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September 20, 2019
Revised June 11, 2021

SBM-17-2126

Corporation of the Municipality of Central Elgin
450 Sunset Drive
St. Thomas, ON N5R 5V1

Attention: Mr. Lloyd Perrin, Director of Physical Services

Re: Servicing and Stormwater Management Feasibility Study
Proposed Subdivision Development – Craigholme Phase 6
Belmont, Ontario

1. INTRODUCTION

This Servicing and Preliminary Stormwater Management (SWM) Feasibility Study (Study) has been prepared by Strik, Baldinelli, Moniz Ltd. (SBM) to provide preliminary servicing and stormwater management design flows and storage requirements for the Craigholme subdivision, Phase 6 in Belmont, Ontario.

The site is bordered by the Seventh Ave Right-of-way (R.O.W.) to the north, existing single-family residential lands to the east, and agricultural/open space to the south and west. It is our understanding that the proposed development is to include 158 single family residential units, 17 semi-detached lots (34 units), 4 street townhouse blocks (4 units each and 16 units total), 2.71 ha block (Block 183) for future residential/school use, and a 1.92 ha block (Block 184) for storm water management (SWM) and wetland located south of the subject site, for a total site area of 19.66 ha.

2. SANITARY SERVICING

As per the Craigholme Estates Ltd. - Phase 5 Sanitary Key Plan by Parsons, dated December 19, 2016, provided in Appendix A, there is a 250 mm diameter sanitary service stub, capped at the southeast of the development limit within a servicing easement. As per this Sanitary Design Sheet, the existing stub capped at property line has been designed for a population of 800 people with a total area of 16.456 ha. The design sheet shows a peak flow for the Phase 6 lands of 17.59 L/s. The Phase 6 residential subdivision sanitary sewers are to be connected to the existing sanitary manhole SA-2 within the Kettle Creek Drive Right-of-Way (R.O.W) via the existing 250 mm stub.

The proposed development is to include a total of 209 residential units and a 2.709 ha block (Block 183) for future residential/school use designed to have a population of 375 people. The population for the entire development was calculated using the population density of 3.5 people per unit, as per the Municipality of Central Elgin Design Guidelines and Construction Standards (DG&CS). This results in a total population of 1103 people. The sanitary peak flow was calculated by multiplying population for the entire site by the average usage of 400 litres per day per capita, and the Harmon peaking factor “M”. The sanitary design flow peak for the entire site area was calculated by adding residential and the infiltration allowance of 0.20 litres per second per hectare. These calculations are provided in the sanitary sewer design sheet provided in Appendix B. The sanitary sewer design sheet shows that the proposed 250 mm diameter sanitary sewers at the existing and proposed minimum slope of 0.28% have sufficient capacity to convey the peak design flow of 18.60 L/s to existing sanitary manhole SA-2.

As per the Craigholme Estates Ltd. - Phase 5 Storm and Sanitary Design Sheet by Parsons, the existing sanitary stub capped at the property limit within the municipal easement was designed for a catchment area of 16.456 ha and a population of 800 people, which produces a peak design flow of 17.59 L/s, which is 1.01 L/s less than the calculated flows per SBM's sanitary design sheet provided in Appendix B. Design sheets provided by Parsons show that the minimum additional capacity downstream prior to the ultimate outlet is 11.76 L/s and therefore it is determined there is available capacity within the downstream sanitary sewers for the increase in flows of 1.01 L/s. The Municipality to review and advise if downstream sewers, lift station, treatment plant etc. have capacity for the slight increase in original design flows.

3. STORM WATER MANAGEMENT AND STORM SERVICING

3.1 Design Criteria

The following SWM management criteria were established for this site:

- Quantity Controls
  - The post-development flows generated from the site during the 2-year to 100-year design storms are to be attenuated to the pre-development levels.

- *Grading and Drainage Controls*
  - Grading will direct overland flows to the proposed on-site dry pond to be released to the existing creek/wetland via outlets within the SWM Block matching pre-development levels or less for each storm event.

- Quality Controls
  - A normal level of stormwater quality control (70% total suspended solids [TSS] removal) is proposed on site and will be accomplished through a treatment train approach using lot-level controls, snouts in road catch basins, and Oil/Grit Separator (OGS) units.

3.2 Hydrologic Model

Hydrologic modelling was performed using EPA SWMM 5.1, a widely accepted model for urban developments, to generate runoff hydrographs and route flows through the storage structures.

3.2.1 Rainfall Data

The Chicago storm distribution in Table 1 was derived from the Intensity-Duration-Frequency (IDF) Parameters obtained from Environment and Climate Change Canada Rain Gauge Information dated 27th of February 2019 for The St Thomas WPCP ID ON_6137362 (Table 2b) from 1926 - 2007 provided in Appendix C.

The Intensity from Table 2b of the above rain gauge information was inputted in Miduss IDF Curve Fit tools (as shown in Miduss IDF to Chicago Conversion provided in Appendix C) to produce the Chicago Distribution parameters. The St Thomas WPCP Chicago Rainfall Distribution Parameters are shown in Table 2 below:

Return Period (Years)	Parameters			Duration (Hours)
	a	b	c	
2	737.970	7.382	0.8035	3
5	1009.820	7.472	0.8055	3
10	1178.220	7.382	0.8049	3
25	1398.350	7.382	0.8048	3
50	1497.170	6.876	0.7978	3
100	1634.380	6.798	0.7954	3

Table 1: St. Thomas WPCP Chicago Distribution

Hyetographs for the 2 to 100-year rainfall events were created using the Ministry of Transportation Ontario Drainage Management Manual (MTO DMM) and provided in Appendix C. The time and intensity values obtained from the hyetographs were inputted into the stormwater management model.

3.2.2 Pre-Development Conditions

Under pre-development conditions, the site is an open field with a wetland feature at the south west of the property. As per the topographic survey completed by MTE Consultants Inc. dated March 9, 2018, shows the entire site drains to the south west corner of the property. Refer to the Pre-development Modelling Diagram provided in Appendix D.

The Soil Conservation Service (SCS) curve number of 91 was used for the pervious areas, based on Hydrologic Soil Group D and cultivated land without conservation treatment according to Table A.4 of the SWMM5.1 user manual.

The pre-development catchment parameters are as follows:

Catchment	Area (ha)	% Impervious	Overland Flow Width (m)	Overland Slope (%)	N-Pervious	Dstore-Pervious (mm)	SCS Curve Number
A101	19.656	0	278	1.5	0.17	5	91

Table 2: Pre-Development Catchment Parameters

Under pre-development conditions, the runoff coefficient 'C' of the subject site is 0.2, which is equivalent to 0% imperviousness. The overland slope of 1.5% was conservatively used based on the existing topography. The N-pervious value of 0.17 (for cultivated soils) was obtained from Table A.6 of the SWMM5.1 manual provided in Appendix C. The depression storage (Dstore) for the pervious surface of 5 mm (for Pasture) was obtained from Table A.5 of the SWMM5.1 manual provided in Appendix C.

3.2.3 Post-Development Conditions

Under post-development conditions, the subject site is to include 158 single family residential units, 17 semi-detached lots (34 units), 4 street townhouse blocks (4 units each and 16 units total), 2.709 ha block (Block 183) for future residential/school use, 1.93 ha block (Block 184) for storm water management (SWM) and wetland located south of the subject site. Refer to the Draft Plan of Subdivision by MTE provided in Appendix A.

The post-development conditions and catchment areas are shown on the Post-development Modelling Diagram provided in Appendix E.

The post-development catchment parameters are as follows:

Catchment	Area (ha)	% Impervious	Overland Flow Width (m)	Overland Slope (%)	SCS Curve Number
A201	12.862	50.00	701	2	92
A202	1.454	61.43	404	2	92
A203	0.708	71.43	182	2	92
A204	2.708	71.43	114	2	92
A205	0.848	0.00	113	2	78
A206	1.076	0.00	83	2	78

Table 3: Post-Development Catchment Parameters

SCS curve numbers of 92 were determined for the residential catchments and 78 for the SWM and Wetland block, based on a conservatively assumed Hydrologic Soil Group D per the MTO DMM Design Chart 1.08, Residential land usages ranging from 50-70% imperviousness (conservative), and cultivated land without conservation treatment based on the SWMM5.1 Design Manual Table A.4, provided in Appendix C, which has the same SCS Curve number as the MTO DMM.

Under post-development conditions, the site has been divided into 6 catchment areas (A201-A206). The overland slope of 2% was conservatively used for catchments located within the subject site. The N-impervious and pervious values used for the catchments are 0.011 (for smooth asphalt), 0.15 (for short grass), and 0.17 (for cultivated land) obtained from Table A.6 of the SWMM5.1 manual. The depression storage (Dstore) for the impervious and pervious surfaces of 2 mm (for impervious surfaces), and ranges from 2.5 - 5 mm (for lawns), were obtained from Table A.5 of the SWMM5.1 manual.

3.3 Stormwater Management Quantity Controls

The SWM quantity control objective for the subject site is to attenuate the post-development runoff to the pre-development levels. The pre-development catchment parameters provided in Table 2 of this brief were used to create the pre-development EPASWMM 5.1 model to estimate the storm flows from the subject site during the 2 to 100-yr storm events. The Pre-development Modelling Diagram and output results for all design storms have been provided in Appendix D.

The post-development catchment parameters provided in Table 3 of this brief were used to create the post-development EPASWMM 5.1 model to estimate the storm flows from the development during the 2 to 100-yr storm events and estimate the volumetric storage requirement in the dry SWM pond during the 2 to 100-yr storm events.

The proposed dry SWM pond is 3 m deep and was preliminarily designed per the MECP SWMP&DM requirements for dry ponds. The volumetric storage capacity of the dry SWM pond is approximately 11,278 m^3 as shown in stage-storage table provided in the SWM calculations in Appendix C. The storm flows discharged from the dry SWM pond will be controlled by 135 mm and 300 mm orifices, installed at elevations of 256.85 m.a.s.l and 258.30 m.a.s.l, which are proposed to be installed in the dry SWM pond outlet structure.

During the 100-yr storm event, the maximum required storage in the dry SWM pond is 9,819 m^3 as shown in the 100-yr post-development modelling output results provided in Appendix E and SWM calculations. The Post-development Modelling Diagram and output results for all design storms have been provided in Appendix E.

The EPASWMM 5.1 modelling output results and the SWM Calculations show that the proposed dry pond has adequate capacity to attenuate the post-development storm flows to the pre-development levels.

As shown on the SWMM5.1 model result summary provided below in Table 4, the post-development flows generated from the site during the 2 to 100-year design storms will be attenuated to the 2 to 100-year pre-development levels via 135 mm and 300 mm orifices. The outlet pipe will be directed to a low flow swale meandering through the wetland (designed by others).

Design Storm Event	Existing Conditions Peak Runoff for Entire Site (m^3/s)	Proposed Conditions Peak Discharge - Lower 135mm Orifice (m^3/s)	Proposed Conditions Peak Discharge - Higher 300mm Orifice (m^3/s)	Proposed Conditions Peak Discharge - Weir (m^3/s)	Proposed Conditions Total Peak Discharge (Including wetland flows) (m^3/s)	Dry-Basin Total Storage Volume (m^3)	Dry-Basin Peak Ponding Elev. (m)	Dry-Basin Peak Ponding Depth. (m)
2-Year	0.05	0.047	0.000	0.00	0.049	3,811	258.23	1.38
5-Year	0.13	0.054	0.091	0.00	0.138	5,403	258.65	1.80
10-Year	0.20	0.058	0.134	0.00	0.194	6,387	258.88	2.03
25-Year	0.30	0.062	0.173	0.00	0.242	7,710	259.17	2.32
50-Year	0.39	0.065	0.196	0.00	0.271	8,742	259.38	2.53
100-Year	0.49	0.067	0.217	0.00	0.297	9,819	259.59	2.74

Table 4: Model Result Summary from EPASWMM5.1 Models Showing Summary

Through completion of a water balance for the wetland feature, the quantity of additional flows to the upstream portion of the wetland will be accommodated through rear yard drainage and, if necessary, a second pipe system conveying clean roof/rear yard water to the feature.

3.4 STORM WATER MANAGEMENT

To achieve quality control for the proposed development, a treatment train approach is proposed. The treatment train approach includes implementing lot-level controls such as side and rear yard grassed swales and low-slope grading (where feasible) to promote pre-treatment and polishing, increase flow length/time of concentration and promote evapotranspiration. Snouts are proposed to be installed in all the catch basins within the R.O.W. Prior to discharging to the existing creek/wetland, an OGS unit will be incorporated downstream of the pond outlet to provide a normal level of treatment (70% T.S.S removal).

Strawbales should be installed at the dry pond outlet pipe as a mean of reducing the sediment that could go into the wetland during construction. It is recommended that the strawbales should remain in place until vegetation is established, as the vegetation will represent an additional measure of preventing sediments in the outlet pipes. A sediment and erosion control plan will be provided as part of the detailed design phase.

4. WATER SERVICING

As per the Craigholme Estates Ltd. - Phase 4 Water Distribution System by Parsons, dated June 2017, and the Craigholme Estates Ltd. - Phase 5 Watermain Key Plan by Parsons, dated December 19, 2016, provided in Appendix A, there are 200 mm diameter water services stubbed at the R.O.W. limits of Snyders Avenue adjacent to Landon Lane and Anita Court. There is also a 200 mm diameter watermain stubbed at property line within the municipal easement off of Kettle Creek Drive. Through the construction of the Phase 3 development, a 300 mm watermain was extended from Kettle Creek Drive to Snyders Avenue within the Seventh Ave R.O.W. Through detailed design, the proposed development of the Phase 6 lands, will connect into existing water services through the extension of Landon Lane and the water service within the municipal easement. If required, the 300 mm diameter watermain along Seventh Ave will be extended to the development's entrance for a third water connection to provide an efficient looped system.

It is our understanding that watermain modelling of the water distribution system was not completed for the previous phases to confirm capacity for the proposed development, however, this will be completed during the detailed design phase for Phase 6 to confirm required watermain sizing to provide for the domestic and fire demands.

5. SUMMARY

Based on the above, the proposed stormwater quantity controls will restrict flows to pre-development levels or less and quality controls utilizing a “treatment train” approach will provide the required normal level of treatment (70% TSS removal) or greater.

6. LIMITATIONS

This Study was prepared by SBM for Craigholme Estates Ltd., the Municipality of Central Elgin, and Kettle Creek Conservation Authority. Use of this study by any third party, or any reliance upon its findings, is solely the responsibility of that party. SBM accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions undertaken as a result of this study. Third party use of this study, without the express written consent of the Consultant, denies any claims, whether in contract, tort, and/or any other cause of action in law, against the Consultant.

All findings and conclusions presented in this study are based on site conditions as they appeared during the period of the investigation. This study is not intended to be exhaustive in scope, or to imply a risk-free facility. It should be recognized that the passage of time may alter the designs, opinions, conclusions, and/or recommendations provided herein.

The design was limited to the documents referenced herein and on the SBM drawings provided separately. SBM accepts no responsibility for the accuracy of the information provided by others. All designs, opinions, conclusions, and/or recommendations presented in this study are based on the information available at the time of the review.

Respectfully submitted,

Strik, Baldinelli, Moniz Ltd.
Planning • Civil • Structural • Mechanical • Electrical

Kevin Moniz, P.Eng.
Principal Engineer

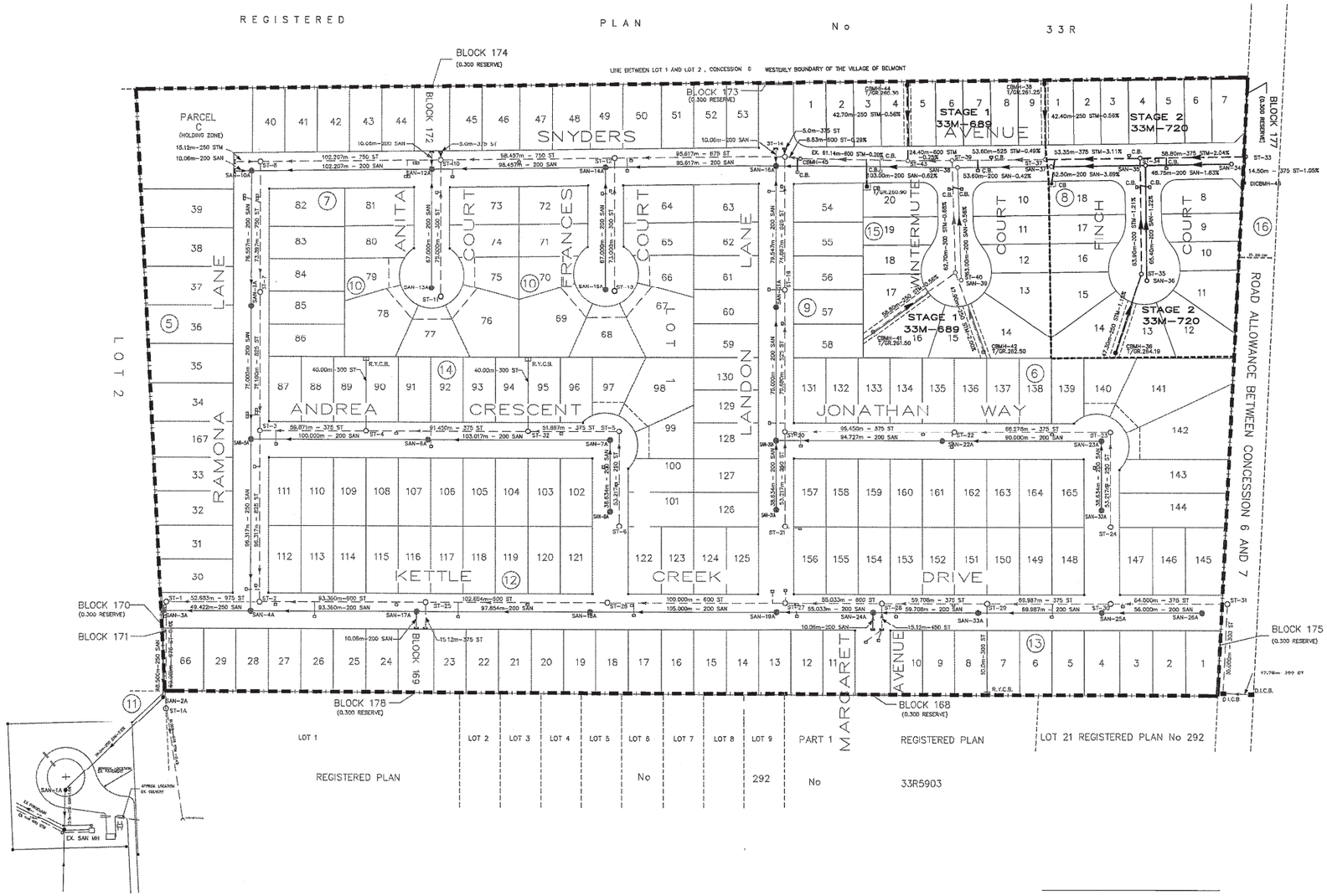
Kurtis Caron, EIT
Civil EIT II

APPENDIX A

Craigholme Estates Ltd. - Phase 4 Storm and Sanitary Key Plan by Parsons, Dated June 2017
Craigholme Estates Ltd. - Phase 4 Water Distribution System by Parsons, Dated June 2017
Craigholme Estates Ltd. - Phase 5 Sanitary Key Plan by Parsons, Dated December 19, 2016
Craigholme Estates Ltd. - Phase 5 Storm and Sanitary Design Sheet by Parsons, Dated December 19, 2016
Craigholme Estates Ltd. - Phase 5 Watermain Key Plan by Parsons, Dated December 19, 2016
Craigholme Estates Ltd. - Phase 5 Kettle Creek Drive & Sanitary Easement by Parsons, Dated December 19, 2016
Draft Plan of Subdivision by MTE

PART 1

REGISTERED PLAN No 33R



LEGEND:

- EXISTING SANITARY SEWER/MANHOLE
- NEW SANITARY SEWER/MANHOLE
- EXISTING STORM SEWER/MANHOLE
- NEW STORM SEWER/MANHOLE
- SINGLE CATCHBASIN
- CURB INLET CATCHBASIN
- CATCHBASIN – MANHOLE
- 25.4mm SQUARE IRON BAR
- (7) REFERENCE NUMBER FOR PLAN & PROFILE DRAWING
- STAGE 2 BOUNDARY

AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION
1 SEE DRAWING No. FOR FURTHER DETAIL	SAN. SEWERS, P.D.C.'S & M.H.'S	NOV. 2016
2 SEWER DESIGN; TRANSITION WIDTH OR AS NOTED	ST. SEWERS, P.D.C.'S & M.H.'S	NOV. 2016
3 REFERENCE B.M. No. ELEVATION	W.M. & W.S.C.'S	NOV. 2016
	GRANULAR BASE	MAR. 2017
	CURBS & GUTTER	APR. 2017
4	PAVING – BASE	APR. 2017
	– SURFACE	
5		

DESIGN	D.M.
DRAWN	D.M.
CHECKED	R.P.
APPROVED	T.L.F.
DATE	DEC/2005

BELGAN
PROJECT No.
07-1681

NO	REVISIONS	DATE	BY
1.	REVISED AS PER CENTRAL ELGIN COMMENTS	APRIL 17/06	RG
2.	APPROVED DRAWING	SEPT. 02/14	D.M.
3.	AS CONSTRUCTED – STAGE 1	SEPT. 2015	D.M.
4.	AS CONSTRUCTED – STAGE 2	JUNE 2017	D.M.

CONSULTANT OR DIVISION

PARSONS

1069 WELLINGTON ROAD SOUTH, SUITE 214
LONDON, ONTARIO, CANADA
TEL: (519) 601-0777 FAX: (519) 601-0999

ENGR'S STAMP

LICENSED PROFESSIONAL ENGINEER
H.E. HUOTARI
PROVINCE OF ONTARIO

The Corporation of the Municipality of Central Elgin

SCALE
10m 0 30m
Horizontal 1:1250

CRAIGHOLME ESTATES LTD.

JOE SNYDER CONSTRUCTION LTD. BELMONT ONT.

PHASE 4
STORM & SANITARY KEY PLAN

PROJECT No.

SHEET No.

DRAWING No. 1

PLAN FILE No.

