr Chc	50-Year 3-hr Chc	100-Year 3-hr Chc	250-Year 3-hr Chc	250-Year 24-hr Chc
Dorchester Creek	0.00	-0.01	-0.01	-0.01	-0.03	-0.10	-0.05	1.16	2.00
Existing Ditch / Culvert	-0.01	-0.03	-0.03	-0.05	-0.09	-0.13	-0.18	-0.70	-1.27
Existing Sewer	0.28	0.45	0.48	0.80	0.90	0.87	0.88	0.97	1.00

Outfall ID	Peak Discharge Reduction (%)								
	25mm 4-hr SCS	2-Year 3-hr Chc	5-Year 3-hr Chc	10-Year 3-hr Chc	25-Year 3-hr Chc	50-Year 3-hr Chc	100-Year 3-hr Chc	250-Year 3-hr Chc	250-Year 24-hr Chc
Dorchester Creek	0%	-37%	-36%	-28%	-37%	-57%	-19%	367%	502%
Existing Ditch / Culvert	-3%	-4%	-5%	-6%	-8%	-11%	-13%	-33%	-46%
Existing Sewer	17%	14%	15%	24%	26%	23%	23%	25%	26%

Parameters	OGS Unit #1	OGS Unit #2
Tributary Area (ha)	3.21	4.78
Imperviousness (%)	50	51
MOE (2003) Treatment Level	Level 1 "Enhanced" Treatment (80% Annual TSS Removal)	Level 1 "Enhanced" Treatment (80% Annual TSS Removal)
Model	CDS 3030_6	CDS 3035_6ES
Structure Size (mm)	1829	1829
Particle Size Distribution	Fine	Fine
Treatment Flow Rate (L/s)	85	108
Annual Load Removal Efficiency (%)	82.1	80.2
Predicted Annual Rainfall Treated (%)	97.4	96.3
Hydrocarbon Storage (L)	895	994
Sediment Storage (L)	2,402	3,203
Total Holding Capacity (L)	5,284	6,476
Estimated Cleanout Frequency (months)	18-24	18-24

ECHELON ENVIRONMENTAL

505 Hood Road, Unit 26 Markham, ON L3R 5V6
Tel: (905) 948-0000 Fax: (905) 948-0577
E-mail: info@echelonenvironmental.ca

Transmittal

Project:	187 Dorchester Road, London ON	**ECH No.:**	N/A
Attn:	Jack Brand, M.Eng., P.Eng.	**From:**	Patrick Graham
Email:	jack.brand@aecom.com	**Date:**	July 17, 2019
Reference:	CDS TSS Removal & Grit Loading – OGS 1 PMSU 3030_6 & OGS 2 PMSU 3035_6ES		
No. of Pages:	9 (Including Cover Page)		

Dear Jack,

Please find attached our CDS TSS and Grit Loading Calculations for OGS 1 & 2 for the development at 187 Dorchester Road in Dorchester, ON.

If you have any questions or concerns, please feel free to contact our office at your convenience.

Sincerely,

Patrick Graham
Project Manager

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name: 187 Dorchester Road Subdivision
Location: Dorchester, ON
OGS #: 1

Engineer: **AECOM**
Contact: **Jack Brand**, M.Eng., P.Eng.
Report Date: 17-Jul-19

Area	3.21	ha	**Rainfall Station #**	195	
Weighted C	0.58		**Particle Size Distribution**	FINE	
CDS Model	3030		**CDS Treatment Capacity**	85	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
1.0	10.3%	20.1%	5.1	5.1	6.0	97.1	10.0
1.5	9.7%	29.7%	7.7	7.7	9.1	96.3	9.3
2.0	8.9%	38.6%	10.3	10.3	12.1	95.4	8.5
2.5	7.7%	46.2%	12.8	12.8	15.1	94.5	7.2
3.0	6.5%	52.7%	15.4	15.4	18.1	93.7	6.0
3.5	4.2%	56.9%	18.0	18.0	21.1	92.8	3.9
4.0	4.7%	61.6%	20.5	20.5	24.2	91.9	4.3
4.5	3.9%	65.4%	23.1	23.1	27.2	91.1	3.5
5.0	3.4%	68.8%	25.7	25.7	30.2	90.2	3.1
6.0	4.7%	73.6%	30.8	30.8	36.2	88.5	4.2
7.0	4.6%	78.2%	35.9	35.9	42.3	86.7	4.0
8.0	3.5%	81.7%	41.0	41.0	48.3	85.0	3.0
9.0	2.3%	84.0%	46.2	46.2	54.4	83.3	1.9
10.0	2.6%	86.6%	51.3	51.3	60.4	81.5	2.1
15.0	6.7%	93.3%	77.0	77.0	90.6	72.9	4.9
20.0	2.7%	96.0%	102.6	85.0	100.0	58.1	1.6
25.0	1.7%	97.7%	128.3	85.0	100.0	46.5	0.8
30.0	1.3%	99.0%	153.9	85.0	100.0	38.7	0.5
35.0	0.6%	99.6%	179.6	85.0	100.0	33.2	0.2
40.0	0.3%	99.8%	205.2	85.0	100.0	29.1	0.1
45.0	0.0%	99.8%	230.9	85.0	100.0	25.8	0.0
50.0	0.2%	100.0%	256.6	85.0	100.0	23.2	0.0
							88.6

Removal Efficiency Adjustment[2] = 6.5%
Predicted Net Annual Load Removal Efficiency = 82.1%
Predicted Annual Rainfall Treated = 97.4%

1 - Based on 44 years of hourly rainfall data from Canadian Station 6144475, London ON
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.
3 - CDS Efficiency based on testing conducted at the University of Central Florida
4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

ECHELON ENVIRONMENTAL

Phone: 905-948-0000
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www.echelonenvironmental.ca

Estimate of Annual Grit Collection

Engineer:	**AECOM**
Contact:	**Jack Brand**, M.Eng., P.Eng.
Report Date:	17-Jul-19

Project:	187 Dorchester Road Subdivision
CDS Model:	30_30_6 OGS 1
OGS Location:	Dorchester, ON

Area :	3.21	ha
Imperviousness :	0.5	%
Runoff Coefficient :	0.58	

Assumptions:

1. Annual Rainfall	1083	mm	
2. Typical Grit Concentration	150	mg/l	(Residential)
3. Apparent Grit Density	1.6	kg/l	(estimated)
4. Grit Capture Efficiency	80%		

Runoff Volume = Area x Rainfall Depth x Runoff Coefficient = 19,989 cu.m

Grit Collected = Grit Concentration x Runoff Volume x Grit Capture Efficiency = 2,399 kg

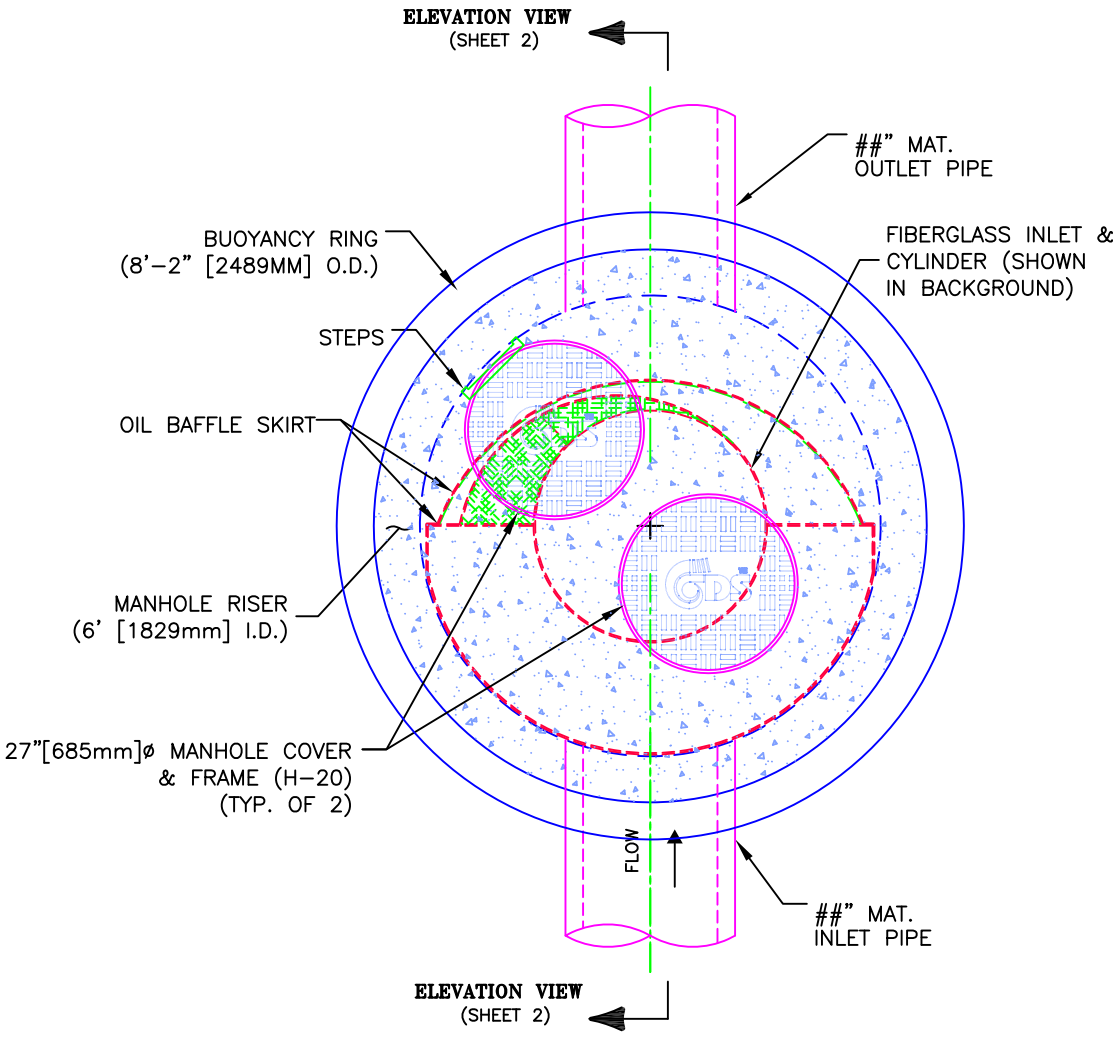
Grit Volume = Mass / Apparent Density = 1,499 litres or 1.499 cu.m

Therefore it can be expected that this site will generate approximately 1.499cu.m of grit annually.

Sump Capacity of CDS unit = 2.402 cu.m

Therefore the design sump capacity will accommodate a cleaning frequency of one time per 18 to 24 months.

PLAN VIEW

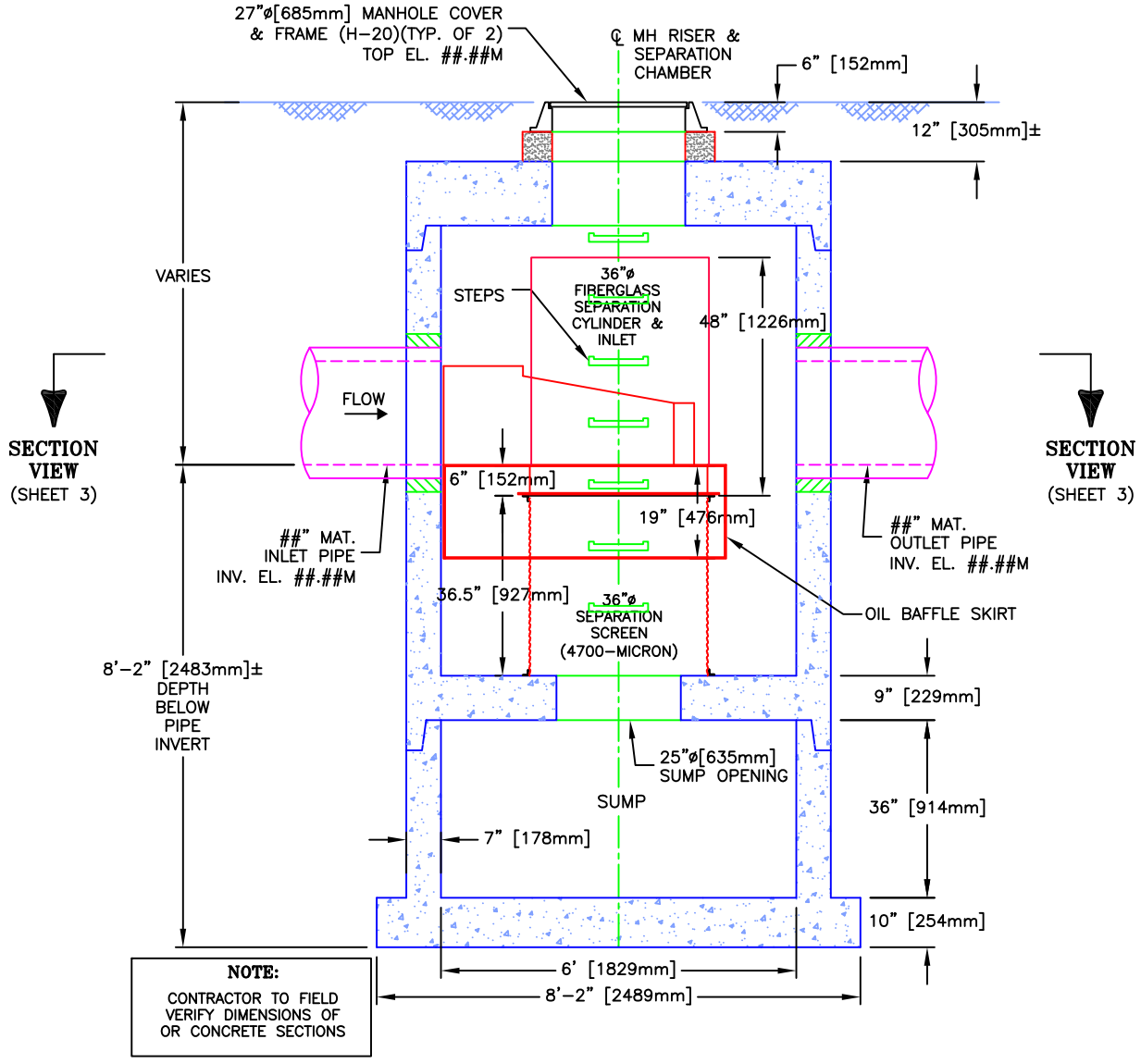


CDS MODEL PMSU30_30m, 85 L/s TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# CAN–##–###	SCALE 1" = 3'
		DATE ##/##/##	SHEET
		DRAWN INITIALS	1
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948–0000 Fax: (905) 948–0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848–9955

ELEVATION VIEW



CDS MODEL PMSU30_30m, 85 L/s TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# CAN-##-###	SCALE 1" = 3'
		DATE ##/##/##	SHEET 2
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name: 187 Dorchester Road Subdivision
Location: Dorchester, ON
OGS #: 2

Engineer: **AECOM**
Contact: **Jack Brand**, M.Eng., P.Eng.
Report Date: 17-Jul-19

Area	4.78	ha	**Rainfall Station #**	195	
Weighted C	0.58		**Particle Size Distribution**	FINE	
CDS Model	3035		**CDS Treatment Capacity**	108	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
1.0	10.3%	20.1%	7.7	7.7	7.2	96.8	9.9
1.5	9.7%	29.7%	11.6	11.6	10.8	95.8	9.3
2.0	8.9%	38.6%	15.5	15.5	14.4	94.7	8.4
2.5	7.7%	46.2%	19.3	19.3	18.0	93.7	7.2
3.0	6.5%	52.7%	23.2	23.2	21.5	92.7	6.0
3.5	4.2%	56.9%	27.0	27.0	25.1	91.7	3.9
4.0	4.7%	61.6%	30.9	30.9	28.7	90.6	4.2
4.5	3.9%	65.4%	34.8	34.8	32.3	89.6	3.5
5.0	3.4%	68.8%	38.6	38.6	35.9	88.6	3.0
6.0	4.7%	73.6%	46.4	46.4	43.1	86.5	4.1
7.0	4.6%	78.2%	54.1	54.1	50.3	84.4	3.9
8.0	3.5%	81.7%	61.8	61.8	57.4	82.4	2.9
9.0	2.3%	84.0%	69.5	69.5	64.6	80.3	1.9
10.0	2.6%	86.6%	77.3	77.3	71.8	78.3	2.0
15.0	6.7%	93.3%	115.9	107.6	100.0	65.2	4.4
20.0	2.7%	96.0%	154.5	107.6	100.0	48.9	1.3
25.0	1.7%	97.7%	193.2	107.6	100.0	39.1	0.7
30.0	1.3%	99.0%	231.8	107.6	100.0	32.6	0.4
35.0	0.6%	99.6%	270.5	107.6	100.0	27.9	0.2
40.0	0.3%	99.8%	309.1	107.6	100.0	24.4	0.1
45.0	0.0%	99.8%	347.7	107.6	100.0	21.7	0.0
50.0	0.2%	100.0%	386.4	107.6	100.0	19.6	0.0
							86.7

Removal Efficiency Adjustment[2] = 6.5%

Predicted Net Annual Load Removal Efficiency = 80.2%

Predicted Annual Rainfall Treated = 96.3%

1 - Based on 44 years of hourly rainfall data from Canadian Station 6144475, London ON

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

3 - CDS Efficiency based on testing conducted at the University of Central Florida

4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

ECHELON ENVIRONMENTAL

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info@echelonenvironmental.ca
www.echelonenvironmental.ca

Estimate of Annual Grit Collection

Engineer:	**AECOM**
Contact:	**Jack Brand**, M.Eng., P.Eng.
Report Date:	17-Jul-19

Project:	187 Dorchester Road Subdivision
CDS Model:	30_35_6 OGS 2 (Ext. Sump)
OGS Location:	Dorchester, ON

Area :	4.78	ha
Imperviousness :	0.51	%
Runoff Coefficient :	0.58	

Assumptions:

1. Annual Rainfall	1083	mm	
2. Typical Grit Concentration	150	mg/l	(Residential)
3. Apparent Grit Density	1.6	kg/l	(estimated)
4. Grit Capture Efficiency	80%		

Runoff Volume = Area x Rainfall Depth x Runoff Coefficient = 29,766 cu.m

Grit Collected = Grit Concentration x Runoff Volume x Grit Capture Efficiency = 3,572 kg

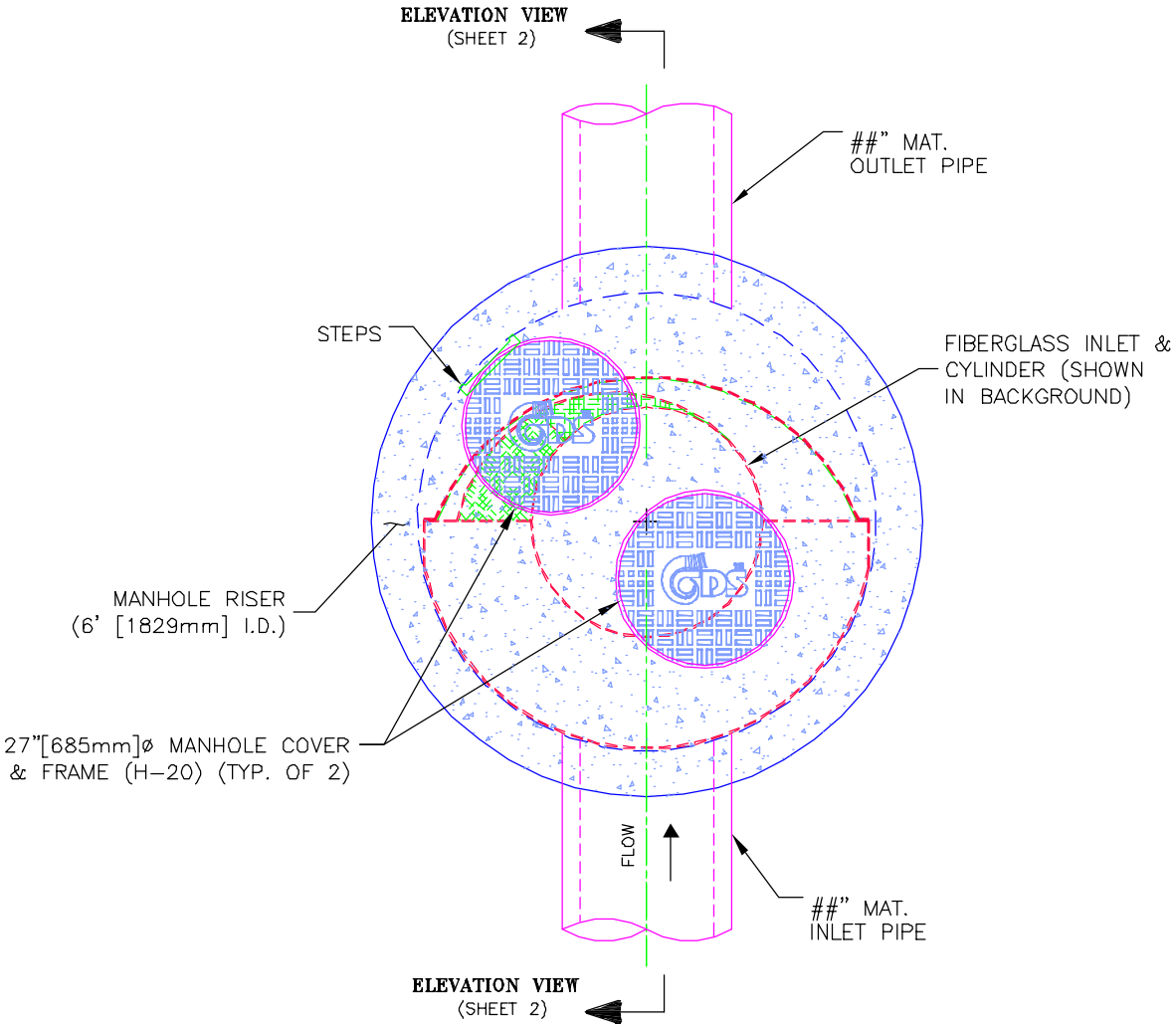
Grit Volume = Mass / Apparent Density = 2,232 litres or 2.232 cu.m

Therefore it can be expected that this site will generate approximately 2.232cu.m of grit annually.

Sump Capacity of CDS unit = 3.203 cu.m

Therefore the design sump capacity will accommodate a cleaning frequency of one time per 18 to 24 months.

PLAN VIEW



CDS MODEL PMSU30_35m
STORM WATER TREATMENT UNIT
FLOW RATE 106 L/S

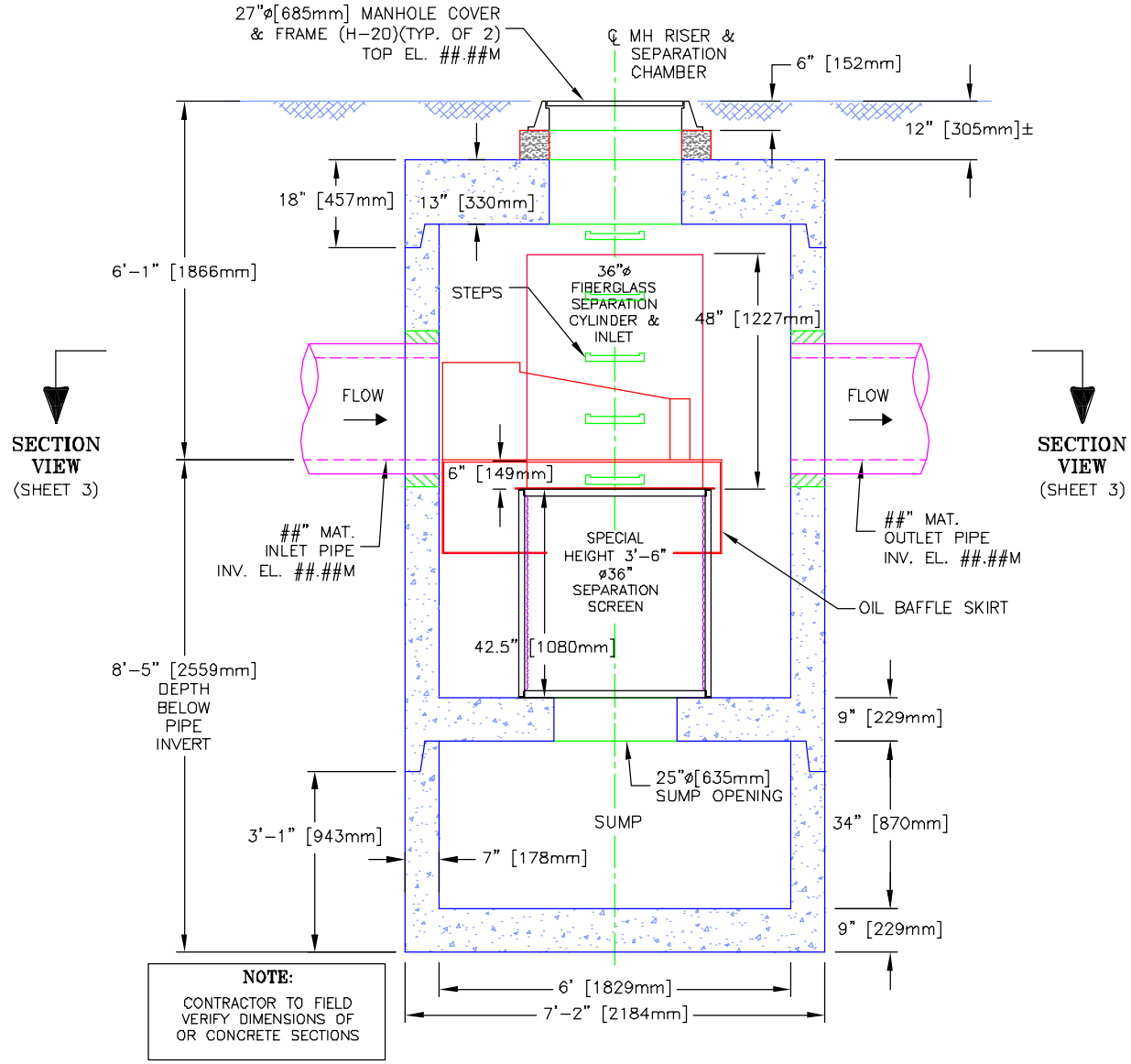
CONTECH STORMWATER SOLUTIONS

PROJECT NAME
CITY, STATE

JOB#	CAN-##-###	SCALE 1" = 2.5'
DATE	##/##/##	SHEET 1
DRAWN	INITIALS	
APPROV.		

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

ELEVATION VIEW



CDS MODEL PMSU30_35m
STORM WATER TREATMENT UNIT
FLOW RATE 106 L/S

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# CAN-##-###	SCALE 1" = 3'
		DATE ##/##/##	SHEET 2
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

Characteristics	Value
Service Catchment Area (ha)	20.82
Level of Water Quality Protection	2 x OGS Units Level 1 - 80% Long-Term S.S. Removal
Impervious Area (ha)	10.37
Total Imperviousness (%)	50
Water Quality Protection	OGS Unit x 2
Minor Storm Sewer Outlet to Dorchester Road	
Service Area (ha) - Total Tributary Area	24.96
Impervious Area (ha)	14.35
Imperviousness (%)	58
2-Year Peak Inflow (m^3/s)	1.43
Minor Storm Sewer Outlet West	
Service Area (ha)	2.11
Impervious Area (ha)	1.16
Imperviousness (%)	55
2-Year Peak Inflow (m^3/s)	0.24
Minor Storm Sewer Outlet East	
Service Area (ha)	4.78
Impervious Area (ha)	2.42
Imperviousness (%)	51
2-Year Peak Inflow (m^3/s)	0.42
Major Overland Flow Attenuation Basin West	
Service Area (ha)	28.30
Impervious Area (ha)	15.64
Imperviousness (%)	55
Depth (m)	1.30
Volume (m^3)	919
Outlet Configuration	250 mm Circular Orifice Plate
100-Year Peak Inflow (m^3/s)	0.5
100-Year Peak Attenuation Volume (m^3)	613
250-Year Major Overland Inflow - 2-Year Discharge (m^3/s)	1.81
Major Overland Flow Attenuation Basin East	
Service Area (ha)	5.49
Impervious Area (ha)	2.81
Imperviousness (%)	51
Depth (m)	0.80
Volume (m^3)	480
Outlet Configuration	150 mm Circular Orifice Plate
100-Year Peak Inflow (m^3/s)	0.5
100-Year Peak Attenuation Volume (m^3)	316
250-Year Major Overland Inflow - 2-Year Discharge (m^3/s)	0.47

AECOM

Internal Subdivision Road Flows - 20 m width

0.25% Slope

ROW Flow Capacity			
Depth of Flow Over Curb (m) =	**0.15**	Curb Height (m) =	0.15
Cross Road Slope =	2.00%	Road "n" =	0.013
Longitudinal Road Slope =	0.25%	Blvd "n" =	0.03
Width of Pavement (m) =	10	ROW Width (m) =	20
Cross Blvd. Slope =	3.00%	**QTOT =**	**3.96**
Flow Width			
Calculated Width of Flow (m) =	20.00	Flow Contained Inside of ROW	
Distance from ROW Boundary =	0.0	m Inside of the ROW	
Road			
Flow Area (m^2) =	2.500	Average Depth (m) =	0.100
Wetted Perimeter (m) =	10.300	Calculated Velocity (m/s) =	1.50
$AR^{2/3}$ =	0.973	Calculated Flow (m^3/s) =	3.74
Velocity * Flow Depth (m/s*m)=	0.45	Safe for Pedestrian Use, less than 0.8 m/s*m	
Boulevard			
Flow Area (m^2) =	0.750	Calculated Velocity (m/s) =	0.30
Wetted Perimeter (m) =	10.004	Calculated Flow (m^3/s) =	0.22
$AR^{2/3}$ =	0.133		
Velocity * Flow Depth (m/s*m)=	0.02	Safe for Pedestrian Use, less than 0.8 m/s*m	

0.50% Slope

1.6

ROW Flow Capacity			
Depth of Flow Over Curb (m) =	**0.15**	Curb Height (m) =	0.15
Cross Road Slope =	2.00%	Road "n" =	0.013
Longitudinal Road Slope =	0.50%	Blvd "n" =	0.03
Width of Pavement (m) =	10	ROW Width (m) =	20
Cross Blvd. Slope =	201.25%	**QTOT =**	**5.29**
Flow Width			
Calculated Width of Flow (m) =	10.15	Flow Contained Inside of ROW	
Distance from ROW Boundary =	-4.9	m Inside of the ROW	
Road			
Flow Area (m^2) =	2.500	Average Depth (m) =	0.100
Wetted Perimeter (m) =	10.300	Calculated Velocity (m/s) =	2.12
$AR^{2/3}$ =	0.973	Calculated Flow (m^3/s) =	5.29
Velocity * Flow Depth (m/s*m)=	0.63	Safe for Pedestrian Use, less than 0.8 m/s*m	
Boulevard			
Flow Area (m^2) =	0.011	Calculated Velocity (m/s) =	0.24
Wetted Perimeter (m) =	0.335	Calculated Flow (m^3/s) =	0.00
$AR^{2/3}$ =	0.001		
Velocity * Flow Depth (m/s*m)=	0.02	Safe for Pedestrian Use, less than 0.8 m/s*m	

0.97

Internal Subdivision Road Flows - 20 m width

0.75% Slope

ROW Flow Capacity			
Depth of Flow Over Curb (m) =	**0.15**	Curb Height (m) =	0.15
Cross Road Slope =	2.00%	Road "n" =	0.013
Longitudinal Road Slope =	0.75%	Blvd "n" =	0.03
Width of Pavement (m) =	10	ROW Width (m) =	20
Cross Blvd. Slope =	3.00%	**QTOT =**	**6.87**
Flow Width			
Calculated Width of Flow (m) =	20.00	Flow Contained Inside of ROW	
Distance from ROW Boundary =	0.0	m Inside of the ROW	
Road			
Flow Area (m^2) =	2.500	Average Depth (m) =	0.100
Wetted Perimeter (m) =	10.300	Calculated Velocity (m/s) =	2.59
$AR^{2/3}$ =	0.973	Calculated Flow (m^3/s) =	6.48
Velocity * Flow Depth (m/s*m)=	0.78	Safe for Pedestrian Use, less than 0.8 m/s*m	
Boulevard			
Flow Area (m^2) =	0.750	Calculated Velocity (m/s) =	0.51
Wetted Perimeter (m) =	10.004	Calculated Flow (m^3/s) =	0.38
$AR^{2/3}$ =	0.133		
Velocity * Flow Depth (m/s*m)=	0.04	Safe for Pedestrian Use, less than 0.8 m/s*m	

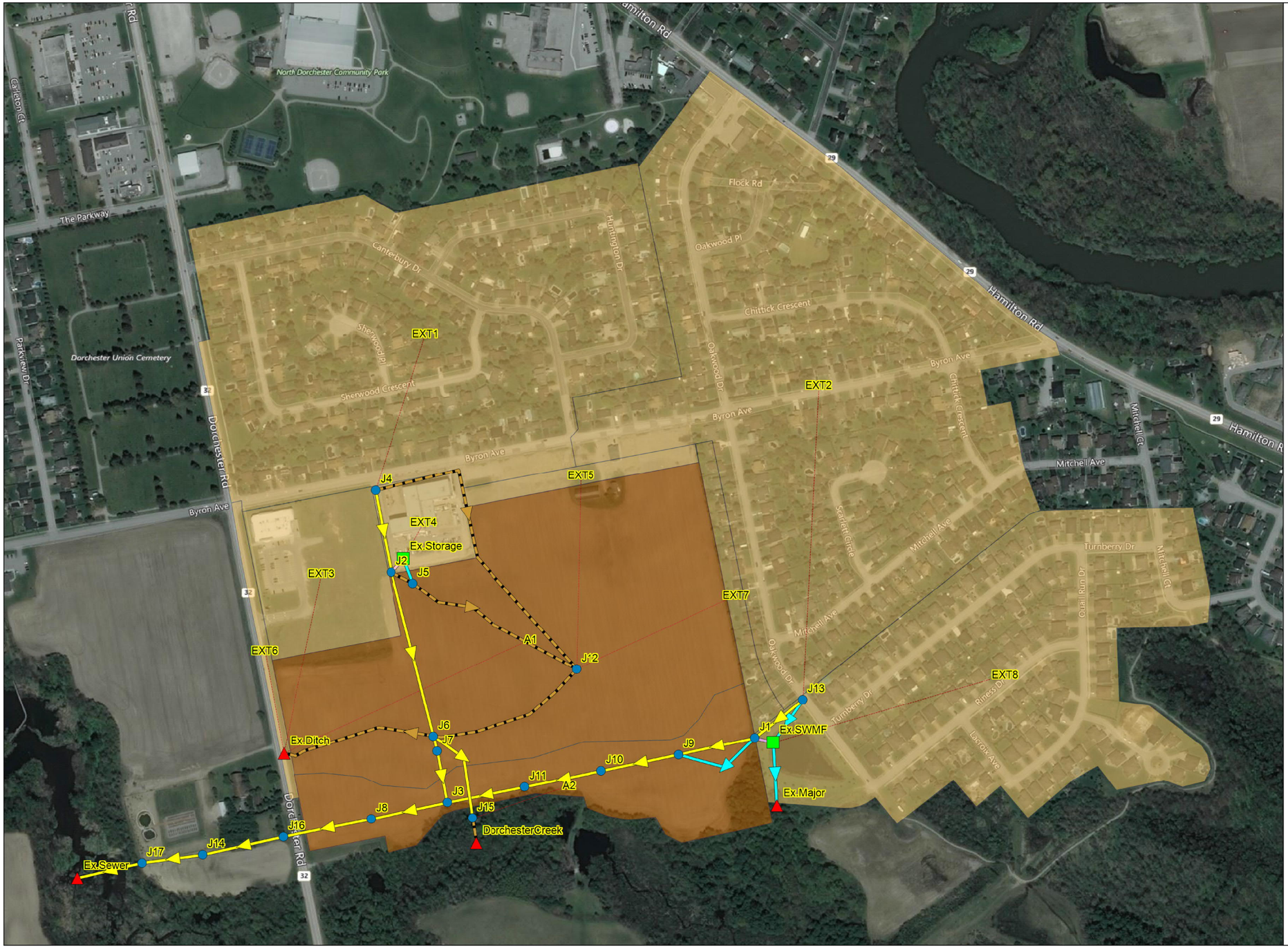
1.00% Slope

ROW Flow Capacity			
Depth of Flow Over Curb (m) =	**0.15**	Curb Height (m) =	0.15
Cross Road Slope =	2.00%	Road "n" =	0.013
Longitudinal Road Slope =	1.00%	Blvd "n" =	0.03
Width of Pavement (m) =	10	ROW Width (m) =	20
Cross Blvd. Slope =	3.00%	**QTOT =**	**7.93**
Flow Width			
Calculated Width of Flow (m) =	20.00	Flow Contained Inside of ROW	
Distance from ROW Boundary =	0.0	m Inside of the ROW	
Road			
Flow Area (m^2) =	2.500	Average Depth (m) =	0.100
Wetted Perimeter (m) =	10.300	Calculated Velocity (m/s) =	2.99
$AR^{2/3}$ =	0.973	Calculated Flow (m^3/s) =	7.48
Velocity * Flow Depth (m/s*m)=	0.90	Unsafe for Pedestrian Use, greater than 0.8	
Boulevard			
Flow Area (m^2) =	0.750	Calculated Velocity (m/s) =	0.59
Wetted Perimeter (m) =	10.004	Calculated Flow (m^3/s) =	0.44
$AR^{2/3}$ =	0.133		
Velocity * Flow Depth (m/s*m)=	0.04	Safe for Pedestrian Use, less than 0.8 m/s*m	

AECOM Imagine it. Delivered.

Appendix D

Existing Conditions SWM Model



187 Dorchester Road (Sifton) - Existing Conditions

- Junctions
- Outfalls
- Storages

Conduits

- Visible
- Overland Flow
- Orifices
- Weirs
- Outlets

Subcatchments

- Rear-Yards
- ROW
- External Areas
- Commercial
- Medium-Density
- Buffer
- Agricultural Field
- Property Line

[TITLE]

[OPTIONS]

;;Options	Value
FLOW_UNITS	CMS
INFILTRATION	CURVE_NUMBER
FLOW_ROUTING	DYNWAVE
LINK_OFFSETS	ELEVATION
MIN_SLOPE	0
ALLOW_PONDING	YES
SKIP_STEADY_STATE	NO
START_DATE	04/01/2005
START_TIME	00:00:00
REPORT_START_DATE	04/01/2005
REPORT_START_TIME	00:00:00
END_DATE	04/04/2005
END_TIME	00:00:00
SWEEP_START	01/01
SWEEP_END	12/31
DRY_DAYS	0
REPORT_STEP	00:01:00
WET_STEP	00:01:00
DRY_STEP	00:01:00
ROUTING_STEP	1
RULE_STEP	00:00:00
INERTIAL_DAMPING	PARTIAL
NORMAL_FLOW_LIMITED	BOTH
FORCE_MAIN_EQUATION	H-W
VARIABLE_STEP	0.75
LENGTHENING_STEP	0
MIN_SURFAREA	1.14
MAX_TRIALS	8
HEAD_TOLERANCE	0.0015
SYS_FLOW_TOL	5
LAT_FLOW_TOL	5
MINIMUM_STEP	0.5
THREADS	1

[EVAPORATION]

;;Type	Parameters											
MONTHLY	0	0	0	0	0	0	0	0	0	0	0	0
DRY_ONLY	NO											

[RAINGAGES]

;;Name	Rain Type	Time Intrvl	Snow Catch	Data Source	
London	INTENSITY	0:10	1.0	TIMESERIES	London-250yr24hr-10min

[SUBCATCHMENTS]

;;Name	Raingage	Outlet	Total Area	Pcnt. Imperv	Width	Pcnt. Slope	Curb Length	Snow Pack
;Field								
A1	London	Ex.Ditch	15.56	0	864.444	0.75	0	
;Field								
A2	London	J15	5.3	0	278.947	1.4	0	
;External								
EXT1	London	J4	20.02	55	541.081	2	0	
;External								
EXT2	London	J13	25.8	55	629.268	2	0	
;External								
EXT3	London	Ex.Ditch	3.24	65	216	2	0	
;External								
EXT4	London	Ex.Storage	1.29	88	143.333	2	0	
;External								
EXT5	London	J12	0.72	55	288	3	0	
;External								
EXT6	London	Ex.Ditch	0.49	50	81.667	2	0	
;External								
EXT7	London	J12	0.89	55	445	3	0	
;External								
EXT8	London	Ex.SWMF	16.26	55	492.727	2	0	

[SUBAREAS]

;;Subcatchment	N-Imperv	N-Perv	S-Imperv	S-Perv	PctZero	RouteTo	PctRouted
A1	0.013	0.25	2	5	25	PERVIOUS	100
A2	0.013	0.25	2	5	25	PERVIOUS	100
EXT1	0.013	0.25	2	5	25	PERVIOUS	50
EXT2	0.013	0.25	2	5	25	PERVIOUS	50
EXT3	0.013	0.25	2	5	25	IMPERVIOUS	100
EXT4	0.013	0.25	2	5	25	IMPERVIOUS	100
EXT5	0.013	0.25	2	5	25	PERVIOUS	100
EXT6	0.013	0.25	2	5	25	PERVIOUS	100
EXT7	0.013	0.25	2	5	25	PERVIOUS	100
EXT8	0.013	0.25	2	5	25	IMPERVIOUS	100

[INFILTRATION]

;;Subcatchment	CurveNum	HydCon	DryTime
A1	71	0.5	7
A2	69	0.5	7
EXT1	65	0.5	7
EXT2	65	0.5	7
EXT3	72	0.5	7
EXT4	72	0.5	7
EXT5	65	0.5	7
EXT6	65	0.5	7
EXT7	65	0.5	7
EXT8	64	0.5	7

Project #: 60568894
Project: Name: 187 Dorchester Road
Existing Conditions PCSWMM Input

[JUNCTIONS]

;;Name	Invert Elev.	Max. Depth	Init. Depth	Surcharge Depth	Ponded Area
J1	253.055	3.235	0	0	0
J10	252.7	3.57	0	0	0
J11	252.48	3.89	0	0	0
J12	256.197	0.5	0	0	0
J13	253.252	3.688	0	0	0
J14	251.044	2.956	0	0	0
J15	254.3	2	0	0	0
J16	251.183	3.817	0	0	0
J17	250.898	3.102	0	0	0
J2	254.82	3.58	0	0	0
J3	252.275	3.635	0	0	0
J4	255.46	5.14	0	0	0
J5	257	0.5	0	0	0
J6	253.54	3.46	0	0	0
J7	253.52	2.65	0	0	0
J8	251.68	4.71	0	0	0
J9	252.81	3.62	0	0	0

[OUTFALLS]

;;Name	Invert Elev.	Outfall Type	Stage/Table Time Series	Tide Gate	Route To
DorchesterCreek	254.1	FREE		NO	
Ex.Ditch	255.62	FREE		NO	
Ex.Major	255.5	FREE		NO	
Ex.Sewer	250.873	FREE		NO	

[STORAGE]

;;Name	Invert Elev.	Max. Depth	Init. Depth	Storage Curve	Curve Params			Evap. Frac.	Infiltration parameters		
Ex.Storage	254.82	3.18	0	TABULAR	Ex.Storage		0	0	49	100	0.413
Ex.SWMF	254.9	1.4	0	TABULAR	Ex.SWMF		0	0			

[CONDUITS]

;;Name	Inlet Node	Outlet Node	Length	Manning N	Inlet Offset	Outlet Offset	Init. Flow	Max. Flow
C1	J4	J2	105.957	0.013	255.46	254.84	0	0
C10	J9	J10	100.042	0.013	252.81	252.72	0	0
C11	J10	J11	100.035	0.013	252.7	252.505	0	0
C12	J11	J3	100.573	0.013	252.48	252.3	0	0
;Overland								
C13	J4	J12	239	0.025	259.78	257.39	0	0
;Overland								
C14	J5	J12	238.866	0.025	257	256.197	0	0
;Overland								
C16	J12	Ex.Ditch	407.907	0.025	256.197	255.62	0	0
;Overland								
C17	J15	DorchesterCreek	10	0.013	254.3	254.1	0	0
C18	J13	J1	78.126	0.013	253.252	253.08	0	1.75
C19	J16	J14	99.5	0.013	251.183	251.094	0	0
C2	J1	J9	99.637	0.013	253.055	252.835	0	0
C20	J14	J17	106.5	0.013	251.044	250.948	0	0
C21	J17	Ex.Sewer	28	0.013	250.898	250.873	0	0
C3	J3	J8	99.514	0.013	252.275	251.795	0	0
C4	J2	J6	215.022	0.013	254.82	253.54	0	0
C5	J6	J7	19.363	0.013	253.54	253.52	0	0
C6	J6	J15	124.328	0.013	254.65	254.3	0	0
;Overland								
C7	J2	J5	31.018	0.025	257.39	257	0	0
C8	J7	J3	66.387	0.013	253.52	252.99	0	0
C9	J8	J16	113.983	0.013	251.68	251.473	0	0