NOTES RE: WATERMAINS:

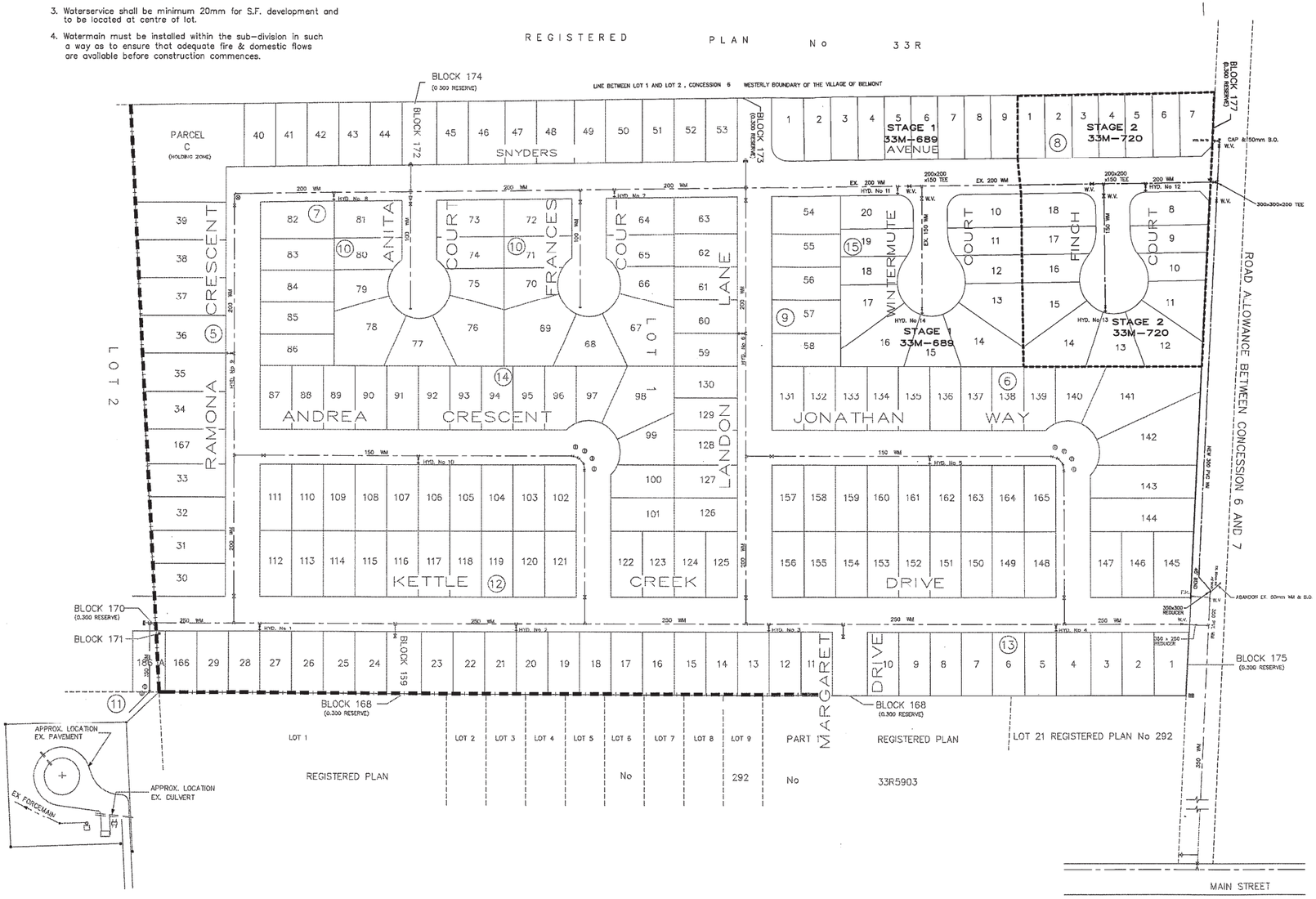
1. All watermains and appurtenances shall be construced in accordance with the Municipality of Central Elgin design & construction standards.
2. Watermain shall be Polyvinyl Chloride AWWA C900 unless otherwise approved by the Municipality Engineer.
3. Waterservice shall be minimum 20mm for S.F. development and to be located at centre of lot.
4. Watermain must be installed within the sub-division in such a way as to ensure that adequate fire & domestic flows are available before construction commences.

PART 1

REGISTERED PLAN No 33R

LEGEND:

- EXISTING WATERMAIN (W.M.)
- NEW WATERMAIN (W.M.)
- W.M. WITH VALVE
- W.M. WITH CAP
- W.M. WITH VALVE AND 50mm BLOW OFF (B.O.)
- W.M. WITH HYDRANT
- REDUCER
- Φ or Θ or ⊗ 22½° BEND OR 11¼° BEND OR 90° BEND
- 25.4mm SQUARE IRON BAR
- (7) REFERENCE NUMBER FOR PLAN & PROFILE DRAWING
- STAGE 2 BOUNDARY



LOT 1 REGISTERED PLAN No 292 | LOT 2 | LOT 3 | LOT 4 | LOT 5 | LOT 6 | LOT 7 | LOT 8 | LOT 9 | PART 1 MARGARET DRIVE REGISTERED PLAN No 33R5903 | LOT 21 REGISTERED PLAN No 292

AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION
1 SEE DRAWING No. FOR ENLARGED DETAIL		
2 SEWER DESIGN; TRANSITION WIDTH OR AS NOTED		
3 REFERENCE B.M. No. ELEVATION		
4		
5		

DESIGN	D.M.
DRAWN	D.M.
CHECKED	R.P.
APPROVED	T.L.F.
DATE	DEC/2005
DELCAN PROJECT No.	07-1681

NO	REVISIONS	DATE	BY
1.	REVISED AS PER CENTRAL ELGIN COMMENTS	APRIL 17/06	RG
2.	APPROVED DRAWING	SEPT. 02/14	D.M.
3.	STAGE 2 SUBMISSION	JUNE 13/16	D.M.
4.	REVISED 350 WM CONNECTION AT KETTLE CREEK DRIVE	OCT. 27/16	D.M.
5.	REVISED MANNING DRIVE W.M. TO 300mm	NOV. 22/16	D.M.
6.	AS CONSTRUCTED - STAGE 1	SEPT. 2014	D.M.
7.	AS CONSTRUCTED - STAGE 2	JUNE 2017	D.M.

CONSULTANT OR DIVISION

PARSONS
1069 WELLINGTON ROAD SOUTH, SUITE 214
LONDON, ONTARIO, CANADA
TEL: (519) 681-2500 FAX: (519) 681-4606

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LICENSED PROFESSIONAL ENGINEER
H.E. HUOTARI
PROVINCE OF ONTARIO

The Corporation of the Municipality of Central Elgin

SCALE
10m 0 30m
Horizontal 1:1250

CRAIGHOLME ESTATES LTD.
JOE SNYDER CONSTRUCTION LTD. BELMONT ONT.

PHASE 4
WATER DISTRIBUTION SYSTEM

DRAWING No. 4

PROJECT No.
SHEET No.
PLAN FILE No.

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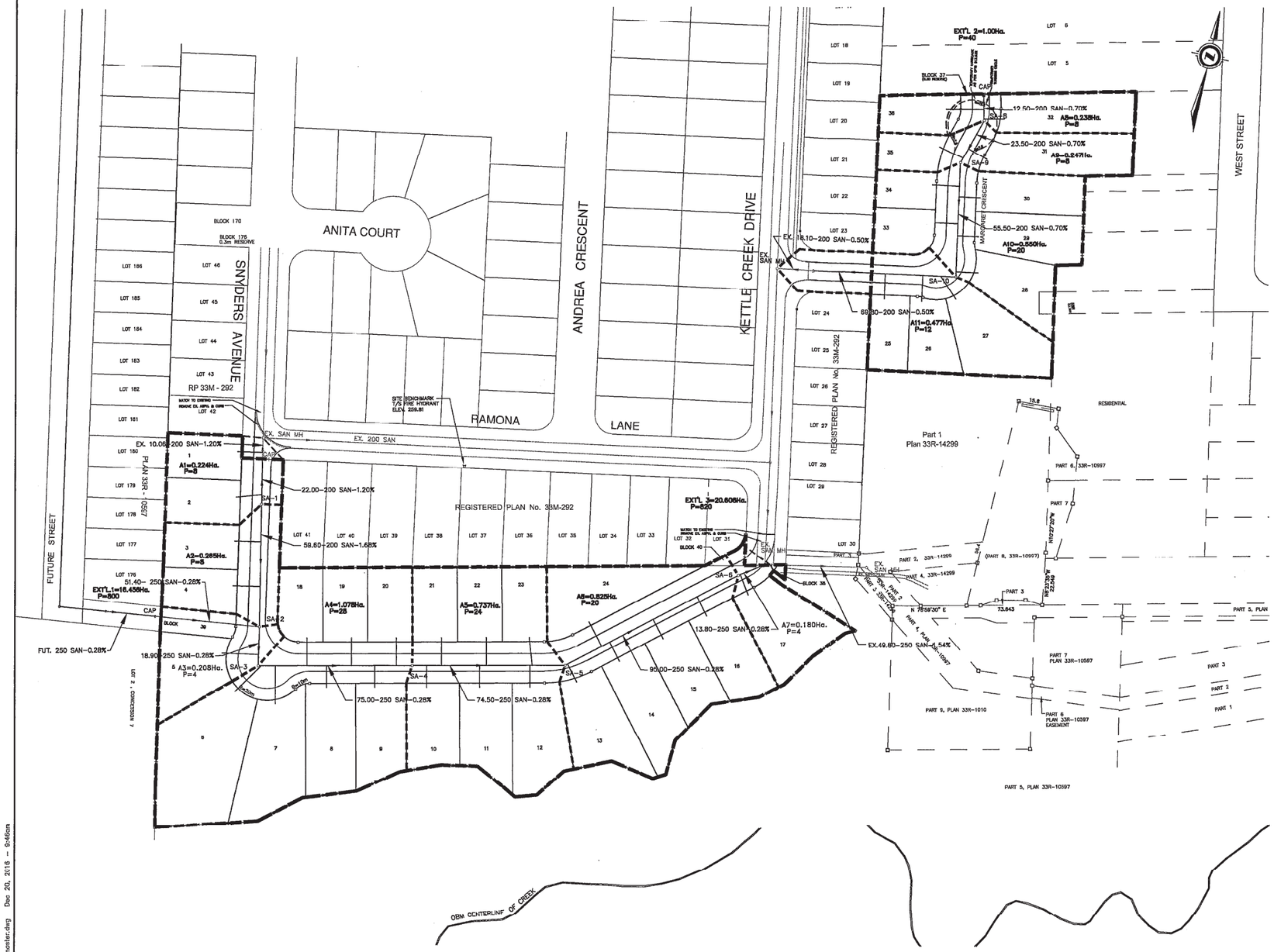

LEGEND

- EX. STORM SEWER
- PROPOSED STORM SEWER
- STORM MANHOLE
- CATCHBASIN/ DITCH INLET C.B.
- EX. SANITARY SEWER
- PROPOSED SANITARY SEWER
- SANITARY MANHOLE
- SUBDIVISION BOUNDARY

AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION
1 SEE DRAWING No. FOR FURTHER DETAIL		
2 SEWER DESIGN; TRANSITION WIDTH OR AS NOTED		
3 REFERENCE B.M. No. ELEVATION		
4		
5		

DESIGN	D.M.
DRAWN	D.M.
CHECKED	R.P.
APPROVED	H.H.
DATE	JUNE 2012
DELCAN PROJECT No.	07-1681

NO	REVISIONS	DATE	BY
1.	REVISION PER MUNICIPALITY REVIEW NOV. 17, 2012	NOV. 23, 2012	D.M.
2.	ENVIRONMENTAL COMPLIANCE APPROVAL APPLICATION	DEC. 19, 2016	D.M.

CONSULTANT OR DIVISION

PARSONS

1595 WELLINGTON ROAD SOUTH, SUITE 204
LONDON, ONTARIO, CANADA
N6E 2H8 TEL: (519) 681-8771 FAX: (519) 681-4995

ENGR'S STAMP

LICENSED PROFESSIONAL ENGINEER
H.E. HOOTARI
Dec. 19/16
PROVINCE OF ONTARIO

The Corporation of the Municipality of Central Elgin

SCALE

SCALE - 1 : 1000
10 0 20m
HORIZONTAL

CRAIGHOLME ESTATES LTD.
JOE SNYDER CONSTRUCTION LTD. BELMONT ONT.

PHASE 5
SANITARY KEY PLAN

DRAWING No. 3

PROJECT No.

SHEET No.

PLAN FILE No.

J:\DATA\07-1681\Phase 5\Dsn_Dwgs\Contract Dwgs\smaster.dwg Dec 20, 2016 - 9:46am

BELMONT ,ONTARIO LOND O.K. 1.000 1000.000
ENTER FREQUENCY YEAR: 2.000 O.K.
PROJECT: CRAIGHOLME ESTATES-PHASE 5
JOB NO: EM1681
DATE : 19-Dec-16

CITY: BELMONT 2.000 YEAR CURVE

STORM SEWER DESIGN SHEET

AREA NO.	LOCATION STREET	NODE FROM	NODE TO	ACCUMULATED STORMWATER FLOWS: INCR. AREA (ha)	ACCUM. AREA (ha)	C	INCR. AxC	TOT. SECT. AxC	TOT. SWR AxC	TOTAL AxCx2.78	TIME OF SECT. (min)	ACCUM. TIME (min)	INTENSITY I	PEAK FLOWS (l/s)	SEWER DESIGN: PIPE DIA. (mm)	SLOPE %	n	CAPACITY (l/s)	VELOCITY (m/s)	LENGTH (m)	TIME (min)	LOSSES (m)	DROP IN NODE (m)	FALL IN SEWER (m)	PROFILE: INVERT ELEV. U/S	INVERT ELEV. D/S
A1	KETTLE CREEK DRIVE	ST-1	ST-2	0.594	0.594	0.35	0.208	0.208	0.208	0.578	20.00	20.00	53.1	30.671	300	0.50	0.013	68.4	1.0	78.80	1.36	0.000	0.000	0.394	257.000	256.606
A2	KETTLE CREEK DRIVE	ST-2	ST-3	0.520	1.114	0.35	0.182	0.182	0.390	1.084	1.36	21.36	50.8	55.081	300	0.50	0.013	68.378	0.967	75.00	1.29	0.100	0.000	0.375	256.506	256.131
A3	KETTLE CREEK DRIVE	ST-3	ST-4	0.460	1.574	0.35	0.161	0.161	0.551	1.532	1.29	20.00	53.1	81.274	375	0.60	0.013	123.977	1.123	76.70	1.14	0.000	0.075	0.384	256.056	255.673
A4	KETTLE CREEK DRIVE	ST-4	ST-5	0.327	1.901	0.35	0.114	0.114	0.665	1.850	1.14	20.00	53.1	98.159	375	0.50	0.013	123.977	1.123	53.80	0.80	0.060	0.000	0.269	255.613	255.344
A5	KETTLE CREEK DRIVE	ST-5	EX.ST-2	0.176	2.077	0.35	0.062	0.062	0.727	2.021	0.80	20.00	53.1	107.246	375	0.50	0.013	123.977	1.123	50.00	0.74	0.030	0.000	0.250	255.314	255.064
EXT'L.				1.000	1.000	0.35	0.350	0.350	0.350	0.973	1.29	22.65	48.9	47.564												
A6	MARGARET CRESCENT	CAP	ST-6	0.128	1.128	0.35	0.045	0.045	0.395	1.098	0.00	22.65	48.9	53.653	300	0.50	0.013	68.378	0.967	11.50	0.20	0.000	0.150	0.058	258.965	258.908
A7	MARGARET CRESCENT	ST-6	ST-7	0.128	1.256	0.35	0.045	0.045	0.440	1.222		20.00	53.1	64.854	300	0.50	0.013	68.378	0.967	23.50	0.40	0.030	0.000	0.118	258.878	258.760
A8	MARGARET CRESCENT	ST-7	ST-8	0.291	1.547	0.35	0.102	0.102	0.541	1.505	0.20	22.85	48.6	73.160	375	0.50	0.013	123.977	1.123	53.20	0.79	0.000	0.075	0.266	258.685	258.419
A8	MARGARET CRESCENT	ST-8	EX.ST-26	0.240	1.787	0.35	0.084	0.084	0.625	1.739	0.40	20.40	52.4	91.060	375	0.50	0.013	123.977	1.123	89.30	1.33	0.100	0.000	0.447	258.319	257.873
EX.EXT'L.	*KETTLE CREEK DRIVE*	*EX.ST-26*	*EX.ST-25*	*9.370*	*10.157*	*0.35*	*2.930*	*2.930*	*2.930*	*8.144*	*1.09*	*24.54*	*46.4*	*377.602*	*600*	*0.60*	*0.013*	*475.612*	*1.682*	*102.85*	*1.02*	*0.025*	*0.000*	*0.617*	*258.482*	*257.823*
EX.EXT'L.	*KETTLE CREEK DRIVE*	*EX.ST-25*	*EX.ST-2*	*0.855*	*11.012*	*0.35*	*0.299*	*0.299*	*3.229*	*8.975*	*1.02*	*25.56*	*45.1*	*405.116*	*600*	*2.75*	*0.013*	*1018.2*	*3.6*	*93.36*	*0.43*	*0.000*	*0.000*	*2.567*	*257.822*	*255.254*
EX.EXT'L.	*RAMONA LANE*	*EX.ST-3*	*EX.ST-2*	*0.621*	*19.160*	*0.35*	*0.217*	*6.706*	*6.706*	*18.643*	*29.05*	*29.05*	*55.3*	*1030.940*	*825*	*0.45*	*0.013*	*962.921*	*1.801*	*96.32*	*0.89*	*0.093*	*0.000*	*0.433*	*255.413*	*254.980*
EX.EXT'L.	*EASEMENT*	*EX.ST-2*	*EX.ST-1*	*0.330*	*32.579*	*0.35*	*0.116*	*0.116*	*10.777*	*29.960*	*0.89*	*29.94*	*40.7*	*1218.193*	*975*	*0.40*	*0.013*	*1417.369*	*1.898*	*52.68*	*0.46*	*0.225*	*0.000*	*0.211*	*254.755*	*254.544*
EX.EXT'L.	*EASEMENT*	*EX.ST-1*	*EX.ST-1A*	*0.000*	*32.579*	*0.35*	*0.000*	*0.000*	*10.777*	*29.960*	*0.46*	*30.40*	*40.3*	*1205.931*	*975*	*0.40*	*0.013*	*1417.369*	*1.898*	*60.00*	*0.53*	*0.075*	*0.000*	*0.240*	*254.469*	*254.229*
EX.EXT'L.	*EASEMENT*	*EX.ST-1A*	*OUTFALL*	*0.000*	*32.579*	*0.35*	*0.000*	*0.000*	*10.777*	*29.960*	*0.53*	*30.93*	*39.8*	*1192.337*	*975*	*0.40*	*0.013*	*1417.369*	*1.898*	*62.00*	*0.54*	*0.036*	*0.000*	*0.248*	*254.193*	*253.945*

Project: Craigholme Subdivision, Phase 5
Job Number: EM-1681
Date: 07-Apr-16
File: J:\DATA\071681\Phase 5\6a-Docs
City: Belmont

Infiltration Factor (l/s/ha): 0.2
Under Development Factor: 1
Litres/Person/Day: 400

SANITARY DESIGN SHEET

AREA NO.	LOCATION STREET	MANHOLES FROM	MANHOLES TO	RESIDENTIAL: AREA (ha)	ACCUM. AREA	POP. PER Ha	NO. LOTS	POP. PER LOT	COMMERCIAL: AREA (ha)	POP. PER Ha	POPULATION: INCRES. POP.	ACCUM. POP.	INDUSTRIAL: AREA (ha)	LITRES/ Ha/DAY (l/ha/day)	DESIGN FLOW: PEAKING FACTOR (Harmon)	POP. FLOW (l/s)	Peak Infiltration Flow (l/s)	PEAK FLOW (l/s)	PIPE DATA: DIA. (mm)	SLOPE (%)	n	VEL. (m/s)	CAPACITY (l/s)	LENGTH (m)	DROP IN (m)	FALL IN SEWER (m)	PROFILE: UPSTREAM INVERT (m)	DOWNSTREAM INVERT (m)
A-1	KETTLE CREEK DRIVE	SAN-1	EX. SAN MH	0.224	0.224		2	4			8	8			4.42	0.16	0.04	0.21	200	1.20	0.013	1.14	35.93	22.00	0.030	0.264	256.065	255.801
A-2	KETTLE CREEK DRIVE	SAN-1	SAN-2	0.265	0.265		2	4			8	8			4.42	0.16	0.05	0.22	200	1.68	0.013	1.35	42.51	59.60	0.455	1.001	255.000	254.999
EXT'L. 1			CAP	16.456	16.456		200	4			800	800			3.86	14.30	3.29	17.59	250	0.28	0.013	0.64	31.47					
	EASEMENT	CAP	SAN-2	0.000	16.456		0	4			0	800			3.86	14.30	3.29	17.59	250	0.28	0.013	0.64	31.47	51.40	0.455	0.144	255.097	254.953
A-3	KETTLE CREEK DRIVE	SAN-2	SAN-3	0.208	16.929		1	4			4	812			3.86	14.50	3.39	17.88	250	0.28	0.013	0.64	31.47	18.90	0.100	0.053	254.853	254.800
A-4	KETTLE CREEK DRIVE	SAN-3	SAN-4	1.078	18.007		7	4			28	840			3.85	14.96	3.60	18.56	250	0.28	0.013	0.64	31.47	75.00	0.058	0.210	254.742	254.532
A-5	KETTLE CREEK DRIVE	SAN-4	SAN-5	0.737	18.744		6	4			24	864			3.84	15.36	3.75	19.11	250	0.28	0.013	0.64	31.47	74.50	0.030	0.209	254.502	254.294
A-6	KETTLE CREEK DRIVE	SAN-5	SAN-6	0.825	19.569		5	4			20	884			3.83	15.69	3.91	19.60	250	0.28	0.013	0.64	31.47	95.00	0.030	0.266	254.264	253.998
A-7	KETTLE CREEK DRIVE	SAN-6	EX. SAN MH	0.180	19.749		1	4			4	888			3.83	15.76	3.95	19.71	250	0.28	0.013	0.64	31.47	13.80	0.030	0.039	253.968	253.929
EXT'L 2			CAP	1.000	1.000		10	4			40	40			4.33	0.80	0.20	1.00										
A-8	MARGARET CRESCENT	CAP	SAN-8	0.238	1.238		2	4			8	48			4.32	0.96	0.25	1.21	200	0.70	0.013	0.87	27.44	12.50	0.000	0.088	258.248	258.161
A-9	MARGARET CRESCENT	SAN-8	SAN-9	0.247	1.485		2	4			8	56			4.30	1.12	0.30	1.41	200	0.70	0.013	0.87	27.44	23.50	0.030	0.165	258.131	257.966
A-10	MARGARET CRESCENT	SAN-9	SAN-10	0.550	2.035		5	4			20	76			4.27	1.50	0.41	1.91	200	0.70	0.013	0.87	27.44	55.50	0.030	0.389	257.936	257.548
A-11	MARGARET CRESCENT	SAN-10	CAP	0.477	2.512		3	4			12	88			4.26	1.73	0.50	2.24	200	0.50	0.013	0.74	23.19	69.80	0.100	0.349	257.448	257.099
	MARGARET CRESCENT	CAP	EX. SAN MH	0.000	2.512		0	4			0	88			4.26	1.73	0.50	2.24	200	0.50	0.013	0.74	23.19	18.10	0.000	0.091	*257.099*	*257.008*
EXT'L. 3	EX. KETTLE CREEK DRIVE	EX.SAN MH	EX.SAN MH	20.606	20.606		205	4			820	820			*3.85*	*14.63*	*4.12*	*18.75*	*250*	*0.44*	*0.013*	*0.80*	*39.45*	*50.80*	*0.455*	*0.224*	*254.090*	*253.865*
	EASEMENT	EX.SAN MH	EX.SAN MH	0.000	42.867		0	4			0	1796			*3.62*	*30.11*	*8.57*	*38.69*	*250*	*1.54*	*0.013*	*1.50*	*73.80*	*49.80*	*0.098*	*0.767*	*253.831*	*253.064*

AS CONSTRUCTED NOTES
1 SEE DRAWING No. FOR FURTHER DETAIL
2 SEWER DESIGN; TRANSITION WIDTH OR AS NOTED
3 REFERENCE B.M. No. ELEVATION
4
5

AS CONSTRUCTED SERVICES | COMPLETION

DESIGN D.M. | DRAWN D.M. | CHECKED R.P. | APPROVED H.H. | DATE JUNE 2012 | DELCAN | PROJECT No. 07-1681

NO	REVISIONS	DATE	BY
1.	REVISION PER MUNICIPALITY REVIEW NOV. 17, 2012	NOV. 23, 2012	D.M.
2.	ENVIRONMENTAL COMPLIANCE APPROVAL APPLICATION	DEC. 19, 2016	D.M.

CONSULTANT OR DIVISION
PARSONS
1999 WELLINGTON ROAD SOUTH, SUITE 214
LONDON, ONTARIO, CANADA
N6E 2H6 TEL: (519) 681-8771 FAX: (519) 681-4995

ENGR'S STAMP
LICENSED PROFESSIONAL ENGINEER
H.E. HOOTARI
Dec. 19/16
PROVINCE OF ONTARIO

The Corporation of the Municipality of Central Elgin

SCALE

CRAIGHOLME ESTATES LTD.
JOE SNYDER CONSTRUCTION LTD. BELMONT ONT.
PROJECT No.
PHASE 5
STORM & SANITARY DESIGN SHEETS
SHEET No.
DRAWING No. 4
PLAN FILE No.

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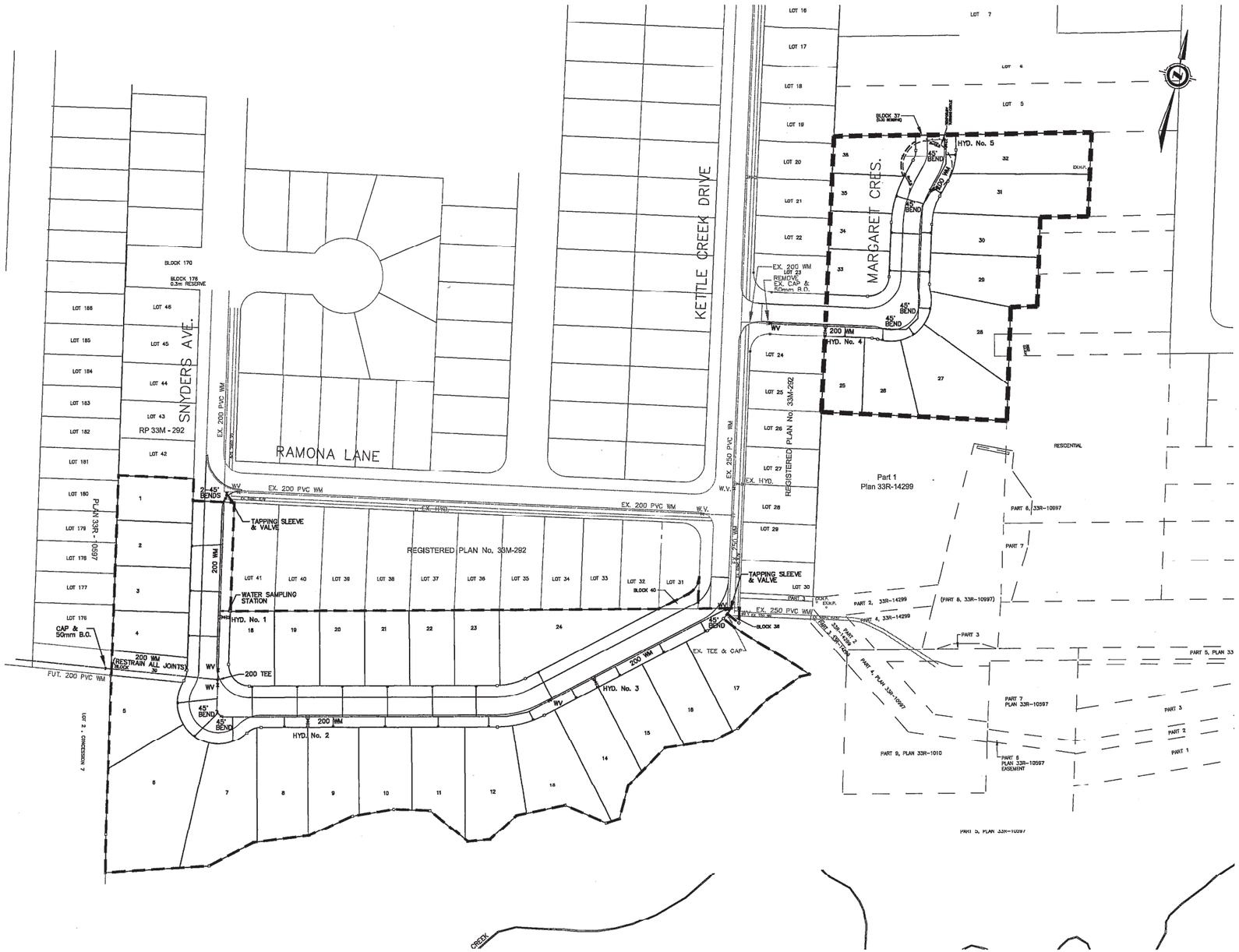
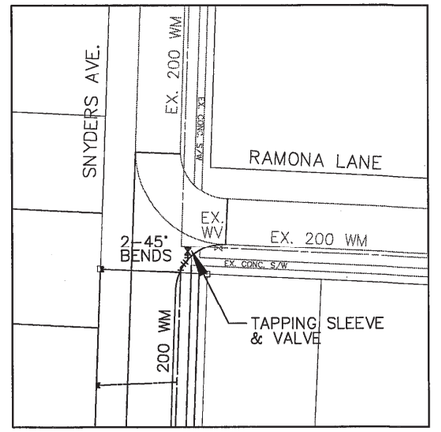


LEGEND

- PROPOSED WATERMAIN
- EXISTING WATERMAIN
- WM. WITH VALVE
- WM. WITH CAP
- WM. WITH 3 WAY HYDRANT
- SUBDIVISION LIMITS



AS CONSTRUCTED NOTES	AS CONSTRUCTED SERVICES	COMPLETION
1 SEE DRAWING No. FOR FURTHER DETAIL		
2 SEWER DESIGN; TRANSITION WIDTH OR AS NOTED		
3 REFERENCE B.M. No. ELEVATION		
4		
5		

DESIGN	D.M.
DRAWN	D.M.
CHECKED	R.P.
APPROVED	H.H.
DATE	JUNE 2012
DELCAN	
PROJECT No.	07-1681

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2.	ENVIRONMENTAL COMPLIANCE APPROVAL APPLICATION	DEC. 19, 2016	D.M.

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LICENSED PROFESSIONAL ENGINEER
H.E. HOOTARI
Dec. 19/16
PROVINCE OF ONTARIO

The Corporation of the Municipality of Central Elgin

SCALE

SCALE - 1 : 1000
10 0 20m
HORIZONTAL

CRAIGHOLME ESTATES LTD.
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PHASE 5
WATERMAIN KEY PLAN

PROJECT No.

SHEET No.

DRAWING No. 5

PLAN FILE No.

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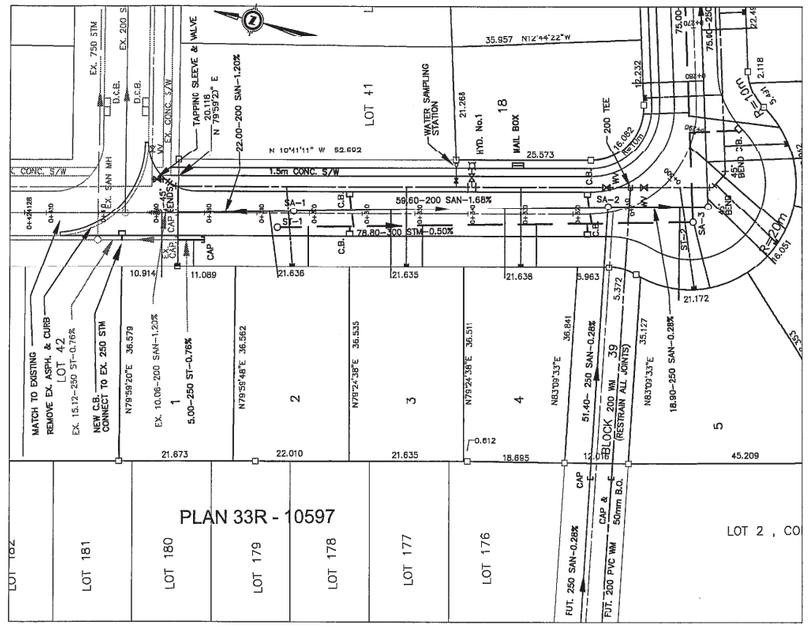

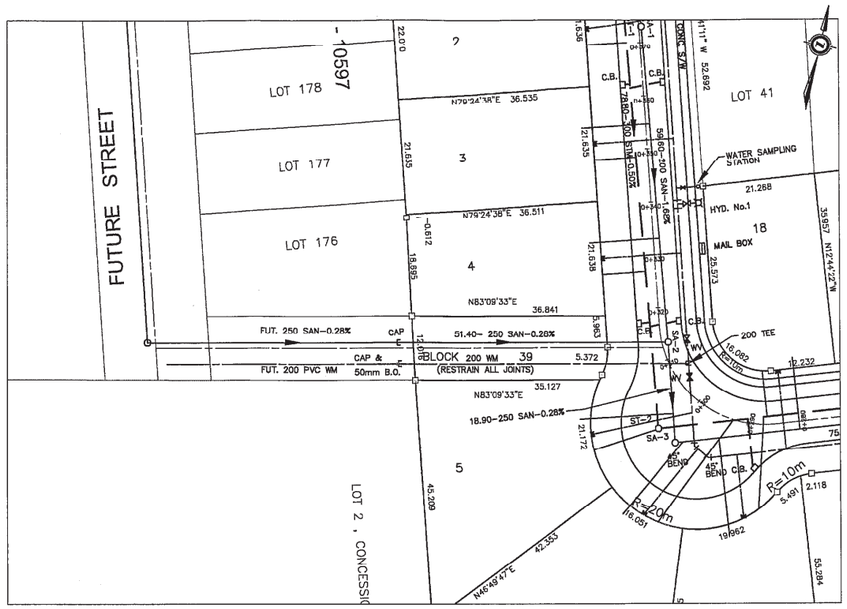

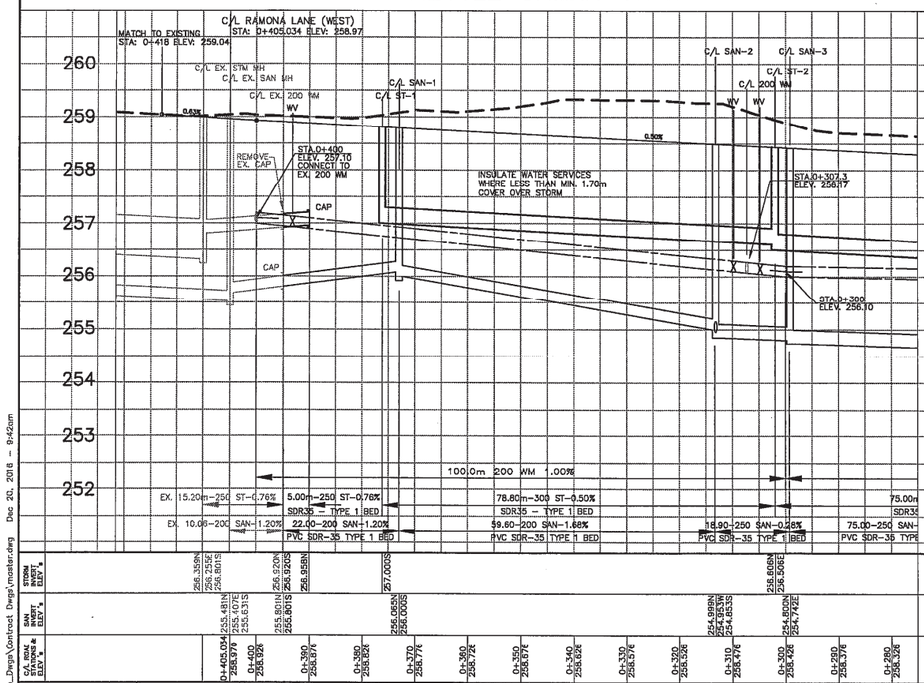

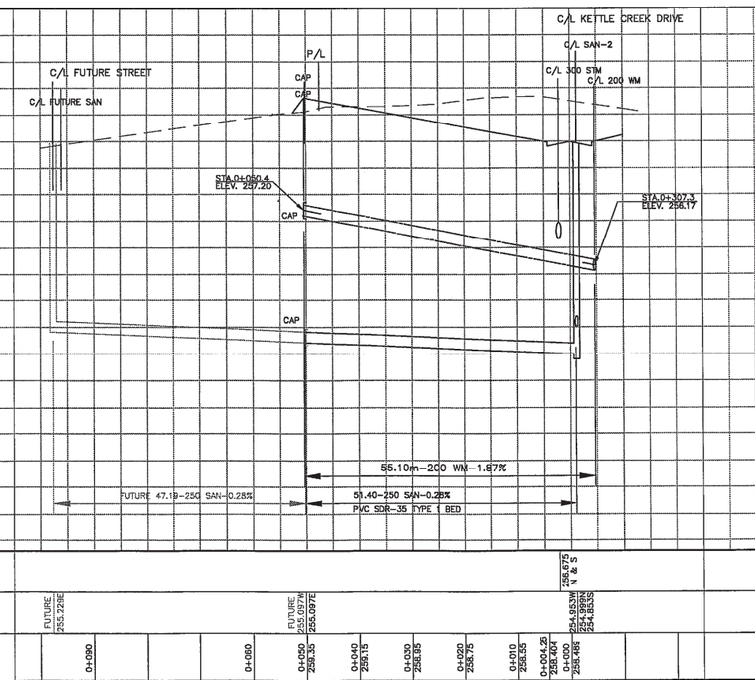

AS CONSTRUCTED NOTES
1 SEE DRAWING No. FOR FURTHER DETAIL
2 SEWER DESIGN: TRANSITION WIDTH OR AS NOTED
3 REFERENCE B.M. No. ELEVATION
4
5

AS CONSTRUCTED SERVICES	COMPLETION

DESIGN	D.M.
DRAWN	D.M.
CHECKED	R.P.
APPROVED	H.H.
DATE	JUNE 2012
DELCAN PROJECT No.	07–1681

NO	REVISIONS	DATE	BY
1.	REVISION PER MUNICIPALITY REVIEW NOV. 17, 2012	NOV. 23, 2012	D.M.
2.	ENVIRONMENTAL COMPLIANCE APPROVAL APPLICATION	DEC. 19, 2016	D.M.

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LICENSED PROFESSIONAL ENGINEER
H.E. HOOTARI
Dec. 19/16
PROVINCE OF ONTARIO

The Corporation of the Municipality of Central Elgin

SCALE
SCALE – 1 : 500
5 0 10m
HORIZONTAL
SCALE – 1 : 50
0.5 0 1m
VERTICAL

CRAICHOLME ESTATES LTD.
JOE SNYDER CONSTRUCTION LTD. BELMONT ONT.

PHASE 5
KETTLE CREEK DRIVE & SANITARY EASEMENT

DRAWING No. 6

PROJECT No.
SHEET No.
PLAN FILE No.

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key plan nts

DRAFT PLAN OF SUBDIVISION

PART OF LOT 2, CONCESSION 7
MUNICIPALITY OF CENTRAL ELGIN
FORMERLY VILLAGE OF BELMONT
COUNTY OF ELGIN

Scale 1 : 1000

10m 0m 20m 50m 100m
METRES

OWNER'S CERTIFICATE

I hereby authorize Mr. Donald D. Leahy to submit this proposed Plan of Subdivision.

MR. DONALD LEAHY — DATE
CRAIGHOLME ESTATES LTD.

SURVEYOR'S CERTIFICATE

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

P.R. LEVAC — DATE
ONTARIO LAND SURVEYOR

REQUIREMENTS UNDER SECTION 51(17) OF THE PLANNING ACT

a) AS SHOWN ON PLAN
b) AS SHOWN ON PLAN
c) AS SHOWN ON KEY PLAN
d) SINGLE DETACHED RESIDENTIAL
SEMI-DETACHED RESIDENTIAL
e) AS SHOWN ON PLAN
f) AS SHOWN ON PLAN
g) AS SHOWN ON PLAN
h) PIPED WATER
j) CLAY LOAM (30% POROSITY)
j) AS SHOWN ON PLAN
k) FULL SERVICES
l) AS SHOWN ON PLAN

LAND USE SCHEDULE

SINGLE DETACHED RESIDENTIAL LOTS 1 – 84, LOTS 102 – 175	9.357 Ha
SEMI DETACHED RESIDENTIAL LOTS 85 – 101	1.107 Ha
STREET TOWNHOMES BLOCK 179, 180, 181, 182	0.706 Ha
INSTITUTIONAL & MULTI FAMILY BLOCK 183	2.709 Ha
STORM WATER MANAGEMENT BLOCK 184	1.923 Ha
FUTURE ROADS, RESERVES, WALKWAY BLOCKS 176, 177, 185, 186	3.854 Ha
TOTAL AREA	19.656 Ha

CRAIGHOLME ESTATES LIMITED

BELMONT, ONTARIO

MTE ONTARIO LAND SURVEYORS LTD.
123 ST. GEORGE STREET
LONDON, ONTARIO, N6A 3A1
TEL: 519-204-6510

Cad File:		CCGD :
Surveyed By :	Checked By : PRL	MTE File No : 43900-101
Drawn By : TS	Date : 21/06/01	HB File No : 95-0098U

APPENDIX B

Sanitary Design Sheet by SBM

STRIK BALDINELLI MONIZ
PLANNING • CIVIL • STRUCTURAL • MECHANICAL • ELECTRICAL

LONDON LOCATION
1599 Adelaide St. N., Units 301 & 203
London, ON N5X 4E8
P: 519-471-6667

KITCHENER LOCATION
1415 Huron Rd., Unit 225
Kitchener, ON N2R 0L3
P: 519-725-8093

www.sbmltd.ca

sbm@sbmltd.ca

Date: June 10, 2021
Job Number: SBM-17-2126
Client: Craigholme Estates Ltd.
Project: Belmont Phase 6
Designed By: KC
Reviewed By: KM
Project File No.: SBM-17-2126

Sanitary Sewer Design Sheet

Municipality of Central Elgin

Residential Population Densities
Area Basis
Average Daily Domestic Flows = 3.5 people/unit
Single Family Units: 158
Semi-Detached Units (18 Lots): 34
Townhouse Units: 16
Students for School: 375

Design Critera (Litres/student/day) 90
Design Critera (Litres/capita/day) 400
Sewage Infiltration (Litres/hectare/day) 17280
Harmon Formula (Peaking Factor)
M = (1 + 14/(4+P^0.5))

Location				Area						Sewage Flows				Sewer design					Profile Design					
Area No.	Street Name	From MH	To MH	Delta Hectare	Total Hectare	People Per Unit	No. of Units	Delta Pop.	Total Pop.	Harmon Peaking Factor	Infilt L/S	Sewage L/S	Total L/S	n	Pipe Slope %	Dia. mm	Capacity L/S	Velocity m/s	Length m	Fall in Sewer	Headloss	Drop in U.S. MH	U.S. Invert	D.S. Invert
Residential		Phase 6 Lands	Existing Sanitary Stub	16.95	16.95	3.5	208	728	728	3.88	3.39	13.09	16.48	0.013	0.28%	250	31.49	0.64				-		
School		Phase 6 Lands	Existing Sanitary Stub	2.71	2.71			375	375	4.04	0.54	1.58	2.12	0.013	0.28%	250	31.49	0.64				-		
Total Site Area					19.66				1103				18.60	0.013	0.28%	250	31.49	0.64				-		

APPENDIX C

SWM Calculations
Tables A.4, A.5, & A.6 of the SWMM 5.1 manual
Environment and Climate Change Canada Rain Gauge Information for St Thomas WPCP ID ON_6137362
IDF to Chicago Conversion Using MIDUSS
Chicago Hyetograph Creation

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1599 Adelaide St. N., Units 301 & 203
London, ON N5X 4E8
P: 519-471-6667

KITCHENER LOCATION
1415 Huron Rd., Unit 225
Kitchener, ON N2R 0L3
P: 519-725-8093

www.sbmltd.ca

sbm@sbmltd.ca

SWM Calculations

DATE: June 11, 2021
JOB No.: SBM-17-2126

Client: Cavanholme Estates Ltd.
Project: Proposed Subdivision Development - Belmont Phase 6
Location: Belmont, Ontario

ST THOMAS WPCP CHICAGO RAINFALL DISTRIBUTION PARAMETERS*

Return Period (years)	A,B Parameters A	B	C
2	737.970	7.382	0.8035
5	1009.820	7.472	0.8055
10	1178.220	7.382	0.8049
25	1398.350	7.382	0.8048
50	1497.170	6.876	0.7978
100	1634.380	6.798	0.7954

*Intensity i=A/(t+B)^C (mm/hr)
*Post development flows must be kept at 2 to 100-year pre development levels

Note: Chicago Rainfall Distribution Parameters were derived from the IDF Parameters obtained from Environment and Climate Change Canada Rain Gauge Information dated 27th of February 2019 for The St Thomas WPCP ID ON_6137362 (Table 2b) from 1926 - 2007 provided in Appendix F. The Intensity from Table 2b was inputted in Midsus IDF Curve Fit tools to produce the Chicago Distribution parameters.