[ORIFICES]

;;Name	Inlet Node	Outlet Node	Orifice Type	Crest Height	Disch. Coeff.	Flap Gate	Open/Close Time
OR1	Ex.Storage	J2	SIDE	255.3	0.65	NO	0

[WEIRS]

;;Name	Inlet Node	Outlet Node	Weir Type	Crest Height	Disch. Coeff.	Flap Gate	End Con.	End Coeff.	Surcharge	RoadWidth	RoadSurf	Coeff. Curve
C15	Ex.Storage	J5	TRANSVERSE	257.4	1.78	NO	0	0	YES			
W1	J13	Ex.SWMF	TRANSVERSE	256.639	1.78	NO	0	0	YES			
W2	Ex.SWMF	Ex.Major	TRAPEZOIDAL	256	1.78	NO	0	0	YES			
W3	J1	J9	TRANSVERSE	255.99	1.78	NO	0	0	YES			

[OUTLETS]

;;Name	Inlet Node	Outlet Node	Outflow Height	Outlet Type	Qcoeff/ QTable	Qexpon	Flap Gate
OL1	Ex.SWMF	J1	254.9	TABULAR/HEAD	Ex.SWMOutlet		NO

[XSECTIONS]

;;Link	Shape	Geom1	Geom2	Geom3	Geom4	Barrels
C1	CIRCULAR	0.9	0	0	0	1
C10	CIRCULAR	1.35	0	0	0	1
C11	CIRCULAR	1.35	0	0	0	1
C12	CIRCULAR	1.35	0	0	0	1
C13	TRAPEZOIDAL	0.3	10	3	3	1
C14	TRIANGULAR	0.5	30	0	0	1
C16	TRIANGULAR	0.5	30	0	0	1
C17	TRIANGULAR	1	4	0	0	1
C18	CIRCULAR	1.35	0	0	0	1

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C19              CIRCULAR     1.35            0          0          0          1
C2               CIRCULAR     1.35            0          0          0          1
C20              CIRCULAR     1.35            0          0          0          1
C21              CIRCULAR     1.35            0          0          0          1
C3               CIRCULAR     1.35            0          0          0          1
C4               CIRCULAR     0.825           0          0          0          1
C5               CIRCULAR     0.825           0          0          0          1
C6               CIRCULAR     0.4             0          0          0          1
C7               TRIANGULAR   0.5             15         0          0          1
C8               CIRCULAR     0.825           0          0          0          1
C9               CIRCULAR     1.35            0          0          0          1
OR1              CIRCULAR     0.125           0          0          0
C15              RECT_OPEN    0.45            3          0          0
W1               RECT_OPEN    0.3             15         0          0
W2               TRAPEZOIDAL  0.2             10         0.333      0.333
W3               RECT_OPEN    0.3             10         0          0

[TRANSECTS]

NC 0.035    0.035    0.035
X1 SWMFOutlet      8        2.2      4.5      0.0      0.0      0.0      0.0      0.0
GR 1.75      0.5      1.3      1.85     1.3      2.2      1        3.1      1        3.6
GR 1.3       4.5      1.3      4.85     1.75     6.2

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate  SeepageRate
;;-------------- ---------- ---------- ---------- ---------- ----------

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Ex.SWMOutlet     Rating     0          0.007
Ex.SWMOutlet                0.1        0.014
Ex.SWMOutlet                0.2        0.124
Ex.SWMOutlet                0.3        0.171
Ex.SWMOutlet                0.4        0.208
Ex.SWMOutlet                0.5        0.239
Ex.SWMOutlet                0.6        0.266
Ex.SWMOutlet                0.7        0.291
Ex.SWMOutlet                0.8        0.314
Ex.SWMOutlet                0.9        0.415
Ex.SWMOutlet                1          0.589
Ex.SWMOutlet                1.1        0.865
Ex.SWMOutlet                1.2        1.248
Ex.SWMOutlet                1.3        1.557

;Sifton Retirement Facility
Ex.Storage       Storage    0          160
Ex.Storage                  0.48       160
Ex.Storage                  0.481      150
Ex.Storage                  2.78       150

Ex.SWMF          Storage    0          4094
Ex.SWMF                     0.1        4375
Ex.SWMF                     0.2        4656
Ex.SWMF                     0.3        4797
Ex.SWMF                     0.4        4939
Ex.SWMF                     0.5        5080
Ex.SWMF                     0.6        5221
Ex.SWMF                     0.7        5362
Ex.SWMF                     0.8        5503
Ex.SWMF                     0.9        5645
Ex.SWMF                     1          5786
Ex.SWMF                     1.1        5927
Ex.SWMF                     1.2        6068
Ex.SWMF                     1.3        6209

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Chicago design storm, a = 2619.363, b = 10.5, c = 0.884, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-100yr3hr-10min            0:00       4.545
London-100yr3hr-10min            0:10       5.529
London-100yr3hr-10min            0:20       7.042
London-100yr3hr-10min            0:30       9.632
London-100yr3hr-10min            0:40       14.915
London-100yr3hr-10min            0:50       30.154
London-100yr3hr-10min            1:00       181.387
London-100yr3hr-10min            1:10       73.569
London-100yr3hr-10min            1:20       40.376
London-100yr3hr-10min            1:30       22.893
London-100yr3hr-10min            1:40       15.501
London-100yr3hr-10min            1:50       11.556
London-100yr3hr-10min            2:00       9.147
London-100yr3hr-10min            2:10       7.54
London-100yr3hr-10min            2:20       6.401
London-100yr3hr-10min            2:30       5.555
London-100yr3hr-10min            2:40       4.903
London-100yr3hr-10min            2:50       4.387
London-100yr3hr-10min            3:00       0

;Chicago design storm, a = 1574.382, b = 9.025, c = 0.86, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-10yr3hr-10min             0:00       3.407
London-10yr3hr-10min             0:10       4.086
London-10yr3hr-10min             0:20       5.115
London-10yr3hr-10min             0:30       6.845
London-10yr3hr-10min             0:40       10.309
London-10yr3hr-10min             0:50       20.166
London-10yr3hr-10min             1:00       124.994
London-10yr3hr-10min             1:10       48.602
London-10yr3hr-10min             1:20       26.78
London-10yr3hr-10min             1:30       15.477
London-10yr3hr-10min             1:40       10.693
London-10yr3hr-10min             1:50       8.115
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London-10yr3hr-10min             2:00       6.524
London-10yr3hr-10min             2:10       5.451
London-10yr3hr-10min             2:20       4.681
London-10yr3hr-10min             2:30       4.104
London-10yr3hr-10min             2:40       3.655
London-10yr3hr-10min             2:50       3.297
London-10yr3hr-10min             3:00       0

;Chicago design storm, a = 3048.22, b = 10.03, c = 0.888, Duration = 1440 minutes, r = 0.38, rain units = mm/hr.
London-250yr24hr-10min           0:00       0.566
London-250yr24hr-10min           0:10       0.576
London-250yr24hr-10min           0:20       0.586
London-250yr24hr-10min           0:30       0.597
London-250yr24hr-10min           0:40       0.608
London-250yr24hr-10min           0:50       0.62
London-250yr24hr-10min           1:00       0.632
London-250yr24hr-10min           1:10       0.644
London-250yr24hr-10min           1:20       0.657
London-250yr24hr-10min           1:30       0.671
London-250yr24hr-10min           1:40       0.685
London-250yr24hr-10min           1:50       0.7
London-250yr24hr-10min           2:00       0.716
London-250yr24hr-10min           2:10       0.733
London-250yr24hr-10min           2:20       0.75
London-250yr24hr-10min           2:30       0.768
London-250yr24hr-10min           2:40       0.787
London-250yr24hr-10min           2:50       0.807
London-250yr24hr-10min           3:00       0.828
London-250yr24hr-10min           3:10       0.851
London-250yr24hr-10min           3:20       0.875
London-250yr24hr-10min           3:30       0.9
London-250yr24hr-10min           3:40       0.927
London-250yr24hr-10min           3:50       0.955
London-250yr24hr-10min           4:00       0.986
London-250yr24hr-10min           4:10       1.018
London-250yr24hr-10min           4:20       1.053
London-250yr24hr-10min           4:30       1.091
London-250yr24hr-10min           4:40       1.131
London-250yr24hr-10min           4:50       1.175
London-250yr24hr-10min           5:00       1.223
London-250yr24hr-10min           5:10       1.275
London-250yr24hr-10min           5:20       1.331
London-250yr24hr-10min           5:30       1.393
London-250yr24hr-10min           5:40       1.462
London-250yr24hr-10min           5:50       1.538
London-250yr24hr-10min           6:00       1.623
London-250yr24hr-10min           6:10       1.718
London-250yr24hr-10min           6:20       1.826
London-250yr24hr-10min           6:30       1.948
London-250yr24hr-10min           6:40       2.089
London-250yr24hr-10min           6:50       2.254
London-250yr24hr-10min           7:00       2.447
London-250yr24hr-10min           7:10       2.677
London-250yr24hr-10min           7:20       2.958
London-250yr24hr-10min           7:30       3.305
London-250yr24hr-10min           7:40       3.747
London-250yr24hr-10min           7:50       4.326
London-250yr24hr-10min           8:00       5.119
London-250yr24hr-10min           8:10       6.263
London-250yr24hr-10min           8:20       8.044
London-250yr24hr-10min           8:30       11.153
London-250yr24hr-10min           8:40       17.716
London-250yr24hr-10min           8:50       38.196
London-250yr24hr-10min           9:00       212.889
London-250yr24hr-10min           9:10       84.17
London-250yr24hr-10min           9:20       41.804
London-250yr24hr-10min           9:30       24.209
London-250yr24hr-10min           9:40       16.564
London-250yr24hr-10min           9:50       12.423
London-250yr24hr-10min           10:00      9.872
London-250yr24hr-10min           10:10      8.16
London-250yr24hr-10min           10:20      6.94
London-250yr24hr-10min           10:30      6.031
London-250yr24hr-10min           10:40      5.33
London-250yr24hr-10min           10:50      4.773
London-250yr24hr-10min           11:00      4.321
London-250yr24hr-10min           11:10      3.947
London-250yr24hr-10min           11:20      3.634
London-250yr24hr-10min           11:30      3.366
London-250yr24hr-10min           11:40      3.136
London-250yr24hr-10min           11:50      2.936
London-250yr24hr-10min           12:00      2.76
London-250yr24hr-10min           12:10      2.605
London-250yr24hr-10min           12:20      2.466
London-250yr24hr-10min           12:30      2.342
London-250yr24hr-10min           12:40      2.23
London-250yr24hr-10min           12:50      2.129
London-250yr24hr-10min           13:00      2.036
London-250yr24hr-10min           13:10      1.952
London-250yr24hr-10min           13:20      1.875
London-250yr24hr-10min           13:30      1.803
London-250yr24hr-10min           13:40      1.737
London-250yr24hr-10min           13:50      1.676
London-250yr24hr-10min           14:00      1.62
London-250yr24hr-10min           14:10      1.567
London-250yr24hr-10min           14:20      1.517
London-250yr24hr-10min           14:30      1.471
London-250yr24hr-10min           14:40      1.428
London-250yr24hr-10min           14:50      1.387
London-250yr24hr-10min           15:00      1.348
London-250yr24hr-10min           15:10      1.312
London-250yr24hr-10min           15:20      1.278
London-250yr24hr-10min           15:30      1.245
London-250yr24hr-10min           15:40      1.215
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London-250yr24hr-10min          15:50      1.185
London-250yr24hr-10min          16:00      1.158
London-250yr24hr-10min          16:10      1.131
London-250yr24hr-10min          16:20      1.106
London-250yr24hr-10min          16:30      1.082
London-250yr24hr-10min          16:40      1.059
London-250yr24hr-10min          16:50      1.037
London-250yr24hr-10min          17:00      1.016
London-250yr24hr-10min          17:10      0.996
London-250yr24hr-10min          17:20      0.977
London-250yr24hr-10min          17:30      0.958
London-250yr24hr-10min          17:40      0.94
London-250yr24hr-10min          17:50      0.923
London-250yr24hr-10min          18:00      0.907
London-250yr24hr-10min          18:10      0.891
London-250yr24hr-10min          18:20      0.875
London-250yr24hr-10min          18:30      0.861
London-250yr24hr-10min          18:40      0.846
London-250yr24hr-10min          18:50      0.833
London-250yr24hr-10min          19:00      0.819
London-250yr24hr-10min          19:10      0.806
London-250yr24hr-10min          19:20      0.794
London-250yr24hr-10min          19:30      0.782
London-250yr24hr-10min          19:40      0.77
London-250yr24hr-10min          19:50      0.759
London-250yr24hr-10min          20:00      0.748
London-250yr24hr-10min          20:10      0.737
London-250yr24hr-10min          20:20      0.727
London-250yr24hr-10min          20:30      0.717
London-250yr24hr-10min          20:40      0.707
London-250yr24hr-10min          20:50      0.698
London-250yr24hr-10min          21:00      0.689
London-250yr24hr-10min          21:10      0.68
London-250yr24hr-10min          21:20      0.671
London-250yr24hr-10min          21:30      0.663
London-250yr24hr-10min          21:40      0.654
London-250yr24hr-10min          21:50      0.646
London-250yr24hr-10min          22:00      0.639
London-250yr24hr-10min          22:10      0.631
London-250yr24hr-10min          22:20      0.624
London-250yr24hr-10min          22:30      0.616
London-250yr24hr-10min          22:40      0.609
London-250yr24hr-10min          22:50      0.602
London-250yr24hr-10min          23:00      0.596
London-250yr24hr-10min          23:10      0.589
London-250yr24hr-10min          23:20      0.583
London-250yr24hr-10min          23:30      0.576
London-250yr24hr-10min          23:40      0.57
London-250yr24hr-10min          23:50      0.564
London-250yr24hr-10min          24:00      0

;Chicago design storm, a = 3048.22, b = 10.03, c = 0.888, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-250yr3hr-10min           0:00       5.009
London-250yr3hr-10min           0:10       6.1
London-250yr3hr-10min           0:20       7.78
London-250yr3hr-10min           0:30       10.665
London-250yr3hr-10min           0:40       16.579
London-250yr3hr-10min           0:50       33.816
London-250yr3hr-10min           1:00       212.889
London-250yr3hr-10min           1:10       83.849
London-250yr3hr-10min           1:20       45.471
London-250yr3hr-10min           1:30       25.565
London-250yr3hr-10min           1:40       17.236
London-250yr3hr-10min           1:50       12.814
London-250yr3hr-10min           2:00       10.124
London-250yr3hr-10min           2:10       8.335
London-250yr3hr-10min           2:20       7.068
London-250yr3hr-10min           2:30       6.128
London-250yr3hr-10min           2:40       5.405
London-250yr3hr-10min           2:50       4.833
London-250yr3hr-10min           3:00       0

;Chicago design storm, a = 538.85, b = 6.331, c = 0.809, Duration = 240 minutes, r = 0.38, rain units = mm/hr.
London-25mm4hr-10min            0:00       1.396
London-25mm4hr-10min            0:10       1.558
London-25mm4hr-10min            0:20       1.769
London-25mm4hr-10min            0:30       2.056
London-25mm4hr-10min            0:40       2.468
London-25mm4hr-10min            0:50       3.115
London-25mm4hr-10min            1:00       4.286
London-25mm4hr-10min            1:10       7.08
London-25mm4hr-10min            1:20       18.278
London-25mm4hr-10min            1:30       56.252
London-25mm4hr-10min            1:40       13.841
London-25mm4hr-10min            1:50       7.728
London-25mm4hr-10min            2:00       5.382
London-25mm4hr-10min            2:10       4.151
London-25mm4hr-10min            2:20       3.394
London-25mm4hr-10min            2:30       2.882
London-25mm4hr-10min            2:40       2.511
London-25mm4hr-10min            2:50       2.231
London-25mm4hr-10min            3:00       2.01
London-25mm4hr-10min            3:10       1.832
London-25mm4hr-10min            3:20       1.686
London-25mm4hr-10min            3:30       1.563
London-25mm4hr-10min            3:40       1.458
London-25mm4hr-10min            3:50       1.367
London-25mm4hr-10min            4:00       0

;Chicago design storm, a = 2019.372, b = 9.824, c = 0.875, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-25yr3hr-10min            0:00       3.8
London-25yr3hr-10min            0:10       4.595
London-25yr3hr-10min            0:20       5.811
London-25yr3hr-10min            0:30       7.88
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London-25yr3hr-10min            0:40       12.072
London-25yr3hr-10min            0:50       24.122
London-25yr3hr-10min            1:00       147.97
London-25yr3hr-10min            1:10       58.745
London-25yr3hr-10min            1:20       32.219
London-25yr3hr-10min            1:30       18.379
London-25yr3hr-10min            1:40       12.537
London-25yr3hr-10min            1:50       9.41
London-25yr3hr-10min            2:00       7.494
London-25yr3hr-10min            2:10       6.211
London-25yr3hr-10min            2:20       5.297
London-25yr3hr-10min            2:30       4.616
London-25yr3hr-10min            2:40       4.089
London-25yr3hr-10min            2:50       3.671
London-25yr3hr-10min            3:00       0

;Chicago design storm, a = 1290, b = 8.5, c = 0.86, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-2yr3hr-10min             0:00       2.762
London-2yr3hr-10min             0:10       3.308
London-2yr3hr-10min             0:20       4.135
London-2yr3hr-10min             0:30       5.526
London-2yr3hr-10min             0:40       8.31
London-2yr3hr-10min             0:50       16.271
London-2yr3hr-10min             1:00       104.911
London-2yr3hr-10min             1:10       39.582
London-2yr3hr-10min             1:20       21.641
London-2yr3hr-10min             1:30       12.473
London-2yr3hr-10min             1:40       8.619
London-2yr3hr-10min             1:50       6.547
London-2yr3hr-10min             2:00       5.268
London-2yr3hr-10min             2:10       4.406
London-2yr3hr-10min             2:20       3.787
London-2yr3hr-10min             2:30       3.323
London-2yr3hr-10min             2:40       2.962
London-2yr3hr-10min             2:50       2.673
London-2yr3hr-10min             3:00       0

;Chicago design storm, a = 2270.665, b = 9.984, c = 0.876, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-50yr3hr-10min            0:00       4.242
London-50yr3hr-10min            0:10       5.135
London-50yr3hr-10min            0:20       6.5
London-50yr3hr-10min            0:30       8.824
London-50yr3hr-10min            0:40       13.536
London-50yr3hr-10min            0:50       27.075
London-50yr3hr-10min            1:00       164.723
London-50yr3hr-10min            1:10       65.843
London-50yr3hr-10min            1:20       36.161
London-50yr3hr-10min            1:30       20.626
London-50yr3hr-10min            1:40       14.059
London-50yr3hr-10min            1:50       10.544
London-50yr3hr-10min            2:00       8.39
London-50yr3hr-10min            2:10       6.949
London-50yr3hr-10min            2:20       5.923
London-50yr3hr-10min            2:30       5.158
London-50yr3hr-10min            2:40       4.567
London-50yr3hr-10min            2:50       4.098
London-50yr3hr-10min            3:00       0

;Chicago design storm, a = 1183.74, b = 7.641, c = 0.838, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-5yr3hr-10min             0:00       3.117
London-5yr3hr-10min             0:10       3.696
London-5yr3hr-10min             0:20       4.56
London-5yr3hr-10min             0:30       5.989
London-5yr3hr-10min             0:40       8.801
London-5yr3hr-10min             0:50       16.675
London-5yr3hr-10min             1:00       106.824
London-5yr3hr-10min             1:10       39.622
London-5yr3hr-10min             1:20       21.953
London-5yr3hr-10min             1:30       12.939
London-5yr3hr-10min             1:40       9.111
London-5yr3hr-10min             1:50       7.028
London-5yr3hr-10min             2:00       5.727
London-5yr3hr-10min             2:10       4.84
London-5yr3hr-10min             2:20       4.198
London-5yr3hr-10min             2:30       3.711
London-5yr3hr-10min             2:40       3.33
London-5yr3hr-10min             2:50       3.023
London-5yr3hr-10min             3:00       0

[REPORT]
INPUT     NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL
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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units	CMS
Process Models:	
Rainfall/Runoff	YES
RDII	NO
Snowmelt	NO
Groundwater	NO
Flow Routing	YES
Ponding Allowed	YES
Water Quality	NO
Infiltration Method	CURVE_NUMBER
Flow Routing Method	DYNWAVE
Surcharge Method	EXTRAN
Starting Date	04/01/2005 00:00:00
Ending Date	04/04/2005 00:00:00
Antecedent Dry Days	0.0
Report Time Step	00:01:00
Wet Time Step	00:01:00
Dry Time Step	00:01:00
Routing Time Step	1.00 sec
Variable Time Step	YES
Maximum Trials	8
Number of Threads	1
Head Tolerance	0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	2.244	25.049
Evaporation Loss	0.000	0.000
Infiltration Loss	1.321	14.753
Surface Runoff	0.800	8.930
Final Storage	0.123	1.369
Continuity Error (%)	-0.013	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.800	7.999
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.782	7.824
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.018	0.178
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	-0.044	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	0.50 sec
Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A1	25.05	0.00	0.00	23.78	0.00	0.00	0.00	0.00	0.00	0.000
A2	25.05	0.00	0.00	23.79	0.00	0.00	0.00	0.00	0.00	0.000
EXT1	25.05	0.00	0.00	12.94	12.95	4.24	10.71	2.14	0.74	0.428
EXT2	25.05	0.00	0.00	13.04	12.95	4.13	10.61	2.74	0.93	0.423
EXT3	25.05	0.00	0.00	8.32	15.31	0.00	15.31	0.50	0.32	0.611
EXT4	25.05	0.00	0.00	2.85	20.73	0.00	20.73	0.27	0.17	0.828

EXT5	25.05	0.00	0.00	11.53	12.97	12.15	12.15	0.09	0.06	0.485
EXT6	25.05	0.00	0.00	13.16	11.78	10.52	10.52	0.05	0.02	0.420
EXT7	25.05	0.00	0.00	11.49	12.97	12.19	12.19	0.11	0.08	0.487
EXT8	25.05	0.00	0.00	10.70	12.95	0.00	12.95	2.11	1.22	0.517

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.03	0.60	253.66	0 01:40	0.60
J10	JUNCTION	0.03	0.60	253.30	0 01:42	0.60
J11	JUNCTION	0.03	0.62	253.10	0 01:42	0.62
J12	JUNCTION	0.01	0.11	256.30	0 02:00	0.11
J13	JUNCTION	0.02	0.57	253.82	0 01:40	0.57
J14	JUNCTION	0.05	0.88	251.92	0 01:44	0.88
J15	JUNCTION	0.00	0.00	254.30	0 00:00	0.00
J16	JUNCTION	0.05	0.93	252.11	0 01:43	0.93
J17	JUNCTION	0.04	0.75	251.65	0 01:44	0.75
J2	JUNCTION	0.01	0.49	255.31	0 01:40	0.48
J3	JUNCTION	0.03	0.63	252.90	0 01:42	0.63
J4	JUNCTION	0.01	0.47	255.93	0 01:40	0.47
J5	JUNCTION	0.00	0.00	257.00	0 00:00	0.00
J6	JUNCTION	0.02	0.52	254.06	0 01:41	0.52
J7	JUNCTION	0.01	0.44	253.96	0 01:41	0.44
J8	JUNCTION	0.04	0.80	252.48	0 01:43	0.80
J9	JUNCTION	0.04	0.68	253.49	0 01:41	0.68
DorchesterCreek	OUTFALL	0.00	0.00	254.10	0 00:00	0.00
Ex.Ditch	OUTFALL	0.00	0.05	255.67	0 02:00	0.05
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.03	0.68	251.55	0 01:44	0.68
Ex.Storage	STORAGE	0.04	0.86	255.68	0 01:56	0.86
Ex.SWMF	STORAGE	0.02	0.28	255.18	0 02:13	0.28

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	1.008	0 01:40	0	4.84	-0.202
J10	JUNCTION	0.000	0.978	0 01:41	0	4.85	0.102
J11	JUNCTION	0.000	0.973	0 01:42	0	4.84	-0.117
J12	JUNCTION	0.134	0.134	0 01:41	0.196	0.196	-0.004
J13	JUNCTION	0.928	0.928	0 01:40	2.74	2.74	0.133
J14	JUNCTION	0.000	1.665	0 01:43	0	7.08	0.104
J15	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J16	JUNCTION	0.000	1.666	0 01:43	0	7.09	0.057
J17	JUNCTION	0.000	1.666	0 01:44	0	7.07	-0.084
J2	JUNCTION	0.000	0.744	0 01:40	0	2.22	-0.310
J3	JUNCTION	0.000	1.668	0 01:42	0	7.08	-0.001
J4	JUNCTION	0.740	0.740	0 01:40	2.14	2.14	0.495
J5	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J6	JUNCTION	0.000	0.727	0 01:40	0	2.23	0.008
J7	JUNCTION	0.000	0.716	0 01:41	0	2.23	-0.000
J8	JUNCTION	0.000	1.674	0 01:42	0	7.08	-0.109
J9	JUNCTION	0.000	0.991	0 01:40	0	4.85	0.046
DorchesterCreek	OUTFALL	0.000	0.000	0 00:00	0	0	0.000 ltr
Ex.Ditch	OUTFALL	0.329	0.339	0 01:40	0.548	0.744	0.000
Ex.Major	OUTFALL	0.000	0.000	0 00:00	0	0	0.000 ltr
Ex.Sewer	OUTFALL	0.000	1.667	0 01:44	0	7.08	0.000
Ex.Storage	STORAGE	0.173	0.173	0 01:40	0.267	0.267	-0.001
Ex.SWMF	STORAGE	1.223	1.223	0 01:40	2.11	2.11	-0.013

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Ex.Storage	0.006	1	0	67	0.134	28	0 01:56	0.033
Ex.SWMF	0.087	1	0	0	1.240	17	0 02:13	0.160

Outfall Loading Summary

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Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	0.00	0.000	0.000	0.000
Ex.Ditch	22.26	0.013	0.339	0.744
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	35.66	0.077	1.667	7.080
System	14.48	0.089	1.667	7.824

****
Link Flow Summary
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Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.733	0 01:40	2.20	0.53	0.52
C10	CONDUIT	0.978	0 01:41	1.49	0.61	0.47
C11	CONDUIT	0.973	0 01:42	1.59	0.41	0.44
C12	CONDUIT	0.976	0 01:42	1.58	0.43	0.45
C13	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C14	CONDUIT	0.000	0 00:00	0.00	0.00	0.11
C16	CONDUIT	0.031	0 02:00	0.18	0.01	0.15
C17	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C18	CONDUIT	0.922	0 01:40	1.60	0.37	0.42
C19	CONDUIT	1.665	0 01:43	1.69	1.04	0.65
C2	CONDUIT	0.991	0 01:40	1.53	0.39	0.46
C20	CONDUIT	1.666	0 01:44	1.92	1.04	0.58
C21	CONDUIT	1.667	0 01:44	2.16	1.04	0.53
C3	CONDUIT	1.674	0 01:42	2.25	0.41	0.52
C4	CONDUIT	0.727	0 01:40	2.13	0.66	0.61
C5	CONDUIT	0.716	0 01:41	2.21	1.55	0.58
C6	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C7	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C8	CONDUIT	0.716	0 01:41	2.47	0.56	0.53
C9	CONDUIT	1.666	0 01:43	2.08	0.73	0.55
OR1	ORIFICE	0.020	0 01:56			1.00
C15	WEIR	0.000	0 00:00			0.00
W1	WEIR	0.000	0 00:00			0.00
W2	WEIR	0.000	0 00:00			0.00
W3	WEIR	0.000	0 00:00			0.00
OL1	DUMMY	0.160	0 02:13			

****
Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.99	0.01	0.00
C10	1.00	0.00	0.00	0.00	0.24	0.00	0.00	0.76	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.19	0.00	0.00	0.81	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.02	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C17	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C18	1.00	0.00	0.00	0.00	0.25	0.00	0.00	0.75	0.23	0.00
C19	1.00	0.00	0.00	0.00	0.14	0.00	0.00	0.85	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.25	0.00	0.00	0.75	0.24	0.00
C20	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
C21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.04	0.16	0.00	0.80	0.09	0.00
C4	1.00	0.00	0.00	0.00	0.97	0.03	0.00	0.00	0.95	0.00
C5	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.17	0.00
C6	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C19	0.01	0.01	0.01	0.05	0.01
C20	0.01	0.01	0.01	0.04	0.01
C21	0.01	0.01	0.01	0.05	0.01
C5	0.01	0.01	0.01	0.20	0.01

Analysis begun on: Thu Jul 11 16:27:01 2019
Analysis ended on: Thu Jul 11 16:27:09 2019
Total elapsed time: 00:00:08

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/01/2005 00:00:00
Ending Date 04/04/2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	3.829	42.751
Evaporation Loss	0.000	0.000
Infiltration Loss	2.046	22.837
Surface Runoff	1.662	18.555
Final Storage	0.122	1.367
Continuity Error (%)	-0.021	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.662	16.620
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.641	16.407
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.021	0.211
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.009	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step   :   0.50 sec
Average Time Step   :   1.00 sec
Maximum Time Step   :   1.00 sec
Percent in Steady State   :   0.00
Average Iterations per Step :   2.00
Percent Not Converging   :   0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A1	42.75	0.00	0.00	38.43	0.00	3.06	3.06	0.48	0.06	0.072
A2	42.75	0.00	0.00	38.67	0.00	2.83	2.83	0.15	0.02	0.066
EXT1	42.75	0.00	0.00	18.93	22.70	11.08	22.43	4.49	1.48	0.525
EXT2	42.75	0.00	0.00	19.10	22.70	10.91	22.26	5.74	1.86	0.521
EXT3	42.75	0.00	0.00	12.42	28.93	2.11	28.93	0.94	0.60	0.677
EXT4	42.75	0.00	0.00	4.11	37.19	0.87	37.19	0.48	0.33	0.870

EXT5	42.75	0.00	0.00	16.80	22.73	24.62	24.62	0.18	0.12	0.576
EXT6	42.75	0.00	0.00	19.16	20.65	22.25	22.25	0.11	0.04	0.520
EXT7	42.75	0.00	0.00	16.74	22.73	24.68	24.68	0.22	0.16	0.577
EXT8	42.75	0.00	0.00	17.77	23.60	0.91	23.60	3.84	2.37	0.552

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.04	0.92	253.97	0 01:11	0.91
J10	JUNCTION	0.04	0.91	253.61	0 01:12	0.91
J11	JUNCTION	0.05	0.94	253.42	0 01:12	0.94
J12	JUNCTION	0.01	0.15	256.35	0 01:28	0.15
J13	JUNCTION	0.02	0.96	254.21	0 01:10	0.94
J14	JUNCTION	0.06	1.32	252.36	0 01:14	1.32
J15	JUNCTION	0.01	0.09	254.39	0 02:50	0.09
J16	JUNCTION	0.06	1.49	252.67	0 01:14	1.48
J17	JUNCTION	0.05	1.04	251.94	0 01:14	1.04
J2	JUNCTION	0.02	1.20	256.02	0 01:11	1.19
J3	JUNCTION	0.04	0.97	253.25	0 01:13	0.97
J4	JUNCTION	0.02	1.11	256.57	0 01:10	1.07
J5	JUNCTION	0.00	0.00	257.00	0 00:00	0.00
J6	JUNCTION	0.02	0.83	254.37	0 01:11	0.83
J7	JUNCTION	0.02	0.66	254.18	0 01:12	0.66
J8	JUNCTION	0.05	1.35	253.03	0 01:14	1.35
J9	JUNCTION	0.05	1.01	253.82	0 01:12	1.01
DorchesterCreek	OUTFALL	0.00	0.09	254.19	0 02:50	0.09
Ex.Ditch	OUTFALL	0.00	0.07	255.69	0 01:28	0.07
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.04	0.94	251.81	0 01:15	0.94
Ex.Storage	STORAGE	0.07	1.76	256.58	0 01:34	1.76
Ex.SWMF	STORAGE	0.03	0.52	255.42	0 01:53	0.52

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	1.913	0 01:11	0	9.57	-0.173
J10	JUNCTION	0.000	1.882	0 01:12	0	9.59	0.036
J11	JUNCTION	0.000	1.877	0 01:12	0	9.59	-0.166
J12	JUNCTION	0.279	0.279	0 01:11	0.397	0.397	-0.004
J13	JUNCTION	1.859	1.859	0 01:10	5.74	5.74	0.140
J14	JUNCTION	0.000	3.079	0 01:14	0	14.3	0.091
J15	JUNCTION	0.019	0.019	0 02:50	0.15	0.15	0.003
J16	JUNCTION	0.000	3.078	0 01:14	0	14.3	0.035
J17	JUNCTION	0.000	3.078	0 01:14	0	14.3	-0.080
J2	JUNCTION	0.000	1.406	0 01:10	0	4.74	-0.287
J3	JUNCTION	0.000	3.125	0 01:12	0	14.4	0.131
J4	JUNCTION	1.483	1.483	0 01:10	4.49	4.49	0.426
J5	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J6	JUNCTION	0.000	1.270	0 01:10	0	4.75	-0.018
J7	JUNCTION	0.000	1.258	0 01:11	0	4.75	0.000
J8	JUNCTION	0.000	3.102	0 01:12	0	14.3	-0.041
J9	JUNCTION	0.000	1.898	0 01:11	0	9.59	-0.013
DorchesterCreek	OUTFALL	0.000	0.019	0 02:50	0	0.15	0.000
Ex.Ditch	OUTFALL	0.636	0.663	0 01:10	1.52	1.92	0.000
Ex.Major	OUTFALL	0.000	0.000	0 00:00	0	0	0.000 ltr
Ex.Sewer	OUTFALL	0.000	3.077	0 01:15	0	14.3	0.000
Ex.Storage	STORAGE	0.326	0.326	0 01:10	0.48	0.48	-0.000
Ex.SWMF	STORAGE	2.369	2.369	0 01:10	3.84	3.84	-0.006

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Ex.Storage	0.010	2	0	44	0.268	56	0 01:34	0.055
Ex.SWMF	0.152	2	0	0	2.446	33	0 01:53	0.245

****
Outfall Loading Summary

****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	6.30	0.009	0.019	0.150
Ex.Ditch	21.74	0.034	0.663	1.919
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	34.98	0.158	3.077	14.338
System	15.75	0.201	3.077	16.407

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	1.401	0 01:10	2.40	1.01	1.00
C10	CONDUIT	1.882	0 01:12	1.76	1.18	0.70
C11	CONDUIT	1.877	0 01:12	1.83	0.80	0.67
C12	CONDUIT	1.869	0 01:12	1.77	0.83	0.70
C13	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C14	CONDUIT	0.000	0 00:00	0.00	0.00	0.15
C16	CONDUIT	0.081	0 01:28	0.23	0.02	0.22
C17	CONDUIT	0.019	0 02:50	1.25	0.00	0.09
C18	CONDUIT	1.750	0 01:09	1.84	0.70	0.68
C19	CONDUIT	3.079	0 01:14	2.17	1.93	0.97
C2	CONDUIT	1.898	0 01:11	1.79	0.76	0.70
C20	CONDUIT	3.078	0 01:14	2.36	1.92	0.86
C21	CONDUIT	3.077	0 01:15	2.74	1.93	0.73
C3	CONDUIT	3.102	0 01:12	2.54	0.77	0.85
C4	CONDUIT	1.270	0 01:10	2.39	1.15	1.00
C5	CONDUIT	1.258	0 01:11	2.51	2.73	0.90
C6	CONDUIT	0.000	0 00:00	0.00	0.00	0.11
C7	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C8	CONDUIT	1.258	0 01:12	2.74	0.98	0.80
C9	CONDUIT	3.078	0 01:14	2.33	1.35	0.94
OR1	ORIFICE	0.039	0 01:34			1.00
C15	WEIR	0.000	0 00:00			0.00
W1	WEIR	0.000	0 00:00			0.00
W2	WEIR	0.000	0 00:00			0.00
W3	WEIR	0.000	0 00:00			0.00
OL1	DUMMY	0.245	0 01:53			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.00	0.03	0.00	0.97	0.03	0.00
C10	1.00	0.00	0.00	0.00	0.26	0.00	0.00	0.74	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.20	0.00	0.00	0.80	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.02	0.00	0.00	0.91	0.08	0.00	0.00	0.96	0.00
C18	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.23	0.00
C19	1.00	0.00	0.00	0.00	0.15	0.00	0.00	0.85	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.24	0.00
C20	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
C21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.05	0.16	0.00	0.79	0.08	0.00
C4	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.95	0.00
C5	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.18	0.00
C6	1.00	0.02	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.06	0.06	0.10	0.01	0.01
C10	0.01	0.01	0.01	0.11	0.01
C19	0.01	0.12	0.01	0.60	0.01
C20	0.01	0.01	0.01	0.59	0.01
C21	0.01	0.01	0.01	0.60	0.01
C4	0.01	0.12	0.01	0.17	0.01
C5	0.01	0.01	0.01	0.98	0.01
C9	0.01	0.01	0.01	0.26	0.01

Analysis begun on: Thu Jul 11 16:27:38 2019
Analysis ended on: Thu Jul 11 16:27:46 2019

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Total elapsed time: 00:00:08
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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 04/01/2005 00:00:00
Ending Date .............. 04/04/2005 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume          Depth
Runoff Quantity Continuity     hectare-m             mm
**************************     ---------       -------
Total Precipitation ......         3.958        44.191
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         2.102        23.463
Surface Runoff ...........         1.735        19.370
Final Storage ............         0.122         1.367
Continuity Error (%) .....        -0.020

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         1.735        17.350
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         1.713        17.132
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.022         0.215
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.013

****************************
Time-Step Critical Elements
****************************
None

********************************
Highest Flow Instability Indexes
********************************
All links are stable.

**************************
Routing Time Step Summary
**************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00

****************************
Subcatchment Runoff Summary
****************************

-----------------------------------------------------------------------------------------------------------------------------------
                        Total      Total      Total      Total      Imperv       Perv      Total      Total       Peak    Runoff
                       Precip      Runon       Evap      Infil     Runoff     Runoff     Runoff     Runoff     Runoff     Coeff
Subcatchment               mm         mm         mm         mm         mm         mm         mm   10^6 ltr        CMS
-----------------------------------------------------------------------------------------------------------------------------------
A1                        44.19       0.00       0.00      39.49       0.00       3.44       3.44       0.54       0.06     0.078
A2                        44.19       0.00       0.00      39.74       0.00       3.21       3.21       0.17       0.02     0.073
EXT1                      44.19       0.00       0.00      19.45      23.49      11.61      23.35       4.67       1.52     0.528
EXT2                      44.19       0.00       0.00      19.63      23.49      11.42      23.17       5.98       1.91     0.524
EXT3                      44.19       0.00       0.00      12.70      30.09       2.33      30.09       0.97       0.61     0.681
EXT4                      44.19       0.00       0.00       4.20      38.55       0.95      38.55       0.50       0.33     0.872
```

EXT5	44.19	0.00	0.00	17.19	23.52	25.66	25.66	0.18	0.13	0.581
EXT6	44.19	0.00	0.00	19.64	21.37	23.21	23.21	0.11	0.05	0.525
EXT7	44.19	0.00	0.00	17.14	23.52	25.72	25.72	0.23	0.16	0.582
EXT8	44.19	0.00	0.00	18.26	24.55	1.06	24.55	3.99	2.42	0.556

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.04	0.93	253.98	0 01:12	0.93
J10	JUNCTION	0.04	0.92	253.62	0 01:13	0.92
J11	JUNCTION	0.05	0.95	253.43	0 01:13	0.95
J12	JUNCTION	0.01	0.15	256.35	0 01:27	0.15
J13	JUNCTION	0.02	1.09	254.34	0 01:10	1.08
J14	JUNCTION	0.06	1.34	252.38	0 01:14	1.34
J15	JUNCTION	0.01	0.09	254.39	0 02:50	0.09
J16	JUNCTION	0.06	1.51	252.69	0 01:14	1.51
J17	JUNCTION	0.05	1.05	251.95	0 01:14	1.05
J2	JUNCTION	0.02	1.30	256.12	0 01:11	1.29
J3	JUNCTION	0.04	1.00	253.27	0 01:14	1.00
J4	JUNCTION	0.02	1.22	256.68	0 01:10	1.18
J5	JUNCTION	0.00	0.00	257.00	0 00:00	0.00
J6	JUNCTION	0.02	0.84	254.38	0 01:12	0.84
J7	JUNCTION	0.02	0.68	254.20	0 01:12	0.68
J8	JUNCTION	0.05	1.37	253.05	0 01:14	1.37
J9	JUNCTION	0.05	1.01	253.82	0 01:12	1.01
DorchesterCreek	OUTFALL	0.00	0.09	254.19	0 02:50	0.09
Ex.Ditch	OUTFALL	0.00	0.07	255.69	0 01:27	0.07
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.04	0.94	251.82	0 01:15	0.94
Ex.Storage	STORAGE	0.07	1.82	256.64	0 01:34	1.82
Ex.SWMF	STORAGE	0.04	0.54	255.44	0 01:54	0.54

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	1.925	0 01:12	0	9.96	-0.161
J10	JUNCTION	0.000	1.906	0 01:12	0	9.98	0.040
J11	JUNCTION	0.000	1.900	0 01:13	0	9.98	-0.155
J12	JUNCTION	0.287	0.287	0 01:10	0.414	0.414	-0.004
J13	JUNCTION	1.910	1.910	0 01:10	5.98	5.98	0.117
J14	JUNCTION	0.000	3.118	0 01:14	0	14.9	0.093
J15	JUNCTION	0.022	0.022	0 02:50	0.17	0.17	0.003
J16	JUNCTION	0.000	3.118	0 01:14	0	14.9	0.022
J17	JUNCTION	0.000	3.115	0 01:14	0	14.9	-0.079
J2	JUNCTION	0.000	1.470	0 01:10	0	4.94	-0.286
J3	JUNCTION	0.000	3.162	0 01:12	0	14.9	0.127
J4	JUNCTION	1.524	1.524	0 01:10	4.67	4.67	0.418
J5	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J6	JUNCTION	0.000	1.289	0 01:11	0	4.95	-0.018
J7	JUNCTION	0.000	1.286	0 01:12	0	4.95	0.000
J8	JUNCTION	0.000	3.128	0 01:13	0	14.9	-0.023
J9	JUNCTION	0.000	1.914	0 01:12	0	9.98	-0.022
DorchesterCreek	OUTFALL	0.000	0.022	0 02:50	0	0.17	0.000
Ex.Ditch	OUTFALL	0.650	0.680	0 01:10	1.62	2.04	0.000
Ex.Major	OUTFALL	0.000	0.000	0 00:00	0	0	0.000 ltr
Ex.Sewer	OUTFALL	0.000	3.117	0 01:15	0	14.9	0.000
Ex.Storage	STORAGE	0.332	0.332	0 01:10	0.497	0.498	0.000
Ex.SWMF	STORAGE	2.419	2.419	0 01:10	3.99	3.99	-0.005

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Ex.Storage	0.011	2	0	43	0.277	58	0 01:34	0.056
Ex.SWMF	0.159	2	0	0	2.518	34	0 01:54	0.249

****
Outfall Loading Summary

****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	6.24	0.011	0.022	0.170
Ex.Ditch	21.79	0.036	0.680	2.038
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	35.04	0.164	3.117	14.924
System	15.77	0.211	3.117	17.132

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	1.470	0 01:10	2.40	1.06	1.00
C10	CONDUIT	1.906	0 01:12	1.77	1.19	0.71
C11	CONDUIT	1.900	0 01:13	1.83	0.81	0.68
C12	CONDUIT	1.877	0 01:12	1.77	0.83	0.71
C13	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C14	CONDUIT	0.000	0 00:00	0.00	0.00	0.15
C16	CONDUIT	0.084	0 01:27	0.23	0.02	0.22
C17	CONDUIT	0.022	0 02:50	1.29	0.00	0.09
C18	CONDUIT	1.750	0 01:08	1.84	0.70	0.73
C19	CONDUIT	3.118	0 01:14	2.19	1.95	0.98
C2	CONDUIT	1.914	0 01:12	1.79	0.76	0.71
C20	CONDUIT	3.115	0 01:14	2.37	1.94	0.87
C21	CONDUIT	3.117	0 01:15	2.75	1.95	0.74
C3	CONDUIT	3.128	0 01:13	2.55	0.77	0.87
C4	CONDUIT	1.289	0 01:11	2.41	1.16	1.00
C5	CONDUIT	1.286	0 01:12	2.52	2.79	0.91
C6	CONDUIT	0.000	0 00:00	0.00	0.00	0.11
C7	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C8	CONDUIT	1.285	0 01:12	2.74	1.00	0.82
C9	CONDUIT	3.118	0 01:14	2.33	1.37	0.95
OR1	ORIFICE	0.040	0 01:34			1.00
C15	WEIR	0.000	0 00:00			0.00
W1	WEIR	0.000	0 00:00			0.00
W2	WEIR	0.000	0 00:00			0.00
W3	WEIR	0.000	0 00:00			0.00
OL1	DUMMY	0.249	0 01:54			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.00	0.03	0.00	0.97	0.03	0.00
C10	1.00	0.00	0.00	0.00	0.26	0.00	0.00	0.74	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.20	0.00	0.00	0.80	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.02	0.00	0.00	0.91	0.07	0.00	0.00	0.96	0.00
C18	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.23	0.00
C19	1.00	0.00	0.00	0.00	0.15	0.00	0.00	0.85	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.24	0.00
C20	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
C21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.05	0.16	0.00	0.79	0.09	0.00
C4	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.95	0.00
C5	1.00	0.00	0.00	0.00	0.95	0.04	0.00	0.00	0.18	0.00
C6	1.00	0.02	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.08	0.08	0.12	0.02	0.02
C10	0.01	0.01	0.01	0.12	0.01
C19	0.01	0.14	0.01	0.64	0.01
C20	0.01	0.01	0.01	0.64	0.01
C21	0.01	0.01	0.01	0.64	0.01
C4	0.06	0.14	0.06	0.19	0.06
C5	0.01	0.06	0.01	1.04	0.01
C8	0.01	0.01	0.01	0.02	0.01
C9	0.01	0.04	0.01	0.27	0.01

Analysis begun on: Thu Jul 11 16:59:41 2019

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Analysis ended on:  Thu Jul 11 16:59:48 2019
Total elapsed time: 00:00:07
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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
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***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 04/01/2005 00:00:00
Ending Date .............. 04/04/2005 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         4.662        52.050
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         2.339        26.111
Surface Runoff ...........         2.202        24.579
Final Storage ............         0.123         1.370
Continuity Error (%) .....        -0.021

**************************        Volume       Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         2.202        22.016
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         2.177        21.772
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.024         0.237
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.033

****************************
Time-Step Critical Elements
****************************
None

********************************
Highest Flow Instability Indexes
********************************
All links are stable.

**************************
Routing Time Step Summary
**************************
Minimum Time Step           :     0.45 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00

****************************
Subcatchment Runoff Summary
****************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A1	52.05	0.00	0.00	44.12	0.00	6.67	6.67	1.04	0.11	0.128
A2	52.05	0.00	0.00	44.48	0.00	6.32	6.32	0.34	0.04	0.121
EXT1	52.05	0.00	0.00	21.48	27.81	15.27	29.17	5.84	1.87	0.560
EXT2	52.05	0.00	0.00	21.68	27.81	15.07	28.98	7.48	2.34	0.557
EXT3	52.05	0.00	0.00	13.99	36.66	3.78	36.66	1.19	0.72	0.704
EXT4	52.05	0.00	0.00	4.63	45.98	1.47	45.98	0.59	0.39	0.883

EXT5	52.05	0.00	0.00	19.15	27.85	31.58	31.58	0.23	0.15	0.607
EXT6	52.05	0.00	0.00	21.81	25.30	28.89	28.89	0.14	0.06	0.555
EXT7	52.05	0.00	0.00	19.08	27.85	31.64	31.64	0.28	0.20	0.608
EXT8	52.05	0.00	0.00	20.57	30.10	2.28	30.10	4.89	2.88	0.578

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.05	1.02	254.08	0 01:21	1.02
J10	JUNCTION	0.05	1.11	253.81	0 01:21	1.11
J11	JUNCTION	0.05	1.22	253.70	0 01:22	1.22
J12	JUNCTION	0.01	0.17	256.36	0 01:26	0.17
J13	JUNCTION	0.03	3.46	256.71	0 01:10	3.44
J14	JUNCTION	0.07	1.40	252.44	0 01:19	1.40
J15	JUNCTION	0.01	0.11	254.41	0 02:20	0.11
J16	JUNCTION	0.07	1.63	252.82	0 01:18	1.63
J17	JUNCTION	0.06	1.08	251.98	0 01:19	1.08
J2	JUNCTION	0.03	2.18	257.00	0 01:12	2.18
J3	JUNCTION	0.04	1.31	253.59	0 01:21	1.31
J4	JUNCTION	0.02	2.33	257.79	0 01:10	2.33
J5	JUNCTION	0.00	0.00	257.00	0 00:00	0.00
J6	JUNCTION	0.03	1.10	254.64	0 01:12	1.10
J7	JUNCTION	0.02	0.91	254.43	0 01:12	0.91
J8	JUNCTION	0.06	1.56	253.24	0 01:21	1.56
J9	JUNCTION	0.06	1.15	253.96	0 01:21	1.15
DorchesterCreek	OUTFALL	0.01	0.11	254.21	0 02:20	0.11
Ex.Ditch	OUTFALL	0.00	0.08	255.70	0 01:26	0.08
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.05	0.97	251.84	0 01:22	0.97
Ex.Storage	STORAGE	0.09	2.39	257.21	0 01:35	2.39
Ex.SWMF	STORAGE	0.04	0.66	255.56	0 02:00	0.66

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	1.997	0 01:21	0	12.4	-0.147
J10	JUNCTION	0.000	1.971	0 01:21	0	12.4	0.045
J11	JUNCTION	0.000	1.969	0 01:21	0	12.4	-0.103
J12	JUNCTION	0.354	0.354	0 01:10	0.509	0.509	-0.005
J13	JUNCTION	2.339	2.339	0 01:10	7.48	7.48	0.127
J14	JUNCTION	0.000	3.283	0 01:22	0	18.6	0.069
J15	JUNCTION	0.039	0.039	0 02:20	0.335	0.335	0.002
J16	JUNCTION	0.000	3.283	0 01:21	0	18.6	0.013
J17	JUNCTION	0.000	3.283	0 01:21	0	18.5	-0.065
J2	JUNCTION	0.000	1.755	0 01:10	0	6.18	-0.268
J3	JUNCTION	0.000	3.320	0 01:12	0	18.6	0.114
J4	JUNCTION	1.866	1.866	0 01:10	5.84	5.84	0.392
J5	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J6	JUNCTION	0.000	1.524	0 01:11	0	6.19	-0.018
J7	JUNCTION	0.000	1.500	0 01:13	0	6.19	0.001
J8	JUNCTION	0.000	3.284	0 01:18	0	18.6	-0.012
J9	JUNCTION	0.000	1.978	0 01:19	0	12.4	-0.031
DorchesterCreek	OUTFALL	0.000	0.039	0 02:20	0	0.335	0.000
Ex.Ditch	OUTFALL	0.779	0.824	0 01:10	2.37	2.88	0.000
Ex.Major	OUTFALL	0.000	0.000	0 00:00	0	0	0.000 ltr
Ex.Sewer	OUTFALL	0.000	3.283	0 01:22	0	18.6	0.000
Ex.Storage	STORAGE	0.391	0.415	0 01:10	0.593	0.604	-0.001
Ex.SWMF	STORAGE	2.881	3.303	0 01:10	4.89	4.94	-0.004

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J7	JUNCTION	0.09	0.086	1.739
J8	JUNCTION	0.27	0.189	3.146

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Ex.Storage	0.014	3	0	39	0.364	76	0 01:35	0.065
Ex.SWMF	0.204	3	0	0	3.152	42	0 02:00	0.280

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	7.15	0.018	0.039	0.335
Ex.Ditch	21.91	0.051	0.824	2.876
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	35.28	0.203	3.283	18.560
System	16.09	0.272	3.283	21.772

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	1.755	0 01:10	2.76	1.27	1.00
C10	CONDUIT	1.971	0 01:21	1.77	1.23	0.83
C11	CONDUIT	1.969	0 01:21	1.83	0.84	0.86
C12	CONDUIT	1.972	0 01:22	1.76	0.87	0.93
C13	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C14	CONDUIT	0.000	0 00:00	0.00	0.00	0.17
C16	CONDUIT	0.110	0 01:26	0.25	0.02	0.24
C17	CONDUIT	0.039	0 02:20	1.50	0.00	0.11
C18	CONDUIT	1.750	0 01:06	1.87	0.70	0.87
C19	CONDUIT	3.283	0 01:22	2.29	2.06	1.00
C2	CONDUIT	1.978	0 01:19	1.82	0.79	0.79
C20	CONDUIT	3.283	0 01:21	2.46	2.05	0.88
C21	CONDUIT	3.283	0 01:22	2.81	2.06	0.76
C3	CONDUIT	3.284	0 01:18	2.61	0.81	0.99
C4	CONDUIT	1.524	0 01:11	2.85	1.38	1.00
C5	CONDUIT	1.500	0 01:13	2.81	3.25	1.00
C6	CONDUIT	0.000	0 00:00	0.00	0.00	0.14
C7	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C8	CONDUIT	1.500	0 01:13	2.88	1.17	0.94
C9	CONDUIT	3.283	0 01:21	2.38	1.44	1.00
OR1	ORIFICE	0.048	0 01:40			1.00
C15	WEIR	0.000	0 00:00			0.00
W1	WEIR	0.527	0 01:10			0.24
W2	WEIR	0.000	0 00:00			0.00
W3	WEIR	0.000	0 00:00			0.00
OL1	DUMMY	0.280	0 02:00			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Up Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.01	0.03	0.00	0.96	0.03	0.00
C10	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.21	0.00	0.00	0.79	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.01	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.02	0.00	0.00	0.90	0.08	0.00	0.00	0.97	0.00
C18	1.00	0.00	0.00	0.00	0.28	0.00	0.00	0.72	0.24	0.00
C19	1.00	0.00	0.00	0.00	0.16	0.00	0.00	0.84	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.28	0.00	0.00	0.72	0.24	0.00
C20	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
C21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.06	0.16	0.00	0.78	0.09	0.00
C4	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.94	0.00
C5	1.00	0.00	0.00	0.00	0.95	0.05	0.00	0.00	0.18	0.00
C6	1.00	0.02	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.27	0.27	0.32	0.14	0.12
C10	0.01	0.01	0.01	0.36	0.01
C18	0.01	0.21	0.01	0.01	0.01
C19	0.01	0.36	0.01	0.98	0.01
C20	0.01	0.26	0.01	0.98	0.01

C21	0.01	0.01	0.01	0.98	0.01
C3	0.01	0.01	0.27	0.01	0.01
C4	0.26	0.34	0.26	0.38	0.26
C5	0.09	0.26	0.09	1.35	0.09
C8	0.01	0.09	0.01	0.23	0.01
C9	0.01	0.29	0.01	0.51	0.01

Analysis begun on: Thu Jul 11 17:00:20 2019
Analysis ended on: Thu Jul 11 17:00:28 2019
Total elapsed time: 00:00:08

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/01/2005 00:00:00
Ending Date 04/04/2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	5.507	61.486
Evaporation Loss	0.000	0.000
Infiltration Loss	2.590	28.920
Surface Runoff	2.796	31.212
Final Storage	0.123	1.368
Continuity Error (%)	-0.022	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	2.796	27.957
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	2.769	27.687
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.025	0.248
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.080	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	0.37 sec
Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.01

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A1	61.49	0.00	0.00	48.86	0.00	11.38	11.38	1.77	0.19	0.185
A2	61.49	0.00	0.00	49.37	0.00	10.85	10.85	0.58	0.07	0.177
EXT1	61.49	0.00	0.00	23.71	33.01	19.88	36.39	7.28	2.32	0.592
EXT2	61.49	0.00	0.00	23.91	33.00	19.68	36.18	9.34	2.91	0.588
EXT3	61.49	0.00	0.00	15.37	44.72	5.71	44.72	1.45	0.86	0.727
EXT4	61.49	0.00	0.00	5.09	54.96	2.14	54.96	0.71	0.47	0.894

EXT5	61.49	0.00	0.00	21.29	33.05	38.89	38.89	0.28	0.19	0.632
EXT6	61.49	0.00	0.00	24.21	30.03	35.95	35.95	0.18	0.08	0.585
EXT7	61.49	0.00	0.00	21.22	33.05	38.96	38.96	0.35	0.25	0.634
EXT8	61.49	0.00	0.00	23.02	37.09	4.08	37.09	6.03	3.46	0.603

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.06	1.44	254.49	0 01:25	1.44
J10	JUNCTION	0.06	1.49	254.19	0 01:25	1.49
J11	JUNCTION	0.06	1.57	254.05	0 01:24	1.57
J12	JUNCTION	0.01	0.21	256.40	0 01:31	0.21
J13	JUNCTION	0.04	3.51	256.76	0 01:10	3.51
J14	JUNCTION	0.08	1.49	252.53	0 01:24	1.48
J15	JUNCTION	0.01	0.15	254.45	0 01:23	0.15
J16	JUNCTION	0.08	1.78	252.96	0 01:24	1.78
J17	JUNCTION	0.07	1.13	252.03	0 01:24	1.13
J2	JUNCTION	0.03	2.79	257.61	0 01:10	2.79
J3	JUNCTION	0.05	1.62	253.90	0 01:24	1.62
J4	JUNCTION	0.03	3.80	259.26	0 01:10	3.74
J5	JUNCTION	0.00	0.12	257.12	0 01:14	0.12
J6	JUNCTION	0.03	1.29	254.83	0 01:22	1.29
J7	JUNCTION	0.02	1.10	254.62	0 01:22	1.10
J8	JUNCTION	0.07	1.78	253.46	0 01:24	1.78
J9	JUNCTION	0.07	1.53	254.34	0 01:25	1.53
DorchesterCreek	OUTFALL	0.01	0.15	254.25	0 01:23	0.15
Ex.Ditch	OUTFALL	0.00	0.10	255.72	0 01:31	0.10
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.05	1.00	251.88	0 01:25	1.00
Ex.Storage	STORAGE	0.10	2.67	257.49	0 01:20	2.67
Ex.SWMF	STORAGE	0.06	0.85	255.75	0 01:58	0.85

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	2.061	0 01:30	0	15.3	-0.131
J10	JUNCTION	0.000	2.078	0 01:30	0	15.4	0.028
J11	JUNCTION	0.000	2.079	0 01:30	0	15.4	-0.063
J12	JUNCTION	0.438	0.465	0 01:11	0.627	0.827	0.367
J13	JUNCTION	2.909	2.909	0 01:10	9.34	9.34	0.305
J14	JUNCTION	0.000	3.528	0 01:24	0	22.9	0.047
J15	JUNCTION	0.068	0.083	0 01:23	0.575	0.604	0.054
J16	JUNCTION	0.000	3.528	0 01:24	0	22.9	0.008
J17	JUNCTION	0.000	3.528	0 01:24	0	22.9	-0.053
J2	JUNCTION	0.000	2.253	0 01:10	0	7.65	-0.282
J3	JUNCTION	0.000	3.527	0 01:24	0	22.9	0.098
J4	JUNCTION	2.321	2.321	0 01:10	7.28	7.28	0.347
J5	JUNCTION	0.000	0.564	0 01:10	0	0.2	-0.234
J6	JUNCTION	0.000	1.649	0 01:10	0	7.54	-0.024
J7	JUNCTION	0.000	1.611	0 01:11	0	7.52	0.021
J8	JUNCTION	0.000	3.528	0 01:24	0	22.9	-0.013
J9	JUNCTION	0.000	2.069	0 01:30	0	15.4	-0.042
DorchesterCreek	OUTFALL	0.000	0.083	0 01:23	0	0.604	0.000
Ex.Ditch	OUTFALL	0.959	1.026	0 01:10	3.4	4.22	0.000
Ex.Major	OUTFALL	0.000	0.000	0 00:00	0	0	0.000 ltr
Ex.Sewer	OUTFALL	0.000	3.528	0 01:25	0	22.9	0.000
Ex.Storage	STORAGE	0.466	0.501	0 01:10	0.709	0.728	-0.000
Ex.SWMF	STORAGE	3.464	4.617	0 01:10	6.03	6.47	-0.002

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J10	JUNCTION	0.21	0.124	2.076
J11	JUNCTION	0.29	0.190	2.325
J14	JUNCTION	0.38	0.085	1.471
J16	JUNCTION	0.37	0.141	2.036
J3	JUNCTION	0.19	0.081	2.014
J7	JUNCTION	0.40	0.272	1.553
J8	JUNCTION	0.56	0.407	2.928

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Project #: 60568894
Project: Name: 187 Dorchester Road
Existing Conditions PCSWMM Output
25 Year – 3hr Chicago

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Ex.Storage	0.016	3	0	34	0.405	84	0 01:20	0.178
Ex.SWMF	0.280	4	0	0	4.204	56	0 01:58	0.365

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	7.83	0.030	0.083	0.604
Ex.Ditch	22.79	0.071	1.026	4.219
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	35.67	0.248	3.528	22.863
System	16.57	0.349	3.528	27.687

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.253	0 01:10	3.54	1.63	1.00
C10	CONDUIT	2.078	0 01:30	1.81	1.30	1.00
C11	CONDUIT	2.079	0 01:30	1.83	0.88	1.00
C12	CONDUIT	2.081	0 01:30	1.79	0.92	1.00
C13	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C14	CONDUIT	0.146	0 01:14	0.23	0.02	0.31
C16	CONDUIT	0.200	0 01:31	0.29	0.04	0.30
C17	CONDUIT	0.083	0 01:23	1.81	0.01	0.15
C18	CONDUIT	1.750	0 01:04	1.86	0.70	1.00
C19	CONDUIT	3.528	0 01:24	2.46	2.21	1.00
C2	CONDUIT	2.069	0 01:30	1.86	0.82	1.00
C20	CONDUIT	3.528	0 01:24	2.60	2.20	0.90
C21	CONDUIT	3.528	0 01:25	2.91	2.21	0.79
C3	CONDUIT	3.528	0 01:24	2.68	0.87	1.00
C4	CONDUIT	1.649	0 01:10	3.08	1.49	1.00
C5	CONDUIT	1.611	0 01:11	3.01	3.49	1.00
C6	CONDUIT	0.043	0 01:22	0.88	0.39	0.41
C7	CONDUIT	0.564	0 01:10	2.02	0.08	0.29
C8	CONDUIT	1.611	0 01:11	3.07	1.26	1.00
C9	CONDUIT	3.528	0 01:24	2.46	1.55	1.00
OR1	ORIFICE	0.050	0 01:48			1.00
C15	WEIR	0.145	0 01:20			0.20
W1	WEIR	1.156	0 01:10			0.41
W2	WEIR	0.000	0 00:00			0.00
W3	WEIR	0.000	0 00:00			0.00
OL1	DUMMY	0.365	0 01:58			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.01	0.03	0.00	0.96	0.03	0.00
C10	1.00	0.00	0.00	0.00	0.29	0.00	0.00	0.71	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.23	0.00	0.00	0.77	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.01	0.00	0.00	0.98	0.00	0.00	0.00	0.98	0.00
C16	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.02	0.00	0.00	0.89	0.09	0.00	0.00	0.97	0.00
C18	1.00	0.00	0.00	0.00	0.29	0.00	0.00	0.71	0.25	0.00
C19	1.00	0.00	0.00	0.00	0.18	0.00	0.00	0.82	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.30	0.00	0.00	0.70	0.25	0.00
C20	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.95	0.00	0.00
C21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.06	0.17	0.00	0.76	0.10	0.00
C4	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.94	0.00
C5	1.00	0.00	0.00	0.00	0.95	0.04	0.00	0.00	0.18	0.00
C6	1.00	0.02	0.98	0.00	0.01	0.00	0.00	0.00	0.98	0.00
C7	1.00	0.02	0.98	0.00	0.00	0.00	0.00	0.00	0.98	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited

C1	0.53	0.53	0.58	0.34	0.33
C10	0.21	0.24	0.21	0.67	0.21
C11	0.23	0.23	0.29	0.01	0.01
C12	0.31	0.31	0.36	0.01	0.01
C18	0.15	0.41	0.15	0.01	0.15
C19	0.38	0.64	0.38	1.32	0.38
C2	0.17	0.17	0.22	0.01	0.01
C20	0.01	0.55	0.01	1.31	0.01
C21	0.01	0.01	0.01	1.32	0.01
C3	0.38	0.38	0.56	0.01	0.01
C4	0.51	0.60	0.51	0.64	0.51
C5	0.40	0.51	0.40	1.60	0.40
C8	0.19	0.40	0.19	0.49	0.19
C9	0.37	0.58	0.37	0.82	0.37

Analysis begun on: Thu Jul 11 17:00:52 2019
Analysis ended on: Thu Jul 11 17:01:00 2019
Total elapsed time: 00:00:08

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/01/2005 00:00:00
Ending Date 04/04/2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	6.156	68.725
Evaporation Loss	0.000	0.000
Infiltration Loss	2.767	30.895
Surface Runoff	3.267	36.477
Final Storage	0.123	1.369
Continuity Error (%)	-0.023	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	3.267	32.672
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	3.240	32.398
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.025	0.252
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.068	

Highest Continuity Errors
Node J5 (-2.54%)
Node J12 (1.47%)

Time-Step Critical Elements
None

Highest Flow Instability Indexes
All links are stable.

Routing Time Step Summary
Minimum Time Step	:	0.50 sec
Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.02

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff

A1	68.73	0.00	0.00	52.09	0.00	15.37	15.37	2.39	0.26	0.224
A2	68.73	0.00	0.00	52.77	0.00	14.70	14.70	0.78	0.10	0.214
EXT1	68.73	0.00	0.00	25.32	36.99	23.53	42.02	8.41	2.68	0.611
EXT2	68.73	0.00	0.00	25.53	36.99	23.31	41.81	10.79	3.35	0.608
EXT3	68.73	0.00	0.00	16.33	51.01	7.28	51.01	1.65	0.96	0.742
EXT4	68.73	0.00	0.00	5.41	61.88	2.68	61.88	0.80	0.52	0.900
EXT5	68.73	0.00	0.00	22.80	37.04	44.62	44.62	0.32	0.22	0.649
EXT6	68.73	0.00	0.00	25.91	33.65	41.49	41.49	0.20	0.10	0.604
EXT7	68.73	0.00	0.00	22.74	37.04	44.69	44.69	0.40	0.28	0.650
EXT8	68.73	0.00	0.00	24.74	42.62	5.63	42.62	6.93	3.89	0.620

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.06	1.77	254.82	0 01:35	1.77
J10	JUNCTION	0.07	1.75	254.45	0 01:34	1.75
J11	JUNCTION	0.07	1.79	254.27	0 01:34	1.79
J12	JUNCTION	0.01	0.26	256.46	0 01:27	0.26
J13	JUNCTION	0.05	3.54	256.79	0 01:10	3.54
J14	JUNCTION	0.08	1.55	252.59	0 01:33	1.55
J15	JUNCTION	0.01	0.20	254.50	0 01:32	0.20
J16	JUNCTION	0.09	1.88	253.07	0 01:33	1.88
J17	JUNCTION	0.07	1.16	252.06	0 01:34	1.16
J2	JUNCTION	0.04	2.82	257.64	0 01:09	2.82
J3	JUNCTION	0.06	1.81	254.09	0 01:33	1.81
J4	JUNCTION	0.04	4.32	259.78	0 01:10	4.32
J5	JUNCTION	0.00	0.18	257.18	0 01:13	0.18
J6	JUNCTION	0.03	1.40	254.94	0 01:31	1.40
J7	JUNCTION	0.03	1.23	254.75	0 01:31	1.23
J8	JUNCTION	0.08	1.93	253.61	0 01:33	1.93
J9	JUNCTION	0.08	1.83	254.64	0 01:35	1.83
DorchesterCreek	OUTFALL	0.01	0.20	254.30	0 01:32	0.20
Ex.Ditch	OUTFALL	0.00	0.13	255.75	0 01:27	0.13
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.06	1.03	251.90	0 01:34	1.03
Ex.Storage	STORAGE	0.11	2.70	257.52	0 01:18	2.70
Ex.SWMF	STORAGE	0.07	0.99	255.89	0 01:46	0.99

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	2.304	0 01:38	0	17.7	-0.100
J10	JUNCTION	0.000	2.315	0 01:38	0	17.7	0.019
J11	JUNCTION	0.000	2.315	0 01:38	0	17.7	-0.042
J12	JUNCTION	0.501	0.830	0 01:12	0.719	1.32	1.496
J13	JUNCTION	3.351	3.351	0 01:10	10.8	10.8	0.250
J14	JUNCTION	0.000	3.691	0 01:34	0	26	0.038
J15	JUNCTION	0.096	0.175	0 01:32	0.779	0.891	0.047
J16	JUNCTION	0.000	3.691	0 01:34	0	26	0.006
J17	JUNCTION	0.000	3.691	0 01:34	0	25.9	-0.048
J2	JUNCTION	0.000	2.575	0 01:11	0	8.76	-0.262
J3	JUNCTION	0.000	3.691	0 01:34	0	26	0.084
J4	JUNCTION	2.675	2.675	0 01:10	8.41	8.41	0.295
J5	JUNCTION	0.000	0.911	0 01:11	0	0.589	-2.481
J6	JUNCTION	0.000	1.656	0 01:08	0	8.37	-0.026
J7	JUNCTION	0.000	1.617	0 01:11	0	8.26	0.037
J8	JUNCTION	0.000	3.691	0 01:34	0	26	-0.011
J9	JUNCTION	0.000	2.308	0 01:38	0	17.7	-0.045
DorchesterCreek	OUTFALL	0.000	0.175	0 01:32	0	0.89	0.000
Ex.Ditch	OUTFALL	1.103	1.190	0 01:10	4.25	5.55	0.000
Ex.Major	OUTFALL	0.000	0.000	0 00:00	0	0	0.000 ltr
Ex.Sewer	OUTFALL	0.000	3.691	0 01:34	0	26	0.000
Ex.Storage	STORAGE	0.522	0.554	0 01:10	0.798	0.818	-0.000
Ex.SWMF	STORAGE	3.892	5.487	0 01:10	6.93	7.87	-0.002

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J10	JUNCTION	0.46	0.385	1.815
J11	JUNCTION	0.53	0.416	2.099
J14	JUNCTION	0.63	0.146	1.410
J16	JUNCTION	0.62	0.242	1.935
J3	JUNCTION	0.43	0.271	1.824
J7	JUNCTION	0.62	0.401	1.424
J8	JUNCTION	0.79	0.555	2.780

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Ex.Storage	0.016	3	0	31	0.409	85	0 01:18	0.233
Ex.SWMF	0.321	4	0	0	4.973	66	0 01:46	0.565

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	8.12	0.042	0.175	0.890
Ex.Ditch	22.94	0.093	1.190	5.551
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	35.95	0.279	3.691	25.957
System	16.75	0.415	3.691	32.398

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.575	0 01:11	4.05	1.86	1.00
C10	CONDUIT	2.315	0 01:38	1.82	1.45	1.00
C11	CONDUIT	2.315	0 01:38	1.87	0.98	1.00
C12	CONDUIT	2.315	0 01:38	1.86	1.03	1.00
C13	CONDUIT	0.001	0 01:09	0.00	0.00	0.00
C14	CONDUIT	0.469	0 01:13	0.45	0.07	0.43
C16	CONDUIT	0.403	0 01:27	0.35	0.09	0.39
C17	CONDUIT	0.175	0 01:32	2.18	0.01	0.20
C18	CONDUIT	1.750	0 01:03	1.85	0.70	1.00
C19	CONDUIT	3.691	0 01:34	2.58	2.31	1.00
C2	CONDUIT	2.308	0 01:38	1.86	0.92	1.00
C20	CONDUIT	3.691	0 01:34	2.70	2.30	0.91
C21	CONDUIT	3.691	0 01:34	2.97	2.31	0.81
C3	CONDUIT	3.691	0 01:34	2.69	0.91	1.00
C4	CONDUIT	1.656	0 01:08	3.10	1.49	1.00
C5	CONDUIT	1.617	0 01:11	3.02	3.50	1.00
C6	CONDUIT	0.091	0 01:31	1.13	0.82	0.61
C7	CONDUIT	0.911	0 01:11	2.12	0.14	0.40
C8	CONDUIT	1.617	0 01:11	3.08	1.26	1.00
C9	CONDUIT	3.691	0 01:34	2.58	1.62	1.00
OR1	ORIFICE	0.049	0 01:56			1.00
C15	WEIR	0.210	0 01:18			0.26
W1	WEIR	1.598	0 01:10			0.51
W2	WEIR	0.000	0 00:00			0.00
W3	WEIR	0.000	0 00:00			0.00
OL1	DUMMY	0.565	0 01:46			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.01	0.03	0.00	0.95	0.03	0.00
C10	1.00	0.00	0.00	0.00	0.29	0.00	0.00	0.71	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.23	0.00	0.00	0.77	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.01	0.00	0.00	0.98	0.00	0.00	0.00	0.98	0.00
C16	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.02	0.00	0.00	0.89	0.09	0.00	0.00	0.97	0.00
C18	1.00	0.00	0.00	0.00	0.30	0.00	0.00	0.70	0.22	0.00
C19	1.00	0.00	0.00	0.00	0.18	0.00	0.00	0.82	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.30	0.00	0.00	0.70	0.26	0.00
C20	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.00	0.00
C21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.07	0.18	0.00	0.76	0.10	0.00
C4	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.94	0.00
C5	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.18	0.00
C6	1.00	0.02	0.98	0.00	0.01	0.00	0.00	0.00	0.98	0.00
C7	1.00	0.02	0.98	0.00	0.00	0.00	0.00	0.00	0.98	0.00
C8	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00

****
Conduit Surcharge Summary

****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.71	0.71	0.75	0.51	0.49
C10	0.46	0.50	0.46	0.98	0.46
C11	0.48	0.48	0.53	0.01	0.01
C12	0.56	0.56	0.61	0.12	0.12
C18	0.38	0.62	0.41	0.01	0.32
C19	0.63	0.87	0.63	1.57	0.63
C2	0.42	0.42	0.48	0.01	0.01
C20	0.01	0.78	0.01	1.56	0.01
C21	0.01	0.01	0.01	1.57	0.01
C3	0.63	0.63	0.79	0.01	0.01
C4	0.70	0.77	0.70	0.80	0.70
C5	0.62	0.70	0.62	1.76	0.62
C8	0.43	0.62	0.43	0.67	0.43
C9	0.62	0.80	0.62	1.08	0.62

Analysis begun on: Thu Jul 11 17:01:18 2019
Analysis ended on: Thu Jul 11 17:01:27 2019
Total elapsed time: 00:00:09

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/01/2005 00:00:00
Ending Date 04/04/2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	6.793	75.839
Evaporation Loss	0.000	0.000
Infiltration Loss	2.923	32.629
Surface Runoff	3.749	41.860
Final Storage	0.123	1.368
Continuity Error (%)	-0.023	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	3.749	37.494
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	3.721	37.208
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.026	0.256
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.081	

****
Highest Continuity Errors
****
Node J5 (-2.79%)
Node J12 (1.85%)

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step   :   0.23 sec
Average Time Step   :   1.00 sec
Maximum Time Step   :   1.00 sec
Percent in Steady State   :   0.00
Average Iterations per Step :   2.00
Percent Not Converging   :   0.02

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff

A1	75.84	0.00	0.00	54.89	0.00	19.69	19.69	3.06	0.35	0.260
A2	75.84	0.00	0.00	55.72	0.00	18.86	18.86	1.00	0.13	0.249
EXT1	75.84	0.00	0.00	26.73	40.90	27.27	47.72	9.55	3.04	0.629
EXT2	75.84	0.00	0.00	26.95	40.90	27.05	47.50	12.26	3.81	0.626
EXT3	75.84	0.00	0.00	17.18	57.27	8.92	57.27	1.86	1.07	0.755
EXT4	75.84	0.00	0.00	5.70	68.72	3.25	68.72	0.89	0.58	0.906
EXT5	75.84	0.00	0.00	24.17	40.95	50.36	50.36	0.36	0.25	0.664
EXT6	75.84	0.00	0.00	27.45	37.21	47.06	47.06	0.23	0.12	0.621
EXT7	75.84	0.00	0.00	24.11	40.96	50.44	50.44	0.45	0.32	0.665
EXT8	75.84	0.00	0.00	26.27	48.20	7.30	48.20	7.84	4.32	0.636

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.07	1.97	255.03	0 01:38	1.97
J10	JUNCTION	0.07	1.92	254.62	0 01:37	1.92
J11	JUNCTION	0.08	1.94	254.42	0 01:36	1.94
J12	JUNCTION	0.01	0.32	256.51	0 01:28	0.32
J13	JUNCTION	0.06	3.57	256.82	0 01:10	3.57
J14	JUNCTION	0.09	1.59	252.63	0 01:35	1.59
J15	JUNCTION	0.01	0.23	254.53	0 01:38	0.23
J16	JUNCTION	0.09	1.95	253.13	0 01:35	1.95
J17	JUNCTION	0.07	1.18	252.08	0 01:36	1.18
J2	JUNCTION	0.05	2.83	257.65	0 01:08	2.82
J3	JUNCTION	0.07	1.94	254.22	0 01:35	1.94
J4	JUNCTION	0.05	4.34	259.80	0 01:11	4.34
J5	JUNCTION	0.00	0.24	257.24	0 01:15	0.24
J6	JUNCTION	0.04	1.51	255.05	0 01:32	1.51
J7	JUNCTION	0.03	1.34	254.86	0 01:32	1.34
J8	JUNCTION	0.08	2.03	253.71	0 01:35	2.03
J9	JUNCTION	0.08	2.01	254.82	0 01:38	2.01
DorchesterCreek	OUTFALL	0.01	0.23	254.33	0 01:38	0.23
Ex.Ditch	OUTFALL	0.01	0.16	255.78	0 01:28	0.16
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.06	1.04	251.91	0 01:36	1.04
Ex.Storage	STORAGE	0.11	2.72	257.54	0 01:14	2.72
Ex.SWMF	STORAGE	0.07	1.15	256.05	0 01:40	1.15

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	2.433	0 01:46	0	19.9	-0.082
J10	JUNCTION	0.000	2.443	0 01:46	0	19.9	0.017
J11	JUNCTION	0.000	2.443	0 01:46	0	19.9	-0.031
J12	JUNCTION	0.565	1.292	0 01:15	0.811	2.01	1.886
J13	JUNCTION	3.807	3.807	0 01:10	12.3	12.3	0.212
J14	JUNCTION	0.000	3.801	0 01:36	0	28.7	0.029
J15	JUNCTION	0.128	0.245	0 01:38	1	1.22	0.035
J16	JUNCTION	0.000	3.801	0 01:36	0	28.7	0.007
J17	JUNCTION	0.000	3.801	0 01:36	0	28.7	-0.038
J2	JUNCTION	0.000	2.591	0 01:11	0	9.88	-0.222
J3	JUNCTION	0.000	3.801	0 01:36	0	28.7	0.065
J4	JUNCTION	3.041	3.041	0 01:10	9.55	9.55	0.289
J5	JUNCTION	0.000	1.198	0 01:14	0	1.16	-2.711
J6	JUNCTION	0.000	1.662	0 01:07	0	9.01	-0.029
J7	JUNCTION	0.000	1.617	0 01:09	0	8.79	0.070
J8	JUNCTION	0.000	3.801	0 01:36	0	28.7	-0.002
J9	JUNCTION	0.000	2.436	0 01:46	0	19.9	-0.042
DorchesterCreek	OUTFALL	0.000	0.245	0 01:38	0	1.22	0.000
Ex.Ditch	OUTFALL	1.257	1.371	0 01:10	5.15	7.12	0.000
Ex.Major	OUTFALL	0.000	0.197	0 01:40	0	0.193	0.000
Ex.Sewer	OUTFALL	0.000	3.801	0 01:36	0	28.7	0.000
Ex.Storage	STORAGE	0.578	0.605	0 01:09	0.886	0.912	-0.000
Ex.SWMF	STORAGE	4.320	6.370	0 01:10	7.84	9.48	-0.002

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J10	JUNCTION	0.74	0.552	1.648
J11	JUNCTION	0.80	0.565	1.950
J14	JUNCTION	0.86	0.186	1.370
J16	JUNCTION	0.85	0.311	1.866
J3	JUNCTION	0.70	0.402	1.693
J7	JUNCTION	0.84	0.513	1.312
J8	JUNCTION	1.01	0.657	2.678

****
Node Flooding Summary
****

Project #: 60568894
Project: Name: 187 Dorchester Road
Existing Conditions PCSWMM Output
100 Year – 3hr Chicago

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Ex.Storage	0.017	4	0	28	0.412	86	0 01:14	0.294
Ex.SWMF	0.351	5	0	0	5.933	79	0 01:40	1.023

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	8.43	0.056	0.245	1.221
Ex.Ditch	23.05	0.119	1.371	7.124
Ex.Major	0.65	0.114	0.197	0.193
Ex.Sewer	36.15	0.306	3.801	28.670
System	17.07	0.596	3.801	37.208

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.591	0 01:11	4.07	1.87	1.00
C10	CONDUIT	2.443	0 01:46	1.84	1.53	1.00
C11	CONDUIT	2.443	0 01:46	1.91	1.04	1.00
C12	CONDUIT	2.443	0 01:46	1.93	1.08	1.00
C13	CONDUIT	0.059	0 01:11	0.31	0.01	0.06
C14	CONDUIT	0.992	0 01:15	0.55	0.14	0.53
C16	CONDUIT	0.684	0 01:28	0.40	0.15	0.48
C17	CONDUIT	0.245	0 01:38	2.37	0.02	0.23
C18	CONDUIT	1.750	0 01:03	1.85	0.70	1.00
C19	CONDUIT	3.801	0 01:36	2.65	2.38	1.00
C2	CONDUIT	2.436	0 01:46	1.87	0.97	1.00
C20	CONDUIT	3.801	0 01:36	2.76	2.37	0.92
C21	CONDUIT	3.801	0 01:36	3.02	2.38	0.82
C3	CONDUIT	3.801	0 01:36	2.69	0.94	1.00
C4	CONDUIT	1.662	0 01:07	3.11	1.50	1.00
C5	CONDUIT	1.617	0 01:09	3.02	3.50	1.00
C6	CONDUIT	0.122	0 01:31	1.19	1.11	0.78
C7	CONDUIT	0.933	0 01:13	2.21	0.14	0.48
C8	CONDUIT	1.617	0 01:09	3.08	1.26	1.00
C9	CONDUIT	3.801	0 01:36	2.65	1.67	1.00
OR1	ORIFICE	0.049	0 02:04			1.00
C15	WEIR	0.269	0 01:14			0.30
W1	WEIR	2.054	0 01:10			0.60
W2	WEIR	0.197	0 01:40			0.25
W3	WEIR	0.000	0 00:00			0.00
OL1	DUMMY	0.957	0 01:51			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.01	0.03	0.00	0.95	0.03	0.00
C10	1.00	0.00	0.00	0.00	0.30	0.00	0.00	0.70	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.24	0.00	0.00	0.76	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.01	0.00	0.00	0.98	0.00	0.00	0.00	0.98	0.00
C16	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.01	0.00	0.00	0.89	0.10	0.00	0.00	0.98	0.00
C18	1.00	0.00	0.00	0.00	0.30	0.00	0.00	0.70	0.22	0.00
C19	1.00	0.00	0.00	0.00	0.18	0.00	0.00	0.81	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.30	0.00	0.00	0.70	0.26	0.00
C20	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.00	0.00
C21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.07	0.18	0.00	0.75	0.11	0.00
C4	1.00	0.00	0.00	0.00	0.97	0.03	0.00	0.00	0.94	0.00
C5	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.18	0.00
C6	1.00	0.01	0.97	0.00	0.01	0.00	0.00	0.00	0.98	0.00
C7	1.00	0.02	0.98	0.00	0.01	0.00	0.00	0.00	0.98	0.00
C8	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00

****
Conduit Surcharge Summary

****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.87	0.87	0.92	0.64	0.63
C10	0.74	0.77	0.74	1.25	0.74
C11	0.76	0.76	0.80	0.45	0.44
C12	0.82	0.82	0.84	0.59	0.59
C18	0.67	0.89	0.71	0.01	0.48
C19	0.86	1.09	0.86	1.77	0.86
C2	0.72	0.72	0.76	0.01	0.01
C20	0.01	1.01	0.01	1.77	0.01
C21	0.01	0.01	0.01	1.77	0.01
C3	0.86	0.86	1.01	0.01	0.01
C4	0.90	0.94	0.90	0.96	0.90
C5	0.84	0.90	0.84	1.88	0.84
C6	0.01	0.01	0.01	0.31	0.01
C8	0.67	0.84	0.70	0.75	0.56
C9	0.85	1.03	0.85	1.29	0.85

Analysis begun on: Thu Jul 11 17:01:57 2019
Analysis ended on: Thu Jul 11 17:02:05 2019
Total elapsed time: 00:00:08

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/01/2005 00:00:00
Ending Date 04/04/2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	7.758	86.611
Evaporation Loss	0.000	0.000
Infiltration Loss	3.134	34.994
Surface Runoff	4.503	50.270
Final Storage	0.123	1.370
Continuity Error (%)	-0.026	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	4.503	45.027
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	4.474	44.739
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.026	0.260
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.064	

****
Highest Continuity Errors
****
Node J5 (-2.38%)
Node J12 (1.63%)

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step   :   0.38 sec
Average Time Step   :   1.00 sec
Maximum Time Step   :   1.00 sec
Percent in Steady State   :   0.00
Average Iterations per Step :   2.00
Percent Not Converging   :   0.03

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff

A1	86.61	0.00	0.00	58.62	0.00	26.73	26.73	4.16	0.51	0.309
A2	86.61	0.00	0.00	59.71	0.00	25.64	25.64	1.36	0.19	0.296
EXT1	86.61	0.00	0.00	28.70	46.83	33.11	56.53	11.32	3.74	0.653
EXT2	86.61	0.00	0.00	28.92	46.83	32.89	56.31	14.53	4.68	0.650
EXT3	86.61	0.00	0.00	18.34	66.90	11.54	66.90	2.17	1.27	0.772
EXT4	86.61	0.00	0.00	6.09	79.11	4.15	79.11	1.02	0.69	0.913
EXT5	86.61	0.00	0.00	26.11	46.89	59.24	59.24	0.43	0.30	0.684
EXT6	86.61	0.00	0.00	29.60	42.61	55.71	55.71	0.27	0.15	0.643
EXT7	86.61	0.00	0.00	26.02	46.90	59.31	59.31	0.53	0.38	0.685
EXT8	86.61	0.00	0.00	28.37	56.88	10.04	56.88	9.25	5.13	0.657

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.08	2.09	255.14	0 01:31	2.09
J10	JUNCTION	0.08	2.02	254.72	0 01:31	2.02
J11	JUNCTION	0.08	2.03	254.51	0 01:31	2.03
J12	JUNCTION	0.01	0.39	256.58	0 01:28	0.39
J13	JUNCTION	0.07	3.62	256.87	0 01:10	3.62
J14	JUNCTION	0.09	1.61	252.65	0 01:31	1.61
J15	JUNCTION	0.01	0.25	254.55	0 01:40	0.25
J16	JUNCTION	0.10	1.99	253.18	0 01:31	1.99
J17	JUNCTION	0.08	1.19	252.09	0 01:31	1.19
J2	JUNCTION	0.05	2.83	257.65	0 01:06	2.83
J3	JUNCTION	0.07	2.02	254.29	0 01:31	2.02
J4	JUNCTION	0.06	4.40	259.86	0 01:11	4.40
J5	JUNCTION	0.00	0.27	257.27	0 01:21	0.27
J6	JUNCTION	0.04	1.59	255.13	0 01:26	1.59
J7	JUNCTION	0.03	1.42	254.94	0 01:26	1.42
J8	JUNCTION	0.09	2.41	254.09	0 01:07	2.09
J9	JUNCTION	0.09	2.12	254.93	0 01:31	2.12
DorchesterCreek	OUTFALL	0.01	0.25	254.35	0 01:40	0.25
Ex.Ditch	OUTFALL	0.01	0.20	255.82	0 01:28	0.20
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.06	1.05	251.92	0 01:31	1.05
Ex.Storage	STORAGE	0.11	2.77	257.59	0 01:11	2.77
Ex.SWMF	STORAGE	0.08	1.29	256.19	0 01:31	1.29

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	2.514	0 01:16	0	21.5	-0.073
J10	JUNCTION	0.000	2.467	0 01:55	0	21.5	0.007
J11	JUNCTION	0.000	2.467	0 01:55	0	21.5	-0.035
J12	JUNCTION	0.685	1.998	0 01:12	0.954	3.33	1.657
J13	JUNCTION	4.678	4.678	0 01:10	14.5	14.5	0.179
J14	JUNCTION	0.000	3.864	0 01:31	0	30.9	0.021
J15	JUNCTION	0.187	0.316	0 01:40	1.36	1.68	0.024
J16	JUNCTION	0.000	3.864	0 01:31	0	30.9	0.008
J17	JUNCTION	0.000	3.864	0 01:31	0	30.9	-0.031
J2	JUNCTION	0.000	2.622	0 01:12	0	11.4	-0.188
J3	JUNCTION	0.000	3.864	0 01:31	0	31	0.053
J4	JUNCTION	3.741	3.741	0 01:10	11.3	11.3	0.276
J5	JUNCTION	0.000	1.425	0 01:11	0	2.07	-2.329
J6	JUNCTION	0.000	1.673	0 01:06	0	9.74	-0.028
J7	JUNCTION	0.000	1.617	0 01:08	0	9.42	0.068
J8	JUNCTION	0.000	3.864	0 01:31	0	30.9	0.003
J9	JUNCTION	0.000	2.459	0 01:55	0	21.5	-0.051
DorchesterCreek	OUTFALL	0.000	0.316	0 01:40	0	1.68	0.000
Ex.Ditch	OUTFALL	1.562	2.131	0 01:30	6.6	9.88	0.000
Ex.Major	OUTFALL	0.000	1.437	0 01:31	0	2.23	0.000
Ex.Sewer	OUTFALL	0.000	3.864	0 01:31	0	30.9	0.000
Ex.Storage	STORAGE	0.686	0.702	0 01:09	1.02	1.05	-0.000
Ex.SWMF	STORAGE	5.132	8.053	0 01:10	9.25	12.3	-0.001

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J10	JUNCTION	0.94	0.650	1.550
J11	JUNCTION	0.98	0.653	1.862
J14	JUNCTION	1.03	0.211	1.345
J16	JUNCTION	1.02	0.353	1.824
J3	JUNCTION	0.90	0.480	1.615
J6	JUNCTION	0.48	0.076	1.874
J7	JUNCTION	1.02	0.592	1.233
J8	JUNCTION	1.18	1.033	2.302

****
Node Flooding Summary

****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Ex.Storage	0.018	4	0	25	0.421	87	0 01:11	0.482
Ex.SWMF	0.375	5	0	0	6.769	91	0 01:31	2.145

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	8.81	0.074	0.316	1.683
Ex.Ditch	23.19	0.164	2.131	9.880
Ex.Major	1.22	0.708	1.437	2.235
Ex.Sewer	36.31	0.329	3.864	30.941
System	17.38	1.276	3.864	44.739

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.622	0 01:12	4.12	1.89	1.00
C10	CONDUIT	2.467	0 01:55	1.88	1.54	1.00
C11	CONDUIT	2.467	0 01:55	1.95	1.05	1.00
C12	CONDUIT	2.467	0 01:55	1.95	1.09	1.00
C13	CONDUIT	0.515	0 01:11	0.72	0.09	0.23
C14	CONDUIT	1.286	0 01:21	0.53	0.19	0.65
C16	CONDUIT	1.229	0 01:28	0.47	0.27	0.59
C17	CONDUIT	0.316	0 01:40	2.53	0.02	0.25
C18	CONDUIT	1.750	0 01:02	1.89	0.70	1.00
C19	CONDUIT	3.864	0 01:31	2.70	2.42	1.00
C2	CONDUIT	2.459	0 01:55	1.88	0.98	1.00
C20	CONDUIT	3.864	0 01:31	2.80	2.41	0.92
C21	CONDUIT	3.864	0 01:31	3.04	2.42	0.83
C3	CONDUIT	3.864	0 01:31	2.71	0.96	1.00
C4	CONDUIT	1.673	0 01:06	3.13	1.51	1.00
C5	CONDUIT	1.617	0 01:08	3.02	3.50	1.00
C6	CONDUIT	0.133	0 01:27	1.23	1.21	0.81
C7	CONDUIT	1.025	0 01:21	2.31	0.15	0.51
C8	CONDUIT	1.617	0 01:08	3.08	1.26	1.00
C9	CONDUIT	3.864	0 01:31	2.70	1.70	1.00
OR1	ORIFICE	0.049	0 02:13			1.00
C15	WEIR	0.454	0 01:11			0.43
W1	WEIR	2.924	0 01:10			0.76
W2	WEIR	1.437	0 01:31			0.93
W3	WEIR	0.000	0 00:00			0.00
OL1	DUMMY	1.022	0 02:01			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Up Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.02	0.03	0.00	0.95	0.03	0.00
C10	1.00	0.00	0.00	0.00	0.30	0.00	0.00	0.70	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.24	0.00	0.00	0.76	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.01	0.00	0.00	0.98	0.00	0.00	0.00	0.98	0.00
C16	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.01	0.00	0.00	0.88	0.10	0.00	0.00	0.98	0.00
C18	1.00	0.00	0.00	0.00	0.30	0.00	0.00	0.70	0.21	0.00
C19	1.00	0.00	0.00	0.00	0.19	0.00	0.00	0.81	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.31	0.00	0.00	0.69	0.26	0.00
C20	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.00	0.00
C21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.07	0.18	0.00	0.75	0.11	0.00
C4	1.00	0.00	0.00	0.00	0.97	0.03	0.00	0.00	0.93	0.00
C5	1.00	0.00	0.00	0.00	0.96	0.04	0.00	0.00	0.18	0.00
C6	1.00	0.01	0.97	0.00	0.01	0.00	0.00	0.00	0.97	0.00
C7	1.00	0.02	0.98	0.00	0.01	0.00	0.00	0.00	0.98	0.00
C8	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00

****

Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	1.02	1.03	1.08	0.80	0.78
C10	0.94	0.97	0.94	1.43	0.94
C11	0.95	0.95	0.98	0.79	0.81
C12	0.99	0.99	1.01	0.90	0.86
C18	0.88	1.07	0.92	0.01	0.68
C19	1.03	1.26	1.03	1.95	1.03
C2	0.93	0.93	0.96	0.01	0.01
C20	0.01	1.18	0.01	1.94	0.01
C21	0.01	0.01	0.01	1.95	0.01
C3	1.03	1.03	1.18	0.01	0.01
C4	1.07	1.09	1.07	1.12	1.07
C5	1.02	1.07	1.02	2.02	1.02
C6	0.01	0.48	0.01	0.56	0.01
C8	0.87	1.02	0.90	0.90	0.74
C9	1.02	1.19	1.02	1.46	1.02

Analysis begun on: Thu Jul 11 17:02:35 2019
Analysis ended on: Thu Jul 11 17:02:44 2019
Total elapsed time: 00:00:09

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/01/2005 00:00:00
Ending Date 04/04/2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	10.212	114.013
Evaporation Loss	0.000	0.000
Infiltration Loss	3.292	36.757
Surface Runoff	6.799	75.907
Final Storage	0.123	1.369
Continuity Error (%)	-0.019	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	6.799	67.991
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	6.754	67.541
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.043	0.432
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.026	

****
Highest Continuity Errors
****
Node J5 (-1.92%)
Node J12 (1.15%)

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
Link OL1 (1)

****
Routing Time Step Summary
****
Minimum Time Step   :   0.09 sec
Average Time Step   :   1.00 sec
Maximum Time Step   :   1.00 sec
Percent in Steady State   :   -0.00
Average Iterations per Step :   2.00
Percent Not Converging   :   0.03

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff

A1	114.01	0.00	0.00	59.82	0.00	52.93	52.93	8.24	0.70	0.464
A2	114.01	0.00	0.00	62.30	0.00	50.44	50.44	2.67	0.26	0.442
EXT1	114.01	0.00	0.00	30.38	61.90	51.31	82.26	16.47	4.23	0.722
EXT2	114.01	0.00	0.00	30.42	61.90	51.26	82.21	21.21	5.26	0.721
EXT3	114.01	0.00	0.00	20.03	92.60	19.43	92.60	3.00	1.32	0.812
EXT4	114.01	0.00	0.00	6.83	105.77	6.71	105.77	1.36	0.70	0.928
EXT5	114.01	0.00	0.00	29.80	61.96	82.93	82.93	0.60	0.32	0.727
EXT6	114.01	0.00	0.00	33.25	56.31	79.44	79.44	0.39	0.16	0.697
EXT7	114.01	0.00	0.00	29.78	61.96	82.95	82.95	0.74	0.40	0.728
EXT8	114.01	0.00	0.00	30.77	81.87	19.97	81.87	13.31	5.21	0.718

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.12	2.16	255.22	0 09:29	2.16
J10	JUNCTION	0.12	2.08	254.78	0 09:29	2.08
J11	JUNCTION	0.13	2.08	254.56	0 09:29	2.08
J12	JUNCTION	0.02	0.43	256.62	0 09:26	0.43
J13	JUNCTION	0.11	3.65	256.90	0 09:10	3.65
J14	JUNCTION	0.16	1.62	252.67	0 09:29	1.62
J15	JUNCTION	0.03	0.27	254.57	0 09:30	0.27
J16	JUNCTION	0.16	2.02	253.20	0 09:29	2.02
J17	JUNCTION	0.13	1.20	252.10	0 09:30	1.20
J2	JUNCTION	0.09	2.83	257.65	0 09:05	2.83
J3	JUNCTION	0.11	2.06	254.34	0 09:29	2.06
J4	JUNCTION	0.10	4.43	259.89	0 09:11	4.43
J5	JUNCTION	0.00	0.27	257.27	0 09:20	0.27
J6	JUNCTION	0.08	1.62	255.16	0 09:29	1.62
J7	JUNCTION	0.06	1.45	254.97	0 09:29	1.45
J8	JUNCTION	0.14	2.20	253.88	0 09:06	2.13
J9	JUNCTION	0.15	2.19	255.00	0 09:29	2.19
DorchesterCreek	OUTFALL	0.03	0.27	254.37	0 09:30	0.27
Ex.Ditch	OUTFALL	0.01	0.23	255.85	0 09:26	0.23
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.11	1.05	251.93	0 09:30	1.05
Ex.Storage	STORAGE	0.17	2.82	257.64	0 09:10	2.82
Ex.SWMF	STORAGE	0.11	1.37	256.27	0 09:29	1.37

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	2.659	0 09:14	0	30.5	-0.050
J10	JUNCTION	0.000	2.497	0 09:30	0	30.6	0.012
J11	JUNCTION	0.000	2.497	0 09:30	0	30.6	-0.018
J12	JUNCTION	0.718	2.716	0 09:11	1.34	4.67	1.165
J13	JUNCTION	5.260	5.260	0 09:10	21.2	21.2	0.116
J14	JUNCTION	0.000	3.900	0 09:30	0	44.3	0.005
J15	JUNCTION	0.259	0.398	0 09:30	2.67	3.05	0.007
J16	JUNCTION	0.000	3.900	0 09:30	0	44.3	-0.007
J17	JUNCTION	0.000	3.900	0 09:30	0	44.3	-0.005
J2	JUNCTION	0.000	2.642	0 09:11	0	16.1	-0.123
J3	JUNCTION	0.000	3.900	0 09:30	0	44.3	0.015
J4	JUNCTION	4.228	4.228	0 09:10	16.5	16.5	0.067
J5	JUNCTION	0.000	1.624	0 09:10	0	2.54	-1.881
J6	JUNCTION	0.000	1.677	0 09:05	0	14.1	-0.018
J7	JUNCTION	0.000	1.617	0 09:11	0	13.8	0.048
J8	JUNCTION	0.000	3.900	0 09:30	0	44.3	0.030
J9	JUNCTION	0.000	2.497	0 09:29	0	30.6	-0.023
DorchesterCreek	OUTFALL	0.000	0.398	0 09:30	0	3.05	0.000
Ex.Ditch	OUTFALL	1.809	2.773	0 09:25	11.6	16.2	0.000
Ex.Major	OUTFALL	0.000	2.093	0 09:29	0	3.96	0.000
Ex.Sewer	OUTFALL	0.000	3.900	0 09:30	0	44.3	0.000
Ex.Storage	STORAGE	0.702	0.707	0 09:08	1.36	1.4	-0.001
Ex.SWMF	STORAGE	5.207	8.710	0 09:10	13.3	17.5	0.003

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J10	JUNCTION	1.02	0.708	1.492
J11	JUNCTION	1.05	0.704	1.811
J14	JUNCTION	1.10	0.225	1.331
J16	JUNCTION	1.09	0.377	1.800
J3	JUNCTION	0.99	0.524	1.571
J6	JUNCTION	0.59	0.108	1.842
J7	JUNCTION	1.08	0.628	1.197
J8	JUNCTION	1.24	0.828	2.507

****
Node Flooding Summary

****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Ex.Storage	0.026	5	0	31	0.428	89	0 09:10	0.648
Ex.SWMF	0.522	7	0	0	7.307	98	0 09:29	2.840

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	35.17	0.033	0.398	3.048
Ex.Ditch	52.07	0.120	2.773	16.242
Ex.Major	1.41	1.082	2.093	3.961
Ex.Sewer	64.48	0.265	3.900	44.289
System	38.28	1.501	3.900	67.541

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.642	0 09:11	4.15	1.91	1.00
C10	CONDUIT	2.497	0 09:30	1.87	1.56	1.00
C11	CONDUIT	2.497	0 09:30	1.91	1.06	1.00
C12	CONDUIT	2.497	0 09:30	1.95	1.11	1.00
C13	CONDUIT	0.999	0 09:11	0.92	0.18	0.35
C14	CONDUIT	1.355	0 09:20	0.52	0.20	0.69
C16	CONDUIT	1.641	0 09:26	0.51	0.37	0.65
C17	CONDUIT	0.398	0 09:30	2.68	0.03	0.27
C18	CONDUIT	1.750	0 09:01	1.83	0.70	1.00
C19	CONDUIT	3.900	0 09:30	2.72	2.44	1.00
C2	CONDUIT	2.497	0 09:29	1.88	1.00	1.00
C20	CONDUIT	3.900	0 09:30	2.82	2.43	0.93
C21	CONDUIT	3.900	0 09:30	3.06	2.45	0.83
C3	CONDUIT	3.900	0 09:30	2.74	0.97	1.00
C4	CONDUIT	1.677	0 09:05	3.14	1.51	1.00
C5	CONDUIT	1.617	0 09:11	3.02	3.50	1.00
C6	CONDUIT	0.139	0 09:30	1.24	1.26	0.84
C7	CONDUIT	1.060	0 09:20	2.37	0.16	0.52
C8	CONDUIT	1.617	0 09:11	3.08	1.26	1.00
C9	CONDUIT	3.900	0 09:30	2.72	1.71	1.00
OR1	ORIFICE	0.049	0 10:15			1.00
C15	WEIR	0.632	0 09:10			0.54
W1	WEIR	3.506	0 09:10			0.86
W2	WEIR	2.093	0 09:29			1.00
W3	WEIR	0.000	0 00:00			0.00
OL1	DUMMY	1.040	0 10:05			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Up Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.02	0.03	0.00	0.95	0.03	0.00
C10	1.00	0.00	0.00	0.00	0.53	0.00	0.00	0.47	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.49	0.00	0.00	0.51	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.00	0.00
C13	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
C14	1.00	0.09	0.04	0.00	0.87	0.00	0.00	0.00	0.87	0.00
C16	1.00	0.09	0.00	0.00	0.91	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.13	0.00	0.00	0.51	0.37	0.00	0.00	0.81	0.00
C18	1.00	0.00	0.00	0.00	0.53	0.00	0.00	0.47	0.37	0.00
C19	1.00	0.00	0.00	0.00	0.42	0.00	0.00	0.57	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.53	0.00	0.00	0.47	0.46	0.00
C20	1.00	0.00	0.00	0.00	0.08	0.00	0.00	0.92	0.00	0.00
C21	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.08	0.41	0.00	0.51	0.32	0.00
C4	1.00	0.00	0.00	0.00	0.94	0.06	0.00	0.00	0.98	0.00
C5	1.00	0.00	0.00	0.00	0.88	0.12	0.00	0.00	0.00	0.00
C6	1.00	0.13	0.86	0.00	0.01	0.00	0.00	0.00	0.86	0.00
C7	1.00	0.13	0.86	0.00	0.01	0.00	0.00	0.00	0.87	0.00
C8	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.97	0.00	0.00

****

Conduit Surcharge Summary
****

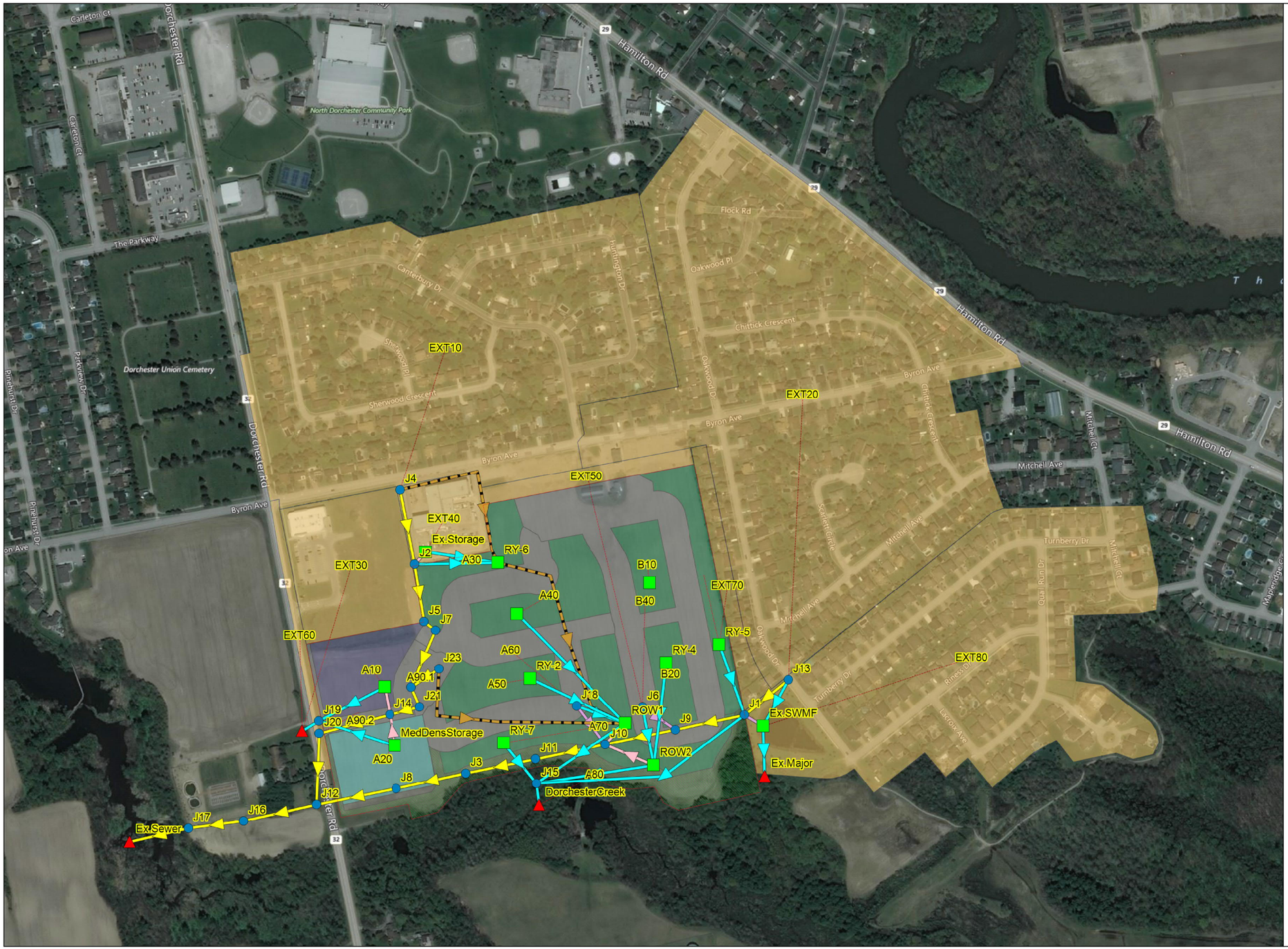
Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	1.07	1.08	1.13	0.85	0.84
C10	1.02	1.05	1.02	1.50	1.02
C11	1.04	1.04	1.05	0.91	0.92
C12	1.06	1.07	1.08	1.01	0.97
C18	0.97	1.14	1.01	0.01	0.77
C19	1.10	1.32	1.10	2.01	1.10
C2	1.02	1.02	1.04	0.01	0.02
C20	0.01	1.24	0.01	2.01	0.01
C21	0.01	0.01	0.01	2.02	0.01
C3	1.10	1.10	1.24	0.01	0.01
C4	1.13	1.15	1.13	1.17	1.13
C5	1.08	1.13	1.08	2.15	1.08
C6	0.01	0.59	0.01	0.66	0.01
C8	0.95	1.08	0.99	0.96	0.81
C9	1.09	1.26	1.09	1.52	1.09

Analysis begun on: Thu Jul 11 17:03:09 2019
Analysis ended on: Thu Jul 11 17:03:18 2019
Total elapsed time: 00:00:09

AECOM Imagine it. Delivered.

Appendix E

Proposed Conditions SWM Model



187 Dorchester Road (Sifton) - Proposed Conditions

- Junctions
- Outfalls
- Storages
- Weirs

Conduits

- Visible
- Overland Flow

- Orifices
- Outlets

Subcatchments

- Rear-Yards
- ROW
- External Areas
- Commercial
- Medium-Density
- Buffer
- Agricultural Field

- Property Line

N

350 m