PRE-DEVELOPMENT CONDITIONS

PRE-DEVELOPMENT AREA FOR ENTIRE SITE

	Area (m^2)	C	A*C
A101 (Slope)	196560.00	0.20	39312
Total Site Area:	196560.00		39312
C_{av} = Σ(A*C)/Σ(A) =	0.20		

POST-DEVELOPMENT CONDITIONS

CALCULATE SUBDIVISION RUNOFF CO-EFFICIENT (R.O.W., SINGLE FAMILY LOTS, & SEMI-DETACHED LOTS ONLY)

R.O.W.	Width (m)	C	A*C (per m of R.O.W.)
Total	20.0		
Pavement	8.00	0.9	7.2
Curb & Gutter (0.5m per side)	1.00	0.9	0.9
Sidewalk (1.5m on one side)	1.50	0.9	1.35
Grass	9.50	0.2	1.9
Total	20.0		11.4
C_{av} = Σ(A*C)/Σ(A) =	0.57		

Composite Runoff Coefficient (R.O.W. and Single Family Lots Combined)

	Area (m^2)	C	A*C
R.O.W.	33933.76	0.57	19257.41
Single Family Lots	94683.77	0.55	52076.07
	128617.53		71333.48
	0.55	calculated	
	0.55	used for design	

Composite Runoff Coefficient (R.O.W. and Semi-Detached Lots Combined)

	Area (m^2)	C	A*C
R.O.W.	3476.73	0.57	1973.04
Semi-Detached Lots	11063.03	0.65	7190.97
	14539.76		9164.01
	0.63	calculated	
	0.63	used for design	

POST-DEVELOPMENT AREA FOR ENTIRE SITE (See DWG)

Single Family Lots + R.O.W. (A201)	128617.53	0.55	70739.64
Semi-Detached Lots + R.O.W. (A202)	14539.76	0.59	8578.46
Townhouse Lots (A203)	7083.14	0.70	4958.20
School (A204)	27084.05	0.70	18958.84
SWM Block (A205)	8475.00	0.20	1695.00
Wetland (A206)	10760.52	0.20	2152.10
	196560.00		107082.24
	0.54		

3.3.5 Runoff Coefficients

The value of runoff coefficient R, is to be taken from the following:

Asphalt or Concrete Surfaces	0.9
Roof Areas	0.9
Single Family Residential	0.35 to 0.75
Semi-Detached Residential	0.40 to 0.75
Apartments	0.50 to 0.70
Light Industrial	0.50 to 0.80
Heavy Industrial	0.60 to 0.90
Neighbourhood Commercial	0.50 to 0.70
Playgrounds	0.2
Parks	0.2

* Refer to Design Guidelines of the Municipality of Central Elgin Infrastructure Design Guidelines and Construction Standards

TABLE 1: PRE-DEVELOPMENT SUBCATCHMENT PARAMETERS

Catchment Area	Total Area (m2)	Total Area (ha)	Land Use 1 Runoff Coefficient 0.2	Land Use 2 Runoff Coefficient 0	Land Use 3 Runoff Coefficient 0	Land Use 4 Runoff Coefficient 0	Weighted C Value	Flow Length (m)	Width (m)	% Slope	[4]% Impervious	[2]N- Imperv	[2] N- Perv	[3] Dstore - Imperv (mm)	[3] Dstore- Perv (mm)	[1] Pervious CN
Pre Development																
A101 (Entire Site)	196560.000	19.656	196560.000				0.20	707	278	1.5	0.00	0.015	0.17	2	5	91

Soil based on clayey silt conditions - Soil group D according to MTO Drainage Management Manual (DMM)
[1] CN number from Table A.4 of Storm Water Management Model User's Manual Version 5.1 for Cultivated Land without conservation treatment (assumed)

TABLE 2: POST-DEVELOPMENT SUBCATCHMENT PARAMETERS

Catchment Area	Total Area (m2)	Total Area (ha)	Land Use 1 Runoff Coefficient 0.2	Land Use 2 Runoff Coefficient 0.55	Land Use 3 Runoff Coefficient 0.63	Land Use 4 Runoff Coefficient 0.70	Weighted C Value	Flow Length (m)	Width (m)	% Slope	[4]% Impervious	[2]N- Imperv	[2] N- Perv	[3] Dstore - Imperv (mm)	[3] Dstore- Perv (mm)	[1] Pervious CN
Post Development																
Single Family Lots + R.O.W. (A201)	128617.528	12.862		128617.528			0.55	184	701	2	50.00	0.011	0.19	2	2.5	92
Semi-Detached Lots + R.O.W. (A202)	14539.760	1.454			14539.760		0.63	36	404	2	61.43	0.011	0.15	2	2.5	92
Townhouse Lots (A203)	7083.140	0.708				7083.140	0.70	39	182	2	71.43	0.011	0.15	2	2.5	92
School (A204)	27084.050	2.708				27084.050	0.70	237	114	2	71.43	0.011	0.15	2	2.5	92
SWM Block (A205)	8475.000	0.848	8475.000				0.20	75	113	2	0.00	0.015	0.17	2	5	78
Wetland (A206)	10760.522	1.076	10760.522				0.20	130	83	2	0.00	0.015	0.17	2	5	78

Soil based on clayey silt conditions - Soil group D according to MTO Drainage Management Manual (DMM)
[1] CN number from Table A.4 of Storm Water Management Model User's Manual Version 5.1 for Residential (assumed)
[2] Values from A.6 of Storm Water Management Model User's Manual Version 5.1
[3] Values from A.5 of Storm Water Management Model User's Manual Version 5.1
[4] Sample Calculation to Convert from C to % Impervious: % Impervious = x
C=x(0.9) + (1-x)0.2 (i.e. weighted C value)
therefore 0.7x = C - 0.2
x=(C-0.2)/0.7

TABLE 3: Model Result Summary from EPASWMM5.1 Models Showing Summary

Design Storm Event	Existing Conditions Peak Runoff for Entire Site (m^3/s)	Proposed Conditions Peak Discharge - Lower 135mm Orifice (m^3/s)	Proposed Conditions Peak Discharge - Higher 300mm Orifice (m^3/s)	Proposed Conditions Peak Discharge - Weir (m^3/s)	Proposed Conditions Total Peak Discharge (including wetland flows) (m^3/s)	Dry-Basin Total Storage Volume(m^3)	Dry-Basin Peak Ponding Elev. (m)	Dry-Basin Peak Ponding Depth. (m)
2-Year	0.05	0.047	0.000	0.00	0.049	3,811	258.23	1.38
5-Year	0.13	0.054	0.091	0.00	0.138	5,403	258.65	1.80
10-Year	0.20	0.058	0.134	0.00	0.194	6,387	258.88	2.03
25-Year	0.30	0.062	0.173	0.00	0.242	7,710	259.17	2.32
50-Year	0.39	0.065	0.196	0.00	0.271	8,742	259.38	2.53
100-Year	0.49	0.067	0.217	0.00	0.297	9,819	259.59	2.74

TABLE 4: Preliminary Stage-Storage Volume Table

DRY SWM POND
Stage-Storage

FOREBAY PERMANENT POOL					
ACTIVE VOLUMES					
Elevation (m)	**Incremental Depth (m)**	**Plan Area (m^2)**	**Avg. Area (m^2)**	**Volume (m^3)**	**Total Volume (m^3)**
256.85		2,037			0
	1.00		2,555	2,555	
257.85		3,073			2,555
	1.00		3,692	3,692	
258.85		4,311			6,247
	1.00		5,031	5,031	
259.85		5,751			11,278
				TOTAL ACTIVE STORAGE	**11,278**

A.4 SCS Curve Numbers[1]

Land Use Description	Hydrologic Soil Group			
	A	B	C	D
Cultivated land				
Without conservation treatment	72	81	88	91
With conservation treatment	62	71	78	81
Pasture or range land				
Poor condition	68	79	86	89
Good condition	39	61	74	80
Meadow				
Good condition	30	58	71	78
Wood or forest land				
Thin stand, poor cover, no mulch	45	66	77	83
Good cover[2]	25	55	70	77
Open spaces, lawns, parks, golf courses, cemeteries, etc.				
Good condition: grass cover on 75% or more of the area	39	61	74	80
Fair condition: grass cover on 50-75% of the area	49	69	79	84
Commercial and business areas (85% impervious)	89	92	94	95
Industrial districts (72% impervious)	81	88	91	93
Residential[3]				
Average lot size (% Impervious[4])				
1/8 ac or less (65)	77	85	90	92
1/4 ac (38)	61	75	83	87
1/3 ac (30)	57	72	81	86
1/2 ac (25)	54	70	80	85
1 ac (20)	51	68	79	84
Paved parking lots, roofs, driveways, etc.[5]	98	98	98	98
Streets and roads				
Paved with curbs and storm sewers[5]	98	98	98	98
Gravel	76	85	89	91
Dirt	72	82	87	89

Source*: SCS Urban Hydrology for Small Watersheds*, 2nd Ed., (TR-55), June 1986.

Footnotes:

1. Antecedent moisture condition II.
2. Good cover is protected from grazing and litter and brush cover soil.

3. Curve numbers are computed assuming that the runoff from the house and driveway is directed toward the street with a minimum of roof water directed to lawns where additional infiltration could occur.
4. The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.
5. In some warmer climates of the country a curve number of 95 may be used.

A.5 Depression Storage

Impervious surfaces	0.05 - 0.10 inches
Lawns	0.10 - 0.20 inches
Pasture	0.20 inches
Forest litter	0.30 inches

Source: ASCE, (1992). *Design & Construction of Urban Stormwater Management Systems,* New York, NY.

A.6 Manning's n – Overland Flow

Surface	n
Smooth asphalt	0.011
Smooth concrete	0.012
Ordinary concrete lining	0.013
Good wood	0.014
Brick with cement mortar	0.014
Vitrified clay	0.015
Cast iron	0.015
Corrugated metal pipes	0.024
Cement rubble surface	0.024
Fallow soils (no residue)	0.05
Cultivated soils	
Residue cover < 20%	0.06
Residue cover > 20%	0.17
Range (natural)	0.13
Grass	
Short, prairie	0.15
Dense	0.24
Bermuda grass	0.41
Woods	
Light underbrush	0.40
Dense underbrush	0.80

Source: McCuen, R. et al. (1996), *Hydrology*, FHWA-SA-96-067, Federal Highway Administration, Washington, DC

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2019/02/27

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ST THOMAS WPCP ON 6137362
(composite)
Latitude: 42 46'N Longitude: 81 13'W Elevation/Altitude: 209 m

Years/Années : 1926 - 2007 # Years/Années : 75

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Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

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Year / Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
1926	8.1	11.9	16.3	24.9	41.1	56.4	75.7	80.3	104.4
1927	7.1	9.4	10.2	15.5	18.3	29.7	40.9	46.2	56.6
1929	9.7	15.0	18.3	21.1	38.4	38.4	38.4	38.4	40.9
1930	8.1	16.0	18.3	24.4	29.0	35.6	49.5	50.3	51.6
1931	8.4	10.7	16.0	20.6	23.1	23.4	33.8	37.1	37.1
1932	7.1	9.9	12.2	22.6	39.4	59.4	64.3	65.3	65.5
1933	10.2	11.2	11.2	11.7	12.2	14.7	24.9	24.9	27.4
1934	7.1	8.4	10.4	12.2	15.2	16.0	25.9	27.2	27.2
1935	14.0	26.4	32.8	49.8	60.2	63.2	63.2	63.2	63.2
1936	6.3	11.4	12.2	14.2	19.0	20.3	30.2	32.8	32.8
1937	8.9	17.8	25.1	37.8	43.9	49.8	54.9	56.9	74.4
1938	10.7	14.0	15.0	17.0	17.8	24.9	46.0	47.5	47.5
1939	6.9	11.7	17.5	21.1	21.6	22.1	27.9	30.0	30.5
1940	6.6	12.4	18.3	25.4	33.5	35.3	38.9	50.5	72.9
1941	8.6	13.2	17.0	27.4	37.8	38.1	38.1	41.4	50.5
1942	15.0	20.3	22.6	23.6	32.0	41.7	47.2	52.8	54.9
1943	7.6	12.2	15.2	20.6	25.9	26.4	40.6	48.8	50.3
1944	8.1	14.5	17.3	21.8	26.4	26.7	33.5	33.5	33.5
1945	9.1	12.2	13.0	18.0	20.1	30.7	47.2	55.4	75.4
1946	9.4	15.0	16.8	17.8	24.6	24.9	27.9	36.3	42.2
1947	9.4	18.3	21.8	29.0	31.7	33.0	40.9	44.2	56.6

1948	10.2	14.7	19.6	19.8	19.8	19.8	26.7	28.2	39.1
1949	6.3	9.9	12.2	14.0	14.2	21.8	33.3	33.5	35.1
1952	8.1	13.7	15.5	23.9	33.0	38.6	44.2	71.4	76.7
1953	5.1	7.9	9.4	16.5	20.6	23.9	25.4	31.0	40.6
1954	5.3	8.9	10.9	16.0	16.3	25.1	33.8	47.2	69.3
1955	6.9	9.9	10.7	12.4	16.0	20.1	33.0	45.5	54.1
1956	10.7	14.7	19.3	23.1	38.1	41.4	51.3	57.7	60.7
1957	12.4	18.5	21.8	24.6	30.7	34.5	42.2	42.7	42.9
1958	6.9	9.7	10.9	18.5	21.1	28.7	36.3	36.3	36.8
1959	9.1	14.7	18.8	25.1	27.4	31.2	35.6	35.8	35.8
1960	8.9	16.0	17.3	21.6	27.4	27.7	31.5	38.6	46.2
1961	12.7	16.0	18.0	20.1	22.6	27.4	31.7	31.7	31.7
1962	12.2	15.7	18.8	18.8	20.8	21.3	36.6	42.7	48.0
1963	4.8	5.8	8.6	10.9	20.6	26.4	29.7	36.1	41.7
1964	11.9	15.0	16.8	23.1	37.1	67.3	86.4	86.9	86.9
1965	5.6	7.6	9.1	12.2	19.3	25.1	31.0	44.2	56.6
1967	6.3	9.4	13.2	23.6	38.1	58.4	66.8	76.2	78.5
1968	11.4	17.8	20.3	25.4	35.8	44.7	86.6	101.6	104.6
1969	29.2	30.5	38.1	45.0	48.5	49.5	49.5	49.5	52.6
1970	5.3	5.8	6.9	11.4	13.5	15.5	29.7	29.7	36.1
1971	10.4	12.7	14.7	22.4	22.4	22.4	26.7	26.7	30.2
1972	5.1	10.2	11.7	15.5	15.5	25.4	27.2	31.7	40.4
1973	6.1	7.4	7.4	8.9	10.2	14.0	23.6	28.4	33.8
1974	6.1	7.4	9.9	11.2	14.5	20.6	25.1	26.9	26.9
1975	10.9	21.8	27.2	35.8	39.4	61.0	66.8	75.9	79.0
1976	20.3	21.6	23.4	25.1	25.4	27.7	49.0	51.6	51.6
1977	11.7	17.3	20.3	22.6	22.6	30.5	45.0	46.0	48.8
1978	9.0	11.4	13.6	16.0	18.7	21.6	32.0	34.4	41.0
1979	5.0	5.8	6.6	8.6	14.0	17.2	27.0	42.8	51.8
1980	8.9	12.3	12.7	16.0	25.1	31.7	34.9	52.9	73.0
1981	-99.9	-99.9	-99.9	-99.9	34.0	36.9	49.2	66.8	73.9
1982	8.5	13.1	16.1	21.2	29.3	30.0	55.6	65.4	68.0
1983	10.7	13.9	18.0	30.6	42.8	50.1	82.2	99.4	108.7
1984	8.6	13.0	14.7	29.4	40.6	64.7	92.1	95.3	124.3
1985	6.5	10.2	14.9	18.4	27.6	34.6	34.8	47.4	52.8
1986	8.9	10.2	13.1	23.9	25.2	37.9	45.1	49.4	50.4
1987	6.1	8.1	8.6	16.3	23.0	27.8	39.4	51.6	51.8
1988	8.9	12.1	13.9	26.9	33.7	40.8	50.4	52.2	52.6
1989	6.1	7.7	9.3	15.4	25.7	26.2	27.2	27.2	27.4
1990	10.3	16.3	21.2	36.4	51.1	56.2	56.7	56.7	76.9
1991	6.1	10.4	13.2	21.4	25.6	27.6	36.9	44.0	46.0
1992	8.4	12.0	17.2	21.2	28.8	30.7	32.2	39.1	52.2
1993	4.0	4.4	5.8	9.0	12.8	13.4	27.5	29.0	34.4
1994	10.3	12.0	12.7	18.4	27.4	31.5	48.6	52.2	52.2
1995	8.1	11.3	12.1	17.4	20.6	31.4	60.0	69.5	72.0
1996	12.1	15.8	18.3	19.1	19.1	24.3	25.3	44.4	52.0
1997	11.4	12.3	16.4	27.2	30.7	31.3	43.4	43.4	46.7
1998	11.7	20.7	29.2	41.5	43.0	43.0	43.0	52.2	56.3
1999	8.5	12.2	16.2	23.0	24.2	25.8	32.9	36.6	36.6
2000	8.5	12.5	16.4	27.8	31.5	44.8	47.5	53.4	58.4

2001	6.1	10.7	11.9	21.4	24.5	24.5	34.8	38.6	40.4
2002	8.4	11.1	14.4	18.8	21.2	23.9	23.9	25.2	34.4
2003	8.1	14.4	16.3	20.6	32.9	38.0	38.4	38.4	38.4
2004	10.2	14.3	15.8	16.9	26.0	26.0	34.7	35.9	45.0
2005	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	-99.9	66.6
2007	5.4	7.7	9.7	13.7	14.7	15.7	19.5	-99.9	-99.9
# Yrs. Années	75	75	75	75	76	76	76	75	76
Mean Moyenne	8.9	12.9	15.7	21.3	27.1	32.5	41.7	47.5	53.5
Std. Dev. Écart-type	3.6	4.6	5.8	7.9	10.0	13.0	15.9	17.4	20.1
Skew. Dissymétrie	2.86	1.13	1.23	1.22	0.77	1.00	1.37	1.26	1.26
Kurtosis	16.47	5.64	5.92	5.49	3.64	3.50	4.77	4.61	4.93

*-99.9 Indicates Missing Data/Données manquantes

Warning: annual maximum amount greater than 100-yr return period amount
Avertissement : la quantité maximale annuelle excède la quantité pour une période de retour de 100 ans

Year/Année	Duration/Durée	Data/Données	100-yr/ans
1935	30 min	49.8	46.1
1935	1 h	60.2	58.5
1969	5 min	29.2	20.2
1969	10 min	30.5	27.3
1969	15 min	38.1	33.8
1976	5 min	20.3	20.2
1984	6 h	92.1	91.6
1984	24 h	124.3	116.4

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Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	8.4	11.5	13.6	16.3	18.3	20.2	75
10 min	12.2	16.2	18.9	22.3	24.8	27.3	75
15 min	14.7	19.8	23.2	27.5	30.6	33.8	75
30 min	20.0	27.0	31.6	37.5	41.8	46.1	75
1 h	25.4	34.3	40.1	47.6	53.1	58.5	76
2 h	30.3	41.8	49.4	59.0	66.1	73.1	76
6 h	39.1	53.1	62.4	74.2	82.9	91.6	76
12 h	44.6	60.0	70.2	83.0	92.6	102.1	75
24 h	50.2	67.9	79.7	94.5	105.5	116.4	76

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Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	100.3	138.4	163.7	195.6	219.3	242.8	75
	+/- 9.0	+/- 15.1	+/- 20.4	+/- 27.5	+/- 32.9	+/- 38.3	75
10 min	73.0	97.2	113.3	133.6	148.7	163.6	75
	+/- 5.7	+/- 9.6	+/- 13.0	+/- 17.5	+/- 20.9	+/- 24.4	75
15 min	59.0	79.4	92.8	109.9	122.6	135.1	75
	+/- 4.8	+/- 8.1	+/- 10.9	+/- 14.7	+/- 17.6	+/- 20.5	75
30 min	40.1	54.0	63.3	75.0	83.6	92.2	75
	+/- 3.3	+/- 5.5	+/- 7.5	+/- 10.1	+/- 12.0	+/- 14.0	75
1 h	25.4	34.3	40.1	47.6	53.1	58.5	76
	+/- 2.1	+/- 3.5	+/- 4.7	+/- 6.3	+/- 7.6	+/- 8.9	76
2 h	15.2	20.9	24.7	29.5	33.0	36.6	76
	+/- 1.3	+/- 2.3	+/- 3.0	+/- 4.1	+/- 4.9	+/- 5.7	76
6 h	6.5	8.9	10.4	12.4	13.8	15.3	76
	+/- 0.5	+/- 0.9	+/- 1.2	+/- 1.7	+/- 2.0	+/- 2.3	76
12 h	3.7	5.0	5.8	6.9	7.7	8.5	75
	+/- 0.3	+/- 0.5	+/- 0.7	+/- 0.9	+/- 1.1	+/- 1.3	75
24 h	2.1	2.8	3.3	3.9	4.4	4.9	76
	+/- 0.2	+/- 0.3	+/- 0.4	+/- 0.5	+/- 0.6	+/- 0.7	76

****

Table 3 : Interpolation Equation / Équation d'interpolation: R = A*T^B

R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)
RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)
T = Rainfall duration (h) / Durée de la pluie (h)