```
[TITLE]


[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           CMS
INFILTRATION         CURVE_NUMBER
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO
START_DATE           04/01/2005
START_TIME           00:00:00
REPORT_START_DATE    04/01/2005
REPORT_START_TIME    00:00:00
END_DATE             04/04/2005
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         1
RULE_STEP            00:00:00
INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         1.14
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
MONTHLY      0.03   0.04   0.29   1.13   2.45   3.77   4.35   3.84   2.67   1.35   0.47   0.1
DRY_ONLY     NO

[RAINGAGES]
;;                Rain      Time   Snow   Data
;;Name            Type      Intrvl Catch  Source
;;--------------- --------- ------ ------ ----------
London            INTENSITY 0:10   1.0    TIMESERIES London-250yr24hr-10min

[SUBCATCHMENTS]
;;                                                    Total    Pcnt.            Pcnt.    Curb     Snow
;;Name            Raingage          Outlet            Area     Imperv   Width   Slope    Length   Pack
;;--------------- ----------------- ----------------- -------- -------- ------- -------- -------- --------
;Commercial
A10               London            Comm.Storage      1.32     75       146.667 2        0
;Medium-Density
A20               London            MedDensStorage    1.46     65       146     2        0
;Rear Yard
A30               London            RY-6              0.92     55       306.667 2        0
;Rear Yard
A40               London            RY-1              1.33     55       443.333 2        0
;Rear Yard
A50               London            RY-2              0.98     55       326.667 2        0
;ROW
A60               London            J18               3.21     50       214     1        0
;Rear Yard
A70               London            RY-7              2.11     55       175.833 2        0
;Buffer
A80               London            DorchesterCreek   2.15     0        477.778 2        0
;ROW
A90.1             London            J23               0.55     50       91.667  1        0
;ROW
A90.2             London            J20               0.32     50       64      1        0
;Rear Yard
B10               London            RY-3              0.67     55       223.333 2        0
;Rear Yard
B20               London            RY-4              0.71     55       236.667 2        0
;Rear Yard
B30               London            RY-5              1.05     55       350     2        0
;ROW
B40               London            J6                4.06     50       253.75  1        0
;External
EXT10             London            J4                20.02    55       541.081 2        0
;External
EXT20             London            J13               25.8     55       629.268 2        0
;External
EXT30             London            Ex.Ditch          3.24     65       216     2        0
;External
EXT40             London            Ex.Storage        1.29     75       143.333 2        0
;External
EXT50             London            J6                0.72     55       288     3        0
;External
EXT60             London            Ex.Ditch          0.49     50       81.667  2        0
;External
EXT70             London            RY-5              0.89     55       445     3        0
;External
EXT80             London            Ex.SWMF           16.26    55       492.727 2        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;--------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
```



```
[TITLE]


[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           CMS
INFILTRATION         CURVE_NUMBER
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO
START_DATE           04/01/2005
START_TIME           00:00:00
REPORT_START_DATE    04/01/2005
REPORT_START_TIME    00:00:00
END_DATE             04/04/2005
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         1
RULE_STEP            00:00:00
INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         1.14
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
MONTHLY      0.03   0.04   0.29   1.13   2.45   3.77   4.35   3.84   2.67   1.35   0.47   0.1
DRY_ONLY     NO

[RAINGAGES]
;;                Rain      Time   Snow   Data
;;Name            Type      Intrvl Catch  Source
;;--------------- --------- ------ ------ ----------
London            INTENSITY 0:10   1.0    TIMESERIES London-250yr24hr-10min

[SUBCATCHMENTS]
;;                                                    Total    Pcnt.            Pcnt.    Curb     Snow
;;Name            Raingage          Outlet            Area     Imperv   Width   Slope    Length   Pack
;;--------------- ----------------- ----------------- -------- -------- ------- -------- -------- --------
;Commercial
A10               London            Comm.Storage      1.32     75       146.667 2        0
;Medium-Density
A20               London            MedDensStorage    1.6      65       160     2        0
;Rear Yard
A30               London            RY-6              0.92     55       306.667 2        0
;Rear Yard
A40               London            RY-1              1.33     55       443.333 2        0
;Rear Yard
A50               London            RY-2              0.98     55       326.667 2        0
;ROW
A60               London            J18               3.21     50       214     1        0
;Rear Yard
A70               London            RY-7              2.11     55       175.833 2        0
;Buffer
A80               London            DorchesterCreek   2.01     0        446.667 2        0
;ROW
A90.1             London            J23               0.55     50       91.667  1        0
;ROW
A90.2             London            J20               0.32     50       64      1        0
;Rear Yard
B10               London            RY-3              0.67     55       223.333 2        0
;Rear Yard
B20               London            RY-4              0.71     55       236.667 2        0
;Rear Yard
B30               London            RY-5              1.05     55       350     2        0
;ROW
B40               London            J6                4.06     50       253.75  1        0
;External
EXT10             London            J4                20.02    55       541.081 2        0
;External
EXT20             London            J13               25.8     55       629.268 2        0
;External
EXT30             London            Ex.Ditch          3.24     65       216     2        0
;External
EXT40             London            Ex.Storage        1.29     75       143.333 2        0
;External
EXT50             London            J6                0.72     55       288     3        0
;External
EXT60             London            Ex.Ditch          0.49     50       81.667  2        0
;External
EXT70             London            RY-5              0.89     55       445     3        0
;External
EXT80             London            Ex.SWMF           16.26    55       492.727 2        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;--------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
```

```
A10             0.013     0.25       2          5          25         IMPERVIOUS 100
A20             0.013     0.25       2          5          25         IMPERVIOUS 100
A30             0.013     0.25       2          5          25         PERVIOUS   100
A40             0.013     0.25       2          5          25         PERVIOUS   100
A50             0.013     0.25       2          5          25         PERVIOUS   100
A60             0.013     0.25       2          5          25         PERVIOUS   50
A70             0.013     0.25       2          5          25         PERVIOUS   100
A80             0.013     0.25       2          5          25         PERVIOUS   100
A90.1           0.013     0.25       2          5          25         PERVIOUS   50
A90.2           0.013     0.25       2          5          25         PERVIOUS   50
B10             0.013     0.25       2          5          25         PERVIOUS   100
B20             0.013     0.25       2          5          25         PERVIOUS   100
B30             0.013     0.25       2          5          25         PERVIOUS   100
B40             0.013     0.25       2          5          25         PERVIOUS   50
EXT10           0.013     0.25       2          5          25         PERVIOUS   50
EXT20           0.013     0.25       2          5          25         PERVIOUS   50
EXT30           0.013     0.25       2          5          25         IMPERVIOUS 31
EXT40           0.013     0.25       2          5          25         IMPERVIOUS 27
EXT50           0.013     0.25       2          5          25         PERVIOUS   100
EXT60           0.013     0.25       2          5          25         PERVIOUS   100
EXT70           0.013     0.25       2          5          25         PERVIOUS   100
EXT80           0.013     0.25       2          5          25         IMPERVIOUS 100

[INFILTRATION]
;;Subcatchment   CurveNum   HydCon     DryTime
;;-------------- ---------- ---------- ----------
A10             65         0.5        7
A20             65         0.5        7
A30             65         0.5        7
A40             65         0.5        7
A50             65         0.5        7
A60             65         0.5        7
A70             65         0.5        7
A80             65         0.5        7
A90.1           65         0.5        7
A90.2           65         0.5        7
B10             65         0.5        7
B20             65         0.5        7
B30             65         0.5        7
B40             65         0.5        7
EXT10           65         0.5        7
EXT20           65         0.5        7
EXT30           72         0.5        7
EXT40           72         0.5        7
EXT50           65         0.5        7
EXT60           65         0.5        7
EXT70           65         0.5        7
EXT80           64         0.5        7

[JUNCTIONS]
;;              Invert     Max.       Init.      Surcharge  Ponded
;;Name          Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ---------
J1              253.06     3.23       0          0          0
J10             252.7      3.57       0          0          0
J11             252.48     3.89       0          0          0
J12             251.18     3.82       0          0          0
J13             253.25     3.69       0          0          0
J14             253        3.8        0          0          0
J15             254        1.5        0          0          0
J16             251.04     2.96       0          0          0
J17             250.9      3.1        0          0          0
J18             253.25     3.6        0          0          0
J19             256.5      0.3        0          0          0
J2              254.82     3.58       0          0          0
J20             252.6      3.91       0          0          0
J21             253.46     4.07       0          0          0
J22             253.63     4.07       0          0          0
J23             253.65     4.15       0          0          0
J3              252.28     3.93       0          0          0
J4              255.46     5.14       0          0          0
J5              254.31     3.49       0          0          0
J6              253.01     3          0          0          0
J7              253.97     3.81       0          0          0
J8              251.68     4.71       0          0          0
J9              252.81     3.62       0          0          0

[OUTFALLS]
;;              Invert     Outfall    Stage/Table    Tide
;;Name          Elev.      Type       Time Series    Gate Route To
;;-------------- ---------- ---------- -------------- ---- ----------
DorchesterCreek 253.9      FREE                      NO
Ex.Ditch        255.3      FREE                      NO
Ex.Major        255.5      FREE                      NO
Ex.Sewer        250.873    FREE                      NO

[STORAGE]
;;              Invert   Max.     Init.    Storage    Curve                          Evap.
;;Name          Elev.    Depth    Depth    Curve      Params                         Frac.    Infiltration parameters
;;-------------- -------- -------- -------- ---------- ------------------------------ -------- -------------------------
Comm.Storage    254.61   3.7      0        TABULAR    Comm.Storage                   0        0
Ex.Storage      254.82   3.18     0        TABULAR    Ex.Storage                     0        0        49       100      0.413
Ex.SWMF         254.9    1.4      0        TABULAR    Ex.SWMF                        0        0
MedDensStorage  254.61   2.8      0        TABULAR    MedDensStorage                 0        0
ROW1            255.6    1.3      0        TABULAR    ROW1(2)                        0        0
ROW2            256.6    0.8      0        TABULAR    ROW2(2)                        0        0
RY-1            257      0.6      0        TABULAR    RY-1                           0        0        60.96    36       0.39
RY-2            257      0.6      0        TABULAR    RY-2                           0        0        60.96    36       0.39
RY-3            0        0.3      0        TABULAR    RY-3                           0        0        60.96    36       0.4
RY-4            257.88   0.6      0        TABULAR    RY-4                           0        0        60.96    36       0.39
RY-5            256      0.6      0        TABULAR    RY-5                           0        0        60.96    36       0.39
RY-6            257.11   0.6      0        TABULAR    RY-6                           0        0        60.96    36       0.39
RY-7            257      0.6      0        TABULAR    RY-7                           0        0        60.96    36       0.39
```



```
[CONDUITS]
;;              Inlet           Outlet                     Manning    Inlet      Outlet     Init.      Max.
;;Name          Node            Node            Length     N          Offset     Offset     Flow       Flow
;;-------------- --------------- --------------- ---------- ---------- ---------- ---------- ---------- ----------
C1              J4              J2              105.957    0.013      255.46     254.84     0          0
C10             J9              J10             100.042    0.013      252.81     252.72     0          0
C11             J10             J11             100.035    0.013      252.7      252.505    0          0
C12             J11             J3              100.573    0.013      252.48     252.3      0          0
C14             J12             J16             105.028    0.013      251.183    251.094    0          0
C16             J13             J1              78.115     0.013      253.252    253.08     0          1.75
C17             J16             J17             78.067     0.013      251.044    250.948    0          0
C18             J17             Ex.Sewer        84.632     0.013      250.898    250.873    0          0
C19             J20             J12             99.37      0.013      252.603    251.196    0          0
C2              J1              J9              99.637     0.013      253.055    252.835    0          0
C20             J14             J20             102.504    0.013      253.002    252.653    0          0
C21             J21             J14             43.173     0.013      253.455    253.027    0          0
C22             J22             J21             29.383     0.013      253.626    253.505    0          0
C23             J23             J22             2          0.013      253.646    253.626    0          0.05
;Overland
C24             J23             ROW1            200        0.013      257.7      256.7      0          0
C3              J3              J8              99.514     0.013      252.275    251.705    0          0
C4              J7              J22             86.489     0.013      254.07     253.971    253.651    0
C5              J2              J5              81.009     0.013      254.82     254.337    0          0
C6              J5              J7              20.346     0.013      254.312    254.046    0          0
C9              J8              J12             113.981    0.013      251.68     251.473    0          0
;Overland
W1              J4              RY-6            241.947    0.025      259.78     257.98     0          0
;Overland
W9              RY-6            ROW1            320        0.013      257.41     256.7      0          0

[ORIFICES]
;;              Inlet           Outlet          Orifice     Crest      Disch.     Flap Open/Close
;;Name          Node            Node            Type        Height     Coeff.     Gate Time
;;-------------- --------------- --------------- ----------- ---------- ---------- ---- ----------
OL1             Comm.Storage    J14             SIDE        254.61     0.65       NO   0
OL2             MedDensStorage  J14             SIDE        254.61     0.65       NO   0
OR1             Ex.Storage      J2              SIDE        255.3      0.65       NO   0
OR2             ROW1            J10             SIDE        255.6      0.65       NO   0
OR3             ROW2            J10             SIDE        256.6      0.65       NO   0

[WEIRS]
;;              Inlet           Outlet          Weir        Crest      Disch.     Flap End      End
;;Name          Node            Node            Type        Height     Coeff.     Gate Con.     Coeff.     Surcharge  RoadWidth
RoadSurf   Coeff. Curve
;;-------------- --------------- --------------- ----------- ---------- ---------- ---- -------- ---------- ---------- ---------- -------
--- ----------------
C15             Ex.Storage      RY-6            TRANSVERSE  257.4      1.78       NO   0        0          YES
;Overland
C7              J2              RY-6            TRANSVERSE  257.39     1.78       NO   0        0          YES
W10             RY-7            J15             TRANSVERSE  257.45     1.78       NO   0        0          YES
W11             J13             Ex.SWMF         TRANSVERSE  256.639    1.78       NO   0        0          YES
W12             RY-4            ROW2            TRANSVERSE  258.18     1.78       NO   0        0          YES
W13             J6              ROW2            TRANSVERSE  257.51     1.78       NO   0        0          YES
W14             Comm.Storage    J19             TRANSVERSE  258.01     1.78       NO   0        0          YES
W15             MedDensStorage  J19             TRANSVERSE  257.11     1.78       NO   0        0          YES
W16             J19             Ex.Ditch        TRANSVERSE  256.5      1.78       NO   0        0          YES
W17             RY-1            ROW1            TRANSVERSE  257.3      1.78       NO   0        0          YES
W18             RY-2            ROW1            TRANSVERSE  257.3      1.78       NO   0        0          YES
W2              Ex.SWMF         Ex.Major        TRAPEZOIDAL 256        1.78       NO   0        0          YES
W3              RY-5            J1              TRANSVERSE  256.3      1.78       NO   0        0          YES
W4              J15             DorchesterCreek TRANSVERSE  254        1.78       NO   0        0          YES
W5              J18             ROW1            TRANSVERSE  256.7      1.78       NO   0        0          YES
W6              J1              J15             TRANSVERSE  255.99     1.78       NO   0        0          YES
W7              ROW2            J15             TRANSVERSE  257.1      1.78       NO   0        0          YES
W8              ROW1            J15             TRANSVERSE  256.6      1.78       NO   0        0          YES

[OUTLETS]
;;              Inlet           Outlet          Outflow     Outlet           Qcoeff/              Flap
;;Name          Node            Node            Height      Type             QTable     Qexpon    Gate
;;-------------- --------------- --------------- ----------- ---------------- ---------- --------- ----
;Flow limited to 0.593 m3/s > equivalent to 370 mm orifice plate at 4.80 m of head.
C13             J6              J9              253.01      TABULAR/HEAD     East                 NO
C8              J18             J10             253.25      TABULAR/HEAD     West                 NO
Ex.SWMOutlet    Ex.SWMF         J1              254.9       TABULAR/HEAD     Ex.SWMOutlet         NO

[XSECTIONS]
;;Link          Shape           Geom1           Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ --------------- ---------- ---------- ---------- ----------
C1              CIRCULAR        0.9             0          0          0          1
C10             CIRCULAR        1.35            0          0          0          1
C11             CIRCULAR        1.35            0          0          0          1
C12             CIRCULAR        1.35            0          0          0          1
C14             CIRCULAR        1.35            0          0          0          1
C16             CIRCULAR        1.35            0          0          0          1
C17             CIRCULAR        1.35            0          0          0          1
C18             CIRCULAR        1.35            0          0          0          1
C19             CIRCULAR        0.975           0          0          0          1
C2              CIRCULAR        1.35            0          0          0          1
C20             CIRCULAR        0.975           0          0          0          1
C21             CIRCULAR        0.975           0          0          0          1
C22             CIRCULAR        0.975           0          0          0          1
C23             CIRCULAR        0.525           0          0          0          1
C24             RECT_OPEN       0.3             10         0          0          1
C3              CIRCULAR        1.35            0          0          0          1
C4              CIRCULAR        0.975           0          0          0          1
C5              CIRCULAR        0.9             0          0          0          1
C6              CIRCULAR        0.9             0          0          0          1
C9              CIRCULAR        1.35            0          0          0          1
W1              TRIANGULAR      0.45            4          0          0          1
W9              RECT_OPEN       0.3             10         0          0          1
OL1             CIRCULAR        0.075           0          0          0
OL2             CIRCULAR        0.075           0          0          0
OR1             CIRCULAR        0.125           0          0          0
OR2             CIRCULAR        0.25            0          0          0
```

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OR3              CIRCULAR     0.15            0          0          0
C15              RECT_OPEN    0.45            3          0          0
C7               RECT_OPEN    3               0.3        0          0
W10              RECT_OPEN    0.3             20         0          0
W11              RECT_OPEN    0.3             15         0          0
W12              RECT_OPEN    0.3             6          0          0
W13              RECT_OPEN    0.3             10         0          0
W14              RECT_OPEN    0.3             5          0          0
W15              RECT_OPEN    0.3             5          0          0
W16              RECT_OPEN    0.3             10         0          0
W17              RECT_OPEN    0.3             5          0          0
W18              RECT_OPEN    0.3             5          0          0
W2               TRAPEZOIDAL  0.3             10         0.333      0.333
W3               RECT_OPEN    0.3             7          0          0
W4               RECT_OPEN    1               10         0          0
W5               RECT_OPEN    0.3             10         0          0
W6               RECT_OPEN    0.3             5          0          0
W7               RECT_OPEN    0.3             3          0          0
W8               RECT_OPEN    0.3             15         0          0

[TRANSECTS]

NC 0.035    0.035    0.035
X1 SWMFOutlet      8        2.2      4.5      0.0      0.0      0.0      0.0      0.0      0.0
GR 1.75      0.5      1.3      1.85     1.3      2.2      1        3.1      1        3.6
GR 1.3       4.5      1.3      4.85     1.75     6.2

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate  SeepageRate
;;-------------- ---------- ---------- ---------- ---------- ----------

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Comm.Block       Rating     0          0
Comm.Block                  0.1        0.001
Comm.Block                  0.2        0.002
Comm.Block                  0.3        0.003
Comm.Block                  0.4        0.005
Comm.Block                  0.5        0.007
Comm.Block                  0.6        0.009
Comm.Block                  0.7        0.011
Comm.Block                  0.8        0.013
Comm.Block                  0.9        0.015
Comm.Block                  1          0.019

Comm.Block2      Rating     0          0
Comm.Block2                 1          0.012

East             Rating     0          0
East                        3          0.424

Ex.SWMOutlet     Rating     0          0.007
Ex.SWMOutlet                0.1        0.014
Ex.SWMOutlet                0.2        0.124
Ex.SWMOutlet                0.3        0.171
Ex.SWMOutlet                0.4        0.208
Ex.SWMOutlet                0.5        0.239
Ex.SWMOutlet                0.6        0.266
Ex.SWMOutlet                0.7        0.291
Ex.SWMOutlet                0.8        0.314
Ex.SWMOutlet                0.9        0.415
Ex.SWMOutlet                1          0.589
Ex.SWMOutlet                1.1        0.865
Ex.SWMOutlet                1.2        1.248
Ex.SWMOutlet                1.3        1.557

Med.Block        Rating     0          0
Med.Block                   0.1        0.001
Med.Block                   0.2        0.002
Med.Block                   0.3        0.003
Med.Block                   0.4        0.005
Med.Block                   0.5        0.007
Med.Block                   0.6        0.009
Med.Block                   0.7        0.011
Med.Block                   0.8        0.013
Med.Block                   0.9        0.015
Med.Block                   1          0.015

Med.Block2       Rating     0          0
Med.Block2                  1          0.012

West             Rating     0          0
West                        2.5        0.242

Comm.Storage     Storage    0          850
Comm.Storage                1          850
Comm.Storage                1.00001    0.36
Comm.Storage                3.7        0.36

;Sifton Retirement Facility
Ex.Storage       Storage    0          160
Ex.Storage                  0.48       160
Ex.Storage                  0.481      150
Ex.Storage                  2.78       150

Ex.SWMF          Storage    0          4094
Ex.SWMF                     0.1        4375
Ex.SWMF                     0.2        4656
Ex.SWMF                     0.3        4797
Ex.SWMF                     0.4        4939
Ex.SWMF                     0.5        5080
Ex.SWMF                     0.6        5221
Ex.SWMF                     0.7        5362
```



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Ex.SWMF                     0.8        5503
Ex.SWMF                     0.9        5645
Ex.SWMF                     1          5786
Ex.SWMF                     1.1        5927
Ex.SWMF                     1.2        6068
Ex.SWMF                     1.3        6209

MedDensStorage   Storage    0          800
MedDensStorage              1          800
MedDensStorage              1.000001   0.36
MedDensStorage              2.8        0.36

ROW1             Storage    0          1000
ROW1                        0.5        1300
ROW1                        0.8        1500

;02-25-2019
ROW1(2)          Storage    0          450
ROW1(2)                     0.1        485
ROW1(2)                     0.2        520
ROW1(2)                     0.3        558
ROW1(2)                     0.4        596
ROW1(2)                     0.5        636
ROW1(2)                     0.6        677
ROW1(2)                     0.7        719
ROW1(2)                     0.8        762
ROW1(2)                     0.9        807
ROW1(2)                     1          853
ROW1(2)                     1.1        901
ROW1(2)                     1.2        949
ROW1(2)                     1.3        999

ROW2             Storage    0          450
ROW2                        0.5        750
ROW2                        0.8        950

;02-25-2019
ROW2(2)          Storage    0          450
ROW2(2)                     0.1        485
ROW2(2)                     0.2        520
ROW2(2)                     0.3        558
ROW2(2)                     0.4        596
ROW2(2)                     0.5        636
ROW2(2)                     0.6        677
ROW2(2)                     0.7        719
ROW2(2)                     0.8        762