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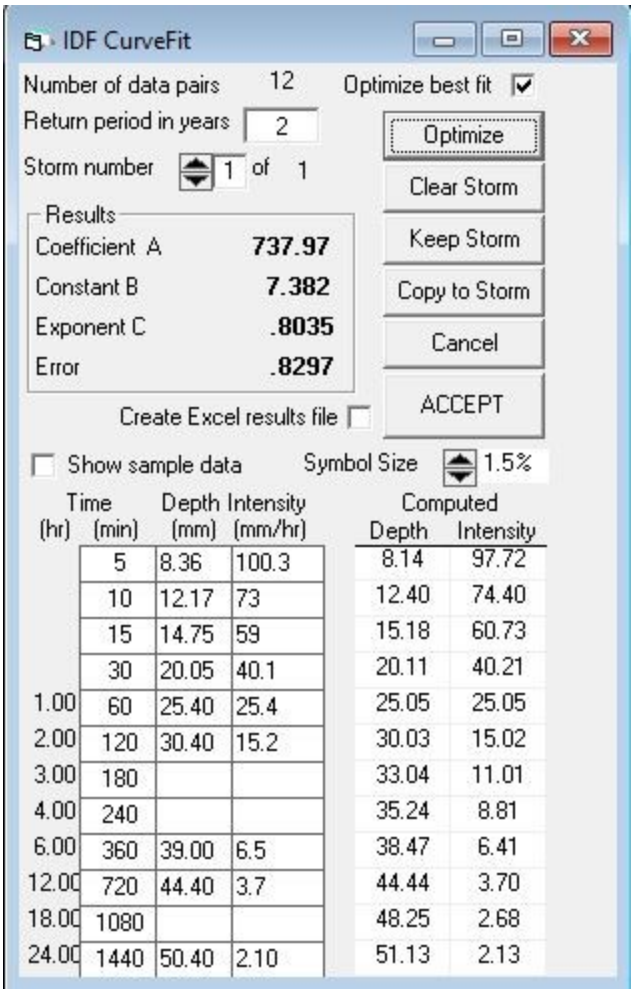
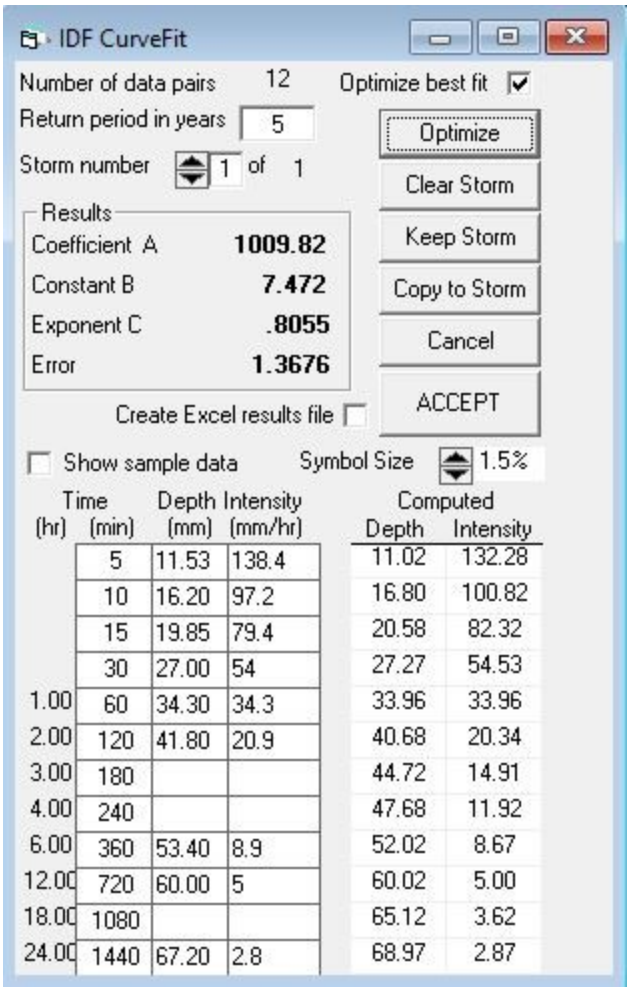
Statistics/Statistiques	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans
Mean of RR/Moyenne de RR	36.1	49.0	57.5	68.3	76.2	84.2
Std. Dev. /Écart-type (RR)	34.7	47.4	55.8	66.3	74.2	82.0
Std. Error/Erreur-type	8.9	11.3	12.9	14.9	16.4	17.8
Coefficient (A)	21.9	29.7	34.8	41.3	46.2	50.9
Exponent/Exposant (B)	-0.694	-0.694	-0.694	-0.694	-0.694	-0.694
Mean % Error/% erreur moyenne	9.9	10.0	10.0	10.0	10.1	10.1

2-YEAR IDF TO CHICAGO CONVERSION USING MIDUSS

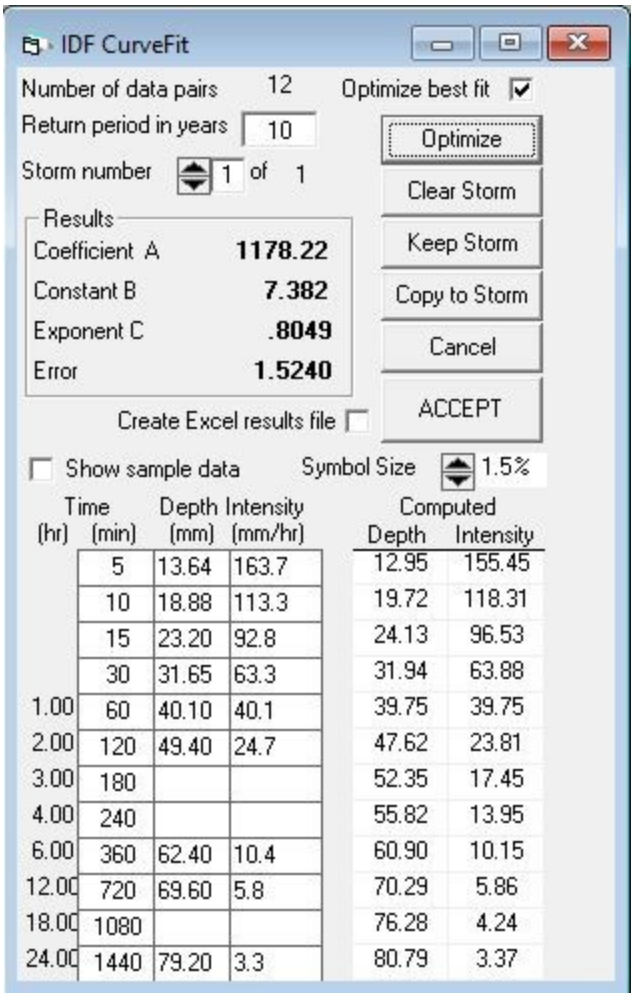


5-YEAR IDF TO CHICAGO CONVERSION USING MIDUSS

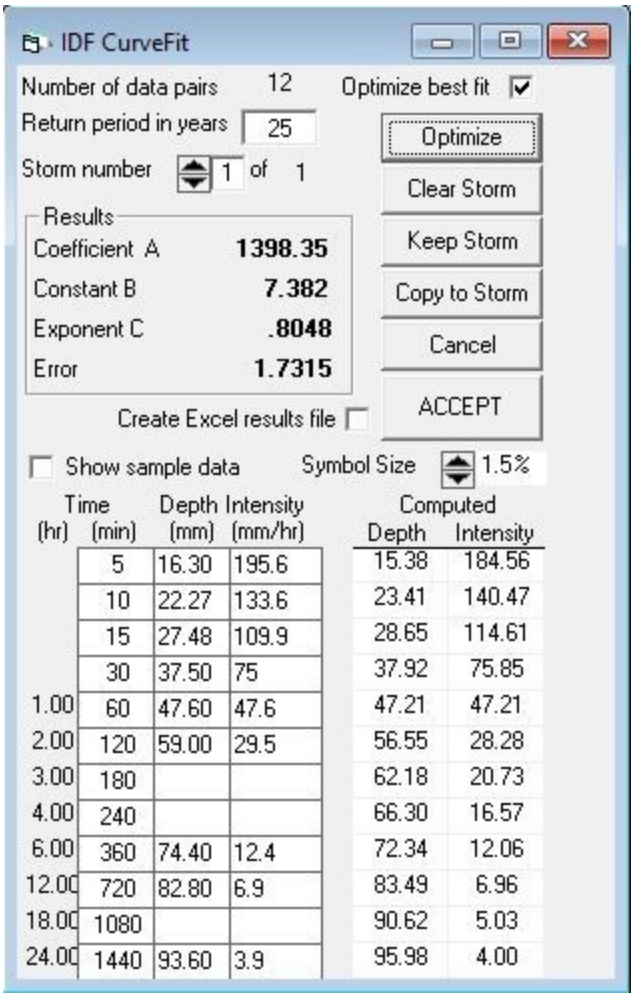


Time (hr)	Time (min)	Depth (mm)	Intensity (mm/hr)	Computed Depth	Computed Intensity
	5	11.53	138.4	11.02	132.28
	10	16.20	97.2	16.80	100.82
	15	19.85	79.4	20.58	82.32
	30	27.00	54	27.27	54.53
1.00	60	34.30	34.3	33.96	33.96
2.00	120	41.80	20.9	40.68	20.34
3.00	180			44.72	14.91
4.00	240			47.68	11.92
6.00	360	53.40	8.9	52.02	8.67
12.00	720	60.00	5	60.02	5.00
18.00	1080			65.12	3.62
24.00	1440	67.20	2.8	68.97	2.87

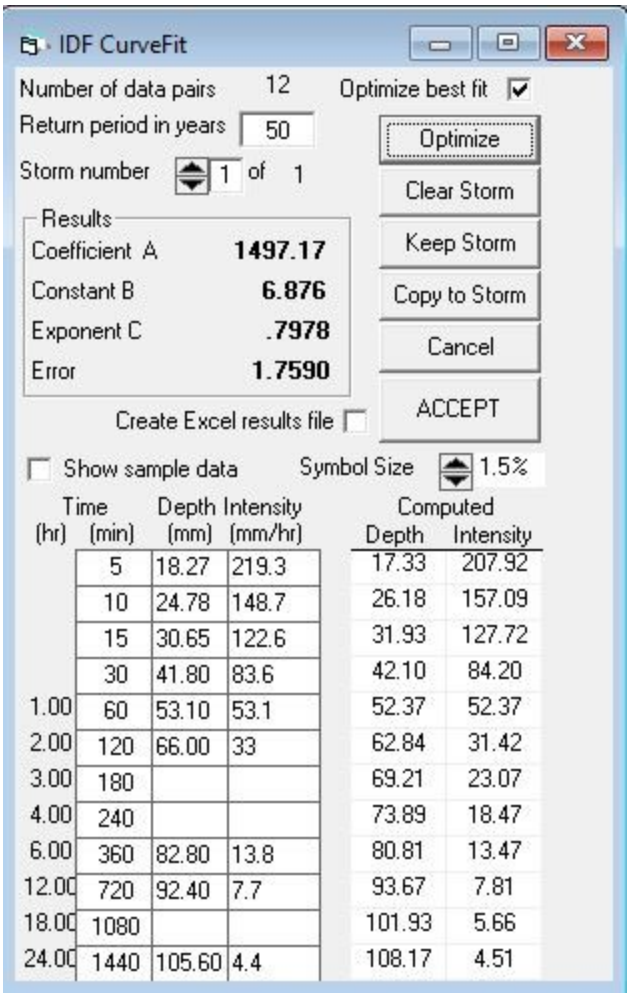
10-YEAR IDF TO CHICAGO CONVERSION USING MIDUSS



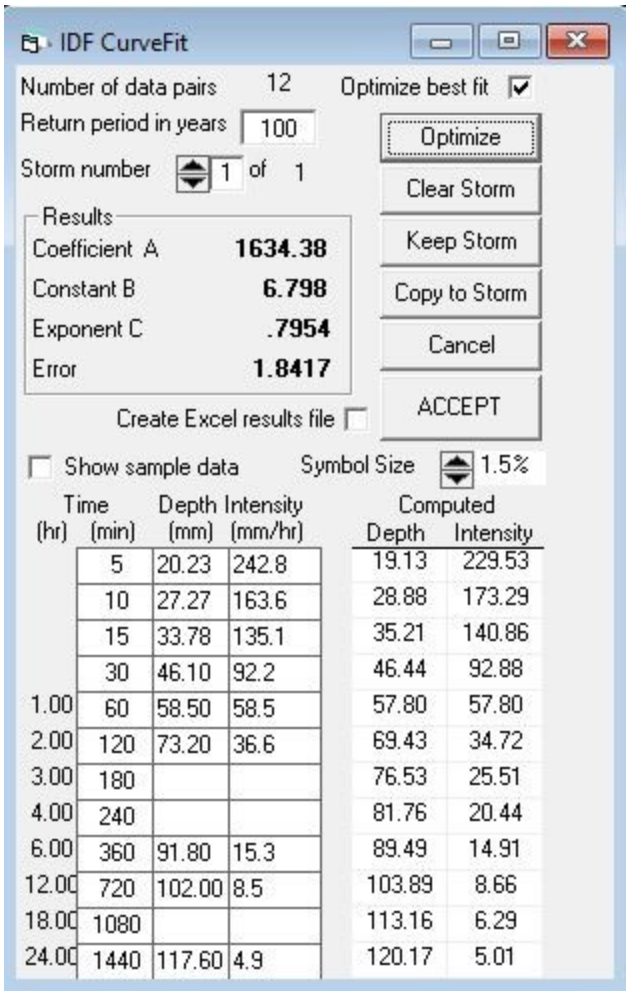
25-YEAR IDF TO CHICAGO CONVERSION USING MIDUSS



50-YEAR IDF TO CHICAGO CONVERSION USING MIDUSS



100-YEAR IDF TO CHICAGO CONVERSION USING MIDUSS



Time (hr)	Time (min)	Depth (mm)	Intensity (mm/hr)	Computed Depth	Computed Intensity
	5	20.23	242.8	19.13	229.53
	10	27.27	163.6	28.88	173.29
	15	33.78	135.1	35.21	140.86
	30	46.10	92.2	46.44	92.88
1.00	60	58.50	58.5	57.80	57.80
2.00	120	73.20	36.6	69.43	34.72
3.00	180			76.53	25.51
4.00	240			81.76	20.44
6.00	360	91.80	15.3	89.49	14.91
12.00	720	102.00	8.5	103.89	8.66
18.00	1080			113.16	6.29
24.00	1440	117.60	4.9	120.17	5.01

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CHICAGO HYETOGRAPH CREATION

DATE: June 10, 2021
JOB No.: SBM-17-2126

Client: Craigholme Estates Ltd.
Project: Proposed Subdivision Development - Belmont Phase 6
Location: Belmont, Ontario

ST THOMAS WPCP CHICAGO RAINFALL DISTRIBUTION PARAMETERS*

Return Period (years)	A,B,C Parameters A	B	C
2	737.970	7.382	0.8035
5	1009.820	7.472	0.8055
10	1178.220	7.382	0.8049
25	1398.350	7.382	0.8048
50	1497.170	6.876	0.7978
100	1634.380	6.798	0.7954

*Intensity i=A/(t+B)^C (mm/hr)

Starting Time= 0:00
Time Step= 0:01
r= 0.38 MTO DMM Section 8, Page 14
t_d= 1
t_d * r= 0.38
t_d * (1-r)= 0.62
i_p= 133.70 peak rainfall intensity, mm/h
t_b= 68.4 time before the peak intensity, min
t_a= 111.6 time after the peak intensity, min

$$i_p = \frac{A}{(\Delta t + B)^c} = \text{peak rainfall intensity}$$

Before the peak:

$$i_b = \frac{A[((1-c)t_b/r) + B]}{[t_b/r + B]^{1+c}}$$

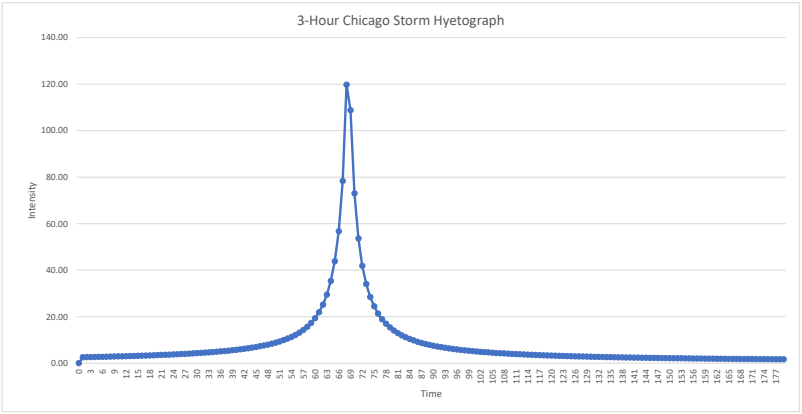
After the peak:

$$i_a = \frac{A[((1-c)t_a/(1-r)) + B]}{[t_a/(1-r) + B]^{1+c}}$$

Return Period (Years)	A,B,C Parameters A	B	C
2	737.970	7.382	0.804

2-Year Hyetograph

t_b OR t_a	Time (min)	Time (h:m)	Intensity
68.40	0	0:00	0.00
67.40	1	0:01	2.55
66.40	2	0:02	2.58
65.40	3	0:03	2.62
64.40	4	0:04	2.65
63.40	5	0:05	2.69
62.40	6	0:06	2.73
61.40	7	0:07	2.77
60.40	8	0:08	2.81
59.40	9	0:09	2.86
58.40	10	0:10	2.90
57.40	11	0:11	2.95
56.40	12	0:12	3.00
55.40	13	0:13	3.05
54.40	14	0:14	3.10
53.40	15	0:15	3.15
52.40	16	0:16	3.21
51.40	17	0:17	3.26
50.40	18	0:18	3.32
49.40	19	0:19	3.39
48.40	20	0:20	3.45
47.40	21	0:21	3.52
46.40	22	0:22	3.59
45.40	23	0:23	3.67
44.40	24	0:24	3.74
43.40	25	0:25	3.82
42.40	26	0:26	3.91
41.40	27	0:27	4.00
40.40	28	0:28	4.09
39.40	29	0:29	4.19
38.40	30	0:30	4.29
37.40	31	0:31	4.40
36.40	32	0:32	4.52
35.40	33	0:33	4.64
34.40	34	0:34	4.77
33.40	35	0:35	4.91
32.40	36	0:36	5.05
31.40	37	0:37	5.21
30.40	38	0:38	5.37
29.40	39	0:39	5.55
28.40	40	0:40	5.74
27.40	41	0:41	5.95
26.40	42	0:42	6.17
25.40	43	0:43	6.41
24.40	44	0:44	6.67
23.40	45	0:45	6.95
22.40	46	0:46	7.25
21.40	47	0:47	7.59
20.40	48	0:48	7.96
19.40	49	0:49	8.37
18.40	50	0:50	8.83
17.40	51	0:51	9.33
16.40	52	0:52	9.91
15.40	53	0:53	10.55
14.40	54	0:54	11.29
13.40	55	0:55	12.14
12.40	56	0:56	13.13
11.40	57	0:57	14.28
10.40	58	0:58	15.66
9.40	59	0:59	17.32
8.40	60	1:00	19.35
7.40	61	1:01	21.89
6.40	62	1:02	25.15



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5.40	63	1:03	29.45
4.40	64	1:04	35.34
3.40	65	1:05	43.79
2.40	66	1:06	56.72
1.40	67	1:07	78.34
0.40	68	1:08	119.69
0.60	69	1:09	108.77
1.60	70	1:10	72.96
2.60	71	1:11	53.63
3.60	72	1:12	41.83
4.60	73	1:13	34.00
5.60	74	1:14	28.49
6.60	75	1:15	24.43
7.60	76	1:16	21.34
8.60	77	1:17	18.91
9.60	78	1:18	16.96
10.60	79	1:19	15.36
11.60	80	1:20	14.04
12.60	81	1:21	12.92
13.60	82	1:22	11.96
14.60	83	1:23	11.14
15.60	84	1:24	10.42
16.60	85	1:25	9.79
17.60	86	1:26	9.23
18.60	87	1:27	8.73
19.60	88	1:28	8.28
20.60	89	1:29	7.88
21.60	90	1:30	7.52
22.60	91	1:31	7.19
23.60	92	1:32	6.89
24.60	93	1:33	6.61
25.60	94	1:34	6.36
26.60	95	1:35	6.12
27.60	96	1:36	5.91
28.60	97	1:37	5.70
29.60	98	1:38	5.52
30.60	99	1:39	5.34
31.60	100	1:40	5.18
32.60	101	1:41	5.02
33.60	102	1:42	4.88
34.60	103	1:43	4.74
35.60	104	1:44	4.62
36.60	105	1:45	4.49
37.60	106	1:46	4.38
38.60	107	1:47	4.27
39.60	108	1:48	4.17
40.60	109	1:49	4.07
41.60	110	1:50	3.98
42.60	111	1:51	3.89
43.60	112	1:52	3.81
44.60	113	1:53	3.73
45.60	114	1:54	3.65
46.60	115	1:55	3.58
47.60	116	1:56	3.51
48.60	117	1:57	3.44
49.60	118	1:58	3.37
50.60	119	1:59	3.31
51.60	120	2:00	3.25
52.60	121	2:01	3.20
53.60	122	2:02	3.14
54.60	123	2:03	3.09
55.60	124	2:04	3.04
56.60	125	2:05	2.99
57.60	126	2:06	2.94
58.60	127	2:07	2.89
59.60	128	2:08	2.85
60.60	129	2:09	2.81
61.60	130	2:10	2.76
62.60	131	2:11	2.72
63.60	132	2:12	2.68
64.60	133	2:13	2.65
65.60	134	2:14	2.61
66.60	135	2:15	2.57
67.60	136	2:16	2.54
68.60	137	2:17	2.51
69.60	138	2:18	2.47
70.60	139	2:19	2.44
71.60	140	2:20	2.41
72.60	141	2:21	2.38
73.60	142	2:22	2.35
74.60	143	2:23	2.32
75.60	144	2:24	2.30
76.60	145	2:25	2.27
77.60	146	2:26	2.24
78.60	147	2:27	2.22
79.60	148	2:28	2.19
80.60	149	2:29	2.17
81.60	150	2:30	2.14
82.60	151	2:31	2.12
83.60	152	2:32	2.10
84.60	153	2:33	2.08
85.60	154	2:34	2.05
86.60	155	2:35	2.03
87.60	156	2:36	2.01
88.60	157	2:37	1.99
89.60	158	2:38	1.97
90.60	159	2:39	1.95
91.60	160	2:40	1.93
92.60	161	2:41	1.92
93.60	162	2:42	1.90
94.60	163	2:43	1.88
95.60	164	2:44	1.86
96.60	165	2:45	1.85
97.60	166	2:46	1.83
98.60	167	2:47	1.81
99.60	168	2:48	1.80

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100.60	169	2:49	1.78
101.60	170	2:50	1.77
102.60	171	2:51	1.75
103.60	172	2:52	1.74
104.60	173	2:53	1.72
105.60	174	2:54	1.71
106.60	175	2:55	1.69
107.60	176	2:56	1.68
108.60	177	2:57	1.67
109.60	178	2:58	1.65
110.60	179	2:59	1.64
111.60	180	3:00	1.63