RY-1             Storage    0          0
RY-1                        0.3        2800
RY-1                        0.6        2800

RY-2             Storage    0          0
RY-2                        0.3        2160
RY-2                        0.6        2160

RY-3             Storage    0          0
RY-3                        0.3        2000

RY-4             Storage    0          0
RY-4                        0.3        2000

RY-5             Storage    0          0
RY-5                        0.3        2000

RY-6             Storage    0          0
RY-6                        0.3        1500

RY-7             Storage    0          0
RY-7                        0.3        2700

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Chicago design storm, a = 2619.363, b = 10.5, c = 0.884, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-100yr3hr-10min                 0:00       4.545
London-100yr3hr-10min                 0:10       5.529
London-100yr3hr-10min                 0:20       7.042
London-100yr3hr-10min                 0:30       9.632
London-100yr3hr-10min                 0:40       14.915
London-100yr3hr-10min                 0:50       30.154
London-100yr3hr-10min                 1:00       181.387
London-100yr3hr-10min                 1:10       73.569
London-100yr3hr-10min                 1:20       40.376
London-100yr3hr-10min                 1:30       22.893
London-100yr3hr-10min                 1:40       15.501
London-100yr3hr-10min                 1:50       11.556
London-100yr3hr-10min                 2:00       9.147
London-100yr3hr-10min                 2:10       7.54
London-100yr3hr-10min                 2:20       6.401
London-100yr3hr-10min                 2:30       5.555
London-100yr3hr-10min                 2:40       4.903
London-100yr3hr-10min                 2:50       4.387
London-100yr3hr-10min                 3:00       0

;Chicago design storm, a = 1574.382, b = 9.025, c = 0.86, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-10yr3hr-10min                  0:00       3.407
London-10yr3hr-10min                  0:10       4.086
London-10yr3hr-10min                  0:20       5.115
London-10yr3hr-10min                  0:30       6.845
London-10yr3hr-10min                  0:40       10.309
London-10yr3hr-10min                  0:50       20.166
London-10yr3hr-10min                  1:00       124.994
London-10yr3hr-10min                  1:10       48.602
London-10yr3hr-10min                  1:20       26.78
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London-10yr3hr-10min          1:30      15.477
London-10yr3hr-10min          1:40      10.693
London-10yr3hr-10min          1:50      8.115
London-10yr3hr-10min          2:00      6.524
London-10yr3hr-10min          2:10      5.451
London-10yr3hr-10min          2:20      4.681
London-10yr3hr-10min          2:30      4.104
London-10yr3hr-10min          2:40      3.655
London-10yr3hr-10min          2:50      3.297
London-10yr3hr-10min          3:00      0

;Chicago design storm, a = 3048.22, b = 10.03, c = 0.888, Duration = 1440 minutes, r = 0.38, rain units = mm/hr.
London-250yr24hr-10min        0:00      0.566
London-250yr24hr-10min        0:10      0.576
London-250yr24hr-10min        0:20      0.586
London-250yr24hr-10min        0:30      0.597
London-250yr24hr-10min        0:40      0.608
London-250yr24hr-10min        0:50      0.62
London-250yr24hr-10min        1:00      0.632
London-250yr24hr-10min        1:10      0.644
London-250yr24hr-10min        1:20      0.657
London-250yr24hr-10min        1:30      0.671
London-250yr24hr-10min        1:40      0.685
London-250yr24hr-10min        1:50      0.7
London-250yr24hr-10min        2:00      0.716
London-250yr24hr-10min        2:10      0.733
London-250yr24hr-10min        2:20      0.75
London-250yr24hr-10min        2:30      0.768
London-250yr24hr-10min        2:40      0.787
London-250yr24hr-10min        2:50      0.807
London-250yr24hr-10min        3:00      0.828
London-250yr24hr-10min        3:10      0.851
London-250yr24hr-10min        3:20      0.875
London-250yr24hr-10min        3:30      0.9
London-250yr24hr-10min        3:40      0.927
London-250yr24hr-10min        3:50      0.955
London-250yr24hr-10min        4:00      0.986
London-250yr24hr-10min        4:10      1.018
London-250yr24hr-10min        4:20      1.053
London-250yr24hr-10min        4:30      1.091
London-250yr24hr-10min        4:40      1.131
London-250yr24hr-10min        4:50      1.175
London-250yr24hr-10min        5:00      1.223
London-250yr24hr-10min        5:10      1.275
London-250yr24hr-10min        5:20      1.331
London-250yr24hr-10min        5:30      1.393
London-250yr24hr-10min        5:40      1.462
London-250yr24hr-10min        5:50      1.538
London-250yr24hr-10min        6:00      1.623
London-250yr24hr-10min        6:10      1.718
London-250yr24hr-10min        6:20      1.826
London-250yr24hr-10min        6:30      1.948
London-250yr24hr-10min        6:40      2.089
London-250yr24hr-10min        6:50      2.254
London-250yr24hr-10min        7:00      2.447
London-250yr24hr-10min        7:10      2.677
London-250yr24hr-10min        7:20      2.958
London-250yr24hr-10min        7:30      3.305
London-250yr24hr-10min        7:40      3.747
London-250yr24hr-10min        7:50      4.326
London-250yr24hr-10min        8:00      5.119
London-250yr24hr-10min        8:10      6.263
London-250yr24hr-10min        8:20      8.044
London-250yr24hr-10min        8:30      11.153
London-250yr24hr-10min        8:40      17.716
London-250yr24hr-10min        8:50      38.196
London-250yr24hr-10min        9:00      212.889
London-250yr24hr-10min        9:10      84.17
London-250yr24hr-10min        9:20      41.804
London-250yr24hr-10min        9:30      24.209
London-250yr24hr-10min        9:40      16.564
London-250yr24hr-10min        9:50      12.423
London-250yr24hr-10min        10:00     9.872
London-250yr24hr-10min        10:10     8.16
London-250yr24hr-10min        10:20     6.94
London-250yr24hr-10min        10:30     6.031
London-250yr24hr-10min        10:40     5.33
London-250yr24hr-10min        10:50     4.773
London-250yr24hr-10min        11:00     4.321
London-250yr24hr-10min        11:10     3.947
London-250yr24hr-10min        11:20     3.634
London-250yr24hr-10min        11:30     3.366
London-250yr24hr-10min        11:40     3.136
London-250yr24hr-10min        11:50     2.936
London-250yr24hr-10min        12:00     2.76
London-250yr24hr-10min        12:10     2.605
London-250yr24hr-10min        12:20     2.466
London-250yr24hr-10min        12:30     2.342
London-250yr24hr-10min        12:40     2.23
London-250yr24hr-10min        12:50     2.129
London-250yr24hr-10min        13:00     2.036
London-250yr24hr-10min        13:10     1.952
London-250yr24hr-10min        13:20     1.875
London-250yr24hr-10min        13:30     1.803
London-250yr24hr-10min        13:40     1.737
London-250yr24hr-10min        13:50     1.676
London-250yr24hr-10min        14:00     1.62
London-250yr24hr-10min        14:10     1.567
London-250yr24hr-10min        14:20     1.517
London-250yr24hr-10min        14:30     1.471
London-250yr24hr-10min        14:40     1.428
London-250yr24hr-10min        14:50     1.387
London-250yr24hr-10min        15:00     1.348
London-250yr24hr-10min        15:10     1.312
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London-250yr24hr-10min        15:20     1.278
London-250yr24hr-10min        15:30     1.245
London-250yr24hr-10min        15:40     1.215
London-250yr24hr-10min        15:50     1.185
London-250yr24hr-10min        16:00     1.158
London-250yr24hr-10min        16:10     1.131
London-250yr24hr-10min        16:20     1.106
London-250yr24hr-10min        16:30     1.082
London-250yr24hr-10min        16:40     1.059
London-250yr24hr-10min        16:50     1.037
London-250yr24hr-10min        17:00     1.016
London-250yr24hr-10min        17:10     0.996
London-250yr24hr-10min        17:20     0.977
London-250yr24hr-10min        17:30     0.958
London-250yr24hr-10min        17:40     0.94
London-250yr24hr-10min        17:50     0.923
London-250yr24hr-10min        18:00     0.907
London-250yr24hr-10min        18:10     0.891
London-250yr24hr-10min        18:20     0.875
London-250yr24hr-10min        18:30     0.861
London-250yr24hr-10min        18:40     0.846
London-250yr24hr-10min        18:50     0.833
London-250yr24hr-10min        19:00     0.819
London-250yr24hr-10min        19:10     0.806
London-250yr24hr-10min        19:20     0.794
London-250yr24hr-10min        19:30     0.782
London-250yr24hr-10min        19:40     0.77
London-250yr24hr-10min        19:50     0.759
London-250yr24hr-10min        20:00     0.748
London-250yr24hr-10min        20:10     0.737
London-250yr24hr-10min        20:20     0.727
London-250yr24hr-10min        20:30     0.717
London-250yr24hr-10min        20:40     0.707
London-250yr24hr-10min        20:50     0.698
London-250yr24hr-10min        21:00     0.689
London-250yr24hr-10min        21:10     0.68
London-250yr24hr-10min        21:20     0.671
London-250yr24hr-10min        21:30     0.663
London-250yr24hr-10min        21:40     0.654
London-250yr24hr-10min        21:50     0.646
London-250yr24hr-10min        22:00     0.639
London-250yr24hr-10min        22:10     0.631
London-250yr24hr-10min        22:20     0.624
London-250yr24hr-10min        22:30     0.616
London-250yr24hr-10min        22:40     0.609
London-250yr24hr-10min        22:50     0.602
London-250yr24hr-10min        23:00     0.596
London-250yr24hr-10min        23:10     0.589
London-250yr24hr-10min        23:20     0.583
London-250yr24hr-10min        23:30     0.576
London-250yr24hr-10min        23:40     0.57
London-250yr24hr-10min        23:50     0.564
London-250yr24hr-10min        24:00     0

;Chicago design storm, a = 3048.22, b = 10.03, c = 0.888, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-250yr3hr-10min         0:00      5.009
London-250yr3hr-10min         0:10      6.1
London-250yr3hr-10min         0:20      7.78
London-250yr3hr-10min         0:30      10.665
London-250yr3hr-10min         0:40      16.579
London-250yr3hr-10min         0:50      33.816
London-250yr3hr-10min         1:00      212.889
London-250yr3hr-10min         1:10      83.849
London-250yr3hr-10min         1:20      45.471
London-250yr3hr-10min         1:30      25.565
London-250yr3hr-10min         1:40      17.236
London-250yr3hr-10min         1:50      12.814
London-250yr3hr-10min         2:00      10.124
London-250yr3hr-10min         2:10      8.335
London-250yr3hr-10min         2:20      7.068
London-250yr3hr-10min         2:30      6.128
London-250yr3hr-10min         2:40      5.405
London-250yr3hr-10min         2:50      4.833
London-250yr3hr-10min         3:00      0

;Chicago design storm, a = 538.85, b = 6.331, c = 0.809, Duration = 240 minutes, r = 0.38, rain units = mm/hr.
London-25mm4hr-10min          0:00      1.396
London-25mm4hr-10min          0:10      1.558
London-25mm4hr-10min          0:20      1.769
London-25mm4hr-10min          0:30      2.056
London-25mm4hr-10min          0:40      2.468
London-25mm4hr-10min          0:50      3.115
London-25mm4hr-10min          1:00      4.286
London-25mm4hr-10min          1:10      7.08
London-25mm4hr-10min          1:20      18.278
London-25mm4hr-10min          1:30      56.252
London-25mm4hr-10min          1:40      13.841
London-25mm4hr-10min          1:50      7.728
London-25mm4hr-10min          2:00      5.382
London-25mm4hr-10min          2:10      4.151
London-25mm4hr-10min          2:20      3.394
London-25mm4hr-10min          2:30      2.882
London-25mm4hr-10min          2:40      2.511
London-25mm4hr-10min          2:50      2.231
London-25mm4hr-10min          3:00      2.01
London-25mm4hr-10min          3:10      1.832
London-25mm4hr-10min          3:20      1.686
London-25mm4hr-10min          3:30      1.563
London-25mm4hr-10min          3:40      1.458
London-25mm4hr-10min          3:50      1.367
London-25mm4hr-10min          4:00      0

;Chicago design storm, a = 2019.372, b = 9.824, c = 0.875, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-25yr3hr-10min          0:00      3.8
```

```
London-25yr3hr-10min            0:10       4.595
London-25yr3hr-10min            0:20       5.811
London-25yr3hr-10min            0:30       7.88
London-25yr3hr-10min            0:40       12.072
London-25yr3hr-10min            0:50       24.122
London-25yr3hr-10min            1:00       147.97
London-25yr3hr-10min            1:10       58.745
London-25yr3hr-10min            1:20       32.219
London-25yr3hr-10min            1:30       18.379
London-25yr3hr-10min            1:40       12.537
London-25yr3hr-10min            1:50       9.41
London-25yr3hr-10min            2:00       7.494
London-25yr3hr-10min            2:10       6.211
London-25yr3hr-10min            2:20       5.297
London-25yr3hr-10min            2:30       4.616
London-25yr3hr-10min            2:40       4.089
London-25yr3hr-10min            2:50       3.671
London-25yr3hr-10min            3:00       0

;Chicago design storm, a = 1290, b = 8.5, c = 0.86, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-2yr3hr-10min           0:00       2.762
London-2yr3hr-10min           0:10       3.308
London-2yr3hr-10min           0:20       4.135
London-2yr3hr-10min           0:30       5.526
London-2yr3hr-10min           0:40       8.31
London-2yr3hr-10min           0:50       16.271
London-2yr3hr-10min           1:00       104.911
London-2yr3hr-10min           1:10       39.582
London-2yr3hr-10min           1:20       21.641
London-2yr3hr-10min           1:30       12.473
London-2yr3hr-10min           1:40       8.619
London-2yr3hr-10min           1:50       6.547
London-2yr3hr-10min           2:00       5.268
London-2yr3hr-10min           2:10       4.406
London-2yr3hr-10min           2:20       3.787
London-2yr3hr-10min           2:30       3.323
London-2yr3hr-10min           2:40       2.962
London-2yr3hr-10min           2:50       2.673
London-2yr3hr-10min           3:00       0

;Chicago design storm, a = 2270.665, b = 9.984, c = 0.876, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-50yr3hr-10min          0:00       4.242
London-50yr3hr-10min          0:10       5.135
London-50yr3hr-10min          0:20       6.5
London-50yr3hr-10min          0:30       8.824
London-50yr3hr-10min          0:40       13.536
London-50yr3hr-10min          0:50       27.075
London-50yr3hr-10min          1:00       164.723
London-50yr3hr-10min          1:10       65.843
London-50yr3hr-10min          1:20       36.161
London-50yr3hr-10min          1:30       20.626
London-50yr3hr-10min          1:40       14.059
London-50yr3hr-10min          1:50       10.544
London-50yr3hr-10min          2:00       8.39
London-50yr3hr-10min          2:10       6.949
London-50yr3hr-10min          2:20       5.923
London-50yr3hr-10min          2:30       5.158
London-50yr3hr-10min          2:40       4.567
London-50yr3hr-10min          2:50       4.098
London-50yr3hr-10min          3:00       0

;Chicago design storm, a = 1183.74, b = 7.641, c = 0.838, Duration = 180 minutes, r = 0.38, rain units = mm/hr.
London-5yr3hr-10min           0:00       3.117
London-5yr3hr-10min           0:10       3.696
London-5yr3hr-10min           0:20       4.56
London-5yr3hr-10min           0:30       5.989
London-5yr3hr-10min           0:40       8.801
London-5yr3hr-10min           0:50       16.675
London-5yr3hr-10min           1:00       106.824
London-5yr3hr-10min           1:10       39.622
London-5yr3hr-10min           1:20       21.953
London-5yr3hr-10min           1:30       12.939
London-5yr3hr-10min           1:40       9.111
London-5yr3hr-10min           1:50       7.028
London-5yr3hr-10min           2:00       5.727
London-5yr3hr-10min           2:10       4.84
London-5yr3hr-10min           2:20       4.198
London-5yr3hr-10min           2:30       3.711
London-5yr3hr-10min           2:40       3.33
London-5yr3hr-10min           2:50       3.023
London-5yr3hr-10min           3:00       0

[REPORT]
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
```



```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 04/01/2005 00:00:00
Ending Date ..... 04/04/2005 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:01:00
Dry Time Step ..... 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 1
Head Tolerance ..... 0.001500 m


**************************        Volume          Depth
Runoff Quantity Continuity    hectare-m             mm
**************************    ---------       -------
Total Precipitation .....         2.243        25.049
Evaporation Loss .....            0.159         1.773
Infiltration Loss .....           1.088        12.151
Surface Runoff .....              0.997        11.130
Final Storage .....               0.000         0.000
Continuity Error (%) .....      -0.021


**************************        Volume        Volume
Flow Routing Continuity       hectare-m      10^6 ltr
**************************    ---------      ---------
Dry Weather Inflow .....          0.000         0.000
Wet Weather Inflow .....          0.997         9.966
Groundwater Inflow .....          0.000         0.000
RDII Inflow .....                 0.000         0.000
External Inflow .....            0.000         0.000
External Outflow .....           0.884         8.838
Flooding Loss .....               0.000         0.000
Evaporation Loss .....            0.000         0.000
Exfiltration Loss .....           0.118         1.185
Initial Stored Volume ....        0.007         0.070
Final Stored Volume .....         0.001         0.005
Continuity Error (%) .....       0.086


**************************
Highest Continuity Errors
**************************
Node J7 (-3.34%)


****************************
Time-Step Critical Elements
****************************
None


*********************************
Highest Flow Instability Indexes
*********************************
All links are stable.


**************************
Routing Time Step Summary
**************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00


****************************
Subcatchment Runoff Summary
****************************

-----------------------------------------------------------------------------------------------------------------------------------
                             Total      Total      Total      Total     Imperv      Perv     Total      Total     Peak  Runoff
                            Precip      Runon       Evap      Infil    Runoff    Runoff    Runoff     Runoff   Runoff   Coeff
Subcatchment                    mm         mm         mm         mm        mm        mm        mm   10^6 ltr      CMS
-----------------------------------------------------------------------------------------------------------------------------------
A10                          25.05       0.00       1.72       5.88     17.46      0.00     17.46       0.23     0.15   0.697
```

A20	25.05	0.00	1.69	8.23	15.14	0.00	15.14	0.24	0.16	0.604
A30	25.05	0.00	1.70	11.50	12.84	11.87	11.87	0.11	0.06	0.474
A40	25.05	0.00	1.70	11.50	12.84	11.87	11.87	0.16	0.09	0.474
A50	25.05	0.00	1.70	11.50	12.84	11.87	11.87	0.12	0.07	0.474
A60	25.05	0.00	1.78	13.65	11.63	3.81	9.62	0.31	0.12	0.384
A70	25.05	0.00	1.75	12.05	12.81	11.26	11.26	0.24	0.06	0.449
A80	25.05	0.00	1.53	23.52	0.00	0.00	0.00	0.00	0.00	0.000
A90.1	25.05	0.00	1.72	13.08	11.65	4.44	10.26	0.06	0.02	0.410
A90.2	25.05	0.00	1.71	12.99	11.66	4.52	10.35	0.03	0.01	0.413
B10	25.05	0.00	1.70	11.50	12.84	11.87	11.87	0.08	0.05	0.474
B20	25.05	0.00	1.70	11.50	12.84	11.87	11.87	0.08	0.05	0.474
B30	25.05	0.00	1.70	11.50	12.84	11.87	11.87	0.12	0.07	0.474
B40	25.05	0.00	1.78	13.71	11.62	3.75	9.57	0.39	0.15	0.382
EXT10	25.05	0.00	1.83	12.76	12.76	4.08	10.46	2.09	0.74	0.418
EXT20	25.05	0.00	1.84	12.87	12.75	3.97	10.35	2.67	0.93	0.413
EXT30	25.05	0.00	1.73	8.20	15.12	0.00	15.12	0.49	0.31	0.604
EXT40	25.05	0.00	1.74	5.86	17.46	0.00	17.46	0.23	0.15	0.697
EXT50	25.05	0.00	1.69	11.42	12.85	11.96	11.96	0.09	0.06	0.477
EXT60	25.05	0.00	1.71	13.02	11.66	10.33	10.33	0.05	0.02	0.412
EXT70	25.05	0.00	1.68	11.39	12.85	12.00	12.00	0.11	0.08	0.479
EXT80	25.05	0.00	1.70	10.59	12.76	0.00	12.76	2.08	1.22	0.510

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.03	0.61	253.67	0 01:40	0.61
J10	JUNCTION	0.03	0.69	253.39	0 01:41	0.68
J11	JUNCTION	0.04	0.68	253.16	0 01:42	0.68
J12	JUNCTION	0.07	1.05	252.23	0 01:44	1.05
J13	JUNCTION	0.02	0.57	253.82	0 01:40	0.57
J14	JUNCTION	0.03	0.54	253.54	0 00:00	0.52
J15	JUNCTION	0.00	0.00	254.00	0 00:00	0.00
J16	JUNCTION	0.06	0.99	252.03	0 01:44	0.99
J17	JUNCTION	0.07	0.96	251.86	0 01:44	0.96
J18	JUNCTION	0.01	1.35	254.60	0 01:40	1.35
J19	JUNCTION	0.00	0.00	256.50	0 00:00	0.00
J2	JUNCTION	0.01	0.46	255.28	0 01:40	0.46
J20	JUNCTION	0.02	0.36	252.96	0 01:42	0.36
J21	JUNCTION	0.01	0.78	254.24	0 00:00	0.40
J22	JUNCTION	0.01	1.09	254.72	0 00:00	0.49
J23	JUNCTION	0.01	0.74	254.39	0 00:00	0.47
J3	JUNCTION	0.03	0.53	252.81	0 01:42	0.52
J4	JUNCTION	0.01	0.47	255.93	0 01:40	0.46
J5	JUNCTION	0.01	0.43	254.74	0 01:40	0.43
J6	JUNCTION	0.03	1.99	255.00	0 01:40	1.99
J7	JUNCTION	0.12	0.73	254.70	0 01:41	0.73
J8	JUNCTION	0.04	0.72	252.40	0 01:43	0.72
J9	JUNCTION	0.04	0.76	253.57	0 01:41	0.76
DorchesterCreek	OUTFALL	0.00	0.00	253.90	0 00:00	0.00
Ex.Ditch	OUTFALL	0.00	0.00	255.30	0 00:00	0.00
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.03	0.74	251.61	0 01:45	0.74
Comm.Storage	STORAGE	0.04	0.22	254.83	0 03:15	0.22
Ex.Storage	STORAGE	0.03	0.73	255.55	0 01:55	0.73
Ex.SWMF	STORAGE	0.02	0.28	255.18	0 02:13	0.28
MedDensStorage	STORAGE	0.04	0.24	254.85	0 03:13	0.24
ROW1	STORAGE	0.00	0.00	255.60	0 00:00	0.00
ROW2	STORAGE	0.00	0.00	256.60	0 00:00	0.00
RY-1	STORAGE	0.00	0.12	257.12	0 02:10	0.12
RY-2	STORAGE	0.00	0.11	257.11	0 02:10	0.11
RY-3	STORAGE	0.00	0.09	0.09	0 02:07	0.09
RY-4	STORAGE	0.00	0.10	257.98	0 02:07	0.10
RY-5	STORAGE	0.01	0.18	256.18	0 02:15	0.18
RY-6	STORAGE	0.01	0.14	257.25	0 02:13	0.14
RY-7	STORAGE	0.01	0.14	257.14	0 02:49	0.14

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	1.002	0 01:40	0	4.74	-0.167
J10	JUNCTION	0.000	1.258	0 01:41	0	5.53	0.122
J11	JUNCTION	0.000	1.257	0 01:41	0	5.53	0.123
J12	JUNCTION	0.000	1.980	0 01:43	0	8.31	0.063
J13	JUNCTION	0.926	0.926	0 01:40	2.67	2.67	0.060
J14	JUNCTION	0.000	1.644	0 00:00	0	2.74	-0.370
J15	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J16	JUNCTION	0.000	1.947	0 01:44	0	8.3	0.076
J17	JUNCTION	0.000	1.943	0 01:44	0	8.29	-0.037
J18	JUNCTION	0.120	0.120	0 01:40	0.309	0.309	-0.001
J19	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J2	JUNCTION	0.000	0.731	0 01:40	0	2.15	-0.002
J20	JUNCTION	0.014	0.752	0 01:42	0.0331	2.78	0.278
J21	JUNCTION	0.000	1.854	0 00:00	0	2.27	-0.109
J22	JUNCTION	0.000	0.739	0 01:41	0	2.28	0.354
J23	JUNCTION	0.023	0.050	0 00:00	0.0564	0.0582	0.041
J3	JUNCTION	0.000	1.254	0 01:42	0	5.52	0.014
J4	JUNCTION	0.738	0.738	0 01:40	2.09	2.09	-0.002
J5	JUNCTION	0.000	0.730	0 01:40	0	2.15	-0.000
J6	JUNCTION	0.207	0.207	0 01:40	0.474	0.474	-0.001

J7	JUNCTION	0.000	0.730	0	01:41	0	2.15	-3.235		
J8	JUNCTION	0.000	1.259	0	01:42	0	5.52	-0.178		
J9	JUNCTION	0.000	1.172	0	01:40	0	5.23	0.021		
DorchesterCreek	OUTFALL	0.000	0.000	0	00:00	0	0	0.000	ltr	
Ex.Ditch	OUTFALL	0.328	0.328	0	01:40	0.54	0.54	0.000		
Ex.Major	OUTFALL	0.000	0.000	0	00:00	0	0	0.000	ltr	
Ex.Sewer	OUTFALL	0.000	1.947	0	01:45	0	8.3	0.000		
Comm.Storage	STORAGE	0.152	0.152	0	01:40	0.23	0.23	0.000		
Ex.Storage	STORAGE	0.148	0.148	0	01:40	0.225	0.225	-0.001		
Ex.SWMF	STORAGE	1.222	1.222	0	01:40	2.08	2.08	-0.000		
MedDensStorage	STORAGE	0.160	0.160	0	01:40	0.242	0.242	0.000		
ROW1	STORAGE	0.000	0.000	0	00:00	0	0	0.000	ltr	
ROW2	STORAGE	0.000	0.000	0	00:00	0	0	0.000	ltr	
RY-1	STORAGE	0.091	0.091	0	01:41	0.158	0.158	0.000		
RY-2	STORAGE	0.067	0.067	0	01:41	0.116	0.116	0.000		
RY-3	STORAGE	0.046	0.046	0	01:41	0.0795	0.0795	0.000		
RY-4	STORAGE	0.049	0.049	0	01:41	0.0842	0.0842	0.000		
RY-5	STORAGE	0.148	0.148	0	01:41	0.231	0.231	0.000		
RY-6	STORAGE	0.063	0.063	0	01:41	0.109	0.109	0.000		
RY-7	STORAGE	0.059	0.059	0	01:50	0.238	0.238	0.000		

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Comm.Storage	0.030	4	0	0	0.184	22	0 03:15	0.005
Ex.Storage	0.006	1	0	75	0.115	24	0 01:55	0.027
Ex.SWMF	0.086	1	0	0	1.233	16	0 02:13	0.160
MedDensStorage	0.030	4	0	0	0.193	24	0 03:13	0.006
ROW1	0.000	0	0	0	0.000	0	0 00:00	0.000
ROW2	0.000	0	0	0	0.000	0	0 00:00	0.000
RY-1	0.002	0	0	100	0.064	5	0 02:10	0.021
RY-2	0.001	0	0	100	0.046	5	0 02:10	0.016
RY-3	0.001	0	0	100	0.029	10	0 02:07	0.012
RY-4	0.001	0	0	100	0.032	3	0 02:07	0.012
RY-5	0.004	0	0	100	0.109	9	0 02:15	0.025
RY-6	0.002	0	0	100	0.046	5	0 02:13	0.013
RY-7	0.004	0	0	100	0.088	5	0 02:49	0.021

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	0.00	0.000	0.000	0.000
Ex.Ditch	8.46	0.030	0.328	0.540
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	99.95	0.035	1.947	8.298
System	27.10	0.064	1.947	8.838

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.727	0 01:40	2.21	0.53	0.52
C10	CONDUIT	1.161	0 01:41	1.52	0.73	0.53
C11	CONDUIT	1.257	0 01:41	1.78	0.53	0.49
C12	CONDUIT	1.254	0 01:42	1.91	0.56	0.47
C14	CONDUIT	1.947	0 01:44	1.73	1.25	0.73
C16	CONDUIT	0.917	0 01:40	1.56	0.37	0.43
C17	CONDUIT	1.943	0 01:44	1.80	1.04	0.70
C18	CONDUIT	1.947	0 01:45	2.05	2.04	0.63
C19	CONDUIT	0.751	0 01:42	2.86	0.28	0.68
C2	CONDUIT	0.982	0 01:40	1.38	0.39	0.50
C20	CONDUIT	0.745	0 01:42	1.90	0.57	0.52
C21	CONDUIT	1.644	0 00:00	3.86	0.73	0.68
C22	CONDUIT	1.854	0 00:00	2.94	1.27	0.90
C23	CONDUIT	0.050	0 00:00	0.45	0.12	1.00
C24	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C3	CONDUIT	1.259	0 01:42	2.02	0.31	0.45
C4	CONDUIT	0.724	0 01:41	1.64	0.95	0.57
C5	CONDUIT	0.730	0 01:40	2.23	0.52	0.51

C6	CONDUIT	0.730	0	01:41	1.82	0.35	0.60
C9	CONDUIT	1.238	0	01:43	1.57	0.54	0.55
W1	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
W9	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
OL1	ORIFICE	0.005	0	03:15			1.00
OL2	ORIFICE	0.006	0	03:13			1.00
OR1	ORIFICE	0.015	0	01:55			1.00
OR2	ORIFICE	0.000	0	00:00			0.00
OR3	ORIFICE	0.000	0	00:00			0.00
C15	WEIR	0.000	0	00:00			0.00
C7	WEIR	0.000	0	00:00			0.00
W10	WEIR	0.000	0	00:00			0.00
W11	WEIR	0.000	0	00:00			0.00
W12	WEIR	0.000	0	00:00			0.00
W13	WEIR	0.000	0	00:00			0.00
W14	WEIR	0.000	0	00:00			0.00
W15	WEIR	0.000	0	00:00			0.00
W16	WEIR	0.000	0	00:00			0.00
W17	WEIR	0.000	0	00:00			0.00
W18	WEIR	0.000	0	00:00			0.00
W2	WEIR	0.000	0	00:00			0.00
W3	WEIR	0.000	0	00:00			0.00
W4	WEIR	0.000	0	00:00			0.00
W5	WEIR	0.000	0	00:00			0.00
W6	WEIR	0.000	0	00:00			0.00
W7	WEIR	0.000	0	00:00			0.00
W8	WEIR	0.000	0	00:00			0.00
C13	DUMMY	0.205	0	01:40			
C8	DUMMY	0.119	0	01:40			
Ex.SWMOutlet	DUMMY	0.160	0	02:13			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		Fraction of Time in Flow Class								
C1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.24	0.00	0.00	0.76	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.19	0.00	0.00	0.81	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.07	0.00	0.00	0.93	0.00	0.00
C16	1.00	0.75	0.13	0.00	0.12	0.00	0.00	0.00	0.98	0.00
C17	1.00	0.00	0.00	0.00	0.30	0.00	0.00	0.70	0.00	0.00
C18	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	0.60	0.09	0.00	0.31	0.59	0.00
C2	1.00	0.00	0.00	0.00	0.25	0.00	0.00	0.75	0.24	0.00
C20	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C21	1.00	0.70	0.15	0.00	0.06	0.07	0.00	0.02	0.98	0.00
C22	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C23	1.00	0.00	0.89	0.00	0.11	0.00	0.00	0.00	0.90	0.00
C24	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.04	0.16	0.00	0.80	0.09	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.89	0.00	0.11	0.00	0.00	0.00	0.99	0.00
C9	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
W1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W9	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C14	0.01	0.01	0.01	0.14	0.01
C17	0.01	0.01	0.01	0.04	0.01
C18	0.01	0.01	0.01	0.37	0.01
C19	0.01	0.01	0.08	0.01	0.01
C22	0.01	0.01	0.01	0.01	0.01
C23	0.01	0.01	0.01	0.01	0.01

Analysis begun on: Wed Jul 17 11:50:50 2019
Analysis ended on: Wed Jul 17 11:50:59 2019
Total elapsed time: 00:00:09

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/01/2005 00:00:00
Ending Date 04/04/2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	3.828	42.751
Evaporation Loss	0.154	1.721
Infiltration Loss	1.645	18.371
Surface Runoff	2.030	22.673
Final Storage	0.000	0.000
Continuity Error (%)	-0.033	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	2.030	20.304
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.804	18.045
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.229	2.290
Initial Stored Volume	0.007	0.070
Final Stored Volume	0.001	0.006
Continuity Error (%)	0.163	

****
Highest Continuity Errors
****
Node J7 (-1.54%)

****
Time-Step Critical Elements
****
Link C23 (2.75%)

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 0.27 sec
Average Time Step : 0.99 sec
Maximum Time Step : 1.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00
Percent Not Converging : 0.03

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A10	42.75	0.00	1.68	9.31	31.78	1.00	31.78	0.42	0.29	0.743

A20	42.75	0.00	1.68	13.14	27.96	1.28	27.96	0.45	0.30	0.654
A30	42.75	0.00	1.62	16.83	22.62	24.34	24.34	0.22	0.14	0.569
A40	42.75	0.00	1.62	16.83	22.62	24.34	24.34	0.32	0.20	0.569
A50	42.75	0.00	1.62	16.83	22.62	24.34	24.34	0.24	0.15	0.569
A60	42.75	0.00	1.70	20.10	20.51	10.72	20.97	0.67	0.24	0.490
A70	42.75	0.00	1.67	17.62	22.58	23.48	23.48	0.50	0.16	0.549
A80	42.75	0.00	1.54	37.77	0.00	3.44	3.44	0.07	0.01	0.080
A90.1	42.75	0.00	1.65	19.17	20.54	11.69	21.96	0.12	0.05	0.514
A90.2	42.75	0.00	1.63	19.05	20.54	11.82	22.09	0.07	0.03	0.517
B10	42.75	0.00	1.62	16.83	22.62	24.34	24.34	0.16	0.10	0.569
B20	42.75	0.00	1.62	16.83	22.62	24.34	24.34	0.17	0.11	0.569
B30	42.75	0.00	1.62	16.83	22.62	24.34	24.34	0.26	0.16	0.569
B40	42.75	0.00	1.70	20.19	20.50	10.62	20.88	0.85	0.30	0.488
EXT10	42.75	0.00	1.75	18.80	22.52	10.95	22.21	4.45	1.48	0.519
EXT20	42.75	0.00	1.77	18.96	22.51	10.77	22.03	5.68	1.86	0.515
EXT30	42.75	0.00	1.70	12.35	27.29	2.06	28.71	0.93	0.60	0.672
EXT40	42.75	0.00	1.69	8.63	31.23	1.67	32.45	0.42	0.28	0.759
EXT50	42.75	0.00	1.61	16.72	22.63	24.47	24.47	0.18	0.12	0.572
EXT60	42.75	0.00	1.64	19.05	20.55	22.09	22.09	0.11	0.04	0.517
EXT70	42.75	0.00	1.60	16.67	22.64	24.54	24.54	0.22	0.16	0.574
EXT80	42.75	0.00	1.71	17.67	23.38	0.86	23.38	3.80	2.37	0.547

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.04	1.02	254.08	0 01:11	1.01
J10	JUNCTION	0.05	1.05	253.75	0 01:13	1.05
J11	JUNCTION	0.05	1.09	253.57	0 01:14	1.09
J12	JUNCTION	0.10	2.14	253.32	0 01:11	1.95
J13	JUNCTION	0.03	0.99	254.24	0 01:10	0.96
J14	JUNCTION	0.05	0.84	253.84	0 01:11	0.84
J15	JUNCTION	0.00	0.00	254.00	0 00:00	0.00
J16	JUNCTION	0.09	1.71	252.75	0 01:11	1.62
J17	JUNCTION	0.10	1.47	252.37	0 01:11	1.42
J18	JUNCTION	0.04	2.95	256.20	0 01:10	2.95
J19	JUNCTION	0.00	0.00	256.50	0 00:00	0.00
J2	JUNCTION	0.02	0.79	255.61	0 01:10	0.78
J20	JUNCTION	0.03	0.80	253.40	0 01:13	0.80
J21	JUNCTION	0.02	0.78	254.24	0 00:00	0.64
J22	JUNCTION	0.02	1.09	254.72	0 00:00	0.75
J23	JUNCTION	0.02	0.74	254.39	0 00:00	0.73
J3	JUNCTION	0.04	1.16	253.44	0 01:14	1.16
J4	JUNCTION	0.02	0.79	256.25	0 01:10	0.78
J5	JUNCTION	0.02	0.99	255.30	0 01:10	0.91
J6	JUNCTION	0.06	3.91	256.92	0 01:10	3.91
J7	JUNCTION	0.13	1.18	255.15	0 01:10	1.12
J8	JUNCTION	0.05	3.63	255.31	0 01:11	1.64
J9	JUNCTION	0.06	1.16	253.97	0 01:11	1.15
DorchesterCreek	OUTFALL	0.00	0.00	253.90	0 00:00	0.00
Ex.Ditch	OUTFALL	0.00	0.00	255.30	0 00:00	0.00
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.05	1.00	251.88	0 01:14	1.00
Comm.Storage	STORAGE	0.07	0.42	255.03	0 03:01	0.42
Ex.Storage	STORAGE	0.06	1.45	256.27	0 01:33	1.45
Ex.SWMF	STORAGE	0.04	0.52	255.42	0 01:53	0.52
MedDensStorage	STORAGE	0.08	0.48	255.09	0 03:02	0.48
ROW1	STORAGE	0.00	0.00	255.60	0 00:00	0.00
ROW2	STORAGE	0.00	0.00	256.60	0 00:00	0.00
RY-1	STORAGE	0.01	0.19	257.19	0 01:47	0.19
RY-2	STORAGE	0.01	0.18	257.18	0 01:47	0.18
RY-3	STORAGE	0.01	0.15	0.15	0 01:44	0.15
RY-4	STORAGE	0.01	0.16	258.04	0 01:44	0.16
RY-5	STORAGE	0.02	0.29	256.29	0 01:54	0.29
RY-6	STORAGE	0.01	0.22	257.33	0 01:51	0.22
RY-7	STORAGE	0.02	0.24	257.24	0 02:19	0.24

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	1.910	0 01:11	0	9.48	-0.134
J10	JUNCTION	0.000	2.453	0 01:10	0	11.2	0.267
J11	JUNCTION	0.000	2.451	0 01:11	0	11.2	0.075
J12	JUNCTION	0.000	3.519	0 01:14	0	17	0.022
J13	JUNCTION	1.856	1.856	0 01:10	5.68	5.68	0.104
J14	JUNCTION	0.000	1.644	0 00:00	0	5.71	-0.060
J15	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J16	JUNCTION	0.000	3.518	0 01:14	0	16.9	0.057
J17	JUNCTION	0.000	3.519	0 01:14	0	16.9	-0.001
J18	JUNCTION	0.242	0.242	0 01:10	0.673	0.673	-0.001
J19	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J2	JUNCTION	0.000	1.479	0 01:10	0	4.66	-0.008
J20	JUNCTION	0.030	1.491	0 01:12	0.0707	5.79	0.099
J21	JUNCTION	0.000	1.854	0 00:00	0	4.85	-0.051
J22	JUNCTION	0.000	1.489	0 01:10	0	4.86	0.166
J23	JUNCTION	0.049	0.050	0 00:00	0.121	0.122	0.027
J3	JUNCTION	0.000	2.455	0 01:11	0	11.1	-0.010
J4	JUNCTION	1.481	1.481	0 01:10	4.45	4.45	0.121
J5	JUNCTION	0.000	1.456	0 01:10	0	4.66	-0.090
J6	JUNCTION	0.424	0.424	0 01:10	1.02	1.02	-0.001

J7	JUNCTION	0.000	1.447	0	01:10	0	4.67	-1.513		
J8	JUNCTION	0.000	2.384	0	01:11	0	11.1	-0.164		
J9	JUNCTION	0.000	2.259	0	01:10	0	10.5	0.012		
DorchesterCreek	OUTFALL	0.012	0.012	0	02:00	0.0691	0.0691	0.000		
Ex.Ditch	OUTFALL	0.635	0.635	0	01:10	1.04	1.04	0.000		
Ex.Major	OUTFALL	0.000	0.000	0	00:00	0	0	0.000	ltr	
Ex.Sewer	OUTFALL	0.000	3.522	0	01:14	0	16.9	0.000		
Comm.Storage	STORAGE	0.286	0.286	0	01:10	0.42	0.42	0.000		
Ex.Storage	STORAGE	0.279	0.279	0	01:10	0.419	0.419	0.000		
Ex.SWMF	STORAGE	2.367	2.367	0	01:10	3.8	3.8	0.000		
MedDensStorage	STORAGE	0.301	0.301	0	01:10	0.447	0.447	0.000		
ROW1	STORAGE	0.000	0.000	0	00:00	0	0	0.000	ltr	
ROW2	STORAGE	0.000	0.000	0	00:00	0	0	0.000	ltr	
RY-1	STORAGE	0.203	0.203	0	01:11	0.324	0.324	0.003		
RY-2	STORAGE	0.149	0.149	0	01:11	0.239	0.239	0.003		
RY-3	STORAGE	0.102	0.102	0	01:11	0.163	0.163	0.003		
RY-4	STORAGE	0.108	0.108	0	01:11	0.173	0.173	0.003		
RY-5	STORAGE	0.316	0.316	0	01:11	0.474	0.474	0.003		
RY-6	STORAGE	0.140	0.140	0	01:11	0.224	0.224	0.003		
RY-7	STORAGE	0.158	0.158	0	01:20	0.495	0.495	0.002		

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J12	JUNCTION	0.16	0.492	1.685
J16	JUNCTION	0.17	0.308	1.248
J17	JUNCTION	0.06	0.675	1.627
J5	JUNCTION	0.01	0.061	2.502
J7	JUNCTION	0.03	0.101	2.634
J8	JUNCTION	0.13	2.252	1.083

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Comm.Storage	0.063	7	0	0	0.361	42	0 03:01	0.008
Ex.Storage	0.010	2	0	47	0.223	46	0 01:33	0.049
Ex.SWMF	0.164	2	0	0	2.439	33	0 01:53	0.244
MedDensStorage	0.065	8	0	0	0.383	48	0 03:02	0.008
ROW1	0.000	0	0	0	0.000	0	0 00:00	0.000
ROW2	0.000	0	0	0	0.000	0	0 00:00	0.000
RY-1	0.007	1	0	100	0.167	13	0 01:47	0.036
RY-2	0.005	1	0	100	0.122	13	0 01:47	0.027
RY-3	0.003	1	0	100	0.079	26	0 01:44	0.020
RY-4	0.003	0	0	100	0.085	7	0 01:44	0.021
RY-5	0.014	1	0	100	0.274	23	0 01:54	0.042
RY-6	0.005	1	0	100	0.120	13	0 01:51	0.023
RY-7	0.013	1	0	100	0.251	16	0 02:19	0.039

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	4.32	0.007	0.012	0.069
Ex.Ditch	8.03	0.061	0.635	1.039
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	99.95	0.077	3.522	16.937
System	28.07	0.146	3.522	18.045

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	1.464	0 01:10	2.54	1.06	0.86
C10	CONDUIT	2.256	0 01:11	1.82	1.41	0.81
C11	CONDUIT	2.451	0 01:11	2.15	1.04	0.78
C12	CONDUIT	2.455	0 01:11	2.37	1.09	0.82
C14	CONDUIT	3.518	0 01:14	2.46	2.26	1.00
C16	CONDUIT	1.750	0 01:09	1.77	0.70	0.73
C17	CONDUIT	3.519	0 01:14	2.46	1.88	1.00

C18	CONDUIT	3.522	0	01:14	2.66	3.69	0.87
C19	CONDUIT	1.433	0	01:12	2.86	0.54	0.91
C2	CONDUIT	1.892	0	01:11	1.56	0.75	0.80
C20	CONDUIT	1.470	0	01:12	2.32	1.12	0.80
C21	CONDUIT	1.644	0	00:00	3.86	0.73	0.74
C22	CONDUIT	1.854	0	00:00	2.94	1.27	0.90
C23	CONDUIT	0.050	0	00:00	0.45	0.12	1.00
C24	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C3	CONDUIT	2.384	0	01:11	2.24	0.59	0.93
C4	CONDUIT	1.451	0	01:10	2.13	1.91	0.86
C5	CONDUIT	1.456	0	01:10	2.52	1.04	0.93
C6	CONDUIT	1.447	0	01:10	2.27	0.70	1.00
C9	CONDUIT	2.170	0	01:16	1.64	0.95	1.00
W1	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
W9	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
OL1	ORIFICE	0.008	0	03:01			1.00
OL2	ORIFICE	0.008	0	03:02			1.00
OR1	ORIFICE	0.034	0	01:33			1.00
OR2	ORIFICE	0.000	0	00:00			0.00
OR3	ORIFICE	0.000	0	00:00			0.00
C15	WEIR	0.000	0	00:00			0.00
C7	WEIR	0.000	0	00:00			0.00
W10	WEIR	0.000	0	00:00			0.00
W11	WEIR	0.000	0	00:00			0.00
W12	WEIR	0.000	0	00:00			0.00
W13	WEIR	0.000	0	00:00			0.00
W14	WEIR	0.000	0	00:00			0.00
W15	WEIR	0.000	0	00:00			0.00
W16	WEIR	0.000	0	00:00			0.00
W17	WEIR	0.000	0	00:00			0.00
W18	WEIR	0.000	0	00:00			0.00
W2	WEIR	0.000	0	00:00			0.00
W3	WEIR	0.000	0	00:00			0.00
W4	WEIR	0.000	0	00:00			0.00
W5	WEIR	0.000	0	00:00			0.00
W6	WEIR	0.000	0	00:00			0.00
W7	WEIR	0.000	0	00:00			0.00
W8	WEIR	0.000	0	00:00			0.00
C13	DUMMY	0.421	0	01:10			
C8	DUMMY	0.240	0	01:10			
Ex.SWMOutlet	DUMMY	0.244	0	01:53			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.20	0.00	0.00	0.80	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.08	0.00	0.00	0.92	0.00	0.00
C16	1.00	0.73	0.16	0.00	0.11	0.00	0.00	0.00	0.96	0.00
C17	1.00	0.00	0.00	0.00	0.39	0.00	0.00	0.61	0.00	0.00
C18	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	0.69	0.09	0.00	0.22	0.68	0.00
C2	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.24	0.00
C20	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C21	1.00	0.60	0.26	0.00	0.06	0.07	0.00	0.01	0.97	0.00
C22	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C23	1.00	0.00	0.90	0.00	0.10	0.00	0.00	0.00	0.91	0.00
C24	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.06	0.16	0.00	0.79	0.09	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.90	0.00	0.10	0.00	0.00	0.00	0.97	0.00
C9	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.00	0.00
W1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W9	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.01	0.01	0.01	0.03	0.01
C10	0.01	0.01	0.01	0.26	0.01
C11	0.01	0.01	0.01	0.04	0.01
C12	0.01	0.01	0.01	0.04	0.01
C14	0.17	0.27	0.17	0.83	0.17
C17	0.06	0.21	0.06	0.60	0.06
C18	0.01	0.12	0.01	1.68	0.01
C19	0.01	0.01	0.67	0.01	0.01
C20	0.01	0.01	0.01	0.08	0.01
C22	0.01	0.01	0.01	0.02	0.01
C23	0.31	0.31	0.36	0.01	0.01
C3	0.01	0.01	0.13	0.01	0.01
C4	0.01	0.03	0.01	0.41	0.01
C5	0.01	0.01	0.01	0.02	0.01
C6	0.01	0.01	0.10	0.01	0.01
C9	0.14	0.14	0.16	0.01	0.01

Analysis begun on: Wed Jul 17 11:57:17 2019

Analysis ended on: Wed Jul 17 11:57:25 2019
Total elapsed time: 00:00:08

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ..................... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ........ EXTRAN
Starting Date ........... 04/01/2005 00:00:00
Ending Date ............. 04/04/2005 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ........ 00:01:00
Wet Time Step ........... 00:01:00
Dry Time Step ........... 00:01:00
Routing Time Step ....... 1.00 sec
Variable Time Step ...... YES
Maximum Trials .......... 8
Number of Threads ....... 1
Head Tolerance .......... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************    ---------       -------
Total Precipitation .....         3.957        44.191
Evaporation Loss ........         0.153         1.714
Infiltration Loss .......         1.690        18.874
Surface Runoff ..........         2.115        23.617
Final Storage ...........         0.000         0.000
Continuity Error (%) ....        -0.032


**************************        Volume         Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************    ---------       --------
Dry Weather Inflow ......         0.000         0.000
Wet Weather Inflow ......         2.115        21.149
Groundwater Inflow ......         0.000         0.000
RDII Inflow .............         0.000         0.000
External Inflow .........         0.000         0.000
External Outflow ........         1.880        18.803
Flooding Loss ...........         0.000         0.000
Evaporation Loss ........         0.000         0.000
Exfiltration Loss .......         0.238         2.381
Initial Stored Volume ...         0.007         0.070
Final Stored Volume .....         0.001         0.006
Continuity Error (%) ....         0.138


*************************
Highest Continuity Errors
*************************
Node J7 (-1.47%)


***************************
Time-Step Critical Elements
***************************
Link C23 (2.92%)


*********************************
Highest Flow Instability Indexes
*********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     0.99 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.03


****************************
Subcatchment Runoff Summary
****************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A10	44.19	0.00	1.69	9.53	33.00	1.14	33.00	0.44	0.29	0.747

A20	44.19	0.00	1.66	13.47	29.07	1.46	29.07	0.47	0.31	0.658
A30	44.19	0.00	1.61	17.26	23.41	25.37	25.37	0.23	0.15	0.574
A40	44.19	0.00	1.61	17.26	23.41	25.37	25.37	0.34	0.21	0.574
A50	44.19	0.00	1.61	17.26	23.41	25.37	25.37	0.25	0.15	0.574
A60	44.19	0.00	1.68	20.64	21.22	11.27	21.88	0.70	0.25	0.495
A70	44.19	0.00	1.66	18.09	23.37	24.46	24.46	0.52	0.16	0.554
A80	44.19	0.00	1.53	38.73	0.00	3.93	3.93	0.08	0.01	0.089
A90.1	44.19	0.00	1.63	19.66	21.26	12.29	22.92	0.13	0.05	0.519
A90.2	44.19	0.00	1.62	19.54	21.26	12.43	23.06	0.07	0.03	0.522
B10	44.19	0.00	1.61	17.26	23.41	25.37	25.37	0.17	0.11	0.574
B20	44.19	0.00	1.61	17.26	23.41	25.37	25.37	0.18	0.11	0.574
B30	44.19	0.00	1.61	17.26	23.41	25.37	25.37	0.27	0.17	0.574
B40	44.19	0.00	1.69	20.73	21.22	11.17	21.78	0.88	0.31	0.493
EXT10	44.19	0.00	1.74	19.33	23.31	11.47	23.13	4.63	1.52	0.523
EXT20	44.19	0.00	1.76	19.50	23.30	11.29	22.94	5.92	1.91	0.519
EXT30	44.19	0.00	1.70	12.64	28.30	2.28	29.87	0.97	0.61	0.676
EXT40	44.19	0.00	1.69	8.82	32.36	1.84	33.70	0.43	0.28	0.763
EXT50	44.19	0.00	1.61	17.13	23.42	25.51	25.51	0.18	0.13	0.577
EXT60	44.19	0.00	1.63	19.54	21.27	23.05	23.05	0.11	0.05	0.522
EXT70	44.19	0.00	1.60	17.08	23.43	25.58	25.58	0.23	0.16	0.579
EXT80	44.19	0.00	1.71	18.16	24.32	1.02	24.32	3.95	2.42	0.550

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******************
Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min		Reported Max Depth Meters
J1	JUNCTION	0.05	1.03	254.09	0	01:11	1.03
J10	JUNCTION	0.05	1.11	253.81	0	01:13	1.11
J11	JUNCTION	0.05	1.19	253.67	0	01:14	1.19
J12	JUNCTION	0.10	2.24	253.42	0	01:10	2.00
J13	JUNCTION	0.03	1.12	254.37	0	01:10	1.11
J14	JUNCTION	0.05	0.85	253.85	0	01:11	0.85
J15	JUNCTION	0.00	0.00	254.00	0	00:00	0.00
J16	JUNCTION	0.09	1.75	252.79	0	01:11	1.66
J17	JUNCTION	0.10	1.48	252.38	0	01:11	1.45
J18	JUNCTION	0.04	3.13	256.38	0	01:10	3.09
J19	JUNCTION	0.00	0.00	256.50	0	00:00	0.00
J2	JUNCTION	0.02	0.86	255.68	0	01:10	0.85
J20	JUNCTION	0.03	0.89	253.49	0	01:14	0.89
J21	JUNCTION	0.02	0.78	254.24	0	00:00	0.64
J22	JUNCTION	0.02	1.09	254.72	0	00:00	0.73
J23	JUNCTION	0.02	0.74	254.39	0	01:10	0.71
J3	JUNCTION	0.04	1.26	253.54	0	01:13	1.24
J4	JUNCTION	0.02	0.82	256.28	0	01:10	0.81
J5	JUNCTION	0.02	1.07	255.38	0	01:10	0.95
J6	JUNCTION	0.06	4.22	257.23	0	01:10	4.12
J7	JUNCTION	0.13	1.23	255.20	0	01:10	1.13
J8	JUNCTION	0.05	4.71	256.39	0	01:11	1.70
J9	JUNCTION	0.06	1.17	253.98	0	01:11	1.17
DorchesterCreek	OUTFALL	0.00	0.00	253.90	0	00:00	0.00
Ex.Ditch	OUTFALL	0.00	0.00	255.30	0	00:00	0.00
Ex.Major	OUTFALL	0.00	0.00	255.50	0	00:00	0.00
Ex.Sewer	OUTFALL	0.05	1.01	251.89	0	01:14	1.01
Comm.Storage	STORAGE	0.08	0.44	255.05	0	03:02	0.44
Ex.Storage	STORAGE	0.07	1.50	256.32	0	01:34	1.50
Ex.SWMF	STORAGE	0.04	0.53	255.43	0	01:54	0.53
MedDensStorage	STORAGE	0.09	0.50	255.11	0	03:03	0.50
ROW1	STORAGE	0.00	0.00	255.60	0	00:00	0.00
ROW2	STORAGE	0.00	0.00	256.60	0	00:00	0.00
RY-1	STORAGE	0.01	0.19	257.19	0	01:48	0.19
RY-2	STORAGE	0.01	0.19	257.19	0	01:48	0.19
RY-3	STORAGE	0.01	0.16	0.16	0	01:44	0.16
RY-4	STORAGE	0.01	0.16	258.04	0	01:45	0.16
RY-5	STORAGE	0.02	0.29	256.29	0	01:55	0.29
RY-6	STORAGE	0.01	0.22	257.33	0	01:52	0.22
RY-7	STORAGE	0.02	0.24	257.24	0	02:20	0.24

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******************
Node Inflow Summary
******************
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Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min		Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	1.923	0	01:11	0	9.87	-0.120
J10	JUNCTION	0.000	2.487	0	01:10	0	11.6	0.241
J11	JUNCTION	0.000	2.486	0	01:12	0	11.6	0.077
J12	JUNCTION	0.000	3.594	0	01:14	0	17.7	0.019
J13	JUNCTION	1.907	1.907	0	01:10	5.92	5.92	0.090
J14	JUNCTION	0.000	1.644	0	00:00	0	5.95	-0.046
J15	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J16	JUNCTION	0.000	3.593	0	01:14	0	17.7	0.053
J17	JUNCTION	0.000	3.594	0	01:14	0	17.6	-0.003
J18	JUNCTION	0.249	0.249	0	01:10	0.702	0.702	-0.001
J19	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J2	JUNCTION	0.000	1.513	0	01:10	0	4.86	-0.025
J20	JUNCTION	0.031	1.516	0	01:11	0.0738	6.03	0.100
J21	JUNCTION	0.000	1.854	0	00:00	0	5.05	-0.049
J22	JUNCTION	0.000	1.512	0	01:10	0	5.06	0.159
J23	JUNCTION	0.051	0.051	0	01:10	0.126	0.128	0.018
J3	JUNCTION	0.000	2.480	0	01:11	0	11.6	-0.045
J4	JUNCTION	1.522	1.522	0	01:10	4.63	4.63	0.121
J5	JUNCTION	0.000	1.475	0	01:10	0	4.86	-0.073
J6	JUNCTION	0.436	0.436	0	01:10	1.07	1.07	-0.001

J7	JUNCTION	0.000	1.463	0	01:10	0	4.86	-1.452
J8	JUNCTION	0.000	2.407	0	01:11	0	11.6	-0.148
J9	JUNCTION	0.000	2.295	0	01:10	0	10.9	0.012
DorchesterCreek	OUTFALL	0.014	0.014	0	02:00	0.079	0.079	0.000
Ex.Ditch	OUTFALL	0.649	0.649	0	01:10	1.08	1.08	0.000
Ex.Major	OUTFALL	0.000	0.000	0	00:00	0	0	0.000 ltr
Ex.Sewer	OUTFALL	0.000	3.595	0	01:14	0	17.6	0.000
Comm.Storage	STORAGE	0.291	0.291	0	01:10	0.436	0.436	0.000
Ex.Storage	STORAGE	0.285	0.285	0	01:10	0.435	0.435	-0.000
Ex.SWMF	STORAGE	2.418	2.418	0	01:10	3.95	3.95	0.000
MedDensStorage	STORAGE	0.306	0.306	0	01:10	0.465	0.465	0.000
ROW1	STORAGE	0.000	0.000	0	00:00	0	0	0.000 ltr
ROW2	STORAGE	0.000	0.000	0	00:00	0	0	0.000 ltr
RY-1	STORAGE	0.210	0.210	0	01:11	0.337	0.337	0.003
RY-2	STORAGE	0.155	0.155	0	01:11	0.249	0.249	0.003
RY-3	STORAGE	0.106	0.106	0	01:11	0.17	0.17	0.003
RY-4	STORAGE	0.112	0.112	0	01:11	0.18	0.18	0.003
RY-5	STORAGE	0.326	0.326	0	01:11	0.494	0.494	0.003
RY-6	STORAGE	0.145	0.145	0	01:11	0.233	0.233	0.003
RY-7	STORAGE	0.164	0.164	0	01:20	0.516	0.516	0.002

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J12	JUNCTION	0.19	0.595	1.582
J16	JUNCTION	0.20	0.347	1.209
J17	JUNCTION	0.09	0.086	1.616
J5	JUNCTION	0.01	0.143	2.420
J7	JUNCTION	0.05	0.159	2.576
J8	JUNCTION	0.15	3.330	0.005

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Comm.Storage	0.066	8	0	0	0.375	44	0 03:02	0.008
Ex.Storage	0.010	2	0	46	0.229	48	0 01:34	0.050
Ex.SWMF	0.172	2	0	0	2.511	34	0 01:54	0.248
MedDensStorage	0.069	9	0	0	0.400	50	0 03:03	0.009
ROW1	0.000	0	0	0	0.000	0	0 00:00	0.000
ROW2	0.000	0	0	0	0.000	0	0 00:00	0.000
RY-1	0.007	1	0	100	0.174	14	0 01:48	0.036
RY-2	0.005	1	0	100	0.127	13	0 01:48	0.027
RY-3	0.003	1	0	100	0.082	27	0 01:44	0.021
RY-4	0.003	0	0	100	0.088	7	0 01:45	0.021
RY-5	0.015	1	0	100	0.285	24	0 01:55	0.043
RY-6	0.006	1	0	100	0.125	14	0 01:52	0.023
RY-7	0.014	1	0	100	0.263	16	0 02:20	0.040

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	4.34	0.009	0.014	0.079
Ex.Ditch	8.08	0.063	0.649	1.081
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	99.95	0.081	3.595	17.643
System	28.09	0.152	3.595	18.803

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	1.499	0 01:10	2.54	1.08	0.90
C10	CONDUIT	2.287	0 01:12	1.83	1.43	0.83
C11	CONDUIT	2.486	0 01:12	2.15	1.05	0.83
C12	CONDUIT	2.480	0 01:11	2.37	1.10	0.89
C14	CONDUIT	3.593	0 01:14	2.51	2.31	1.00
C16	CONDUIT	1.750	0 01:08	1.77	0.70	0.78
C17	CONDUIT	3.594	0 01:14	2.51	1.92	1.00

C18	CONDUIT	3.595	0	01:14	2.71	3.77	0.88	
C19	CONDUIT	1.446	0	01:12	2.86	0.54	0.95	
C2	CONDUIT	1.930	0	01:12	1.57	0.76	0.80	
C20	CONDUIT	1.493	0	01:11	2.32	1.14	0.86	
C21	CONDUIT	1.644	0	00:00	3.86	0.73	0.75	
C22	CONDUIT	1.854	0	00:00	2.94	1.27	0.90	
C23	CONDUIT	0.050	0	00:00	0.45	0.12	1.00	
C24	CONDUIT	0.000	0	00:00	0.00	0.00	0.00	
C3	CONDUIT	2.407	0	01:11	2.25	0.59	0.97	
C4	CONDUIT	1.466	0	01:10	2.15	1.93	0.86	
C5	CONDUIT	1.475	0	01:10	2.52	1.05	0.97	
C6	CONDUIT	1.463	0	01:10	2.30	0.71	1.00	
C9	CONDUIT	2.215	0	01:14	1.64	0.97	1.00	
W1	CONDUIT	0.000	0	00:00	0.00	0.00	0.00	
W9	CONDUIT	0.000	0	00:00	0.00	0.00	0.00	
OL1	ORIFICE	0.008	0	03:02			1.00	
OL2	ORIFICE	0.009	0	03:03			1.00	
OR1	ORIFICE	0.035	0	01:34			1.00	
OR2	ORIFICE	0.000	0	00:00			0.00	
OR3	ORIFICE	0.000	0	00:00			0.00	
C15	WEIR	0.000	0	00:00			0.00	
C7	WEIR	0.000	0	00:00			0.00	
W10	WEIR	0.000	0	00:00			0.00	
W11	WEIR	0.000	0	00:00			0.00	
W12	WEIR	0.000	0	00:00			0.00	
W13	WEIR	0.000	0	00:00			0.00	
W14	WEIR	0.000	0	00:00			0.00	
W15	WEIR	0.000	0	00:00			0.00	
W16	WEIR	0.000	0	00:00			0.00	
W17	WEIR	0.000	0	00:00			0.00	
W18	WEIR	0.000	0	00:00			0.00	
W2	WEIR	0.000	0	00:00			0.00	
W3	WEIR	0.000	0	00:00			0.00	
W4	WEIR	0.000	0	00:00			0.00	
W5	WEIR	0.000	0	00:00			0.00	
W6	WEIR	0.000	0	00:00			0.00	
W7	WEIR	0.000	0	00:00			0.00	
W8	WEIR	0.000	0	00:00			0.00	
C13	DUMMY	0.424	0	01:09				
C8	DUMMY	0.242	0	01:09				
Ex.SWMOutlet	DUMMY	0.248	0	01:54				

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.20	0.00	0.00	0.80	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.08	0.00	0.00	0.92	0.00	0.00
C16	1.00	0.73	0.16	0.00	0.11	0.00	0.00	0.00	0.96	0.00
C17	1.00	0.00	0.00	0.00	0.40	0.00	0.00	0.60	0.00	0.00
C18	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	0.70	0.09	0.00	0.21	0.69	0.00
C2	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.24	0.00
C20	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C21	1.00	0.60	0.27	0.00	0.06	0.07	0.00	0.01	0.97	0.00
C22	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C23	1.00	0.00	0.90	0.00	0.10	0.00	0.00	0.00	0.91	0.00
C24	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.06	0.16	0.00	0.79	0.09	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.90	0.00	0.10	0.00	0.00	0.00	0.97	0.00
C9	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.00	0.00
W1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W9	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.01	0.01	0.01	0.04	0.01
C10	0.01	0.01	0.01	0.27	0.01
C11	0.01	0.01	0.01	0.05	0.01
C12	0.01	0.01	0.01	0.04	0.01
C14	0.20	0.29	0.20	0.89	0.20
C17	0.09	0.24	0.09	0.64	0.09
C18	0.01	0.14	0.01	1.80	0.01
C19	0.01	0.01	0.71	0.01	0.01
C20	0.01	0.01	0.01	0.09	0.01
C22	0.01	0.01	0.01	0.03	0.01
C23	0.33	0.33	0.38	0.01	0.01
C3	0.01	0.01	0.15	0.01	0.01
C4	0.01	0.05	0.01	0.45	0.01
C5	0.01	0.01	0.01	0.05	0.01
C6	0.02	0.02	0.11	0.01	0.01
C9	0.17	0.17	0.19	0.01	0.01

Analysis begun on: Wed Jul 17 11:58:03 2019