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CHICAGO HYETOGRAPH CREATION

DATE: June 10, 2021
JOB No.: SBM-17-2126

Client: Craigholme Estates Ltd.
Project: Proposed Subdivision Development - Belmont Phase 6
Location: Belmont, Ontario

ST THOMAS WPCP CHICAGO RAINFALL DISTRIBUTION PARAMETERS*

Return Period (years)	A,B,C Parameters A	B	C
2	737.970	7.382	0.8035
5	1009.820	7.472	0.8055
10	1178.220	7.382	0.8049
25	1398.350	7.382	0.8048
50	1497.170	6.876	0.7978
100	1634.380	6.798	0.7954

*Intensity i=A/(t+B)^C (mm/hr)

Starting Time= 0:00
Time Step= 0:01
r= 0.38 MTO DMM Section 8, Page 14
t_d= 1
t_d * r= 0.38
t_d * (1-r)= 0.62
i_p= 133.70 peak rainfall intensity, mm/h
t_b= 68.4 time before the peak intensity, min
t_a= 111.6 time after the peak intensity, min

$$i_p = \frac{A}{(\Delta t + B)^c} = \text{peak rainfall intensity}$$

$$i_a = A[((1-c)t_a/r) + B]$$

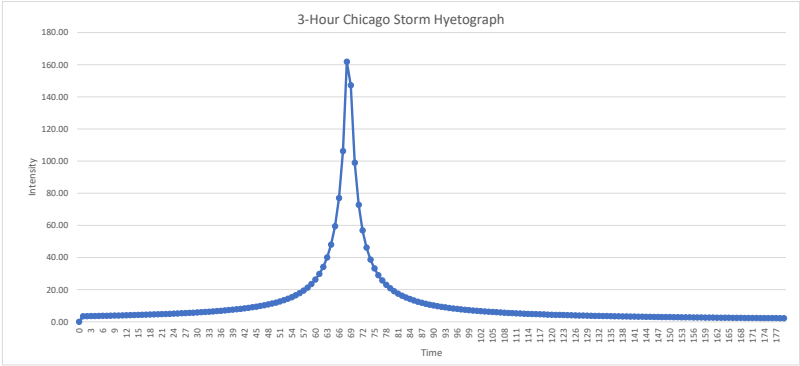
After the peak:

$$i_a = \frac{A[((1-c)t_a/(1-r)) + B]}{[t_a/(1-r) + B]^{1+c}}$$

Return Period (Years)	A,B,C Parameters A	B	C
5	1009.820	7.472	0.806

5-Year Hyetograph

t_b OR t_a	Time (min)	Time (h:m)	Intensity
68.40	0	0:00	0.00
67.40	1	0:01	3.42
66.40	2	0:02	3.47
65.40	3	0:03	3.52
64.40	4	0:04	3.57
63.40	5	0:05	3.62
62.40	6	0:06	3.67
61.40	7	0:07	3.73
60.40	8	0:08	3.78
59.40	9	0:09	3.84
58.40	10	0:10	3.90
57.40	11	0:11	3.97
56.40	12	0:12	4.03
55.40	13	0:13	4.10
54.40	14	0:14	4.17
53.40	15	0:15	4.24
52.40	16	0:16	4.32
51.40	17	0:17	4.39
50.40	18	0:18	4.48
49.40	19	0:19	4.56
48.40	20	0:20	4.65
47.40	21	0:21	4.74
46.40	22	0:22	4.84
45.40	23	0:23	4.94
44.40	24	0:24	5.04
43.40	25	0:25	5.15
42.40	26	0:26	5.27
41.40	27	0:27	5.39
40.40	28	0:28	5.51
39.40	29	0:29	5.65
38.40	30	0:30	5.79
37.40	31	0:31	5.94
36.40	32	0:32	6.09
35.40	33	0:33	6.26
34.40	34	0:34	6.43
33.40	35	0:35	6.62
32.40	36	0:36	6.82
31.40	37	0:37	7.03
30.40	38	0:38	7.25
29.40	39	0:39	7.49
28.40	40	0:40	7.75
27.40	41	0:41	8.03
26.40	42	0:42	8.33
25.40	43	0:43	8.65
24.40	44	0:44	9.00
23.40	45	0:45	9.39
22.40	46	0:46	9.80
21.40	47	0:47	10.26
20.40	48	0:48	10.76
19.40	49	0:49	11.32
18.40	50	0:50	11.94
17.40	51	0:51	12.63
16.40	52	0:52	13.41
15.40	53	0:53	14.29
14.40	54	0:54	15.29
13.40	55	0:55	16.45
12.40	56	0:56	17.79
11.40	57	0:57	19.36
10.40	58	0:58	21.24
9.40	59	0:59	23.49
8.40	60	1:00	26.26
7.40	61	1:01	29.72
6.40	62	1:02	34.15



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5.40	63	1:03	40.00
4.40	64	1:04	48.00
3.40	65	1:05	59.47
2.40	66	1:06	76.99
1.40	67	1:07	106.21
0.40	68	1:08	161.84
0.60	69	1:09	147.18
1.60	70	1:10	98.95
2.60	71	1:11	72.80
3.60	72	1:12	56.80
4.60	73	1:13	46.17
5.60	74	1:14	38.68
6.60	75	1:15	33.17
7.60	76	1:16	28.96
8.60	77	1:17	25.66
9.60	78	1:18	23.00
10.60	79	1:19	20.83
11.60	80	1:20	19.03
12.60	81	1:21	17.50
13.60	82	1:22	16.20
14.60	83	1:23	15.08
15.60	84	1:24	14.10
16.60	85	1:25	13.25
17.60	86	1:26	12.49
18.60	87	1:27	11.81
19.60	88	1:28	11.21
20.60	89	1:29	10.66
21.60	90	1:30	10.17
22.60	91	1:31	9.72
23.60	92	1:32	9.31
24.60	93	1:33	8.93
25.60	94	1:34	8.59
26.60	95	1:35	8.27
27.60	96	1:36	7.97
28.60	97	1:37	7.70
29.60	98	1:38	7.44
30.60	99	1:39	7.21
31.60	100	1:40	6.98
32.60	101	1:41	6.78
33.60	102	1:42	6.58
34.60	103	1:43	6.40
35.60	104	1:44	6.22
36.60	105	1:45	6.06
37.60	106	1:46	5.91
38.60	107	1:47	5.76
39.60	108	1:48	5.62
40.60	109	1:49	5.49
41.60	110	1:50	5.36
42.60	111	1:51	5.24
43.60	112	1:52	5.13
44.60	113	1:53	5.02
45.60	114	1:54	4.92
46.60	115	1:55	4.82
47.60	116	1:56	4.72
48.60	117	1:57	4.63
49.60	118	1:58	4.54
50.60	119	1:59	4.46
51.60	120	2:00	4.38
52.60	121	2:01	4.30
53.60	122	2:02	4.23
54.60	123	2:03	4.15
55.60	124	2:04	4.09
56.60	125	2:05	4.02
57.60	126	2:06	3.95
58.60	127	2:07	3.89
59.60	128	2:08	3.83
60.60	129	2:09	3.77
61.60	130	2:10	3.72
62.60	131	2:11	3.66
63.60	132	2:12	3.61
64.60	133	2:13	3.56
65.60	134	2:14	3.51
66.60	135	2:15	3.46
67.60	136	2:16	3.41
68.60	137	2:17	3.37
69.60	138	2:18	3.33
70.60	139	2:19	3.28
71.60	140	2:20	3.24
72.60	141	2:21	3.20
73.60	142	2:22	3.16
74.60	143	2:23	3.12
75.60	144	2:24	3.09
76.60	145	2:25	3.05
77.60	146	2:26	3.01
78.60	147	2:27	2.98
79.60	148	2:28	2.95
80.60	149	2:29	2.91
81.60	150	2:30	2.88
82.60	151	2:31	2.85
83.60	152	2:32	2.82
84.60	153	2:33	2.79
85.60	154	2:34	2.76
86.60	155	2:35	2.73
87.60	156	2:36	2.70
88.60	157	2:37	2.68
89.60	158	2:38	2.65
90.60	159	2:39	2.62
91.60	160	2:40	2.60
92.60	161	2:41	2.57
93.60	162	2:42	2.55
94.60	163	2:43	2.52
95.60	164	2:44	2.50
96.60	165	2:45	2.48
97.60	166	2:46	2.46
98.60	167	2:47	2.43
99.60	168	2:48	2.41

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100.60	169	2:49	2.39
101.60	170	2:50	2.37
102.60	171	2:51	2.35
103.60	172	2:52	2.33
104.60	173	2:53	2.31
105.60	174	2:54	2.29
106.60	175	2:55	2.27
107.60	176	2:56	2.25
108.60	177	2:57	2.24
109.60	178	2:58	2.22
110.60	179	2:59	2.20
111.60	180	3:00	2.18

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CHICAGO HYETOGRAPH CREATION

DATE: June 10, 2021
JOB No.: SBM-17-2126

Client: Craigholme Estates Ltd.
Project: Proposed Subdivision Development - Belmont Phase 6
Location: Belmont, Ontario

ST THOMAS WPCP CHICAGO RAINFALL DISTRIBUTION PARAMETERS*

Return Period (years)	A,B,C Parameters A	B	C
2	737.970	7.382	0.8035
5	1009.820	7.472	0.8055
10	1178.220	7.382	0.8049
25	1398.350	7.382	0.8048
50	1497.170	6.876	0.7978
100	1634.380	6.798	0.7954

*Intensity i=A/(t+B)^C (mm/hr)

Starting Time= 0:00
Time Step= 0:01
r= 0.38 MTO DMM Section 8, Page 14
t_d= 1
t_d * r= 0.38
t_d * (1-r)= 0.62
i_p= 133.70 peak rainfall intensity, mm/h
t_b= 68.4 time before the peak intensity, min
t_a= 111.6 time after the peak intensity, min

$$i_p = \frac{A}{(\Delta t + B)^c} = \text{peak rainfall intensity}$$

Before the peak:

$$i_b = \frac{A[((1-c)t_b/r) + B]}{[t_b/r + B]^{1+c}}$$

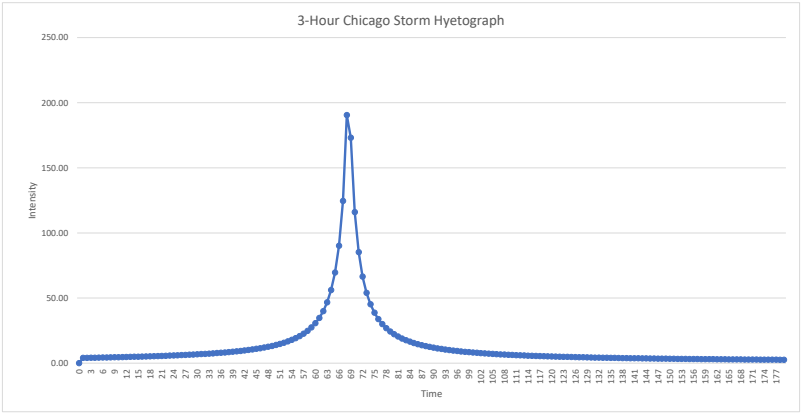
After the peak:

$$i_a = \frac{A[((1-c)t_a/(1-r)) + B]}{[t_a/(1-r) + B]^{1+c}}$$

Return Period (Years)	A,B,C Parameters A	B	C
10	1178.220	7.382	0.805

10-Year Hyetograph

t_b OR t_a	Time (min)	Time (h:m)	Intensity
68.40	0	0:00	0.00
67.40	1	0:01	4.01
66.40	2	0:02	4.07
65.40	3	0:03	4.12
64.40	4	0:04	4.18
63.40	5	0:05	4.24
62.40	6	0:06	4.30
61.40	7	0:07	4.37
60.40	8	0:08	4.43
59.40	9	0:09	4.50
58.40	10	0:10	4.57
57.40	11	0:11	4.65
56.40	12	0:12	4.72
55.40	13	0:13	4.80
54.40	14	0:14	4.88
53.40	15	0:15	4.97
52.40	16	0:16	5.06
51.40	17	0:17	5.15
50.40	18	0:18	5.24
49.40	19	0:19	5.34
48.40	20	0:20	5.44
47.40	21	0:21	5.55
46.40	22	0:22	5.66
45.40	23	0:23	5.78
44.40	24	0:24	5.90
43.40	25	0:25	6.03
42.40	26	0:26	6.17
41.40	27	0:27	6.31
40.40	28	0:28	6.45
39.40	29	0:29	6.61
38.40	30	0:30	6.77
37.40	31	0:31	6.95
36.40	32	0:32	7.13
35.40	33	0:33	7.32
34.40	34	0:34	7.53
33.40	35	0:35	7.75
32.40	36	0:36	7.98
31.40	37	0:37	8.22
30.40	38	0:38	8.49
29.40	39	0:39	8.77
28.40	40	0:40	9.07
27.40	41	0:41	9.39
26.40	42	0:42	9.74
25.40	43	0:43	10.12
24.40	44	0:44	10.53
23.40	45	0:45	10.98
22.40	46	0:46	11.46
21.40	47	0:47	12.00
20.40	48	0:48	12.58
19.40	49	0:49	13.23
18.40	50	0:50	13.96
17.40	51	0:51	14.76
16.40	52	0:52	15.67
15.40	53	0:53	16.70
14.40	54	0:54	17.87
13.40	55	0:55	19.22
12.40	56	0:56	20.78
11.40	57	0:57	22.62
10.40	58	0:58	24.80
9.40	59	0:59	27.44
8.40	60	1:00	30.67
7.40	61	1:01	34.71
6.40	62	1:02	39.89



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5.40	63	1:03	46.73
4.40	64	1:04	56.10
3.40	65	1:05	69.55
2.40	66	1:06	90.14
1.40	67	1:07	124.58
0.40	68	1:08	190.49
0.60	69	1:09	173.08
1.60	70	1:10	116.01
2.60	71	1:11	85.21
3.60	72	1:12	66.42
4.60	73	1:13	53.96
5.60	74	1:14	45.20
6.60	75	1:15	38.74
7.60	76	1:16	33.82
8.60	77	1:17	29.96
9.60	78	1:18	26.87
10.60	79	1:19	24.33
11.60	80	1:20	22.23
12.60	81	1:21	20.45
13.60	82	1:22	18.93
14.60	83	1:23	17.62
15.60	84	1:24	16.48
16.60	85	1:25	15.48
17.60	86	1:26	14.59
18.60	87	1:27	13.80
19.60	88	1:28	13.10
20.60	89	1:29	12.46
21.60	90	1:30	11.89
22.60	91	1:31	11.36
23.60	92	1:32	10.88
24.60	93	1:33	10.45
25.60	94	1:34	10.04
26.60	95	1:35	9.67
27.60	96	1:36	9.33
28.60	97	1:37	9.01
29.60	98	1:38	8.71
30.60	99	1:39	8.43
31.60	100	1:40	8.17
32.60	101	1:41	7.93
33.60	102	1:42	7.70
34.60	103	1:43	7.49
35.60	104	1:44	7.28
36.60	105	1:45	7.09
37.60	106	1:46	6.91
38.60	107	1:47	6.74
39.60	108	1:48	6.58
40.60	109	1:49	6.42
41.60	110	1:50	6.28
42.60	111	1:51	6.14
43.60	112	1:52	6.01
44.60	113	1:53	5.88
45.60	114	1:54	5.76
46.60	115	1:55	5.64
47.60	116	1:56	5.53
48.60	117	1:57	5.42
49.60	118	1:58	5.32
50.60	119	1:59	5.22
51.60	120	2:00	5.13
52.60	121	2:01	5.04
53.60	122	2:02	4.95
54.60	123	2:03	4.87
55.60	124	2:04	4.79
56.60	125	2:05	4.71
57.60	126	2:06	4.63
58.60	127	2:07	4.56
59.60	128	2:08	4.49
60.60	129	2:09	4.42
61.60	130	2:10	4.36
62.60	131	2:11	4.29
63.60	132	2:12	4.23
64.60	133	2:13	4.17
65.60	134	2:14	4.11
66.60	135	2:15	4.06
67.60	136	2:16	4.00
68.60	137	2:17	3.95
69.60	138	2:18	3.90
70.60	139	2:19	3.85
71.60	140	2:20	3.80
72.60	141	2:21	3.75
73.60	142	2:22	3.70
74.60	143	2:23	3.66
75.60	144	2:24	3.62
76.60	145	2:25	3.57
77.60	146	2:26	3.53
78.60	147	2:27	3.49
79.60	148	2:28	3.45
80.60	149	2:29	3.41
81.60	150	2:30	3.38
82.60	151	2:31	3.34
83.60	152	2:32	3.30
84.60	153	2:33	3.27
85.60	154	2:34	3.24
86.60	155	2:35	3.20
87.60	156	2:36	3.17
88.60	157	2:37	3.14
89.60	158	2:38	3.11
90.60	159	2:39	3.08
91.60	160	2:40	3.05
92.60	161	2:41	3.02
93.60	162	2:42	2.99
94.60	163	2:43	2.96
95.60	164	2:44	2.93
96.60	165	2:45	2.91
97.60	166	2:46	2.88
98.60	167	2:47	2.85
99.60	168	2:48	2.83

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100.60	169	2:49	2.80
101.60	170	2:50	2.78
102.60	171	2:51	2.76
103.60	172	2:52	2.73
104.60	173	2:53	2.71
105.60	174	2:54	2.69
106.60	175	2:55	2.67
107.60	176	2:56	2.64
108.60	177	2:57	2.62
109.60	178	2:58	2.60
110.60	179	2:59	2.58
111.60	180	3:00	2.56

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CHICAGO HYETOGRAPH CREATION

DATE: June 10, 2021
JOB No.: SBM-17-2126

Client: Craigholme Estates Ltd.
Project: Proposed Subdivision Development - Belmont Phase 6
Location: Belmont, Ontario

ST THOMAS WPCP CHICAGO RAINFALL DISTRIBUTION PARAMETERS*

Return Period (years)	A,B,C Parameters A	B	C
2	737.970	7.382	0.8035
5	1009.820	7.472	0.8055
10	1178.220	7.382	0.8049
25	1398.350	7.382	0.8048
50	1497.170	6.876	0.7978
100	1634.380	6.798	0.7954

*Intensity i=A/(t+B)^C (mm/hr)

$$i_p = \frac{A}{(\Delta t + B)^c} = \text{peak rainfall intensity}$$

$$i_a = A[(1-c)t_a/r) + B]$$

After the peak:

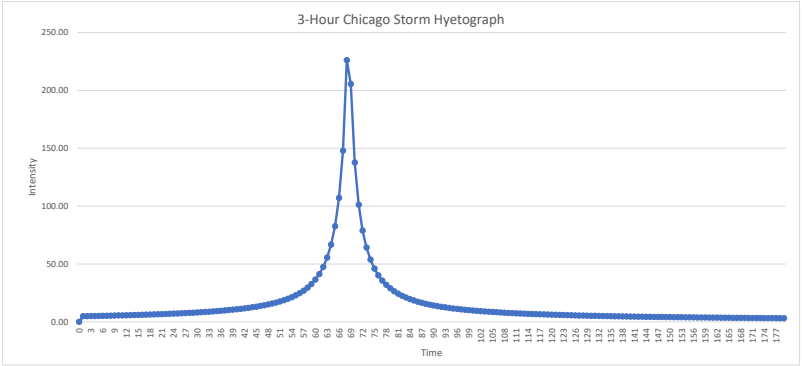
$$i_a = \frac{A[(1-c)t_a/(1-r)) + B]}{[t_a/(1-r) + B]^{1+c}}$$

Starting Time=	0:00	
Time Step=	0:01	
r=	0.38	MTO DMM Section 8, Page 14
t_d=	1	
t_d * r=	0.38	
t_d * (1-r)=	0.62	
i_p=	133.70	peak rainfall intensity, mm/h
t_b=	68.4	time before the peak intensity, min
t_a=	111.6	time after the peak intensity, min

Return Period (Years)	A,B,C Parameters A	B	C
25	1398.350	7.382	0.805

25-Year Hyetograph

t_b OR t_a	Time (min)	Time (h:m)	Intensity
68.40	0	0:00	0.00
67.40	1	0:01	4.77
66.40	2	0:02	4.83
65.40	3	0:03	4.90
64.40	4	0:04	4.97
63.40	5	0:05	5.04
62.40	6	0:06	5.11
61.40	7	0:07	5.19
60.40	8	0:08	5.27
59.40	9	0:09	5.35
58.40	10	0:10	5.43
57.40	11	0:11	5.52
56.40	12	0:12	5.61
55.40	13	0:13	5.70
54.40	14	0:14	5.80
53.40	15	0:15	5.90
52.40	16	0:16	6.01
51.40	17	0:17	6.11
50.40	18	0:18	6.23
49.40	19	0:19	6.34
48.40	20	0:20	6.47
47.40	21	0:21	6.59
46.40	22	0:22	6.73
45.40	23	0:23	6.87
44.40	24	0:24	7.01
43.40	25	0:25	7.16
42.40	26	0:26	7.32
41.40	27	0:27	7.49
40.40	28	0:28	7.67
39.40	29	0:29	7.85
38.40	30	0:30	8.05
37.40	31	0:31	8.25
36.40	32	0:32	8.47
35.40	33	0:33	8.70
34.40	34	0:34	8.94
33.40	35	0:35	9.20
32.40	36	0:36	9.47
31.40	37	0:37	9.77
30.40	38	0:38	10.08
29.40	39	0:39	10.41
28.40	40	0:40	10.77
27.40	41	0:41	11.16
26.40	42	0:42	11.57
25.40	43	0:43	12.02
24.40	44	0:44	12.51
23.40	45	0:45	13.04
22.40	46	0:46	13.61
21.40	47	0:47	14.25
20.40	48	0:48	14.95
19.40	49	0:49	15.72
18.40	50	0:50	16.57
17.40	51	0:51	17.53
16.40	52	0:52	18.61
15.40	53	0:53	19.83
14.40	54	0:54	21.22
13.40	55	0:55	22.82
12.40	56	0:56	24.68
11.40	57	0:57	26.86
10.40	58	0:58	29.45
9.40	59	0:59	32.58
8.40	60	1:00	36.42
7.40	61	1:01	41.22
6.40	62	1:02	47.37



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5.40	63	1:03	55.49
4.40	64	1:04	66.61
3.40	65	1:05	82.58
2.40	66	1:06	107.01
1.40	67	1:07	147.90
0.40	68	1:08	226.13
0.60	69	1:09	205.47
1.60	70	1:10	137.72
2.60	71	1:11	101.17
3.60	72	1:12	78.86
4.60	73	1:13	64.07
5.60	74	1:14	53.66
6.60	75	1:15	46.00
7.60	76	1:16	40.16
8.60	77	1:17	35.58
9.60	78	1:18	31.90
10.60	79	1:19	28.90
11.60	80	1:20	26.39
12.60	81	1:21	24.28
13.60	82	1:22	22.48
14.60	83	1:23	20.93
15.60	84	1:24	19.57
16.60	85	1:25	18.38
17.60	86	1:26	17.33
18.60	87	1:27	16.40
19.60	88	1:28	15.56
20.60	89	1:29	14.80
21.60	90	1:30	14.12
22.60	91	1:31	13.49
23.60	92	1:32	12.93
24.60	93	1:33	12.41
25.60	94	1:34	11.93
26.60	95	1:35	11.49
27.60	96	1:36	11.08
28.60	97	1:37	10.70
29.60	98	1:38	10.34
30.60	99	1:39	10.02
31.60	100	1:40	9.71
32.60	101	1:41	9.42
33.60	102	1:42	9.15
34.60	103	1:43	8.89
35.60	104	1:44	8.65
36.60	105	1:45	8.43
37.60	106	1:46	8.21
38.60	107	1:47	8.01
39.60	108	1:48	7.81
40.60	109	1:49	7.63
41.60	110	1:50	7.46
42.60	111	1:51	7.29
43.60	112	1:52	7.13
44.60	113	1:53	6.98
45.60	114	1:54	6.84
46.60	115	1:55	6.70
47.60	116	1:56	6.57
48.60	117	1:57	6.44
49.60	118	1:58	6.32
50.60	119	1:59	6.20
51.60	120	2:00	6.09
52.60	121	2:01	5.98
53.60	122	2:02	5.88
54.60	123	2:03	5.78
55.60	124	2:04	5.69
56.60	125	2:05	5.59
57.60	126	2:06	5.50
58.60	127	2:07	5.42
59.60	128	2:08	5.33
60.60	129	2:09	5.25
61.60	130	2:10	5.17
62.60	131	2:11	5.10
63.60	132	2:12	5.02
64.60	133	2:13	4.95
65.60	134	2:14	4.89
66.60	135	2:15	4.82
67.60	136	2:16	4.75
68.60	137	2:17	4.69
69.60	138	2:18	4.63
70.60	139	2:19	4.57
71.60	140	2:20	4.51
72.60	141	2:21	4.46
73.60	142	2:22	4.40
74.60	143	2:23	4.35
75.60	144	2:24	4.30
76.60	145	2:25	4.25
77.60	146	2:26	4.20
78.60	147	2:27	4.15
79.60	148	2:28	4.10
80.60	149	2:29	4.06
81.60	150	2:30	4.01
82.60	151	2:31	3.97
83.60	152	2:32	3.93
84.60	153	2:33	3.88
85.60	154	2:34	3.84
86.60	155	2:35	3.80
87.60	156	2:36	3.77
88.60	157	2:37	3.73
89.60	158	2:38	3.69
90.60	159	2:39	3.65
91.60	160	2:40	3.62
92.60	161	2:41	3.58
93.60	162	2:42	3.55
94.60	163	2:43	3.52
95.60	164	2:44	3.48
96.60	165	2:45	3.45
97.60	166	2:46	3.42
98.60	167	2:47	3.39
99.60	168	2:48	3.36

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100.60	169	2:49	3.33
101.60	170	2:50	3.30
102.60	171	2:51	3.27
103.60	172	2:52	3.25
104.60	173	2:53	3.22
105.60	174	2:54	3.19
106.60	175	2:55	3.17
107.60	176	2:56	3.14
108.60	177	2:57	3.11
109.60	178	2:58	3.09
110.60	179	2:59	3.07
111.60	180	3:00	3.04

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CHICAGO HYETOGRAPH CREATION

DATE: June 10, 2021
JOB No.: SBM-17-2126

Client: Craigholme Estates Ltd.
Project: Proposed Subdivision Development - Belmont Phase 6
Location: Belmont, Ontario

ST THOMAS WPCP CHICAGO RAINFALL DISTRIBUTION PARAMETERS*

Return Period (years)	A,B,C Parameters A	B	C
2	737.970	7.382	0.8035
5	1009.820	7.472	0.8055
10	1178.220	7.382	0.8049
25	1398.350	7.382	0.8048
50	1497.170	6.876	0.7978
100	1634.380	6.798	0.7954

*Intensity i=A/(t+B)^C (mm/hr)

Starting Time= 0:00
Time Step= 0:01
r= 0.38 MTO DMM Section 8, Page 14
t_d= 1
t_d * r= 0.38
t_d * (1-r)= 0.62
i_p= 133.70 peak rainfall intensity, mm/h
t_b= 68.4 time before the peak intensity, min
t_a= 111.6 time after the peak intensity, min

$$i_p = \frac{A}{(\Delta t + B)^c} = \text{peak rainfall intensity}$$

$$i_a = A[((1-c)t_a/r) + B]$$

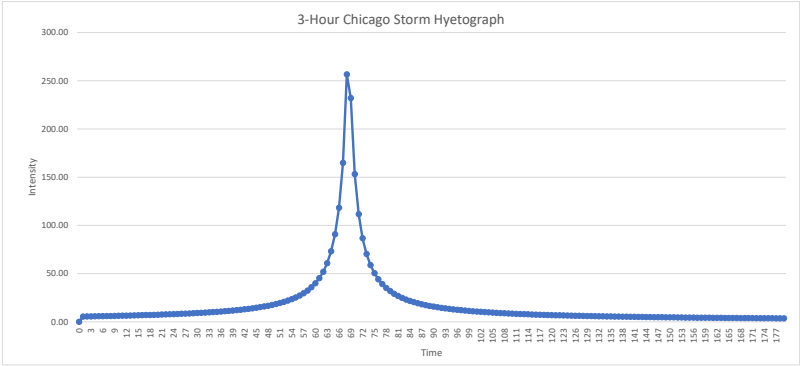
After the peak:

$$i_a = \frac{A[((1-c)t_a/(1-r)) + B]}{[t_a/(1-r) + B]^{1+c}}$$

Return Period (Years)	A,B,C Parameters A	B	C
50	1497.170	6.876	0.798

50-Year Hyetograph

t_b OR t_a	Time (min)	Time (h:m)	Intensity
68.40	0	0:00	0.00
67.40	1	0:01	5.41
66.40	2	0:02	5.48
65.40	3	0:03	5.56
64.40	4	0:04	5.64
63.40	5	0:05	5.72
62.40	6	0:06	5.80
61.40	7	0:07	5.88
60.40	8	0:08	5.97
59.40	9	0:09	6.06
58.40	10	0:10	6.15
57.40	11	0:11	6.25
56.40	12	0:12	6.35
55.40	13	0:13	6.46
54.40	14	0:14	6.56
53.40	15	0:15	6.67
52.40	16	0:16	6.79
51.40	17	0:17	6.91
50.40	18	0:18	7.04
49.40	19	0:19	7.17
48.40	20	0:20	7.30
47.40	21	0:21	7.44
46.40	22	0:22	7.59
45.40	23	0:23	7.74
44.40	24	0:24	7.90
43.40	25	0:25	8.07
42.40	26	0:26	8.25
41.40	27	0:27	8.43
40.40	28	0:28	8.63
39.40	29	0:29	8.83
38.40	30	0:30	9.04
37.40	31	0:31	9.27
36.40	32	0:32	9.51
35.40	33	0:33	9.76
34.40	34	0:34	10.03
33.40	35	0:35	10.31
32.40	36	0:36	10.61
31.40	37	0:37	10.94
30.40	38	0:38	11.28
29.40	39	0:39	11.64
28.40	40	0:40	12.04
27.40	41	0:41	12.46
26.40	42	0:42	12.91
25.40	43	0:43	13.40
24.40	44	0:44	13.93
23.40	45	0:45	14.51
22.40	46	0:46	15.14
21.40	47	0:47	15.83
20.40	48	0:48	16.60
19.40	49	0:49	17.44
18.40	50	0:50	18.37
17.40	51	0:51	19.41
16.40	52	0:52	20.58
15.40	53	0:53	21.91
14.40	54	0:54	23.42
13.40	55	0:55	25.16
12.40	56	0:56	27.18
11.40	57	0:57	29.55
10.40	58	0:58	32.37
9.40	59	0:59	35.77
8.40	60	1:00	39.95
7.40	61	1:01	45.18
6.40	62	1:02	51.90



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5.40	63	1:03	60.81
4.40	64	1:04	73.06
3.40	65	1:05	90.77
2.40	66	1:06	118.17
1.40	67	1:07	164.79
0.40	68	1:08	256.61
0.60	69	1:09	232.04
1.60	70	1:10	153.10
2.60	71	1:11	111.58
3.60	72	1:12	86.63
4.60	73	1:13	70.26
5.60	74	1:14	58.81
6.60	75	1:15	50.41
7.60	76	1:16	44.03
8.60	77	1:17	39.04
9.60	78	1:18	35.04
10.60	79	1:19	31.77
11.60	80	1:20	29.05
12.60	81	1:21	26.75
13.60	82	1:22	24.79
14.60	83	1:23	23.10
15.60	84	1:24	21.63
16.60	85	1:25	20.34
17.60	86	1:26	19.19
18.60	87	1:27	18.17
19.60	88	1:28	17.26
20.60	89	1:29	16.44
21.60	90	1:30	15.69
22.60	91	1:31	15.01
23.60	92	1:32	14.39
24.60	93	1:33	13.82
25.60	94	1:34	13.30
26.60	95	1:35	12.82
27.60	96	1:36	12.37
28.60	97	1:37	11.96
29.60	98	1:38	11.57
30.60	99	1:39	11.21
31.60	100	1:40	10.87
32.60	101	1:41	10.55
33.60	102	1:42	10.26
34.60	103	1:43	9.97
35.60	104	1:44	9.71
36.60	105	1:45	9.46
37.60	106	1:46	9.22
38.60	107	1:47	9.00
39.60	108	1:48	8.79
40.60	109	1:49	8.59
41.60	110	1:50	8.39
42.60	111	1:51	8.21
43.60	112	1:52	8.04
44.60	113	1:53	7.87
45.60	114	1:54	7.71
46.60	115	1:55	7.56
47.60	116	1:56	7.41
48.60	117	1:57	7.27
49.60	118	1:58	7.14
50.60	119	1:59	7.01
51.60	120	2:00	6.89
52.60	121	2:01	6.77
53.60	122	2:02	6.65
54.60	123	2:03	6.54
55.60	124	2:04	6.43
56.60	125	2:05	6.33
57.60	126	2:06	6.23
58.60	127	2:07	6.14
59.60	128	2:08	6.04
60.60	129	2:09	5.95
61.60	130	2:10	5.87
62.60	131	2:11	5.78
63.60	132	2:12	5.70
64.60	133	2:13	5.62
65.60	134	2:14	5.54
66.60	135	2:15	5.47
67.60	136	2:16	5.40
68.60	137	2:17	5.33
69.60	138	2:18	5.26
70.60	139	2:19	5.19
71.60	140	2:20	5.13
72.60	141	2:21	5.07
73.60	142	2:22	5.01
74.60	143	2:23	4.95
75.60	144	2:24	4.89
76.60	145	2:25	4.83
77.60	146	2:26	4.78
78.60	147	2:27	4.72
79.60	148	2:28	4.67
80.60	149	2:29	4.62
81.60	150	2:30	4.57
82.60	151	2:31	4.52
83.60	152	2:32	4.47
84.60	153	2:33	4.43
85.60	154	2:34	4.38
86.60	155	2:35	4.34
87.60	156	2:36	4.29
88.60	157	2:37	4.25
89.60	158	2:38	4.21
90.60	159	2:39	4.17
91.60	160	2:40	4.13
92.60	161	2:41	4.09
93.60	162	2:42	4.05
94.60	163	2:43	4.02
95.60	164	2:44	3.98
96.60	165	2:45	3.94
97.60	166	2:46	3.91
98.60	167	2:47	3.87
99.60	168	2:48	3.84

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100.60	169	2:49	3.81
101.60	170	2:50	3.77
102.60	171	2:51	3.74
103.60	172	2:52	3.71
104.60	173	2:53	3.68
105.60	174	2:54	3.65
106.60	175	2:55	3.62
107.60	176	2:56	3.59
108.60	177	2:57	3.56
109.60	178	2:58	3.54
110.60	179	2:59	3.51
111.60	180	3:00	3.48

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CHICAGO HYETOGRAPH CREATION

DATE: June 10, 2021
JOB No.: SBM-17-2126

Client: Craigholme Estates Ltd.
Project: Proposed Subdivision Development - Belmont Phase 6
Location: Belmont, Ontario

ST THOMAS WPCP CHICAGO RAINFALL DISTRIBUTION PARAMETERS*

Return Period (years)	A,B,C Parameters A	B	C
2	737.970	7.382	0.8035
5	1009.820	7.472	0.8055
10	1178.220	7.382	0.8049
25	1398.350	7.382	0.8048
50	1497.170	6.876	0.7978
100	1634.380	6.798	0.7954

*Intensity i=A/(t+B)^C (mm/hr)

Starting Time= 0:00
Time Step= 0:01
r= 0.38 MTO DMM Section 8, Page 14
t_d= 1
t_d * r= 0.38
t_d * (1-r)= 0.62
i_p= 133.70 peak rainfall intensity, mm/h
t_b= 68.4 time before the peak intensity, min
t_a= 111.6 time after the peak intensity, min

$$i_p = \frac{A}{(\Delta t + B)^c} = \text{peak rainfall intensity}$$

$$i_a = A[((1-c)t_a/r) + B]$$

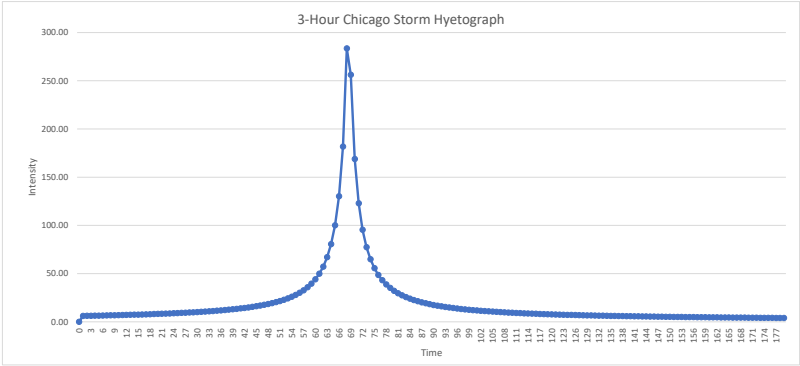
After the peak:

$$i_a = \frac{A[((1-c)t_a/(1-r)) + B]}{[t_a/(1-r) + B]^{1+c}}$$

Return Period (Years)	A,B,C Parameters A	B	C
100	1634.380	6.798	0.795

100-Year Hyetograph

t_b OR t_a	Time (min)	Time (h:m)	Intensity
68.40	0	0:00	0.00
67.40	1	0:01	6.04
66.40	2	0:02	6.12
65.40	3	0:03	6.20
64.40	4	0:04	6.29
63.40	5	0:05	6.37
62.40	6	0:06	6.46
61.40	7	0:07	6.56
60.40	8	0:08	6.66
59.40	9	0:09	6.76
58.40	10	0:10	6.86
57.40	11	0:11	6.97
56.40	12	0:12	7.08
55.40	13	0:13	7.19
54.40	14	0:14	7.31
53.40	15	0:15	7.43
52.40	16	0:16	7.56
51.40	17	0:17	7.70
50.40	18	0:18	7.83
49.40	19	0:19	7.98
48.40	20	0:20	8.13
47.40	21	0:21	8.28
46.40	22	0:22	8.45
45.40	23	0:23	8.62
44.40	24	0:24	8.80
43.40	25	0:25	8.98
42.40	26	0:26	9.18
41.40	27	0:27	9.38
40.40	28	0:28	9.60
39.40	29	0:29	9.82
38.40	30	0:30	10.06
37.40	31	0:31	10.31
36.40	32	0:32	10.57
35.40	33	0:33	10.85
34.40	34	0:34	11.15
33.40	35	0:35	11.46
32.40	36	0:36	11.79
31.40	37	0:37	12.15
30.40	38	0:38	12.53
29.40	39	0:39	12.93
28.40	40	0:40	13.36
27.40	41	0:41	13.83
26.40	42	0:42	14.33
25.40	43	0:43	14.87
24.40	44	0:44	15.46
23.40	45	0:45	16.10
22.40	46	0:46	16.79
21.40	47	0:47	17.55
20.40	48	0:48	18.39
19.40	49	0:49	19.32
18.40	50	0:50	20.34
17.40	51	0:51	21.49
16.40	52	0:52	22.78
15.40	53	0:53	24.24
14.40	54	0:54	25.91
13.40	55	0:55	27.82
12.40	56	0:56	30.04
11.40	57	0:57	32.65
10.40	58	0:58	35.75
9.40	59	0:59	39.49
8.40	60	1:00	44.08
7.40	61	1:01	49.83
6.40	62	1:02	57.22



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5.40	63	1:03	67.01
4.40	64	1:04	80.48
3.40	65	1:05	99.98
2.40	66	1:06	130.18
1.40	67	1:07	181.67
0.40	68	1:08	283.51
0.60	69	1:09	256.21
1.60	70	1:10	168.75
2.60	71	1:11	122.91
3.60	72	1:12	95.43
4.60	73	1:13	77.40
5.60	74	1:14	64.81
6.60	75	1:15	55.58
7.60	76	1:16	48.57
8.60	77	1:17	43.08
9.60	78	1:18	38.68
10.60	79	1:19	35.08
11.60	80	1:20	32.09
12.60	81	1:21	29.57
13.60	82	1:22	27.42
14.60	83	1:23	25.56
15.60	84	1:24	23.94
16.60	85	1:25	22.51
17.60	86	1:26	21.25
18.60	87	1:27	20.13
19.60	88	1:28	19.12
20.60	89	1:29	18.22
21.60	90	1:30	17.39
22.60	91	1:31	16.65
23.60	92	1:32	15.96
24.60	93	1:33	15.34
25.60	94	1:34	14.76
26.60	95	1:35	14.23
27.60	96	1:36	13.73
28.60	97	1:37	13.27
29.60	98	1:38	12.85
30.60	99	1:39	12.45
31.60	100	1:40	12.07
32.60	101	1:41	11.73
33.60	102	1:42	11.40
34.60	103	1:43	11.09
35.60	104	1:44	10.79
36.60	105	1:45	10.52
37.60	106	1:46	10.26
38.60	107	1:47	10.01
39.60	108	1:48	9.78
40.60	109	1:49	9.55
41.60	110	1:50	9.34
42.60	111	1:51	9.14
43.60	112	1:52	8.94
44.60	113	1:53	8.76
45.60	114	1:54	8.58
46.60	115	1:55	8.41
47.60	116	1:56	8.25
48.60	117	1:57	8.10
49.60	118	1:58	7.95
50.60	119	1:59	7.81
51.60	120	2:00	7.67
52.60	121	2:01	7.54
53.60	122	2:02	7.41
54.60	123	2:03	7.29
55.60	124	2:04	7.17
56.60	125	2:05	7.05
57.60	126	2:06	6.94
58.60	127	2:07	6.84
59.60	128	2:08	6.74
60.60	129	2:09	6.64
61.60	130	2:10	6.54
62.60	131	2:11	6.45
63.60	132	2:12	6.36
64.60	133	2:13	6.27
65.60	134	2:14	6.18
66.60	135	2:15	6.10
67.60	136	2:16	6.02
68.60	137	2:17	5.94
69.60	138	2:18	5.87
70.60	139	2:19	5.79
71.60	140	2:20	5.72
72.60	141	2:21	5.65
73.60	142	2:22	5.58
74.60	143	2:23	5.52
75.60	144	2:24	5.45
76.60	145	2:25	5.39
77.60	146	2:26	5.33
78.60	147	2:27	5.27
79.60	148	2:28	5.21
80.60	149	2:29	5.16
81.60	150	2:30	5.10
82.60	151	2:31	5.05
83.60	152	2:32	4.99
84.60	153	2:33	4.94
85.60	154	2:34	4.89
86.60	155	2:35	4.84
87.60	156	2:36	4.79
88.60	157	2:37	4.75
89.60	158	2:38	4.70
90.60	159	2:39	4.66
91.60	160	2:40	4.61
92.60	161	2:41	4.57
93.60	162	2:42	4.53
94.60	163	2:43	4.49
95.60	164	2:44	4.44
96.60	165	2:45	4.40
97.60	166	2:46	4.37
98.60	167	2:47	4.33
99.60	168	2:48	4.29

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100.60	169	2:49	4.25
101.60	170	2:50	4.22
102.60	171	2:51	4.18
103.60	172	2:52	4.15
104.60	173	2:53	4.11
105.60	174	2:54	4.08
106.60	175	2:55	4.05
107.60	176	2:56	4.01
108.60	177	2:57	3.98
109.60	178	2:58	3.95
110.60	179	2:59	3.92
111.60	180	3:00	3.89

APPENDIX D

Pre-development Catchment Areas
Pre-development Modelling Diagram
Pre-development Modelling Output Results

PRE DEVELOPMENT SWM CATCHMENT AREAS

PLAN SUBMISSION FORM
2041842

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(ROAD ALLOWANCE BETWEEN CONCESSIONS 6 AND 7) KNOWN AS SEVENTH AVENUE (WIDTH 20.117) P.I.N. 08195 – 0031

STREET LINE

N82°55'19"E (P1) N82°59'50"E (MEAS)

CENTRELINE OF ROAD, EDGE OF ASPHALT, TOP OF DITCH, BOTTOM OF DITCH

262.55 (P1 & MEAS)

296.250 (P1 & MEAS)

BLOCK 181 PLAN 33M-292 P.I.N. 08195 – 0083

LOT 7 P.I.N. 08195 – 0082
LOT 6 P.I.N. 08195 – 0084
LOT 5 P.I.N. 08195 – 0085
LOT 4 P.I.N. 08195 – 0086
LOT 3 P.I.N. 08195 – 0087
LOT 2 P.I.N. 08195 – 0088
LOT 1 P.I.N. 08195 – 0089
LOT 9 P.I.N. 08195 – 0090
LOT 8 P.I.N. 08195 – 0091

PLAN 33M-720

SNYDERS AVENUE

DIRT PILE

TREE LINE

IB(HR)

LOT 2

CONCESSION

(GEOGRAPHIC TOWNSHIP OF WESTMINSTER)

P.I.N. 08195 – 0031

PART 1, PLAN 33R-8653
P.I.N. 08195 – 0082

A101

LANDON LANE P.I.N. 08195 – 0078

BLOCK 175 PLAN 33M-292 P.I.N. 08195 – 0077

LOT 55 P.I.N. 08195 – 0057
LOT 54 P.I.N. 08195 – 0058
LOT 53 P.I.N. 08195 – 0059
LOT 52 P.I.N. 08195 – 0060
LOT 51 P.I.N. 08195 – 0061
LOT 50 P.I.N. 08195 – 0062
LOT 49 P.I.N. 08195 – 0063
LOT 48 P.I.N. 08195 – 0064
LOT 47 P.I.N. 08195 – 0065

BLOCK 170 P.I.N. 08195 – 0068

BLOCK 176 PLAN 33M-292 P.I.N. 08195 – 0076

LOT 46 P.I.N. 08195 – 0069
LOT 45 P.I.N. 08195 – 0070
LOT 44 P.I.N. 08195 – 0071
LOT 43 P.I.N. 08195 – 0072
LOT 42 P.I.N. 08195 – 0073

LIMIT OF PLAN 33M-111

LOT 1 P.I.N. 08195 – 0074
LOT 2 P.I.N. 08195 – 0075
LOT 3 P.I.N. 08195 – 0076
LOT 4 P.I.N. 08195 – 0077

KETTLE CREEK DRIVE

BLOCK 39 P.I.N. 08195 – 0078

LOT 5 P.I.N. 08195 – 0079
LOT 6

UNREP

WETLANDS

LIMIT BETWEEN NORTH

SIB(HR) 0.316 E 0.084 S

N83°09'15"E (P1) N83°09'15"E (MEAS)

300.784 (P1) 300.885 (MEAS)

SSIB(MTE) (ORP 2)

P.I.N. 08195 – 0068

HR File No : 95-0098Z

TOPOGRAPHIC PLAN OF SURVEY

OF PART OF
LOT 2
CONCESSION 7
(GEOGRAPHIC TOWNSHIP OF WESTMINSTER)
IN THE
MUNICIPALITY OF CENTRAL ELGIN
COUNTY OF ELGIN

MTE | OLS LTD.