```
Analysis ended on:  Wed Jul 17 11:58:12 2019
Total elapsed time: 00:00:09
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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ..................... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ........ EXTRAN
Starting Date ........... 04/01/2005 00:00:00
Ending Date ............. 04/04/2005 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ........ 00:01:00
Wet Time Step ........... 00:01:00
Dry Time Step ........... 00:01:00
Routing Time Step ....... 1.00 sec
Variable Time Step ...... YES
Maximum Trials .......... 8
Number of Threads ....... 1
Head Tolerance .......... 0.001500 m

**************************        Volume          Depth
Runoff Quantity Continuity     hectare-m             mm
**************************     ---------       -------
Total Precipitation ......         4.661        52.050
Evaporation Loss .........         0.154         1.720
Infiltration Loss ........         1.878        20.966
Surface Runoff ...........         2.631        29.381
Final Storage ............         0.000         0.000
Continuity Error (%) .....        -0.033

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         2.631        26.311
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         2.350        23.495
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.285         2.851
Initial Stored Volume ....         0.007         0.070
Final Stored Volume ......         0.001         0.007
Continuity Error (%) .....         0.106

*************************
Highest Continuity Errors
*************************
Node J7 (-1.19%)

***************************
Time-Step Critical Elements
***************************
Link C23 (2.84%)

*********************************
Highest Flow Instability Indexes
*********************************
All links are stable.

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     0.99 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.01
Percent Not Converging      :     0.08

****************************
Subcatchment Runoff Summary
****************************

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                          Total      Total      Total      Total      Imperv      Perv      Total      Total      Peak  Runoff
                         Precip      Runon       Evap      Infil     Runoff    Runoff     Runoff     Runoff     Runoff  Coeff
Subcatchment                 mm         mm         mm         mm         mm        mm         mm   10^6 ltr        CMS
-----------------------------------------------------------------------------------------------------------------------------------
A10                       52.05       0.00       1.69      10.63      39.76      2.00      39.76       0.52       0.34  0.764
```

A20	52.05	0.00	1.67	15.03	35.37	2.65	35.37	0.57	0.36	0.680
A30	52.05	0.00	1.61	19.21	27.74	31.29	31.29	0.29	0.18	0.601
A40	52.05	0.00	1.61	19.21	27.74	31.29	31.29	0.42	0.26	0.601
A50	52.05	0.00	1.61	19.21	27.74	31.29	31.29	0.31	0.19	0.601
A60	52.05	0.00	1.69	22.87	25.16	14.92	27.50	0.88	0.31	0.528
A70	52.05	0.00	1.66	20.05	27.69	30.36	30.36	0.64	0.21	0.583
A80	52.05	0.00	1.53	43.24	0.00	7.28	7.28	0.15	0.03	0.140
A90.1	52.05	0.00	1.64	21.85	25.19	15.99	28.59	0.16	0.06	0.549
A90.2	52.05	0.00	1.63	21.72	25.20	16.14	28.73	0.09	0.04	0.552
B10	52.05	0.00	1.61	19.21	27.74	31.29	31.29	0.21	0.13	0.601
B20	52.05	0.00	1.61	19.21	27.74	31.29	31.29	0.22	0.14	0.601
B30	52.05	0.00	1.61	19.21	27.74	31.29	31.29	0.33	0.21	0.601
B40	52.05	0.00	1.69	22.97	25.15	14.82	27.40	1.11	0.38	0.526
EXT10	52.05	0.00	1.75	21.37	27.63	15.13	28.95	5.80	1.86	0.556
EXT20	52.05	0.00	1.77	21.55	27.63	14.93	28.75	7.42	2.34	0.552
EXT30	52.05	0.00	1.71	13.94	33.86	3.73	36.43	1.18	0.72	0.700
EXT40	52.05	0.00	1.69	9.72	38.54	2.00	40.66	0.52	0.34	0.781
EXT50	52.05	0.00	1.60	19.08	27.75	31.43	31.43	0.23	0.15	0.604
EXT60	52.05	0.00	1.63	21.72	25.20	28.74	28.74	0.14	0.06	0.552
EXT70	52.05	0.00	1.60	19.02	27.76	31.50	31.50	0.28	0.20	0.605
EXT80	52.05	0.00	1.72	20.49	29.85	2.22	29.85	4.85	2.88	0.573

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.05	1.81	254.87	0 01:14	1.81
J10	JUNCTION	0.06	2.17	254.87	0 01:12	1.83
J11	JUNCTION	0.06	2.40	254.88	0 01:11	1.82
J12	JUNCTION	0.12	3.07	254.25	0 01:09	2.39
J13	JUNCTION	0.04	3.46	256.71	0 01:10	3.45
J14	JUNCTION	0.06	2.26	255.26	0 01:11	1.62
J15	JUNCTION	0.00	0.00	254.00	0 00:00	0.00
J16	JUNCTION	0.10	2.29	253.33	0 01:09	1.91
J17	JUNCTION	0.11	1.60	252.50	0 01:12	1.60
J18	JUNCTION	0.05	3.47	256.72	0 01:10	3.47
J19	JUNCTION	0.00	0.00	256.50	0 00:00	0.00
J2	JUNCTION	0.02	1.42	256.24	0 01:10	1.42
J20	JUNCTION	0.04	2.76	255.36	0 01:10	1.44
J21	JUNCTION	0.02	2.16	255.62	0 01:11	1.41
J22	JUNCTION	0.02	2.24	255.87	0 01:11	1.41
J23	JUNCTION	0.02	2.74	256.39	0 01:11	2.71
J3	JUNCTION	0.05	2.56	254.84	0 01:11	1.78
J4	JUNCTION	0.02	1.78	257.24	0 01:10	1.73
J5	JUNCTION	0.02	1.81	256.12	0 01:11	1.29
J6	JUNCTION	0.07	4.53	257.54	0 01:10	4.53
J7	JUNCTION	0.13	2.09	256.06	0 01:11	1.48
J8	JUNCTION	0.06	4.71	256.39	0 01:09	2.15
J9	JUNCTION	0.07	1.92	254.73	0 01:14	1.92
DorchesterCreek	OUTFALL	0.00	0.00	253.90	0 00:00	0.00
Ex.Ditch	OUTFALL	0.00	0.00	255.30	0 00:00	0.00
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.06	1.08	251.95	0 01:15	1.08
Comm.Storage	STORAGE	0.10	0.54	255.15	0 03:02	0.54
Ex.Storage	STORAGE	0.09	1.93	256.75	0 01:35	1.93
Ex.SWMF	STORAGE	0.05	0.66	255.56	0 01:59	0.66
MedDensStorage	STORAGE	0.11	0.62	255.23	0 03:03	0.62
ROW1	STORAGE	0.00	0.02	255.62	0 01:11	0.02
ROW2	STORAGE	0.00	0.04	256.64	0 01:12	0.04
RY-1	STORAGE	0.01	0.22	257.22	0 01:49	0.22
RY-2	STORAGE	0.01	0.21	257.21	0 01:48	0.21
RY-3	STORAGE	0.01	0.18	0.18	0 01:45	0.18
RY-4	STORAGE	0.01	0.19	258.07	0 01:46	0.19
RY-5	STORAGE	0.02	0.32	256.32	0 01:39	0.32
RY-6	STORAGE	0.02	0.25	257.36	0 01:52	0.25
RY-7	STORAGE	0.02	0.28	257.28	0 02:19	0.28

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	1.987	0 01:18	0	12.3	-0.113
J10	JUNCTION	0.000	2.587	0 01:10	0	14.5	0.174
J11	JUNCTION	0.000	2.562	0 01:10	0	14.5	0.025
J12	JUNCTION	0.000	4.085	0 01:15	0	22	0.021
J13	JUNCTION	2.336	2.336	0 01:10	7.42	7.42	0.297
J14	JUNCTION	0.000	1.734	0 01:10	0	7.41	-0.013
J15	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J16	JUNCTION	0.000	4.085	0 01:15	0	22	0.038
J17	JUNCTION	0.000	4.085	0 01:15	0	22	-0.007
J18	JUNCTION	0.306	0.306	0 01:10	0.883	0.883	-0.000
J19	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J2	JUNCTION	0.000	1.794	0 01:10	0	6.1	-0.058
J20	JUNCTION	0.040	1.748	0 01:11	0.0919	7.5	0.012
J21	JUNCTION	0.000	1.854	0 00:00	0	6.32	-0.064
J22	JUNCTION	0.000	1.807	0 01:11	0	6.33	0.126
J23	JUNCTION	0.065	0.065	0 01:10	0.157	0.159	0.013
J3	JUNCTION	0.000	2.553	0 01:16	0	14.5	-0.040
J4	JUNCTION	1.863	1.863	0 01:10	5.8	5.8	0.129
J5	JUNCTION	0.000	1.750	0 01:11	0	6.1	-0.060
J6	JUNCTION	0.537	0.537	0 01:10	1.34	1.34	-0.001

J7	JUNCTION	0.000	1.750	0	01:11	0	6.1	-1.176		
J8	JUNCTION	0.000	2.553	0	01:16	0	14.5	-0.111		
J9	JUNCTION	0.000	2.356	0	01:11	0	13.6	-0.001		
DorchesterCreek	OUTFALL	0.028	0.028	0	01:40	0.146	0.146	0.000		
Ex.Ditch	OUTFALL	0.775	0.775	0	01:10	1.32	1.32	0.000		
Ex.Major	OUTFALL	0.000	0.000	0	00:00	0	0	0.000	ltr	
Ex.Sewer	OUTFALL	0.000	4.085	0	01:15	0	22	0.000		
Comm.Storage	STORAGE	0.342	0.342	0	01:10	0.525	0.525	0.000		
Ex.Storage	STORAGE	0.335	0.348	0	01:10	0.525	0.528	-0.000		
Ex.SWMF	STORAGE	2.880	3.385	0	01:10	4.85	4.91	0.001		
MedDensStorage	STORAGE	0.359	0.359	0	01:10	0.566	0.566	0.000		
ROW1	STORAGE	0.000	0.064	0	01:10	0	0.0113	0.056		
ROW2	STORAGE	0.000	0.119	0	01:10	0	0.0207	0.076		
RY-1	STORAGE	0.263	0.263	0	01:11	0.416	0.416	0.009		
RY-2	STORAGE	0.194	0.194	0	01:11	0.307	0.307	0.009		
RY-3	STORAGE	0.133	0.133	0	01:11	0.21	0.21	0.009		
RY-4	STORAGE	0.141	0.141	0	01:11	0.222	0.222	0.009		
RY-5	STORAGE	0.403	0.403	0	01:11	0.609	0.609	0.009		
RY-6	STORAGE	0.182	0.182	0	01:11	0.288	0.288	0.009		
RY-7	STORAGE	0.215	0.215	0	01:17	0.641	0.641	0.007		

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J10	JUNCTION	0.16	0.800	1.400
J11	JUNCTION	0.18	1.026	1.489
J12	JUNCTION	0.42	1.432	0.745
J14	JUNCTION	0.20	1.262	1.536
J16	JUNCTION	0.43	0.888	0.668
J17	JUNCTION	0.31	0.200	1.502
J20	JUNCTION	0.20	1.728	1.154
J21	JUNCTION	0.13	1.144	1.906
J22	JUNCTION	0.01	0.924	1.830
J3	JUNCTION	0.20	1.187	1.373
J5	JUNCTION	0.14	0.878	1.685
J7	JUNCTION	0.19	1.018	1.717
J8	JUNCTION	0.39	3.335	0.000
J9	JUNCTION	0.17	0.541	1.704

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
J8	0.01	0.350	0 01:09	0.000	0.000

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Comm.Storage	0.084	10	0	0	0.458	54	0 03:02	0.009
Ex.Storage	0.013	3	0	42	0.295	61	0 01:35	0.058
Ex.SWMF	0.223	3	0	0	3.147	42	0 01:59	0.280
MedDensStorage	0.089	11	0	0	0.492	61	0 03:03	0.010
ROW1	0.001	0	0	0	0.011	1	0 01:11	0.002
ROW2	0.001	0	0	0	0.020	4	0 01:12	0.002
RY-1	0.010	1	0	100	0.226	18	0 01:49	0.042
RY-2	0.007	1	0	100	0.166	17	0 01:48	0.031
RY-3	0.004	1	0	100	0.108	36	0 01:45	0.024
RY-4	0.005	0	0	100	0.116	10	0 01:46	0.025
RY-5	0.018	2	0	90	0.338	28	0 01:39	0.075
RY-6	0.008	1	0	100	0.162	18	0 01:52	0.027
RY-7	0.020	1	0	100	0.346	21	0 02:19	0.047

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	4.69	0.016	0.028	0.146
Ex.Ditch	8.23	0.071	0.775	1.321
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	99.95	0.099	4.085	22.028
System	28.22	0.186	4.085	23.495

****

Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	1.794	0	01:10	2.82	1.30	1.00
C10	CONDUIT	2.352	0	01:16	1.82	1.47	1.00
C11	CONDUIT	2.562	0	01:10	2.16	1.09	1.00
C12	CONDUIT	2.553	0	01:16	2.38	1.13	1.00
C14	CONDUIT	4.085	0	01:15	2.85	2.63	1.00
C16	CONDUIT	1.750	0	01:06	1.81	0.70	1.00
C17	CONDUIT	4.085	0	01:15	2.85	2.18	1.00
C18	CONDUIT	4.085	0	01:15	3.01	4.28	0.90
C19	CONDUIT	1.750	0	01:11	2.86	0.66	1.00
C2	CONDUIT	2.018	0	01:16	1.58	0.80	1.00
C20	CONDUIT	1.717	0	01:11	2.34	1.31	1.00
C21	CONDUIT	1.722	0	01:10	3.86	0.77	1.00
C22	CONDUIT	1.854	0	00:00	2.94	1.27	1.00
C23	CONDUIT	0.050	0	00:00	0.45	0.12	1.00
C24	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C3	CONDUIT	2.553	0	01:16	2.32	0.63	1.00
C4	CONDUIT	1.757	0	01:11	2.48	2.32	1.00
C5	CONDUIT	1.750	0	01:11	2.75	1.25	1.00
C6	CONDUIT	1.750	0	01:11	2.75	0.85	1.00
C9	CONDUIT	2.553	0	01:16	1.78	1.12	1.00
W1	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
W9	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
OL1	ORIFICE	0.009	0	03:02			1.00
OL2	ORIFICE	0.010	0	03:03			1.00
OR1	ORIFICE	0.042	0	01:35			1.00
OR2	ORIFICE	0.002	0	01:11			0.10
OR3	ORIFICE	0.002	0	01:12			0.30
C15	WEIR	0.000	0	00:00			0.00
C7	WEIR	0.000	0	00:00			0.00
W10	WEIR	0.000	0	00:00			0.00
W11	WEIR	0.556	0	01:10			0.25
W12	WEIR	0.000	0	00:00			0.00
W13	WEIR	0.119	0	01:10			0.12
W14	WEIR	0.000	0	00:00			0.00
W15	WEIR	0.000	0	00:00			0.00
W16	WEIR	0.000	0	00:00			0.00
W17	WEIR	0.000	0	00:00			0.00
W18	WEIR	0.000	0	00:00			0.00
W2	WEIR	0.000	0	00:00			0.00
W3	WEIR	0.032	0	01:39			0.06
W4	WEIR	0.000	0	00:00			0.00
W5	WEIR	0.064	0	01:10			0.08
W6	WEIR	0.000	0	00:00			0.00
W7	WEIR	0.000	0	00:00			0.00
W8	WEIR	0.000	0	00:00			0.00
C13	DUMMY	0.424	0	01:06			
C8	DUMMY	0.242	0	01:05			
Ex.SWMOutlet	DUMMY	0.280	0	01:59			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.29	0.00	0.00	0.71	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.22	0.00	0.00	0.78	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.10	0.00	0.00	0.90	0.00	0.00
C16	1.00	0.71	0.17	0.00	0.12	0.00	0.00	0.00	0.96	0.00
C17	1.00	0.00	0.00	0.00	0.44	0.00	0.00	0.56	0.00	0.00
C18	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	0.74	0.09	0.00	0.17	0.73	0.00
C2	1.00	0.00	0.00	0.00	0.29	0.00	0.00	0.71	0.25	0.00
C20	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C21	1.00	0.56	0.30	0.00	0.07	0.06	0.00	0.01	0.97	0.00
C22	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C23	1.00	0.00	0.90	0.00	0.10	0.00	0.00	0.00	0.91	0.00
C24	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.06	0.16	0.00	0.77	0.10	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.89	0.00	0.11	0.00	0.00	0.00	0.97	0.00
C9	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.00	0.00
W1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W9	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.12	0.13	0.13	0.14	0.10
C10	0.16	0.18	0.16	0.52	0.16
C11	0.17	0.17	0.18	0.19	0.13
C12	0.19	0.20	0.20	0.27	0.18

C14	0.43	0.54	0.43	1.24	0.43
C16	0.11	0.19	0.13	0.01	0.09
C17	0.31	0.47	0.31	0.98	0.31
C18	0.01	0.37	0.01	2.07	0.01
C19	0.22	0.22	1.05	0.01	0.01
C2	0.14	0.14	0.17	0.01	0.01
C20	0.20	0.21	0.20	0.27	0.20
C21	0.14	0.14	0.20	0.01	0.01
C22	0.13	0.13	0.13	0.17	0.11
C23	0.58	0.58	0.65	0.01	0.20
C3	0.21	0.21	0.39	0.01	0.01
C4	0.01	0.19	0.01	0.71	0.01
C5	0.13	0.14	0.14	0.17	0.13
C6	0.16	0.16	0.27	0.01	0.01
C9	0.40	0.40	0.42	0.25	0.26

Analysis begun on: Wed Jul 17 11:58:45 2019
Analysis ended on: Wed Jul 17 11:58:54 2019
Total elapsed time: 00:00:09

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ..................... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ........ EXTRAN
Starting Date ........... 04/01/2005 00:00:00
Ending Date ............. 04/04/2005 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ........ 00:01:00
Wet Time Step ........... 00:01:00
Dry Time Step ........... 00:01:00
Routing Time Step ....... 1.00 sec
Variable Time Step ...... YES
Maximum Trials .......... 8
Number of Threads ....... 1
Head Tolerance .......... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************    ---------       -------
Total Precipitation ......         5.506        61.486
Evaporation Loss .........         0.154         1.722
Infiltration Loss ........         2.081        23.237
Surface Runoff ...........         3.273        36.548
Final Storage ............         0.000         0.000
Continuity Error (%) .....        -0.035

**************************        Volume         Volume
Flow Routing Continuity        hectare-m       10^6 ltr
**************************    ---------       ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         3.273        32.730
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         2.936        29.361
Flooding Loss ............         0.000         0.001
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.339         3.393
Initial Stored Volume ....         0.007         0.070
Final Stored Volume ......         0.001         0.008
Continuity Error (%) .....         0.114

***************************
Time-Step Critical Elements
***************************
Link C23 (2.67%)

*********************************
Highest Flow Instability Indexes
*********************************
All links are stable.

************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.18 sec
Average Time Step           :     0.99 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.01
Percent Not Converging      :     0.08

****************************
Subcatchment Runoff Summary
****************************

-----------------------------------------------------------------------------------------------------------------------
                         Total      Total      Total      Total      Imperv       Perv      Total      Total       Peak  Runoff
                        Precip      Runon       Evap      Infil     Runoff     Runoff     Runoff     Runoff     Runoff  Coeff
Subcatchment                mm         mm         mm         mm         mm         mm         mm  10^6 ltr        CMS
-----------------------------------------------------------------------------------------------------------------------
A10                        61.49       0.00       1.69      11.83      48.00       3.16      48.00       0.63       0.41   0.781
A20                        61.49       0.00       1.67      16.73      43.12       4.26      43.12       0.69       0.43   0.701
A30                        61.49       0.00       1.62      21.34      32.94      38.59      38.59       0.36       0.23   0.628
A40                        61.49       0.00       1.62      21.34      32.94      38.59      38.59       0.51       0.33   0.628
A50                        61.49       0.00       1.62      21.34      32.94      38.59      38.59       0.38       0.24   0.628
A60                        61.49       0.00       1.70      25.32      29.88      19.56      34.50       1.11       0.38   0.561
A70                        61.49       0.00       1.66      22.22      32.89      37.64      37.64       0.79       0.29   0.612
```



```
A80                        61.49       0.00       1.53      48.13       0.00      11.83      11.83       0.24       0.05   0.192
A90.1                      61.49       0.00       1.63      24.27      29.92      20.67      35.62       0.20       0.08   0.579
A90.2                      61.49       0.00       1.63      24.12      29.92      20.82      35.78       0.11       0.05   0.582
B10                        61.49       0.00       1.62      21.34      32.94      38.59      38.59       0.26       0.17   0.628
B20                        61.49       0.00       1.62      21.34      32.94      38.59      38.59       0.27       0.18   0.628
B30                        61.49       0.00       1.62      21.34      32.94      38.59      38.59       0.41       0.26   0.628
B40                        61.49       0.00       1.70      25.42      29.87      19.45      34.39       1.40       0.48   0.559
EXT10                      61.49       0.00       1.75      23.60      32.83      19.74      36.16       7.24       2.32   0.588
EXT20                      61.49       0.00       1.76      23.79      32.82      19.54      35.95       9.27       2.91   0.585
EXT30                      61.49       0.00       1.71      15.31      40.59       5.65      44.49       1.44       0.86   0.724
EXT40                      61.49       0.00       1.69      10.69      46.00       4.29      49.13       0.63       0.40   0.799
EXT50                      61.49       0.00       1.61      21.21      32.95      38.74      38.74       0.28       0.19   0.630
EXT60                      61.49       0.00       1.62      24.12      29.93      35.79      35.79       0.18       0.08   0.582
EXT70                      61.49       0.00       1.60      21.16      32.96      38.81      38.81       0.35       0.25   0.631
EXT80                      61.49       0.00       1.74      22.94      36.83       4.02      36.83       5.99       3.46   0.599

******************
Node Depth Summary
******************

-------------------------------------------------------------------------------
                                  Average  Maximum  Maximum  Time of Max    Reported
                                    Depth    Depth      HGL   Occurrence   Max Depth
Node                 Type          Meters   Meters   Meters  days hr:min      Meters
-------------------------------------------------------------------------------
J1                   JUNCTION        0.06     2.09   255.15    0  01:13        2.09
J10                  JUNCTION        0.07     2.12   254.82    0  01:13        2.11
J11                  JUNCTION        0.07     3.51   255.99    0  01:09        2.11
J12                  JUNCTION        0.13     3.82   255.00    0  01:08        2.69
J13                  JUNCTION        0.05     3.51   256.76    0  01:10        3.51
J14                  JUNCTION        0.07     2.76   255.76    0  01:09        2.35
J15                  JUNCTION        0.00     0.00   254.00    0  00:00        0.00
J16                  JUNCTION        0.12     2.45   253.49    0  01:08        2.11
J17                  JUNCTION        0.13     2.09   252.99    0  01:08        1.71
J18                  JUNCTION        0.06     3.49   256.74    0  01:10        3.49
J19                  JUNCTION        0.00     0.00   256.50    0  00:00        0.00
J2                   JUNCTION        0.03     2.73   257.55    0  01:11        2.73
J20                  JUNCTION        0.05     3.40   256.00    0  01:08        2.00
J21                  JUNCTION        0.03     2.76   256.22    0  01:09        2.48
J22                  JUNCTION        0.03     2.88   256.51    0  01:09        2.66
J23                  JUNCTION        0.05     4.05   257.70    0  01:21        4.05
J3                   JUNCTION        0.06     3.64   255.92    0  01:09        2.07
J4                   JUNCTION        0.03     3.37   258.83    0  01:11        3.37
J5                   JUNCTION        0.03     2.37   256.68    0  01:12        2.37
J6                   JUNCTION        0.09     4.56   257.57    0  01:10        4.56
J7                   JUNCTION        0.14     2.63   256.60    0  01:09        2.48
J8                   JUNCTION        0.08     4.71   256.39    0  01:08        2.46
J9                   JUNCTION        0.08     2.20   255.01    0  01:13        2.20
DorchesterCreek      OUTFALL         0.00     0.00   253.90    0  00:00        0.00
Ex.Ditch             OUTFALL         0.00     0.00   255.30    0  00:00        0.00
Ex.Major             OUTFALL         0.00     0.00   255.50    0  00:00        0.00
Ex.Sewer             OUTFALL         0.07     1.12   251.99    0  01:13        1.12
Comm.Storage         STORAGE         0.13     0.67   255.28    0  03:02        0.67
Ex.Storage           STORAGE         0.11     2.60   257.42    0  01:32        2.60
Ex.SWMF              STORAGE         0.07     0.86   255.76    0  01:57        0.86
MedDensStorage       STORAGE         0.15     0.77   255.38    0  03:03        0.77
ROW1                 STORAGE         0.00     0.17   255.77    0  01:26        0.17
ROW2                 STORAGE         0.01     0.21   256.81    0  01:21        0.21
RY-1                 STORAGE         0.02     0.25   257.25    0  01:50        0.25
RY-2                 STORAGE         0.02     0.24   257.24    0  01:50        0.24
RY-3                 STORAGE         0.01     0.20     0.20    0  01:46        0.20
RY-4                 STORAGE         0.01     0.21   258.09    0  01:46        0.21
RY-5                 STORAGE         0.02     0.34   256.34    0  01:31        0.34
RY-6                 STORAGE         0.02     0.29   257.40    0  01:50        0.29
RY-7                 STORAGE         0.03     0.32   257.32    0  02:20        0.32

******************
Node Inflow Summary
******************

-------------------------------------------------------------------------------------------------
                                  Maximum  Maximum                    Lateral      Total       Flow
                                  Lateral    Total  Time of Max       Inflow     Inflow     Balance
                                   Inflow   Inflow   Occurrence       Volume     Volume       Error
Node                 Type             CMS      CMS  days hr:min   10^6 ltr   10^6 ltr     Percent
-------------------------------------------------------------------------------------------------
J1                   JUNCTION       0.000    2.111    0  01:28          0       15.4      -0.093
J10                  JUNCTION       0.000    2.679    0  01:28          0       18.2       0.124
J11                  JUNCTION       0.000    2.679    0  01:28          0       18.2       0.021
J12                  JUNCTION       0.000    4.432    0  01:13          0       27.5       0.019
J13                  JUNCTION       2.905    2.905    0  01:10       9.27       9.27       0.252
J14                  JUNCTION       0.000    1.969    0  01:11          0        9.2       0.007
J15                  JUNCTION       0.000    0.000    0  00:00          0          0       0.000 ltr
J16                  JUNCTION       0.000    4.432    0  01:13          0       27.5       0.024
J17                  JUNCTION       0.000    4.432    0  01:13          0       27.5      -0.004
J18                  JUNCTION       0.383    0.383    0  01:10       1.11       1.11       0.000
J19                  JUNCTION       0.000    0.000    0  00:00          0          0       0.000 ltr
J2                   JUNCTION       0.000    2.138    0  01:10          0       7.63      -0.042
J20                  JUNCTION       0.051    2.000    0  01:11      0.114       9.31      -0.009
J21                  JUNCTION       0.000    1.969    0  01:11          0       7.88      -0.057
J22                  JUNCTION       0.000    1.998    0  01:08          0       7.89       0.094
J23                  JUNCTION       0.084    0.084    0  01:10      0.196      0.198      -0.215
J3                   JUNCTION       0.000    2.679    0  01:28          0       18.2       0.022
J4                   JUNCTION       2.318    2.318    0  01:10       7.24       7.24       0.128
J5                   JUNCTION       0.000    1.942    0  01:08          0       7.62      -0.054
J6                   JUNCTION       0.670    0.670    0  01:10       1.68       1.68       0.002
J7                   JUNCTION       0.000    1.944    0  01:08          0       7.62      -0.947
J8                   JUNCTION       0.000    2.680    0  01:28          0       18.2      -0.078
J9                   JUNCTION       0.000    2.439    0  01:28          0         17      -0.002
DorchesterCreek      OUTFALL        0.052    0.052    0  01:30      0.238      0.238       0.000
Ex.Ditch             OUTFALL        0.939    0.939    0  01:10       1.62       1.62       0.000
Ex.Major             OUTFALL        0.000    0.000    0  00:00          0          0       0.000 ltr
```

Ex.Sewer	OUTFALL	0.000	4.432	0	01:13	0	27.5	0.000
Comm.Storage	STORAGE	0.406	0.416	0	01:09	0.634	0.636	0.000
Ex.Storage	STORAGE	0.402	0.433	0	01:10	0.634	0.652	-0.001
Ex.SWMF	STORAGE	3.462	4.613	0	01:10	5.99	6.42	0.002
MedDensStorage	STORAGE	0.426	0.436	0	01:09	0.69	0.692	0.000
ROW1	STORAGE	0.000	0.172	0	01:10	0	0.104	0.001
ROW2	STORAGE	0.000	0.287	0	01:10	0	0.115	-0.007
RY-1	STORAGE	0.331	0.331	0	01:11	0.513	0.513	0.015
RY-2	STORAGE	0.244	0.244	0	01:11	0.378	0.378	0.015
RY-3	STORAGE	0.167	0.167	0	01:11	0.259	0.259	0.015
RY-4	STORAGE	0.176	0.176	0	01:11	0.274	0.274	0.015
RY-5	STORAGE	0.505	0.505	0	01:10	0.751	0.751	0.015
RY-6	STORAGE	0.229	0.251	0	01:11	0.355	0.364	0.015
RY-7	STORAGE	0.285	0.285	0	01:15	0.794	0.794	0.010

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J10	JUNCTION	0.44	0.746	1.454
J11	JUNCTION	0.46	2.139	0.376
J12	JUNCTION	0.72	2.177	0.000
J14	JUNCTION	0.47	1.756	1.042
J16	JUNCTION	0.73	1.050	0.506
J17	JUNCTION	0.61	0.692	1.010
J20	JUNCTION	0.46	2.376	0.506
J21	JUNCTION	0.40	1.740	1.310
J22	JUNCTION	0.29	1.561	1.193
J3	JUNCTION	0.48	2.266	0.294
J5	JUNCTION	0.41	1.447	1.116
J7	JUNCTION	0.45	1.555	1.180
J8	JUNCTION	0.69	3.335	0.000
J9	JUNCTION	0.46	0.825	1.420

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
J12	0.01	0.238	0 01:08	0.000	0.000
J8	0.01	0.409	0 01:08	0.000	0.000

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Comm.Storage	0.110	13	0	0	0.566	66	0 03:02	0.010
Ex.Storage	0.017	4	0	38	0.395	82	0 01:32	0.082
Ex.SWMF	0.307	4	0	0	4.239	57	0 01:57	0.372
MedDensStorage	0.118	15	0	0	0.613	77	0 03:03	0.011
ROW1	0.002	0	0	0	0.079	9	0 01:26	0.027
ROW2	0.004	1	0	0	0.102	21	0 01:21	0.019
RY-1	0.014	1	0	100	0.292	23	0 01:50	0.048
RY-2	0.010	1	0	100	0.214	22	0 01:50	0.036
RY-3	0.006	2	0	100	0.140	47	0 01:46	0.027
RY-4	0.006	1	0	100	0.150	12	0 01:46	0.028
RY-5	0.019	2	0	76	0.379	32	0 01:31	0.137
RY-6	0.011	1	0	99	0.215	24	0 01:50	0.031
RY-7	0.028	2	0	100	0.455	28	0 02:20	0.055

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	4.84	0.023	0.052	0.238
Ex.Ditch	8.32	0.083	0.939	1.617
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	99.95	0.120	4.432	27.506
System	28.28	0.227	4.432	29.361

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.138	0 01:10	3.36	1.54	1.00
C10	CONDUIT	2.439	0 01:28	1.83	1.52	1.00
C11	CONDUIT	2.679	0 01:28	2.18	1.14	1.00
C12	CONDUIT	2.679	0 01:28	2.38	1.19	1.00
C14	CONDUIT	4.432	0 01:13	3.10	2.85	1.00
C16	CONDUIT	1.750	0 01:04	1.86	0.70	1.00
C17	CONDUIT	4.432	0 01:13	3.10	2.37	1.00
C18	CONDUIT	4.432	0 01:13	3.23	4.65	0.91
C19	CONDUIT	1.999	0 01:11	2.86	0.75	1.00
C2	CONDUIT	2.119	0 01:28	1.62	0.84	1.00
C20	CONDUIT	1.957	0 01:11	2.62	1.50	1.00
C21	CONDUIT	1.969	0 01:11	3.86	0.88	1.00
C22	CONDUIT	1.969	0 01:11	2.94	1.35	1.00
C23	CONDUIT	0.050	0 00:00	0.45	0.12	1.00
C24	CONDUIT	0.005	0 01:08	0.16	0.00	0.01
C3	CONDUIT	2.680	0 01:28	2.37	0.66	1.00
C4	CONDUIT	1.948	0 01:08	2.66	2.57	1.00
C5	CONDUIT	1.942	0 01:08	3.05	1.39	1.00
C6	CONDUIT	1.944	0 01:08	3.06	0.94	1.00
C9	CONDUIT	2.680	0 01:28	1.87	1.18	1.00
W1	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
W9	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
OL1	ORIFICE	0.012	0 01:09			1.00
OL2	ORIFICE	0.012	0 01:09			1.00
OR1	ORIFICE	0.050	0 01:45			1.00
OR2	ORIFICE	0.027	0 01:26			0.66
OR3	ORIFICE	0.019	0 01:21			1.00
C15	WEIR	0.014	0 01:32			0.04
C7	WEIR	0.035	0 01:11			0.05
W10	WEIR	0.000	0 00:00			0.00
W11	WEIR	1.152	0 01:10			0.41
W12	WEIR	0.000	0 00:00			0.00
W13	WEIR	0.287	0 01:10			0.21
W14	WEIR	0.000	0 00:00			0.00
W15	WEIR	0.000	0 00:00			0.00
W16	WEIR	0.000	0 00:00			0.00
W17	WEIR	0.000	0 00:00			0.00
W18	WEIR	0.000	0 00:00			0.00
W2	WEIR	0.000	0 00:00			0.00
W3	WEIR	0.089	0 01:31			0.12
W4	WEIR	0.000	0 00:00			0.00
W5	WEIR	0.171	0 01:10			0.15
W6	WEIR	0.000	0 00:00			0.00
W7	WEIR	0.000	0 00:00			0.00
W8	WEIR	0.000	0 00:00			0.00
C13	DUMMY	0.424	0 01:04			
C8	DUMMY	0.242	0 01:03			
Ex.SWMOutlet	DUMMY	0.372	0 01:57			

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.30	0.00	0.00	0.70	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.23	0.00	0.00	0.77	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.11	0.00	0.00	0.89	0.00	0.00
C16	1.00	0.70	0.18	0.00	0.12	0.00	0.00	0.00	0.94	0.00
C17	1.00	0.00	0.00	0.00	0.48	0.00	0.00	0.52	0.00	0.00
C18	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	0.79	0.09	0.00	0.13	0.77	0.00
C2	1.00	0.00	0.00	0.00	0.30	0.00	0.00	0.70	0.26	0.00
C20	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C21	1.00	0.51	0.35	0.00	0.07	0.06	0.00	0.01	0.96	0.00
C22	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C23	1.00	0.00	0.90	0.00	0.10	0.00	0.00	0.00	0.91	0.00
C24	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.07	0.17	0.00	0.76	0.11	0.00
C4	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C6	1.00	0.00	0.89	0.00	0.11	0.00	0.00	0.00	0.97	0.00
C9	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
W1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W9	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.37	0.38	0.39	0.34	0.32
C10	0.44	0.47	0.44	0.86	0.44
C11	0.45	0.46	0.46	0.48	0.43
C12	0.47	0.49	0.48	0.59	0.45
C14	0.73	0.85	0.73	1.57	0.73
C16	0.39	0.47	0.41	0.01	0.29
C17	0.61	0.77	0.61	1.31	0.61
C18	0.01	0.67	0.01	2.25	0.01
C19	0.48	0.48	1.38	0.01	0.01

Project #: 60568894
Project: Name: 187 Dorchester Road
Proposed Conditions PCSWMM Output
25 Year – 3hr Chicago

C2	0.42	0.42	0.46	0.01	0.01
C20	0.46	0.47	0.46	0.51	0.46
C21	0.41	0.41	0.47	0.01	0.01
C22	0.40	0.41	0.40	0.38	0.33
C23	0.84	0.84	0.91	0.01	0.59
C3	0.50	0.50	0.69	0.01	0.01
C4	0.29	0.45	0.29	0.98	0.28
C5	0.39	0.40	0.41	0.40	0.38
C6	0.43	0.43	0.50	0.01	0.01
C9	0.70	0.70	0.72	0.57	0.57

Analysis begun on: Wed Jul 17 11:59:27 2019
Analysis ended on: Wed Jul 17 11:59:37 2019
Total elapsed time: 00:00:10

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/01/2005 00:00:00
Ending Date 04/04/2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	6.154	68.726
Evaporation Loss	0.155	1.726
Infiltration Loss	2.226	24.857
Surface Runoff	3.776	42.167
Final Storage	0.000	0.000
Continuity Error (%)	-0.036	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	3.776	37.762
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	3.400	33.999
Flooding Loss	0.000	0.002
Evaporation Loss	0.000	0.001
Exfiltration Loss	0.380	3.798
Initial Stored Volume	0.007	0.070
Final Stored Volume	0.001	0.008
Continuity Error (%)	0.063	

Time-Step Critical Elements

Link C23 (2.61%)

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	0.50 sec
Average Time Step	:	0.99 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.01
Percent Not Converging	:	0.08

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A10	68.73	0.00	1.69	12.68	54.39	4.12	54.39	0.72	0.45	0.791
A20	68.73	0.00	1.68	17.93	49.16	5.59	49.16	0.79	0.48	0.715
A30	68.73	0.00	1.61	22.87	36.93	44.32	44.32	0.41	0.26	0.645
A40	68.73	0.00	1.61	22.87	36.93	44.32	44.32	0.59	0.38	0.645
A50	68.73	0.00	1.61	22.87	36.93	44.32	44.32	0.43	0.28	0.645
A60	68.73	0.00	1.69	27.08	33.50	23.23	39.98	1.28	0.44	0.582
A70	68.73	0.00	1.66	23.77	36.87	43.33	43.33	0.91	0.34	0.630

A80	68.73	0.00	1.53	51.58	0.00	15.61	15.61	0.31	0.07	0.227
A90.1	68.73	0.00	1.64	25.97	33.54	24.38	41.15	0.23	0.10	0.599
A90.2	68.73	0.00	1.62	25.84	33.55	24.54	41.31	0.13	0.06	0.601
B10	68.73	0.00	1.61	22.87	36.93	44.32	44.32	0.30	0.19	0.645
B20	68.73	0.00	1.61	22.87	36.93	44.32	44.32	0.31	0.20	0.645
B30	68.73	0.00	1.61	22.87	36.93	44.32	44.32	0.47	0.30	0.645
B40	68.73	0.00	1.69	27.18	33.50	23.12	39.87	1.62	0.55	0.580
EXT10	68.73	0.00	1.75	25.20	36.81	23.38	41.79	8.37	2.67	0.608
EXT20	68.73	0.00	1.77	25.40	36.80	23.17	41.57	10.72	3.35	0.605
EXT30	68.73	0.00	1.71	16.27	45.79	7.23	50.77	1.65	0.97	0.739
EXT40	68.73	0.00	1.69	11.37	51.74	5.43	55.70	0.72	0.45	0.811
EXT50	68.73	0.00	1.60	22.74	36.94	44.47	44.47	0.32	0.22	0.647
EXT60	68.73	0.00	1.63	25.82	33.55	41.33	41.33	0.20	0.10	0.601
EXT70	68.73	0.00	1.60	22.67	36.94	44.54	44.54	0.40	0.28	0.648
EXT80	68.73	0.00	1.75	24.65	42.34	5.55	42.34	6.89	3.89	0.616

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Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.07	2.31	255.37	0 01:23	2.31
J10	JUNCTION	0.08	2.31	255.01	0 01:23	2.31
J11	JUNCTION	0.08	3.89	256.37	0 01:09	2.28
J12	JUNCTION	0.15	3.82	255.00	0 01:07	2.80
J13	JUNCTION	0.06	3.54	256.79	0 01:10	3.54
J14	JUNCTION	0.08	2.94	255.94	0 01:07	2.63
J15	JUNCTION	0.00	0.00	254.00	0 00:00	0.00
J16	JUNCTION	0.13	2.63	253.67	0 01:07	2.17
J17	JUNCTION	0.14	2.29	253.19	0 01:07	1.75
J18	JUNCTION	0.07	3.51	256.76	0 01:09	3.50
J19	JUNCTION	0.00	0.00	256.50	0 00:00	0.00
J2	JUNCTION	0.04	3.28	258.10	0 01:12	3.28
J20	JUNCTION	0.06	3.91	256.51	0 01:07	2.21
J21	JUNCTION	0.03	2.97	256.43	0 01:07	2.52
J22	JUNCTION	0.04	3.08	256.71	0 01:07	2.59
J23	JUNCTION	0.06	4.06	257.71	0 01:11	4.06
J3	JUNCTION	0.07	3.93	256.21	0 01:08	2.22
J4	JUNCTION	0.04	4.42	259.88	0 01:11	4.42
J5	JUNCTION	0.04	2.83	257.14	0 01:12	2.82
J6	JUNCTION	0.10	4.59	257.60	0 01:09	4.57
J7	JUNCTION	0.14	2.93	256.90	0 01:12	2.92
J8	JUNCTION	0.09	4.71	256.39	0 01:07	2.58
J9	JUNCTION	0.09	3.61	256.42	0 01:09	2.41
DorchesterCreek	OUTFALL	0.00	0.00	253.90	0 00:00	0.00
Ex.Ditch	OUTFALL	0.00	0.00	255.30	0 00:00	0.00
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.08	1.13	252.00	0 01:13	1.13
Comm.Storage	STORAGE	0.16	0.77	255.38	0 03:02	0.77
Ex.Storage	STORAGE	0.13	2.68	257.50	0 01:20	2.68
Ex.SWMF	STORAGE	0.07	1.04	255.94	0 01:43	1.04
MedDensStorage	STORAGE	0.18	0.89	255.50	0 03:03	0.89
ROW1	STORAGE	0.01	0.43	256.03	0 01:38	0.43
ROW2	STORAGE	0.02	0.42	257.02	0 01:30	0.42
RY-1	STORAGE	0.02	0.27	257.27	0 01:51	0.27
RY-2	STORAGE	0.02	0.26	257.26	0 01:51	0.26
RY-3	STORAGE	0.01	0.22	0.22	0 01:46	0.22
RY-4	STORAGE	0.01	0.23	258.11	0 01:47	0.23
RY-5	STORAGE	0.02	0.35	256.35	0 01:26	0.35
RY-6	STORAGE	0.02	0.33	257.44	0 01:33	0.33
RY-7	STORAGE	0.03	0.35	257.35	0 02:24	0.35

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Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	2.154	0 01:37	0	17.9	-0.079
J10	JUNCTION	0.000	2.766	0 01:34	0	21.3	0.098
J11	JUNCTION	0.000	2.766	0 01:34	0	21.3	0.053
J12	JUNCTION	0.000	4.558	0 01:13	0	31.9	0.024
J13	JUNCTION	3.347	3.347	0 01:10	10.7	10.7	0.215
J14	JUNCTION	0.000	2.068	0 01:10	0	10.5	0.012
J15	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J16	JUNCTION	0.000	4.558	0 01:13	0	31.8	0.022
J17	JUNCTION	0.000	4.558	0 01:13	0	31.8	-0.004
J18	JUNCTION	0.444	0.444	0 01:10	1.28	1.28	-0.003
J19	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
J2	JUNCTION	0.000	2.426	0 01:09	0	8.8	-0.045
J20	JUNCTION	0.061	2.112	0 01:10	0.132	10.6	-0.043
J21	JUNCTION	0.000	2.069	0 01:10	0	8.96	-0.055
J22	JUNCTION	0.000	2.070	0 01:10	0	8.97	0.083
J23	JUNCTION	0.099	0.099	0 01:10	0.226	0.228	-8.314
J3	JUNCTION	0.000	2.766	0 01:34	0	21.2	0.010
J4	JUNCTION	2.672	2.672	0 01:10	8.37	8.37	0.143
J5	JUNCTION	0.000	2.021	0 01:10	0	8.68	-0.049
J6	JUNCTION	0.773	0.773	0 01:10	1.94	1.94	-0.001
J7	JUNCTION	0.000	2.021	0 01:10	0	8.69	-0.823
J8	JUNCTION	0.000	2.766	0 01:34	0	21.2	-0.060
J9	JUNCTION	0.000	2.484	0 01:34	0	19.6	-0.001
DorchesterCreek	OUTFALL	0.075	0.075	0 01:30	0.314	0.314	0.000
Ex.Ditch	OUTFALL	1.063	1.063	0 01:10	1.85	1.85	0.000
Ex.Major	OUTFALL	0.000	0.000	0 00:00	0	0	0.000 ltr

Ex.Sewer	OUTFALL	0.000	4.558	0	01:13	0	31.8	0.000		
Comm.Storage	STORAGE	0.453	0.462	0	01:09	0.718	0.725	-0.000		
Ex.Storage	STORAGE	0.452	0.494	0	01:10	0.719	0.788	0.001		
Ex.SWMF	STORAGE	3.890	5.483	0	01:10	6.89	7.82	0.003		
MedDensStorage	STORAGE	0.477	0.485	0	01:09	0.787	0.793	-0.000		
ROW1	STORAGE	0.000	0.293	0	01:09	0	0.393	0.013		
ROW2	STORAGE	0.000	0.471	0	01:09	0	0.255	0.035		
RY-1	STORAGE	0.382	0.382	0	01:10	0.589	0.589	0.019		
RY-2	STORAGE	0.281	0.281	0	01:10	0.434	0.434	0.018		
RY-3	STORAGE	0.192	0.192	0	01:10	0.297	0.297	0.018		
RY-4	STORAGE	0.204	0.204	0	01:10	0.315	0.315	0.018		
RY-5	STORAGE	0.581	0.581	0	01:10	0.862	0.862	0.018		
RY-6	STORAGE	0.264	0.579	0	01:11	0.408	0.606	-0.013		
RY-7	STORAGE	0.343	0.343	0	01:14	0.914	0.914	0.015		

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J10	JUNCTION	0.74	0.942	1.258
J11	JUNCTION	0.75	2.515	0.000
J12	JUNCTION	0.98	2.177	0.000
J14	JUNCTION	0.68	1.938	0.860
J16	JUNCTION	1.00	1.223	0.333
J17	JUNCTION	0.87	0.887	0.815
J20	JUNCTION	0.70	2.882	0.000
J21	JUNCTION	0.60	1.949	1.101
J22	JUNCTION	0.48	1.768	0.986
J3	JUNCTION	0.75	2.560	0.000
J5	JUNCTION	0.58	1.902	0.661
J7	JUNCTION	0.62	1.852	0.883
J8	JUNCTION	0.96	3.335	0.000
J9	JUNCTION	0.76	2.235	0.010

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Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
J11	0.01	0.431	0 01:09	0.000	0.000
J12	0.01	0.289	0 01:07	0.001	0.000
J20	0.01	0.355	0 01:07	0.000	0.000
J3	0.01	0.282	0 01:08	0.000	0.000
J8	0.01	0.538	0 01:07	0.001	0.000

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Comm.Storage	0.132	16	0	0	0.654	77	0 03:02	0.011
Ex.Storage	0.019	4	0	33	0.407	84	0 01:20	0.183
Ex.SWMF	0.357	5	0	0	5.281	71	0 01:43	0.695
MedDensStorage	0.144	18	0	0	0.713	89	0 03:03	0.012
ROW1	0.006	1	0	0	0.224	24	0 01:38	0.078
ROW2	0.008	2	0	0	0.219	46	0 01:30	0.030
RY-1	0.017	1	0	100	0.344	27	0 01:51	0.052
RY-2	0.012	1	0	100	0.252	26	0 01:51	0.039
RY-3	0.007	2	0	100	0.165	55	0 01:46	0.030
RY-4	0.008	1	0	100	0.177	15	0 01:47	0.031
RY-5	0.020	2	0	67	0.406	34	0 01:26	0.186
RY-6	0.014	2	0	68	0.269	30	0 01:33	0.114
RY-7	0.036	2	0	100	0.546	34	0 02:24	0.061

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	4.90	0.029	0.075	0.314
Ex.Ditch	8.38	0.093	1.063	1.848
Ex.Major	0.00	0.000	0.000	0.000
Ex.Sewer	99.95	0.139	4.558	31.837
System	28.31	0.260	4.558	33.998

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.426	0	01:09	3.81	1.75	1.00
C10	CONDUIT	2.484	0	01:34	1.86	1.55	1.00
C11	CONDUIT	2.766	0	01:34	2.21	1.17	1.00
C12	CONDUIT	2.766	0	01:34	2.38	1.22	1.00
C14	CONDUIT	4.558	0	01:13	3.18	2.93	1.00
C16	CONDUIT	1.750	0	01:03	1.85	0.70	1.00
C17	CONDUIT	4.558	0	01:13	3.18	2.43	1.00
C18	CONDUIT	4.558	0	01:13	3.31	4.78	0.92
C19	CONDUIT	2.111	0	01:10	2.86	0.79	1.00
C2	CONDUIT	2.173	0	01:37	1.62	0.86	1.00
C20	CONDUIT	2.052	0	01:10	2.75	1.57	1.00
C21	CONDUIT	2.068	0	01:10	3.86	0.92	1.00
C22	CONDUIT	2.069	0	01:10	2.94	1.42	1.00
C23	CONDUIT	0.050	0	00:00	0.45	0.12	1.00
C24	CONDUIT	0.031	0	01:11	0.29	0.00	0.04
C3	CONDUIT	2.766	0	01:34	2.40	0.68	1.00
C4	CONDUIT	2.020	0	01:10	2.71	2.66	1.00
C5	CONDUIT	2.021	0	01:10	3.18	1.45	1.00
C6	CONDUIT	2.021	0	01:10	3.18	0.98	1.00
C9	CONDUIT	2.766	0	01:34	1.93	1.22	1.00
W1	CONDUIT	0.015	0	01:11	0.46	0.01	0.19
W9	CONDUIT	0.074	0	01:33	0.32	0.02	0.08
OL1	ORIFICE	0.013	0	01:07			1.00
OL2	ORIFICE	0.013	0	01:07			1.00
OR1	ORIFICE	0.051	0	01:56			1.00
OR2	ORIFICE	0.078	0	01:38			1.00
OR3	ORIFICE	0.030	0	01:30			1.00
C15	WEIR	0.160	0	01:20			0.22
C7	WEIR	0.317	0	01:12			0.24
W10	WEIR	0.000	0	00:00			0.00
W11	WEIR	1.595	0	01:10			0.51
W12	WEIR	0.000	0	00:00			0.00
W13	WEIR	0.471	0	01:09			0.29
W14	WEIR	0.000	0	00:00			0.00
W15	WEIR	0.000	0	00:00			0.00
W16	WEIR	0.000	0	00:00			0.00
W17	WEIR	0.000	0	00:00			0.00
W18	WEIR	0.000	0	00:00			0.00
W2	WEIR	0.000	0	00:00			0.00
W3	WEIR	0.135	0	01:26			0.16
W4	WEIR	0.000	0	00:00			0.00
W5	WEIR	0.265	0	01:09			0.20
W6	WEIR	0.000	0	00:00			0.00
W7	WEIR	0.000	0	00:00			0.00
W8	WEIR	0.000	0	00:00			0.00
C13	DUMMY	0.424	0	01:03			
C8	DUMMY	0.242	0	01:03			
Ex.SWMOutlet	DUMMY	0.695	0	01:45			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.89	0.00	0.00	0.01	0.00	0.00	0.10	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.31	0.00	0.00	0.69	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.24	0.00	0.00	0.76	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.12	0.00	0.00	0.88	0.00	0.00
C16	1.00	0.69	0.18	0.00	0.13	0.00	0.00	0.00	0.91	0.00
C17	1.00	0.00	0.00	0.00	0.51	0.00	0.00	0.49	0.00	0.00
C18	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	0.82	0.09	0.00	0.09	0.80	0.00
C2	1.00	0.00	0.00	0.00	0.31	0.00	0.00	0.69	0.26	0.00
C20	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C21	1.00	0.48	0.38	0.00	0.07	0.06	0.00	0.01	0.96	0.00
C22	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C23	1.00	0.00	0.90	0.00	0.10	0.00	0.00	0.00	0.91	0.00
C24	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.07	0.18	0.00	0.75	0.11	0.00
C4	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C6	1.00	0.00	0.89	0.00	0.11	0.00	0.00	0.00	0.96	0.00
C9	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
W1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W9	1.00	0.98	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.54	0.56	0.57	0.51	0.48
C10	0.74	0.77	0.74	1.18	0.73
C11	0.75	0.75	0.75	0.85	0.73
C12	0.75	0.77	0.75	0.90	0.73
C14	1.00	1.13	1.00	1.86	1.00
C16	0.68	0.76	0.71	0.01	0.46

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C17	0.87	1.04	0.87	1.59	0.87
C18	0.01	0.94	0.01	2.40	0.01
C19	0.72	0.72	1.66	0.01	0.01
C2	0.72	0.72	0.76	0.01	0.01
C20	0.67	0.69	0.70	0.67	0.62
C21	0.61	0.61	0.68	0.01	0.01
C22	0.59	0.60	0.60	0.55	0.50
C23	1.00	1.00	1.06	0.01	0.72
C3	0.77	0.77	0.96	0.01	0.01
C4	0.48	0.62	0.48	1.14	0.48
C5	0.57	0.57	0.58	0.56	0.54
C6	0.60	0.60	0.67	0.01	0.01
C9	0.97	0.97	0.98	0.90	0.90

Analysis begun on: Wed Jul 17 12:00:03 2019
Analysis ended on: Wed Jul 17 12:00:13 2019
Total elapsed time: 00:00:10

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
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*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 04/01/2005 00:00:00
Ending Date .............. 04/04/2005 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	6.791	75.839
Evaporation Loss	0.155	1.727
Infiltration Loss	2.355	26.300
Surface Runoff	4.284	47.840
Final Storage	0.000	0.000
Continuity Error (%)	-0.037	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	4.284	42.843
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	3.870	38.699
Flooding Loss	0.000	0.003
Evaporation Loss	0.000	0.001
Exfiltration Loss	0.416	4.158
Initial Stored Volume	0.007	0.070
Final Stored Volume	0.001	0.009
Continuity Error (%)	0.102	

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***************************
Time-Step Critical Elements
***************************
Link C23 (2.53%)

********************************
Highest Flow Instability Indexes
********************************
Link W5 (1)
Link W13 (1)

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     0.99 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.02
Percent Not Converging      :     0.08
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A10	75.84	0.00	1.69	13.46	60.73	5.12	60.73	0.80	0.50	0.801
A20	75.84	0.00	1.68	19.01	55.18	6.99	55.18	0.88	0.53	0.728
A30	75.84	0.00	1.61	24.26	40.85	50.06	50.06	0.46	0.30	0.660
A40	75.84	0.00	1.61	24.26	40.85	50.06	50.06	0.67	0.43	0.660
A50	75.84	0.00	1.61	24.26	40.85	50.06	50.06	0.49	0.32	0.660
A60	75.84	0.00	1.69	28.65	37.06	27.00	45.53	1.46	0.51	0.600
A70	75.84	0.00	1.67	25.15	40.79	49.06	49.06	1.04	0.40	0.647
A80	75.84	0.00	1.56	54.69	0.00	19.60	19.60	0.39	0.10	0.258
A90.1	75.84	0.00	1.64	27.53	37.10	28.17	46.72	0.26	0.11	0.616
A90.2	75.84	0.00	1.63	27.37	37.11	28.33	46.88	0.15	0.07	0.618
B10	75.84	0.00	1.61	24.26	40.85	50.06	50.06	0.34	0.22	0.660
B20	75.84	0.00	1.61	24.26	40.85	50.06	50.06	0.36	0.23	0.660
B30	75.84	0.00	1.61	24.26	40.85	50.06	50.06	0.53	0.34	0.660
B40	75.84	0.00	1.69	28.75	37.06	26.89	45.42	1.84	0.63	0.599
EXT10	75.84	0.00	1.75	26.63	40.72	27.12	47.48	9.51	3.04	0.626
EXT20	75.84	0.00	1.77	26.83	40.72	26.90	47.26	12.19	3.80	0.623
EXT30	75.84	0.00	1.71	17.12	50.92	8.87	57.04	1.85	1.08	0.752
EXT40	75.84	0.00	1.70	11.97	57.40	6.60	62.22	0.80	0.50	0.820
EXT50	75.84	0.00	1.60	24.12	40.86	50.21	50.21	0.36	0.25	0.662
EXT60	75.84	0.00	1.63	27.36	37.11	46.91	46.91	0.23	0.12	0.619
EXT70	75.84	0.00	1.60	24.05	40.86	50.29	50.29	0.45	0.32	0.663
EXT80	75.84	0.00	1.75	26.18	47.93	7.22	47.93	7.79	4.32	0.632

Project #: 60568894
Project: Name: 187 Dorchester Road
Proposed Conditions PCSWMM Output
100 Year – 3hr Chicago

****
Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.08	2.49	255.55	0 01:25	2.49
J10	JUNCTION	0.09	2.84	255.54	0 01:08	2.48
J11	JUNCTION	0.09	3.89	256.37	0 01:08	2.44
J12	JUNCTION	0.16	3.82	255.00	0 01:07	2.92
J13	JUNCTION	0.07	3.57	256.82	0 01:10	3.57
J14	JUNCTION	0.08	2.98	255.98	0 01:07	2.71
J15	JUNCTION	0.00	0.03	254.03	0 01:28	0.03
J16	JUNCTION	0.14	2.96	254.00	0 01:06	2.25
J17	JUNCTION	0.15	2.34	253.24	0 01:07	1.79
J18	JUNCTION	0.08	3.52	256.77	0 01:10	3.52
J19	JUNCTION	0.00	0.00	256.50	0 02:42	0.00
J2	JUNCTION	0.04	3.36	258.18	0 01:12	3.36
J20	JUNCTION	0.06	3.91	256.51	0 01:07	2.30
J21	JUNCTION	0.04	3.02	256.48	0 01:07	2.59
J22	JUNCTION	0.04	3.15	256.78	0 01:07	2.66
J23	JUNCTION	0.06	4.06	257.71	0 01:20	4.06
J3	JUNCTION	0.07	3.93	256.21	0 01:08	2.37
J4	JUNCTION	0.05	4.57	260.03	0 01:11	4.56
J5	JUNCTION	0.04	2.91	257.22	0 01:13	2.89
J6	JUNCTION	0.11	4.60	257.61	0 01:08	4.59
J7	JUNCTION	0.15	3.00	256.97	0 01:12	3.00
J8	JUNCTION	0.10	4.71	256.39	0 01:07	2.71
J9	JUNCTION	0.10	3.39	256.20	0 01:08	2.58
DorchesterCreek	OUTFALL	0.00	0.00	253.90	0 00:00	0.00
Ex.Ditch	OUTFALL	0.00	0.00	255.30	0 00:00	0.00
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.08	1.14	252.02	0 01:21	1.14
Comm.Storage	STORAGE	0.18	0.87	255.48	0 03:02	0.87
Ex.Storage	STORAGE	0.13	2.72	257.54	0 01:20	2.72
Ex.SWMF	STORAGE	0.08	1.20	256.10	0 01:39	1.20
MedDensStorage	STORAGE	0.22	2.51	257.12	0 02:42	2.51
ROW1	STORAGE	0.03	0.97	256.57	0 01:45	0.97
ROW2	STORAGE	0.02	0.57	257.17	0 01:28	0.57
RY-1	STORAGE	0.02	0.29	257.29	0 01:52	0.29
RY-2	STORAGE	0.02	0.28	257.28	0 01:51	0.28
RY-3	STORAGE	0.01	0.24	0.24	0 01:47	0.24
RY-4	STORAGE	0.02	0.25	258.13	0 01:48	0.25
RY-5	STORAGE	0.03	0.36	256.36	0 01:23	0.36
RY-6	STORAGE	0.02	0.36	257.47	0 01:24	0.36
RY-7	STORAGE	0.03	0.38	257.38	0 02:27	0.38

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Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	2.249	0 01:59	0	19.6	-0.069
J10	JUNCTION	0.000	2.817	0 01:41	0	23.7	0.083
J11	JUNCTION	0.000	2.817	0 01:41	0	23.7	0.065
J12	JUNCTION	0.000	4.684	0 01:21	0	35.4	0.026
J13	JUNCTION	3.803	3.803	0 01:10	12.2	12.2	0.182
J14	JUNCTION	0.000	2.097	0 01:09	0	11.6	0.011
J15	JUNCTION	0.000	0.100	0 01:28	0	0.0918	-0.005
J16	JUNCTION	0.000	4.684	0 01:21	0	35.4	0.017
J17	JUNCTION	0.000	4.684	0 01:21	0	35.4	-0.005
J18	JUNCTION	0.507	0.507	0 01:10	1.46	1.46	-0.003
J19	JUNCTION	0.000	0.003	0 02:42	0	0.00122	0.001
J2	JUNCTION	0.000	2.476	0 01:08	0	9.88	-0.092
J20	JUNCTION	0.071	2.148	0 01:09	0.15	11.7	-0.055
J21	JUNCTION	0.000	2.097	0 01:09	0	9.85	-0.051
J22	JUNCTION	0.000	2.098	0 01:09	0	9.86	0.077
J23	JUNCTION	0.115	0.115	0 01:10	0.257	0.259	-0.941
J3	JUNCTION	0.000	2.817	0 01:41	0	23.7	0.005
J4	JUNCTION	3.037	3.037	0 01:10	9.51	9.51	0.195
J5	JUNCTION	0.000	2.049	0 01:09	0	9.56	-0.046
J6	JUNCTION	0.880	0.880	0 01:10	2.21	2.21	0.003
J7	JUNCTION	0.000	2.048	0 01:09	0	9.57	-0.749
J8	JUNCTION	0.000	2.817	0 01:41	0	23.7	-0.053
J9	JUNCTION	0.000	2.489	0 01:40	0	21.3	-0.003
DorchesterCreek	OUTFALL	0.100	0.199	0 01:30	0.394	0.486	0.000
Ex.Ditch	OUTFALL	1.189	1.189	0 01:10	2.08	2.08	0.000

Ex.Major	OUTFALL	0.000	0.571	0	01:39	0	0.778	0.000
Ex.Sewer	OUTFALL	0.000	4.684	0	01:21	0	35.4	0.000
Comm.Storage	STORAGE	0.502	0.511	0	01:10	0.802	0.814	0.000
Ex.Storage	STORAGE	0.503	0.544	0	01:10	0.803	0.893	0.001
Ex.SWMF	STORAGE	4.319	6.367	0	01:10	7.79	9.43	0.004
MedDensStorage	STORAGE	0.528	0.537	0	01:10	0.883	0.893	0.002
ROW1	STORAGE	0.000	0.536	0	01:23	0	0.922	0.010
ROW2	STORAGE	0.000	0.538	0	01:10	0	0.44	0.002
RY-1	STORAGE	0.435	0.435	0	01:10	0.666	0.666	0.021
RY-2	STORAGE	0.320	0.320	0	01:10	0.491	0.491	0.021
RY-3	STORAGE	0.219	0.219	0	01:10	0.335	0.335	0.021
RY-4	STORAGE	0.232	0.232	0	01:10	0.355	0.355	0.021
RY-5	STORAGE	0.658	0.658	0	01:10	0.973	0.973	0.020
RY-6	STORAGE	0.301	0.855	0	01:11	0.461	1.01	0.025
RY-7	STORAGE	0.403	0.403	0	01:13	1.04	1.04	0.017

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J10	JUNCTION	0.98	1.467	0.733
J11	JUNCTION	0.98	2.515	0.000
J12	JUNCTION	1.20	2.177	0.000
J14	JUNCTION	0.84	1.980	0.818
J16	JUNCTION	1.22	1.556	0.000
J17	JUNCTION	1.09	0.946	0.756
J20	JUNCTION	0.89	2.882	0.000
J21	JUNCTION	0.74	2.003	1.047
J22	JUNCTION	0.64	1.833	0.921
J3	JUNCTION	0.98	2.560	0.000
J5	JUNCTION	0.73	1.980	0.583
J7	JUNCTION	0.76	1.927	0.808
J8	JUNCTION	1.19	3.335	0.000
J9	JUNCTION	1.00	2.010	0.235

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Node Flooding Summary
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Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
J11	0.01	0.471	0 01:08	0.000	0.000
J12	0.01	0.012	0 01:07	0.000	0.000
J16	0.01	0.285	0 01:06	0.000	0.000
J20	0.01	0.374	0 01:07	0.001	0.000
J3	0.01	0.467	0 01:08	0.000	0.000
J8	0.01	0.690	0 01:07	0.001	0.000

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Comm.Storage	0.156	18	0	0	0.742	87	0 03:02	0.012
Ex.Storage	0.020	4	0	29	0.412	86	0 01:20	0.250
Ex.SWMF	0.387	5	0	0	6.243	83	0 01:39	1.067
MedDensStorage	0.168	21	0	0	0.801	100	0 02:42	0.023
ROW1	0.016	2	0	0	0.613	67	0 01:45	0.130
ROW2	0.011	2	0	0	0.316	66	0 01:28	0.136
RY-1	0.021	2	0	100	0.398	32	0 01:52	0.057
RY-2	0.015	2	0	100	0.292	30	0 01:51	0.042
RY-3	0.009	3	0	100	0.191	64	0 01:47	0.032
RY-4	0.010	1	0	100	0.205	17	0 01:48	0.033
RY-5	0.021	2	0	61	0.434	36	0 01:23	0.239
RY-6	0.015	2	0	42	0.332	37	0 01:24	0.369
RY-7	0.045	3	0	100	0.644	40	0 02:27	0.064

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	4.96	0.042	0.199	0.486
Ex.Ditch	8.43	0.103	1.189	2.079
Ex.Major	0.92	0.325	0.571	0.778
Ex.Sewer	99.95	0.153	4.684	35.355
System	28.56	0.623	4.684	38.699

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Link Flow Summary
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Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.476	0 01:08	3.89	1.79	1.00
C10	CONDUIT	2.489	0 01:40	1.89	1.55	1.00
C11	CONDUIT	2.817	0 01:41	2.23	1.20	1.00
C12	CONDUIT	2.817	0 01:41	2.38	1.25	1.00
C14	CONDUIT	4.684	0 01:21	3.27	3.01	1.00
C16	CONDUIT	1.750	0 01:03	1.84	0.70	1.00
C17	CONDUIT	4.684	0 01:21	3.27	2.50	1.00
C18	CONDUIT	4.684	0 01:21	3.39	4.91	0.92
C19	CONDUIT	2.148	0 01:09	2.88	0.81	1.00
C2	CONDUIT	2.262	0 02:00	1.64	0.89	1.00
C20	CONDUIT	2.091	0 01:07	2.87	1.60	1.00
C21	CONDUIT	2.097	0 01:09	3.86	0.93	1.00
C22	CONDUIT	2.097	0 01:09	2.94	1.43	1.00
C23	CONDUIT	0.050	0 00:00	0.45	0.12	1.00
C24	CONDUIT	0.028	0 01:20	0.28	0.00	0.03
C3	CONDUIT	2.817	0 01:41	2.41	0.69	1.00
C4	CONDUIT	2.048	0 01:09	2.75	2.70	1.00
C5	CONDUIT	2.049	0 01:09	3.22	1.47	1.00
C6	CONDUIT	2.048	0 01:09	3.22	0.99	1.00
C9	CONDUIT	2.817	0 01:41	1.97	1.24	1.00
W1	CONDUIT	0.205	0 01:11	0.87	0.18	0.51
W9	CONDUIT	0.329	0 01:24	0.59	0.07	0.19
OL1	ORIFICE	0.013	0 01:07			1.00
OL2	ORIFICE	0.020	0 02:42			1.00
OR1	ORIFICE	0.051	0 02:03			1.00
OR2	ORIFICE	0.130	0 01:45			1.00
OR3	ORIFICE	0.036	0 01:28			1.00
C15	WEIR	0.227	0 01:19			0.30
C7	WEIR	0.372	0 01:12			0.26
W10	WEIR	0.000	0 00:00			0.00
W11	WEIR	2.050	0 01:10			0.60
W12	WEIR	0.000	0 00:00			0.00
W13	WEIR	0.538	0 01:10			0.31
W14	WEIR	0.000	0 00:00			0.00
W15	WEIR	0.003	0 02:42			0.02
W16	WEIR	0.003	0 02:42			0.01
W17	WEIR	0.000	0 00:00			0.00
W18	WEIR	0.000	0 00:00			0.00
W2	WEIR	0.571	0 01:39			0.34
W3	WEIR	0.186	0 01:23			0.20
W4	WEIR	0.100	0 01:28			0.03
W5	WEIR	0.332	0 01:08			0.24
W6	WEIR	0.000	0 00:00			0.00
W7	WEIR	0.100	0 01:28			0.24
W8	WEIR	0.000	0 00:00			0.00
C13	DUMMY	0.424	0 01:02			
C8	DUMMY	0.242	0 01:02			
Ex.SWMOutlet	DUMMY	0.976	0 02:00			

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.89	0.00	0.00	0.01	0.01	0.00	0.09	0.01	0.00
C10	1.00	0.00	0.00	0.00	0.31	0.00	0.00	0.69	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.24	0.00	0.00	0.76	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.12	0.00	0.00	0.88	0.00	0.00
C16	1.00	0.69	0.18	0.00	0.13	0.00	0.00	0.00	0.90	0.00
C17	1.00	0.00	0.00	0.00	0.54	0.00	0.00	0.46	0.00	0.00
C18	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	0.85	0.09	0.00	0.06	0.82	0.00
C2	1.00	0.00	0.00	0.00	0.31	0.00	0.00	0.69	0.26	0.00
C20	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C21	1.00	0.45	0.41	0.00	0.08	0.06	0.00	0.01	0.96	0.00
C22	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C23	1.00	0.00	0.90	0.00	0.10	0.00	0.00	0.00	0.91	0.00
C24	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.07	0.18	0.00	0.75	0.12	0.00
C4	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C6	1.00	0.00	0.89	0.00	0.11	0.00	0.00	0.00	0.96	0.00
C9	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
W1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W9	1.00	0.97	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.69	0.70	0.71	0.65	0.63
C10	0.98	1.01	0.98	1.40	0.97
C11	0.98	0.99	0.98	1.11	0.96
C12	0.98	1.00	0.98	1.15	0.96

C14	1.22	1.35	1.22	2.06	1.22
C16	0.92	1.01	0.96	0.01	0.60
C17	1.09	1.26	1.09	1.82	1.09
C18	0.01	1.16	0.01	2.56	0.01
C19	0.93	0.93	1.91	0.01	0.01
C2	0.96	0.96	1.00	0.01	0.01
C20	0.83	0.85	0.89	0.79	0.75
C21	0.76	0.76	0.84	0.01	0.01
C22	0.74	0.74	0.74	0.68	0.64
C23	1.12	1.13	1.19	0.01	0.77
C3	0.99	0.99	1.19	0.01	0.01
C4	0.64	0.76	0.64	1.26	0.63
C5	0.71	0.71	0.73	0.70	0.68
C6	0.74	0.74	0.81	0.01	0.01
C9	1.20	1.20	1.20	1.16	1.16

Analysis begun on: Wed Jul 17 12:00:46 2019
Analysis ended on: Wed Jul 17 12:00:55 2019
Total elapsed time: 00:00:09

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/01/2005 00:00:00
Ending Date 04/04/2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	7.756	86.611
Evaporation Loss	0.155	1.726
Infiltration Loss	2.534	28.297
Surface Runoff	5.071	56.623
Final Storage	0.000	0.000
Continuity Error (%)	-0.041	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	5.071	50.709
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	4.608	46.076
Flooding Loss	0.000	0.005
Evaporation Loss	0.000	0.001
Exfiltration Loss	0.465	4.646
Initial Stored Volume	0.007	0.070
Final Stored Volume	0.001	0.009
Continuity Error (%)	0.082	

Time-Step Critical Elements
Link C23 (2.43%)

Highest Flow Instability Indexes
Link W5 (2)
Link W13 (1)

Routing Time Step Summary
Minimum Time Step : 0.37 sec
Average Time Step : 0.99 sec
Maximum Time Step : 1.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.02
Percent Not Converging : 0.08

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A10	86.61	0.00	1.69	14.54	70.44	6.74	70.44	0.93	0.60	0.813
A20	86.61	0.00	1.67	20.54	64.45	9.25	64.45	1.03	0.63	0.744
A30	86.61	0.00	1.61	26.17	46.79	58.93	58.93	0.54	0.37	0.680
A40	86.61	0.00	1.61	26.17	46.79	58.93	58.93	0.78	0.53	0.680
A50	86.61	0.00	1.61	26.17	46.79	58.93	58.93	0.58	0.39	0.680
A60	86.61	0.00	1.69	30.82	42.45	32.91	54.14	1.74	0.63	0.625

A70	86.61	0.00	1.66	27.10	46.72	57.91	57.91	1.22	0.52	0.669
A80	86.61	0.00	1.55	59.04	0.00	26.03	26.03	0.52	0.14	0.301
A90.1	86.61	0.00	1.63	29.69	42.50	34.10	55.35	0.30	0.15	0.639
A90.2	86.61	0.00	1.62	29.54	42.50	34.26	55.52	0.18	0.09	0.641
B10	86.61	0.00	1.61	26.17	46.79	58.93	58.93	0.39	0.27	0.680
B20	86.61	0.00	1.61	26.17	46.79	58.93	58.93	0.42	0.28	0.680
B30	86.61	0.00	1.61	26.17	46.79	58.93	58.93	0.62	0.42	0.680
B40	86.61	0.00	1.70	30.92	42.45	32.80	54.02	2.19	0.78	0.624
EXT10	86.61	0.00	1.75	28.59	46.65	32.97	56.29	11.27	3.74	0.650
EXT20	86.61	0.00	1.76	28.81	46.64	32.74	56.06	14.46	4.67	0.647
EXT30	86.61	0.00	1.72	18.27	58.74	11.48	66.66	2.16	1.29	0.770
EXT40	86.61	0.00	1.70	12.79	65.99	8.48	72.18	0.93	0.60	0.833
EXT50	86.61	0.00	1.60	26.04	46.80	59.09	59.09	0.43	0.30	0.682
EXT60	86.61	0.00	1.63	29.51	42.51	55.55	55.55	0.27	0.15	0.641
EXT70	86.61	0.00	1.60	25.97	46.80	59.16	59.16	0.53	0.38	0.683
EXT80	86.61	0.00	1.76	28.29	56.59	9.96	56.59	9.20	5.13	0.653

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Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.09	2.72	255.78	0 01:23	2.72
J10	JUNCTION	0.10	2.69	255.39	0 01:23	2.69
J11	JUNCTION	0.10	3.89	256.37	0 01:07	2.65
J12	JUNCTION	0.17	3.82	255.00	0 01:05	3.23
J13	JUNCTION	0.07	3.62	256.87	0 01:10	3.62
J14	JUNCTION	0.09	2.84	255.84	0 01:21	2.84
J15	JUNCTION	0.00	0.18	254.18	0 01:25	0.18
J16	JUNCTION	0.14	2.96	254.00	0 01:05	2.59
J17	JUNCTION	0.15	2.84	253.74	0 01:06	2.08
J18	JUNCTION	0.09	3.54	256.79	0 01:09	3.53
J19	JUNCTION	0.00	0.03	256.53	0 01:39	0.03
J2	JUNCTION	0.05	3.43	258.25	0 01:12	3.43
J20	JUNCTION	0.07	3.91	256.51	0 01:06	2.55
J21	JUNCTION	0.04	2.73	256.19	0 01:21	2.72
J22	JUNCTION	0.05	2.79	256.42	0 01:21	2.79
J23	JUNCTION	0.07	4.07	257.72	0 01:20	4.07
J3	JUNCTION	0.08	3.93	256.21	0 01:07	2.77
J4	JUNCTION	0.06	4.72	260.18	0 01:11	4.72
J5	JUNCTION	0.05	2.99	257.30	0 01:20	2.99
J6	JUNCTION	0.12	4.62	257.63	0 01:07	4.62
J7	JUNCTION	0.16	3.10	257.07	0 01:20	3.10
J8	JUNCTION	0.10	4.71	256.39	0 01:06	3.19
J9	JUNCTION	0.11	3.25	256.06	0 01:07	2.80
DorchesterCreek	OUTFALL	0.00	0.00	253.90	0 00:00	0.00
Ex.Ditch	OUTFALL	0.00	0.00	255.30	0 00:00	0.00
Ex.Major	OUTFALL	0.00	0.00	255.50	0 00:00	0.00
Ex.Sewer	OUTFALL	0.08	1.16	252.03	0 01:23	1.16
Comm.Storage	STORAGE	0.25	3.41	258.02	0 02:26	3.41
Ex.Storage	STORAGE	0.14	2.75	257.57	0 01:20	2.75
Ex.SWMF	STORAGE	0.08	1.32	256.22	0 01:31	1.32
MedDensStorage	STORAGE	0.25	2.55	257.16	0 01:39	2.55
ROW1	STORAGE	0.03	1.12	256.72	0 01:26	1.12
ROW2	STORAGE	0.02	0.65	257.25	0 01:21	0.65
RY-1	STORAGE	0.02	0.32	257.32	0 01:43	0.32
RY-2	STORAGE	0.02	0.31	257.31	0 01:45	0.31
RY-3	STORAGE	0.02	0.26	0.26	0 01:47	0.26
RY-4	STORAGE	0.02	0.27	258.15	0 01:48	0.27
RY-5	STORAGE	0.03	0.38	256.38	0 01:21	0.38
RY-6	STORAGE	0.03	0.42	257.53	0 01:22	0.42
RY-7	STORAGE	0.04	0.42	257.42	0 02:31	0.42

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	2.264	0 02:08	0	20.9	-0.070
J10	JUNCTION	0.000	2.814	0 01:25	0	25.3	0.068
J11	JUNCTION	0.000	2.814	0 01:24	0	25.3	0.064
J12	JUNCTION	0.000	4.831	0 01:23	0	38.2	0.023
J13	JUNCTION	4.673	4.673	0 01:10	14.5	14.5	0.154
J14	JUNCTION	0.000	2.173	0 01:06	0	12.7	0.001
J15	JUNCTION	0.000	1.335	0 01:25	0	1.5	-0.000
J16	JUNCTION	0.000	4.831	0 01:23	0	38.2	0.013
J17	JUNCTION	0.000	4.831	0 01:23	0	38.2	-0.005
J18	JUNCTION	0.630	0.630	0 01:10	1.74	1.74	-0.015
J19	JUNCTION	0.000	0.102	0 01:39	0	0.125	0.004
J2	JUNCTION	0.000	2.598	0 01:06	0	11.2	-0.069
J20	JUNCTION	0.090	2.239	0 01:06	0.178	12.9	-0.053
J21	JUNCTION	0.000	2.161	0 01:06	0	10.9	-0.047
J22	JUNCTION	0.000	2.172	0 01:06	0	10.9	0.075
J23	JUNCTION	0.145	0.145	0 01:10	0.304	0.306	0.899
J3	JUNCTION	0.000	2.814	0 01:25	0	25.3	0.007
J4	JUNCTION	3.737	3.737	0 01:10	11.3	11.3	0.174
J5	JUNCTION	0.000	2.126	0 01:06	0	10.6	-0.048
J6	JUNCTION	1.086	1.086	0 01:10	2.62	2.62	0.006
J7	JUNCTION	0.000	2.124	0 01:06	0	10.6	-0.673
J8	JUNCTION	0.000	2.814	0 01:25	0	25.3	-0.058
J9	JUNCTION	0.000	2.502	0 01:25	0	22.7	-0.004
DorchesterCreek	OUTFALL	0.140	1.476	0 01:25	0.523	2.02	0.000
Ex.Ditch	OUTFALL	1.430	1.430	0 01:10	2.43	2.56	0.000

Ex.Major	OUTFALL	0.000	1.898	0	01:31	0	3.32	0.000		
Ex.Sewer	OUTFALL	0.000	4.831	0	01:23	0	38.2	0.000		
Comm.Storage	STORAGE	0.595	0.606	0	01:10	0.93	0.945	0.067		
Ex.Storage	STORAGE	0.602	0.646	0	01:10	0.931	1.04	-0.000		
Ex.SWMF	STORAGE	5.130	8.049	0	01:10	9.2	12.2	0.004		
MedDensStorage	STORAGE	0.627	0.637	0	01:10	1.03	1.04	0.075		
ROW1	STORAGE	0.000	1.300	0	01:21	0	2.2	-0.161		
ROW2	STORAGE	0.000	0.738	0	01:10	0	0.769	-0.005		
RY-1	STORAGE	0.534	0.534	0	01:10	0.784	0.784	0.022		
RY-2	STORAGE	0.393	0.393	0	01:10	0.578	0.578	0.022		
RY-3	STORAGE	0.269	0.269	0	01:10	0.395	0.395	0.022		
RY-4	STORAGE	0.285	0.285	0	01:10	0.418	0.418	0.022		
RY-5	STORAGE	0.803	0.803	0	01:10	1.15	1.15	0.021		
RY-6	STORAGE	0.369	1.733	0	01:12	0.542	1.98	-0.015		
RY-7	STORAGE	0.515	0.515	0	01:12	1.22	1.22	0.017		

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J10	JUNCTION	1.14	1.323	0.877
J11	JUNCTION	1.14	2.515	0.000
J12	JUNCTION	1.37	2.177	0.000
J14	JUNCTION	1.00	1.842	0.956
J16	JUNCTION	1.38	1.556	0.000
J17	JUNCTION	1.25	1.438	0.264
J20	JUNCTION	1.05	2.882	0.000
J21	JUNCTION	0.90	1.705	1.345
J22	JUNCTION	0.79	1.472	1.282
J3	JUNCTION	1.14	2.560	0.000
J5	JUNCTION	0.88	2.067	0.496
J7	JUNCTION	0.91	2.024	0.711
J8	JUNCTION	1.35	3.335	0.000
J9	JUNCTION	1.16	1.875	0.370

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
J11	0.01	0.504	0 01:07	0.001	0.000
J12	0.01	0.588	0 01:05	0.001	0.000
J16	0.01	0.448	0 01:05	0.000	0.000
J20	0.01	0.230	0 01:06	0.000	0.000
J3	0.01	0.517	0 01:07	0.001	0.000
J8	0.01	1.234	0 01:06	0.002	0.000

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Comm.Storage	0.187	22	0	0	0.851	100	0 02:26	0.027
Ex.Storage	0.021	4	0	25	0.418	87	0 01:20	0.325
Ex.SWMF	0.409	5	0	0	7.006	94	0 01:31	2.136
MedDensStorage	0.169	21	0	0	0.801	100	0 01:39	0.119
ROW1	0.021	2	0	0	0.743	81	0 01:26	1.188
ROW2	0.012	3	0	0	0.373	78	0 01:21	0.360
RY-1	0.024	2	0	95	0.468	37	0 01:43	0.077
RY-2	0.018	2	0	97	0.347	36	0 01:45	0.053
RY-3	0.011	4	0	100	0.233	78	0 01:47	0.036
RY-4	0.012	1	0	100	0.249	21	0 01:48	0.037
RY-5	0.021	2	0	52	0.476	40	0 01:21	0.325
RY-6	0.016	2	0	22	0.438	49	0 01:22	1.003
RY-7	0.062	4	0	100	0.799	49	0 02:31	0.069

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	5.04	0.158	1.476	2.023
Ex.Ditch	8.50	0.125	1.430	2.558
Ex.Major	1.35	0.941	1.898	3.321
Ex.Sewer	99.95	0.164	4.831	38.174
System	28.71	1.388	4.831	46.076

****

Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.598	0	01:06	4.08	1.88	1.00
C10	CONDUIT	2.502	0	01:24	1.94	1.56	1.00
C11	CONDUIT	2.814	0	01:24	2.26	1.19	1.00
C12	CONDUIT	2.814	0	01:25	2.38	1.25	1.00
C14	CONDUIT	4.831	0	01:23	3.37	3.11	1.00
C16	CONDUIT	1.750	0	01:02	1.88	0.70	1.00
C17	CONDUIT	4.831	0	01:23	3.37	2.58	1.00
C18	CONDUIT	4.831	0	01:23	3.49	5.07	0.93
C19	CONDUIT	2.194	0	01:07	2.94	0.82	1.00
C2	CONDUIT	2.277	0	02:09	1.69	0.90	1.00
C20	CONDUIT	2.173	0	01:06	2.96	1.66	1.00
C21	CONDUIT	2.160	0	01:06	3.86	0.96	1.00
C22	CONDUIT	2.161	0	01:06	2.94	1.48	1.00
C23	CONDUIT	0.050	0	00:00	0.45	0.12	1.00
C24	CONDUIT	0.049	0	01:20	0.34	0.01	0.05
C3	CONDUIT	2.814	0	01:25	2.42	0.69	1.00
C4	CONDUIT	2.122	0	01:06	2.84	2.80	1.00
C5	CONDUIT	2.126	0	01:06	3.34	1.52	1.00
C6	CONDUIT	2.124	0	01:06	3.34	1.03	1.00
C9	CONDUIT	2.814	0	01:25	1.97	1.24	1.00
W1	CONDUIT	0.778	0	01:11	1.21	0.69	0.85
W9	CONDUIT	0.959	0	01:23	0.89	0.20	0.36
OL1	ORIFICE	0.023	0	02:26			1.00
OL2	ORIFICE	0.020	0	01:53			1.00
OR1	ORIFICE	0.051	0	02:12			1.00
OR2	ORIFICE	0.141	0	01:26			1.00
OR3	ORIFICE	0.039	0	01:21			1.00
C15	WEIR	0.299	0	01:13			0.39
C7	WEIR	0.426	0	01:12			0.29
W10	WEIR	0.000	0	00:00			0.00
W11	WEIR	2.920	0	01:10			0.76
W12	WEIR	0.000	0	00:00			0.00
W13	WEIR	0.738	0	01:10			0.40
W14	WEIR	0.003	0	02:26			0.02
W15	WEIR	0.102	0	01:39			0.17
W16	WEIR	0.098	0	01:39			0.10
W17	WEIR	0.020	0	01:43			0.06
W18	WEIR	0.010	0	01:45			0.04
W2	WEIR	1.898	0	01:31			0.75
W3	WEIR	0.270	0	01:22			0.26
W4	WEIR	1.336	0	01:25			0.18
W5	WEIR	0.475	0	01:09			0.29
W6	WEIR	0.000	0	00:00			0.00
W7	WEIR	0.322	0	01:21			0.51
W8	WEIR	1.047	0	01:26			0.38
C13	DUMMY	0.424	0	01:02			
C8	DUMMY	0.242	0	01:01			
Ex.SWMOutlet	DUMMY	1.005	0	02:08			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.89	0.00	0.00	0.01	0.02	0.00	0.08	0.02	0.00
C10	1.00	0.00	0.00	0.00	0.31	0.00	0.00	0.69	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.25	0.00	0.00	0.75	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.12	0.00	0.00	0.88	0.00	0.00
C16	1.00	0.69	0.18	0.00	0.13	0.00	0.00	0.00	0.90	0.00
C17	1.00	0.00	0.00	0.00	0.56	0.00	0.00	0.44	0.00	0.00
C18	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	0.87	0.09	0.00	0.05	0.84	0.00
C2	1.00	0.00	0.00	0.00	0.31	0.00	0.00	0.69	0.26	0.00
C20	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
C21	1.00	0.43	0.43	0.00	0.08	0.06	0.00	0.01	0.96	0.00
C22	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C23	1.00	0.00	0.90	0.00	0.10	0.00	0.00	0.00	0.91	0.00
C24	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.07	0.18	0.00	0.74	0.12	0.00
C4	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C6	1.00	0.00	0.89	0.00	0.11	0.00	0.00	0.00	0.96	0.00
C9	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
W1	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
W9	1.00	0.97	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.84	0.85	0.86	0.80	0.78
C10	1.14	1.17	1.14	1.56	1.14
C11	1.14	1.15	1.14	1.27	1.13
C12	1.14	1.16	1.14	1.31	1.12

C14	1.38	1.51	1.38	2.15	1.38
C16	1.09	1.17	1.12	0.01	0.77
C17	1.25	1.42	1.25	1.99	1.25
C18	0.01	1.32	0.01	2.70	0.01
C19	1.08	1.08	2.04	0.01	0.01
C2	1.13	1.13	1.16	0.01	0.01
C20	0.99	1.01	1.05	0.94	0.90
C21	0.91	0.91	1.00	0.01	0.01
C22	0.90	0.90	0.90	0.83	0.79
C23	1.25	1.27	1.33	0.01	0.84
C3	1.15	1.15	1.35	0.01	0.01
C4	0.79	0.91	0.79	1.40	0.79
C5	0.86	0.87	0.88	0.85	0.83
C6	0.89	0.89	0.95	0.01	0.03
C9	1.36	1.36	1.37	1.33	1.32

Analysis begun on: Wed Jul 17 12:01:27 2019
Analysis ended on: Wed Jul 17 12:01:37 2019
Total elapsed time: 00:00:10

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 04/01/2005 00:00:00
Ending Date .............. 04/04/2005 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m

**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......        10.210       114.013
Evaporation Loss .........         0.271         3.029
Infiltration Loss ........         2.696        30.105
Surface Runoff ...........         7.240        80.848
Final Storage ............         0.006         0.063
Continuity Error (%) .....        -0.029

**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         7.240        72.403
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         6.620        66.204
Flooding Loss ............         0.001         0.006
Evaporation Loss .........         0.000         0.001
Exfiltration Loss ........         0.622         6.223
Initial Stored Volume ....         0.007         0.070
Final Stored Volume ......         0.002         0.016
Continuity Error (%) .....         0.034

***************************
Time-Step Critical Elements
***************************
Link C23 (3.51%)

********************************
Highest Flow Instability Indexes
********************************
Link W5 (2)
Link W13 (1)
Link C8 (1)
Link C13 (1)

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     0.99 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.03
Percent Not Converging      :     0.12

***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A10	114.01	0.00	2.84	16.35	94.88	11.36	94.88	1.25	0.61	0.832
A20	114.01	0.00	2.90	22.92	88.24	15.87	88.24	1.41	0.65	0.774
A30	114.01	0.00	2.95	29.43	61.31	81.73	81.73	0.75	0.39	0.717
A40	114.01	0.00	2.95	29.43	61.31	81.73	81.73	1.09	0.57	0.717

Project #: 60568894
Project: Name: 187 Dorchester Road
Proposed Conditions PCSWMM Output
250 Year – 24hr Chicago

A50	114.01	0.00	2.95	29.43	61.31	81.73	81.73	0.80	0.42	0.717
A60	114.01	0.00	3.05	33.03	55.67	50.08	77.92	2.50	0.73	0.683
A70	114.01	0.00	3.01	29.62	61.26	81.42	81.42	1.72	0.59	0.714
A80	114.01	0.00	3.22	65.56	0.00	45.24	45.24	0.91	0.21	0.397
A90.1	114.01	0.00	3.02	32.82	55.71	50.37	78.22	0.43	0.17	0.686
A90.2	114.01	0.00	3.01	32.79	55.71	50.41	78.27	0.25	0.10	0.686
B10	114.01	0.00	2.95	29.43	61.31	81.73	81.73	0.55	0.28	0.717
B20	114.01	0.00	2.95	29.43	61.31	81.73	81.73	0.58	0.30	0.717
B30	114.01	0.00	2.95	29.43	61.31	81.73	81.73	0.86	0.45	0.717
B40	114.01	0.00	3.05	33.05	55.66	50.06	77.89	3.16	0.90	0.683
EXT10	114.01	0.00	3.05	29.88	61.20	50.42	81.02	16.22	4.21	0.711
EXT20	114.01	0.00	3.05	29.92	61.19	50.37	80.97	20.89	5.23	0.710
EXT30	114.01	0.00	2.94	19.63	78.26	19.05	91.41	2.96	1.34	0.802
EXT40	114.01	0.00	2.86	13.97	87.22	13.68	97.20	1.25	0.63	0.853
EXT50	114.01	0.00	2.94	29.40	61.32	81.78	81.78	0.59	0.32	0.717
EXT60	114.01	0.00	3.01	32.79	55.72	78.28	78.28	0.38	0.16	0.687
EXT70	114.01	0.00	2.93	29.39	61.33	81.80	81.80	0.73	0.40	0.718
EXT80	114.01	0.00	3.04	30.31	80.64	19.49	80.64	13.11	5.20	0.707

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******************
Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Meters
J1	JUNCTION	0.13	2.86	255.92	0	09:21	2.86
J10	JUNCTION	0.14	2.81	255.51	0	09:20	2.80
J11	JUNCTION	0.14	3.89	256.37	0	09:06	2.73
J12	JUNCTION	0.23	3.82	255.00	0	09:05	3.13
J13	JUNCTION	0.12	3.65	256.90	0	09:10	3.65
J14	JUNCTION	0.12	3.00	256.00	0	09:05	2.91
J15	JUNCTION	0.00	0.25	254.25	0	09:23	0.25
J16	JUNCTION	0.20	2.96	254.00	0	09:05	2.38
J17	JUNCTION	0.21	2.71	253.61	0	09:05	1.86
J18	JUNCTION	0.11	3.55	256.80	0	09:09	3.54
J19	JUNCTION	0.00	0.05	256.55	0	09:26	0.04
J2	JUNCTION	0.09	3.51	258.33	0	09:12	3.50
J20	JUNCTION	0.09	3.91	256.51	0	09:05	2.52
J21	JUNCTION	0.07	2.84	256.30	0	09:26	2.80
J22	JUNCTION	0.08	2.90	256.53	0	09:26	2.86
J23	JUNCTION	0.09	4.07	257.72	0	09:13	4.07
J3	JUNCTION	0.12	3.93	256.21	0	09:06	2.64
J4	JUNCTION	0.10	4.85	260.31	0	09:11	4.85
J5	JUNCTION	0.08	3.07	257.38	0	09:13	3.07
J6	JUNCTION	0.16	4.64	257.65	0	09:10	4.64
J7	JUNCTION	0.21	3.18	257.15	0	09:18	3.17
J8	JUNCTION	0.15	4.71	256.39	0	09:05	2.95
J9	JUNCTION	0.16	3.62	256.43	0	09:07	2.92
DorchesterCreek	OUTFALL	0.00	0.00	253.90	0	00:00	0.00
Ex.Ditch	OUTFALL	0.00	0.00	255.30	0	00:00	0.00
Ex.Major	OUTFALL	0.00	0.00	255.50	0	00:00	0.00
Ex.Sewer	OUTFALL	0.13	1.16	252.04	0	09:20	1.16
Comm.Storage	STORAGE	0.34	3.44	258.05	0	09:39	3.44
Ex.Storage	STORAGE	0.19	2.78	257.60	0	09:11	2.78
Ex.SWMF	STORAGE	0.12	1.39	256.29	0	09:26	1.39
MedDensStorage	STORAGE	0.34	2.58	257.19	0	09:26	2.57
ROW1	STORAGE	0.04	1.16	256.76	0	09:24	1.16
ROW2	STORAGE	0.02	0.70	257.30	0	09:20	0.70
RY-1	STORAGE	0.03	0.34	257.34	0	09:34	0.34
RY-2	STORAGE	0.03	0.33	257.33	0	09:34	0.33
RY-3	STORAGE	0.03	0.29	0.29	0	09:51	0.29
RY-4	STORAGE	0.03	0.30	258.18	0	09:50	0.30
RY-5	STORAGE	0.04	0.39	256.39	0	09:18	0.39
RY-6	STORAGE	0.04	0.46	257.57	0	09:21	0.46
RY-7	STORAGE	0.07	0.46	257.46	0	10:07	0.46

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	2.297	0	09:21	0	29.5	-0.046
J10	JUNCTION	0.000	2.870	0	09:23	0	35.5	0.007
J11	JUNCTION	0.000	2.870	0	09:23	0	35.5	0.058
J12	JUNCTION	0.000	4.898	0	09:20	0	53.4	0.013
J13	JUNCTION	5.234	5.234	0	09:10	20.9	20.9	0.104
J14	JUNCTION	0.000	2.190	0	09:05	0	17.7	-0.005
J15	JUNCTION	0.000	2.201	0	09:23	0	3.03	-0.001
J16	JUNCTION	0.000	4.898	0	09:20	0	53.4	0.008
J17	JUNCTION	0.000	4.898	0	09:20	0	53.4	-0.011
J18	JUNCTION	0.730	0.730	0	09:10	2.5	2.5	0.001
J19	JUNCTION	0.000	0.189	0	09:26	0	0.296	0.012
J2	JUNCTION	0.000	2.645	0	09:05	0	15.7	-0.027
J20	JUNCTION	0.104	2.267	0	09:05	0.25	17.9	-0.038
J21	JUNCTION	0.000	2.173	0	09:05	0	15.3	-0.038
J22	JUNCTION	0.000	2.179	0	09:05	0	15.3	0.054
J23	JUNCTION	0.170	0.170	0	09:10	0.43	0.433	-0.079
J3	JUNCTION	0.000	2.870	0	09:23	0	35.5	-0.002
J4	JUNCTION	4.207	4.207	0	09:10	16.2	16.2	0.163
J5	JUNCTION	0.000	2.137	0	09:05	0	14.9	-0.035
J6	JUNCTION	1.222	1.222	0	09:10	3.75	3.75	0.000
J7	JUNCTION	0.000	2.130	0	09:05	0	14.9	-0.477
J8	JUNCTION	0.000	2.870	0	09:23	0	35.5	-0.023
J9	JUNCTION	0.000	2.561	0	09:22	0	32.2	-0.006

DorchesterCreek	OUTFALL	0.207	2.396	0	09:23	0.909	3.94	0.000
Ex.Ditch	OUTFALL	1.503	1.503	0	09:10	3.35	3.64	0.000
Ex.Major	OUTFALL	0.000	2.803	0	09:26	0	5.25	0.000
Ex.Sewer	OUTFALL	0.000	4.898	0	09:20	0	53.4	0.000
Comm.Storage	STORAGE	0.614	0.624	0	09:10	1.25	1.27	0.001
Ex.Storage	STORAGE	0.627	0.681	0	09:09	1.25	1.38	-0.000
Ex.SWMF	STORAGE	5.201	8.679	0	09:10	13.1	17.2	0.008
MedDensStorage	STORAGE	0.649	0.659	0	09:10	1.41	1.42	-0.009
ROW1	STORAGE	0.000	2.058	0	09:20	0	3.5	-0.402
ROW2	STORAGE	0.000	0.894	0	09:10	0	1	0.018
RY-1	STORAGE	0.565	0.565	0	09:10	1.09	1.09	0.014
RY-2	STORAGE	0.416	0.416	0	09:10	0.801	0.801	0.014
RY-3	STORAGE	0.285	0.285	0	09:10	0.548	0.548	0.015
RY-4	STORAGE	0.302	0.302	0	09:10	0.58	0.58	0.015
RY-5	STORAGE	0.845	0.845	0	09:10	1.59	1.59	0.012
RY-6	STORAGE	0.391	2.386	0	09:11	0.752	2.99	0.048
RY-7	STORAGE	0.593	0.593	0	09:12	1.72	1.72	0.012

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J10	JUNCTION	1.20	1.438	0.762
J11	JUNCTION	1.21	2.515	0.000
J12	JUNCTION	1.42	2.177	0.000
J14	JUNCTION	1.06	2.002	0.796
J16	JUNCTION	1.44	1.556	0.000
J17	JUNCTION	1.31	1.315	0.387
J20	JUNCTION	1.11	2.882	0.000
J21	JUNCTION	0.96	1.816	1.234
J22	JUNCTION	0.85	1.580	1.174
J3	JUNCTION	1.21	2.560	0.000
J4	JUNCTION	0.06	0.084	0.286
J5	JUNCTION	0.93	2.148	0.415
J7	JUNCTION	0.97	2.103	0.632
J8	JUNCTION	1.41	3.335	0.000
J9	JUNCTION	1.22	2.245	0.000

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Node Flooding Summary
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Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
J11	0.01	0.503	0 09:06	0.001	0.000
J12	0.01	0.706	0 09:05	0.001	0.000
J16	0.01	0.440	0 09:05	0.000	0.000
J20	0.01	0.339	0 09:05	0.000	0.000
J3	0.01	0.531	0 09:06	0.001	0.000
J8	0.01	1.231	0 09:05	0.002	0.000
J9	0.01	0.310	0 09:07	0.000	0.000

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
Comm.Storage	0.239	28	0	0	0.851	100	0 09:39	0.092
Ex.Storage	0.029	6	0	31	0.422	88	0 09:11	0.462
Ex.SWMF	0.552	7	0	0	7.426	99	0 09:26	3.019
MedDensStorage	0.226	28	0	0	0.801	100	0 09:26	0.203
ROW1	0.023	2	0	0	0.787	86	0 09:24	1.912
ROW2	0.013	3	0	0	0.406	85	0 09:20	0.518
RY-1	0.034	3	0	86	0.526	42	0 09:34	0.109
RY-2	0.025	3	0	87	0.389	40	0 09:34	0.080
RY-3	0.018	6	0	100	0.288	96	0 09:51	0.029
RY-4	0.020	2	0	100	0.307	26	0 09:50	0.031
RY-5	0.033	3	0	54	0.519	43	0 09:18	0.398
RY-6	0.022	2	0	18	0.518	58	0 09:21	1.553
RY-7	0.103	6	0	95	0.953	59	0 10:07	0.083

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
DorchesterCreek	24.80	0.062	2.396	3.936
Ex.Ditch	37.94	0.039	1.503	3.641
Ex.Major	1.52	1.325	2.803	5.253
Ex.Sewer	99.95	0.224	4.898	53.373

System	41.05	1.650	4.898	66.203

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Link Flow Summary
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Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	2.645	0 09:05	4.16	1.91	1.00
C10	CONDUIT	2.561	0 09:22	1.85	1.60	1.00
C11	CONDUIT	2.870	0 09:23	2.24	1.22	1.00
C12	CONDUIT	2.870	0 09:23	2.39	1.27	1.00
C14	CONDUIT	4.898	0 09:20	3.42	3.15	1.00
C16	CONDUIT	1.750	0 09:01	1.83	0.70	1.00
C17	CONDUIT	4.898	0 09:20	3.42	2.62	1.00
C18	CONDUIT	4.898	0 09:20	3.53	5.14	0.93
C19	CONDUIT	2.205	0 09:06	2.95	0.83	1.00
C2	CONDUIT	2.298	0 09:22	1.66	0.91	1.00
C20	CONDUIT	2.191	0 09:05	2.97	1.68	1.00
C21	CONDUIT	2.175	0 09:05	3.86	0.97	1.00
C22	CONDUIT	2.173	0 09:05	2.94	1.49	1.00
C23	CONDUIT	0.050	0 00:00	0.45	0.12	1.00
C24	CONDUIT	0.076	0 09:13	0.40	0.01	0.13
C3	CONDUIT	2.870	0 09:23	2.39	0.71	1.00
C4	CONDUIT	2.129	0 09:05	2.85	2.81	1.00
C5	CONDUIT	2.137	0 09:05	3.36	1.53	1.00
C6	CONDUIT	2.130	0 09:05	3.35	1.03	1.00
C9	CONDUIT	2.870	0 09:23	2.01	1.26	1.00
W1	CONDUIT	1.111	0 09:11	1.33	0.98	0.96
W9	CONDUIT	1.525	0 09:22	1.06	0.33	0.48
OL1	ORIFICE	0.023	0 09:56			1.00
OL2	ORIFICE	0.020	0 09:56			1.00
OR1	ORIFICE	0.051	0 10:14			1.00
OR2	ORIFICE	0.144	0 09:24			1.00
OR3	ORIFICE	0.040	0 09:20			1.00
C15	WEIR	0.449	0 09:11			0.45
C7	WEIR	0.476	0 09:12			0.31
W10	WEIR	0.037	0 10:07			0.03
W11	WEIR	3.481	0 09:10			0.86
W12	WEIR	0.002	0 09:50			0.01
W13	WEIR	0.894	0 09:10			0.46
W14	WEIR	0.072	0 09:39			0.13
W15	WEIR	0.189	0 09:26			0.26
W16	WEIR	0.195	0 09:26			0.16
W17	WEIR	0.065	0 09:34			0.13
W18	WEIR	0.047	0 09:34			0.10
W2	WEIR	2.803	0 09:26			0.97
W3	WEIR	0.363	0 09:18			0.32
W4	WEIR	2.204	0 09:23			0.25
W5	WEIR	0.616	0 09:09			0.32
W6	WEIR	0.000	0 00:00			0.00
W7	WEIR	0.478	0 09:20			0.67
W8	WEIR	1.768	0 09:24			0.55
C13	DUMMY	0.424	0 09:01			
C8	DUMMY	0.242	0 09:01			
Ex.SWMOutlet	DUMMY	1.015	0 10:11			

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.55	0.00	0.00	0.01	0.00	0.00	0.43	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.52	0.00	0.00	0.48	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.49	0.00	0.00	0.51	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
C14	1.00	0.00	0.00	0.00	0.26	0.00	0.00	0.74	0.00	0.00
C16	1.00	0.47	0.07	0.00	0.45	0.00	0.00	0.00	0.83	0.00
C17	1.00	0.00	0.00	0.00	0.74	0.00	0.00	0.26	0.00	0.00
C18	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
C2	1.00	0.00	0.00	0.00	0.52	0.00	0.00	0.48	0.46	0.00
C20	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
C21	1.00	0.25	0.27	0.00	0.15	0.24	0.00	0.08	0.88	0.00
C22	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C23	1.00	0.00	0.58	0.00	0.42	0.00	0.00	0.00	0.59	0.00
C24	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.07	0.42	0.00	0.51	0.31	0.00
C4	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C6	1.00	0.00	0.55	0.00	0.45	0.00	0.00	0.00	0.95	0.00
C9	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.00	0.00
W1	1.00	0.99	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
W9	1.00	0.97	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited

C1	0.90	0.91	0.92	0.86	0.84
C10	1.20	1.23	1.20	1.62	1.20
C11	1.20	1.21	1.21	1.33	1.19
C12	1.20	1.22	1.21	1.37	1.19
C14	1.44	1.57	1.44	2.40	1.44
C16	1.15	1.23	1.18	0.01	0.84
C17	1.31	1.48	1.31	2.06	1.31
C18	0.01	1.38	0.01	3.46	0.01
C19	1.15	1.15	2.16	0.01	0.01
C2	1.19	1.19	1.22	0.01	0.01
C20	1.05	1.07	1.11	1.00	0.97
C21	0.97	0.97	1.06	0.01	0.01
C22	0.96	0.96	0.96	0.88	0.85
C23	1.30	1.32	1.37	0.01	0.80
C3	1.22	1.22	1.41	0.01	0.01
C4	0.85	0.97	0.85	1.45	0.85
C5	0.92	0.92	0.93	0.91	0.89
C6	0.95	0.95	1.01	0.01	0.03
C9	1.42	1.42	1.42	1.39	1.38
W1	0.01	0.06	0.01	0.01	0.01

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Analysis begun on:  Wed Jul 17 12:02:06 2019
Analysis ended on:  Wed Jul 17 12:02:15 2019
Total elapsed time: 00:00:09
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Appendix F

Water Balance

Month (-)	Average Monthy Temp (°C)	Heat Index (-)	Potential ET (mm)	Daylight Correction Value (-)	Adjusted ET (mm)	Total Precipitation (mm)	Surplus (mm)	Deficit (mm)
Jan	-5.6	0	0	0.78	0	74.2	74.2	
Feb	-4.5	0	0	0.88	0	65.5	65.5	
Mar	-0.1	0	0	0.99	0.0	71.5	71.5	
Apr	6.8	1.6	30.2	1.12	33.7	83.4	49.7	
May	13.1	4.3	62.2	1.22	75.9	89.8	0.0	-13.9
Jun	18.3	7.1	89.9	1.28	114.6	91.7	0.0	22.9
Jul	20.8	8.7	103.6	1.25	129.9	82.7	0.0	47.2
Aug	19.7	8.0	97.5	1.16	113.4	82.9	0.0	30.5
Sep	15.5	5.5	74.9	1.05	78.6	103.0	24.4	-24.4
Oct	9.2	2.5	42.1	0.92	38.8	81.3	42.5	-42.5
Nov	3.4	0.6	14.0	0.81	11.4	98.0	86.6	-86.6
Dec	-2.6	0.0	-	0.75	0	87.5	87.5	
Totals	a	38.3 1.10			596.3	1,012	501.9	-66.8
					Total Water Surplus	415.2		

1. Average London, ON monthly temperature and precipitation from Canadian Climate Normals (Government of Canada) from 1981-2010.

2. Daylight correction values from Thornthwaite's Equation for estimating potential evaportranspiration (Hydrology: An Environmental Approach, I. Watson & A.D. Burnett)

$PET\ (in) = 0.63(10T/I)^a$
Where $a = 6.751x10^{-7}(I^3) - 7.71x10^{-5}(I^2) + 1.792x10^{-2}(I) + 0.49239$
And I is the sum of the i values for the year,
Where $i = (T/5)^{1.514}$

Latitude correction for daylight hours

$(24\cos^{-1}(-\tan(L\Pi/180)\tan(0.4093\sin(2\Pi(jnt(30.4m-15))/(365-1.39)))/12\Pi$
Where L is latitude, and m is month number (1 to 12).

Infiltration Factors	Pervious	Impervious
Topography Infiltration Factor	0.15	0.15
Soil Infiltration Factor	0.40	0.40
Land Cover Infiltration Factor	0.10	0.10
MOE Infiltration Factor	0.65	0.00
Runoff Coefficient	0.35	1.00
Runoff from Impervious Surfaces	0.00	0.80

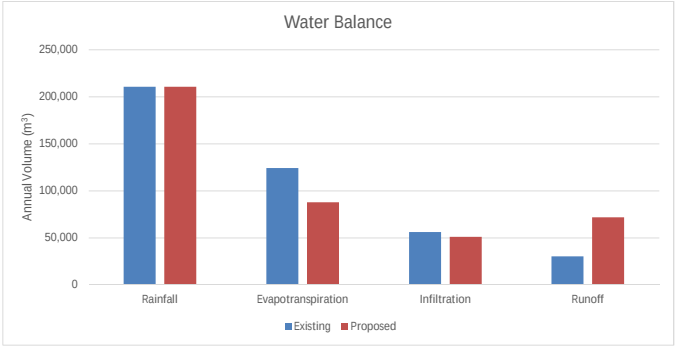
Topography	Flat Land, average slope < 0.6 m/km	0.3
	Rolling Land, average slope 2.8 m to 3.8 m/km	0.2
	Hilly Land, average slope 28 m to 47 m/km	0.1
Soils	Tight impervious clay	0.1
	Medium combinations of clay and loam	0.2
	Open Sandy loam	0.4
Cover	Cultivated Land	0.1
	Woodland	0.2

Existing Conditions

	Catchments (ID)	Area (ha)		Land Use	Area (ha)	Annual Water Balance Rainfall (mm)	Evapotranspiration (mm)	Infiltration (mm)	Runoff (mm)
Subject Property	A1	15.55	Impervious	Existing Field	0	1,012	0	0	1,012
			Pervious		15.55	1,012	596	270	145
	A2	5.29	Impervious	Existing Field	0	1,012	0	0	1,012
			Pervious		5.29	1,012	596	270	145
Total Subject Property		20.84			20.84	1,012	596	270	145
Total (m^3)						210,800	124,300	56,200	30,300

Proposed Future Conditions

		Area (ha)			Area (ha)	Annual Water Balance Rainfall (mm)	Evapotranspiration (mm)	Infiltration (mm)	Runoff (mm)
Subject Property	A10	1.32	Impervious	Commercial (75%	0.99	1,012	0	0	1,012
			Pervious	Imperviousness)	0.33	1,012	596	270	145
	A20	1.60	Impervious	Medium-Density (65%	1.04	1,012	0	0	1,012
			Pervious	Imperviousness)	0.56	1,012	596	270	145
	A60, A90.1, A90.2, B40	8.14	Impervious	ROW Single-Family (50%	4.07	1,012	0	0	1,012
			Pervious	Imperviousness)	4.07	1,012	596	270	145
	A30, A40, A50, A60, A70, B10, B20, B30	7.77	Impervious	Infiltrated Single-Family	4.27	1,012	596	415	0
			Pervious	(50% Imperviousness)	3.50	1,012	596	415	0
	A80	2.01	Impervious	Infiltrated Single-Family	0.00	1,012	0	0	1,012
			Pervious	(50% Imperviousness)	2.01	1,012	596	270	145
Total Subject Property		20.84			20.84	1,012	422	245	345
Total (m^3)						210,800	87,900	51,100	71,900



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