SCALE 1 : 1000

10m 0m 20m 50m 100m
METRES

METRIC: DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048
AREAS SHOWN ON THIS PLAN ARE IN SQUARE METRES AND CAN BE CONVERTED TO SQUARE FEET BY MULTIPLYING BY 10.7639

BEARINGS ARE UTM GRID IN NAD83 (2010.0) DERIVED FROM G.P.S. OBSERVATIONS AND THE CAN-NET BASE STATION NETWORK AND ARE REFERRED TO THE CENTRAL MERIDIAN 81°00' WEST LONGITUDE, ZONE 17

OBSERVED REFERENCE POINTS (ORPs)
UTM ZONE 17, NAD83 (2010.0) GRID COORDINATES TO URBAN ACCURACY PER SEC. 14 (2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
ORP 1	4748236.447	491811.668
ORP 2	4747624.244	492226.788

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

DISTANCES SHOWN ON THIS PLAN ARE GROUND LEVEL DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.999569425

FH

SITE BENCH MARK ELEV=000.000 TOP OF SPIKE IN FIRE HYDRANT

NOTES

SIB	DENOTES	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
IB	"	IRON BAR
CC	"	CUT CROSS
WIT	"	WITNESS
(MTE)	"	MTE | OLS LTD., O.L.S.'s
(HR)	"	HOLSTEAD & REDMOND LIMITED, O.L.S.'s
■	"	MONUMENT FOUND
□	"	MONUMENT SET
P1	"	PLAN 33R-8653
P2	"	PLAN 33M-720
P3	"	PLAN 33M-689
P4	"	PLAN 33M-292
P5	"	PLAN 33M-UNDEP
OU	"	OVERHEAD UTILITY LINE
UP	"	UTILITY POLE
GW	"	GUY WIRE
CONC.	"	CONCRETE
FP	"	FENCE POST
BF	"	BOARD FENCE
CLF	"	CHAIN LINK FENCE
MH	"	MANHOLE
CB	"	CATCH BASIN
WV	"	WATER VALVE
FH	"	FIRE HYDRANT
STM	"	STORM
SAN	"	SANITARY
TFDN	"	TOP OF FOUNDATION ELEVATION
FF	"	FINISHED FLOOR ELEVATION

TRDEC 300 3000 — DECIDUOUS TREE (CALIPER mm CANOPY mm RADIUS)

TRCON 300 3000 — CONIFEROUS TREE (CALIPER mm CANOPY mm RADIUS)

SHR — SHRUB

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM GPS OBSERVATIONS

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

(1) THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT, AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.

(2) THE SURVEY WAS COMPLETED ON THE 1st DAY OF MARCH, 2018.

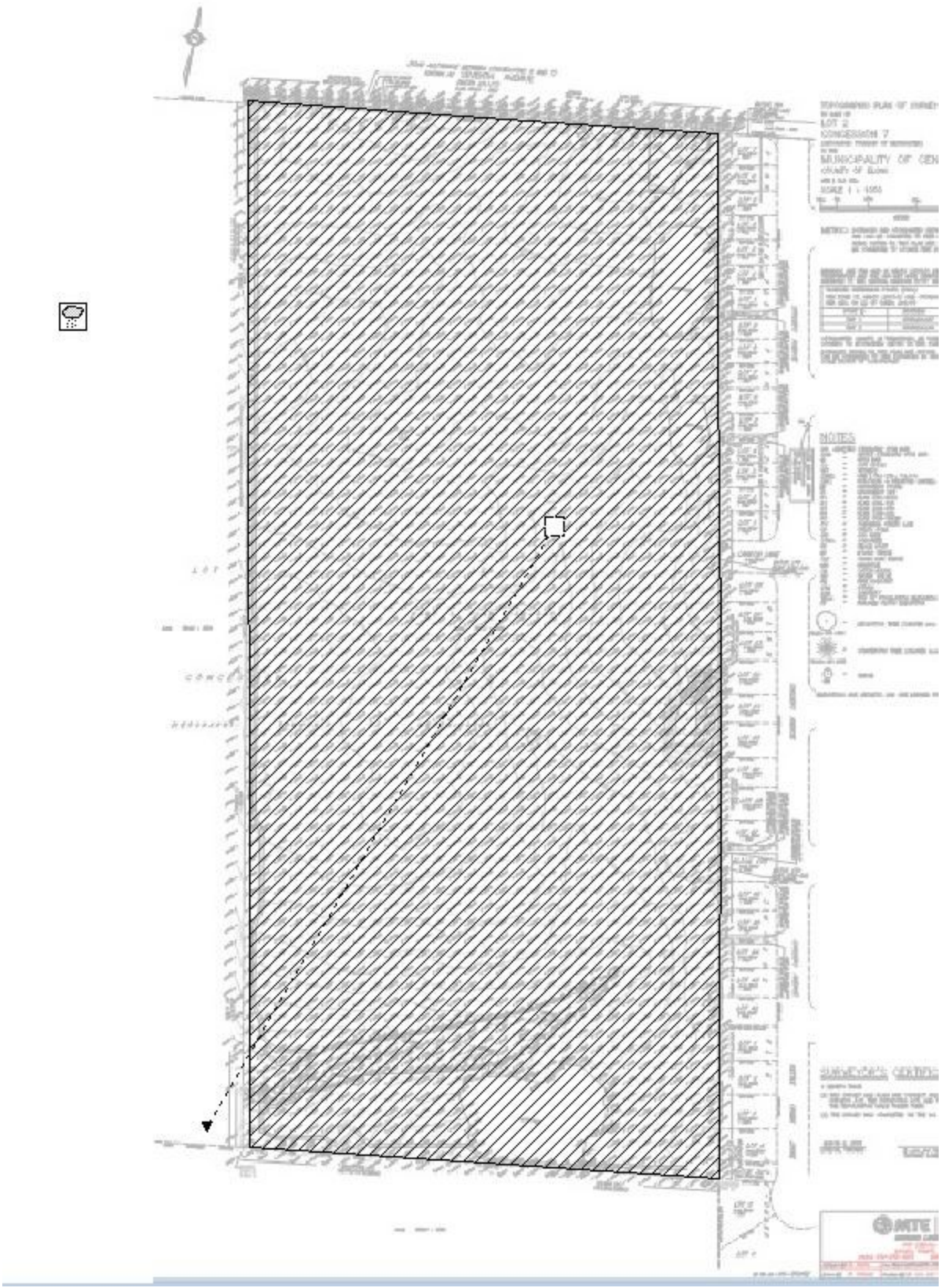
MARCH 9, 2018
LONDON, ONTARIO

B. van der Veen
ONTARIO LAND SURVEYOR

MTE | OLS Ltd.
ONTARIO LAND SURVEYORS
649 Colborne Street
London, Ontario, N6A 3Z2
phone 519-672-4551 toll free 1-800-265-4945

Surveyed By: N. Rebic	Cad File: S:\2018\43900-100\43900-100.DWG	Date : March 9, 2018
Drawn By: R. Crowell	Checked By: B. van der Veen, O.L.S.	File No : 43900-100

PRE-DEVELOPMENT MODELLING DIAGRAM



```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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 For 2 Year Pre-Development Storm Event
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Surcharge Method ......... EXTRAN
Starting Date ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.520        26.434
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.253        12.880
Surface Runoff ...........         0.027         1.385
Final Storage ............         0.239        12.177
Continuity Error (%) .....        -0.031


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.027         0.269
Groundwater Inflow .......         0.000         0.000
```

RDII Inflow	0.000
External Inflow	0.000
External Outflow	0.027
Flooding Loss	0.000
Evaporation Loss	0.000
Exfiltration Loss	0.000
Initial Stored Volume	0.000
Final Stored Volume	0.000
Continuity Error (%)	0.000

****
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
A100	26.43	0.00	0.00	12.88	0.00	1.38	1.38	0.27	0.05	0.052

Analysis begun on: Thu Jun 10 14:02:50 2021
Analysis ended on: Thu Jun 10 14:02:50 2021
Total elapsed time: < 1 sec

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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***********************************************************

****************
Analysis Options For 5 Year Pre-Development Storm Event
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Surcharge Method ......... EXTRAN
Starting Date ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.702        35.727
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.290        14.750
Surface Runoff ...........         0.077         3.895
Final Storage ............         0.336        17.102
Continuity Error (%) .....        -0.056


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.076         0.758
Groundwater Inflow .......         0.000         0.000
```

RDII Inflow	0.000
External Inflow	0.000
External Outflow	0.076
Flooding Loss	0.000
Evaporation Loss	0.000
Exfiltration Loss	0.000
Initial Stored Volume	0.000
Final Stored Volume	0.000
Continuity Error (%)	0.000

****
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
A100	35.73	0.00	0.00	14.75	0.00	3.90	3.90	0.77	0.13	0.109

Analysis begun on: Thu Jun 10 14:03:55 2021
Analysis ended on: Thu Jun 10 14:03:55 2021
Total elapsed time: < 1 sec

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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***********************************************************

****************
Analysis Options For 10 Year Pre-Development Storm Event
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Surcharge Method ......... EXTRAN
Starting Date ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.822        41.829
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.309        15.695
Surface Runoff ...........         0.119         6.058
Final Storage ............         0.395        20.105
Continuity Error (%) .....        -0.069


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.118         1.180
Groundwater Inflow .......         0.000         0.000
```

RDII Inflow	0.000
External Inflow	0.000
External Outflow	0.118
Flooding Loss	0.000
Evaporation Loss	0.000
Exfiltration Loss	0.000
Initial Stored Volume	0.000
Final Stored Volume	0.000
Continuity Error (%)	0.000

****
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
A100	41.83	0.00	0.00	15.70	0.00	6.06	6.06	1.19	0.20	0.145

Analysis begun on: Thu Jun 10 14:04:23 2021
Analysis ended on: Thu Jun 10 14:04:23 2021
Total elapsed time: < 1 sec

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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***********************************************************

****************
Analysis Options For 25 Year Pre-Development Storm Event
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Surcharge Method ......... EXTRAN
Starting Date ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.977        49.691
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.328        16.686
Surface Runoff ...........         0.183         9.332
Final Storage ............         0.466        23.714
Continuity Error (%) .....        -0.083


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.182         1.818
Groundwater Inflow .......         0.000         0.000
```

RDII Inflow	0.000
External Inflow	0.000
External Outflow	0.182
Flooding Loss	0.000
Evaporation Loss	0.000
Exfiltration Loss	0.000
Initial Stored Volume	0.000
Final Stored Volume	0.000
Continuity Error (%)	0.000

****
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
A100	49.69	0.00	0.00	16.69	0.00	9.33	9.33	1.83	0.30	0.188

Analysis begun on: Thu Jun 10 14:32:23 2021
Analysis ended on: Thu Jun 10 14:32:23 2021
Total elapsed time: < 1 sec

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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***********************************************************

****************
Analysis Options For 50 Year Pre-Development Storm Event
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Surcharge Method ......... EXTRAN
Starting Date ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         1.088        55.353
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.340        17.279
Surface Runoff ...........         0.235        11.942
Final Storage ............         0.515        26.182
Continuity Error (%) .....        -0.092


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.233         2.328
Groundwater Inflow .......         0.000         0.000
```

RDII Inflow	0.000
External Inflow	0.000
External Outflow	0.233
Flooding Loss	0.000
Evaporation Loss	0.000
Exfiltration Loss	0.000
Initial Stored Volume	0.000
Final Stored Volume	0.000
Continuity Error (%)	0.000

****
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
A100	55.35	0.00	0.00	17.28	0.00	11.94	11.94	2.35	0.39	0.216

Analysis begun on: Thu Jun 10 14:32:56 2021
Analysis ended on: Thu Jun 10 14:32:56 2021
Total elapsed time: < 1 sec

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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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 ........... NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Surcharge Method ......... EXTRAN
Starting Date ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         1.205        61.296
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.350        17.818
Surface Runoff ...........         0.293        14.920
Final Storage ............         0.563        28.619
Continuity Error (%) .....        -0.099


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.291         2.909
Groundwater Inflow .......         0.000         0.000
```

RDII Inflow	0.000
External Inflow	0.000
External Outflow	0.291
Flooding Loss	0.000
Evaporation Loss	0.000
Exfiltration Loss	0.000
Initial Stored Volume	0.000
Final Stored Volume	0.000
Continuity Error (%)	0.000

****
Subcatchment Runoff Summary
****

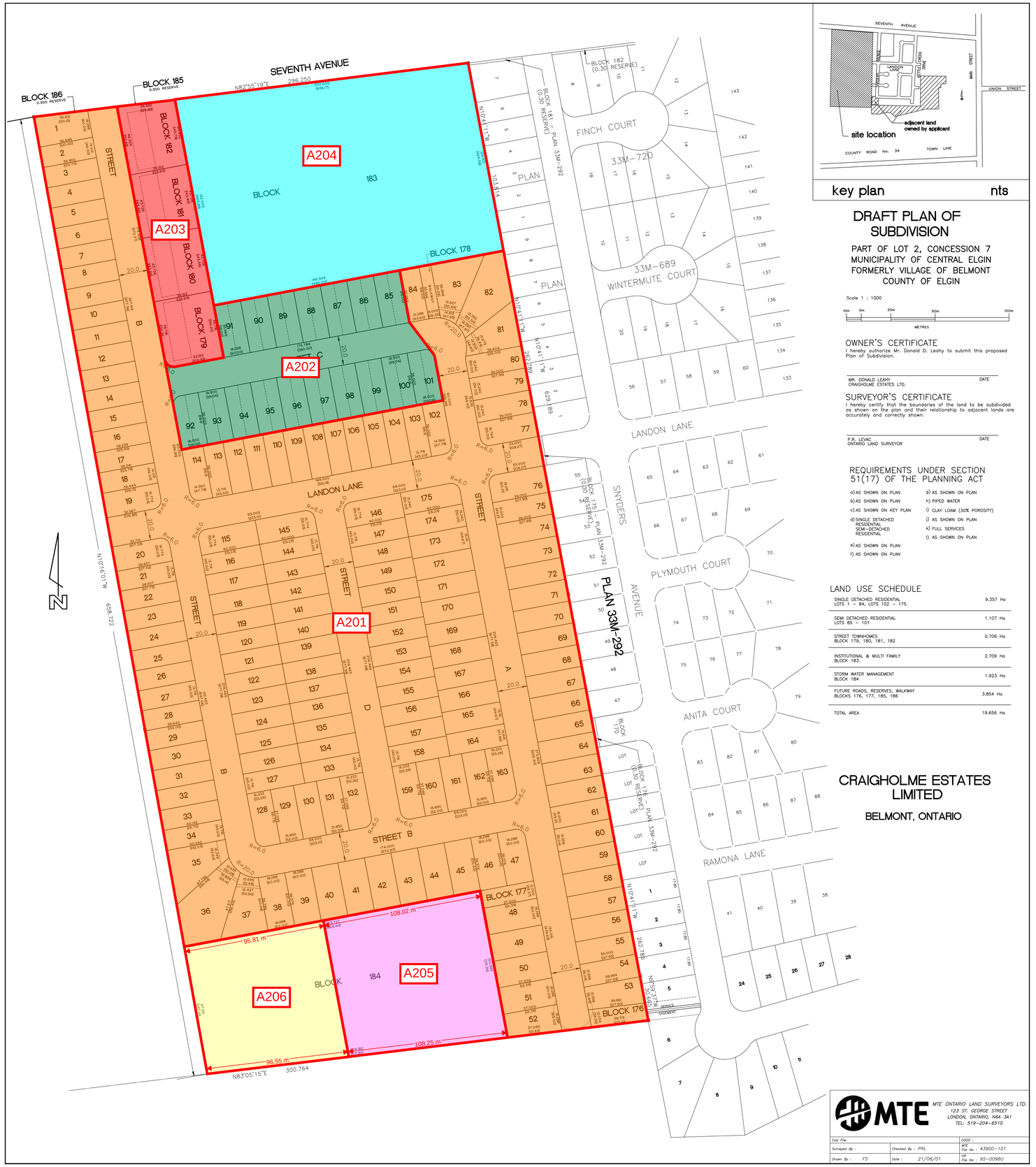
Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A100	61.30	0.00	0.00	17.82	0.00	14.92	14.92	2.93	0.49	0.243

Analysis begun on: Thu Jun 10 14:33:18 2021
Analysis ended on: Thu Jun 10 14:33:18 2021
Total elapsed time: < 1 sec

APPENDIX E

Post-development Catchment Areas
Post-development Modelling Diagram
Post-development Modelling Output Results

POST DEVELOPMENT SWM CATCHMENT AREAS



key plan nts

DRAFT PLAN OF SUBDIVISION

PART OF LOT 2, CONCESSION 7
MUNICIPALITY OF CENTRAL ELGIN
FORMERLY VILLAGE OF BELMONT
COUNTY OF ELGIN

Scale 1 : 1000

10m 0m 20m 50m 100m
METRES

OWNER'S CERTIFICATE

I hereby authorize Mr. Donald D. Leahy to submit this proposed Plan of Subdivision.

MR. DONALD LEAHY — DATE
CRAIGHOLME ESTATES LTD.

SURVEYOR'S CERTIFICATE

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

P.R. LEVAC — DATE
ONTARIO LAND SURVEYOR

REQUIREMENTS UNDER SECTION 51(17) OF THE PLANNING ACT

a) AS SHOWN ON PLAN
b) AS SHOWN ON PLAN
c) AS SHOWN ON KEY PLAN
d) SINGLE DETACHED RESIDENTIAL
SEMI-DETACHED RESIDENTIAL
e) AS SHOWN ON PLAN
f) AS SHOWN ON PLAN
g) AS SHOWN ON PLAN
h) PIPED WATER
i) CLAY LOAM (30% POROSITY)
j) AS SHOWN ON PLAN
k) FULL SERVICES
l) AS SHOWN ON PLAN

LAND USE SCHEDULE

SINGLE DETACHED RESIDENTIAL LOTS 1 – 84, LOTS 102 – 175	9.357 Ha
SEMI DETACHED RESIDENTIAL LOTS 85 – 101	1.107 Ha
STREET TOWNHOMES BLOCK 179, 180, 181, 182	0.706 Ha
INSTITUTIONAL & MULTI FAMILY BLOCK 183	2.709 Ha
STORM WATER MANAGEMENT BLOCK 184	1.923 Ha
FUTURE ROADS, RESERVES, WALKWAY BLOCKS 176, 177, 185, 186	3.854 Ha
TOTAL AREA	19.656 Ha

CRAIGHOLME ESTATES LIMITED

BELMONT, ONTARIO

MTE ONTARIO LAND SURVEYORS LTD.
123 ST. GEORGE STREET
LONDON, ONTARIO, N6A 3A1
TEL: 519-204-6510

Cad File:		CCDD :
Surveyed By :	Checked By : PRL	MTE File No : 43900-101
Drawn By : FS	Date : 21/06/01	MB File No : 95-0098U

POST-DEVELOPMENT MODELLING DIAGRAM

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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based on results found at every computational time step,
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***********************************************************

****************
Analysis Options For 2 Year Post-Development Storm Event
****************
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 ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
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 ........ 30.00 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 ......         0.653        33.245
Outfall Runon ............         0.029         1.477
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.149         7.602
Surface Runoff ...........         0.432        22.001
Final Storage ............         0.101         5.157
Continuity Error (%) .....        -0.109
```

```
**************************        Volume         Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.432          4.315
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........         0.000          0.000
External Outflow .........         0.050          0.505
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......         0.381          3.810
Continuity Error (%) .....         0.006


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


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :    29.50 sec
Average Time Step           :    29.92 sec
Maximum Time Step           :    30.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
   30.000 - 13.228 sec      :   100.00 %
   13.228 -  5.833 sec      :     0.00 %
    5.833 -  2.572 sec      :     0.00 %
    2.572 -  1.134 sec      :     0.00 %
    1.134 -  0.500 sec      :     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
A204	33.25	0.00	0.00	3.79	21.97	4.13	26.10	0.71	0.41	0.785
A203	33.25	0.00	0.00	3.79	22.48	4.76	27.23	0.19	0.15	0.819
A202	33.25	0.00	0.00	5.12	19.36	6.37	25.73	0.37	0.27	0.774
A201	33.25	9.89	0.00	6.64	20.42	11.35	31.76	4.09	2.00	0.736
A205	33.25	0.00	0.00	22.71	0.00	3.09	3.09	0.03	0.01	0.093
A206	33.25	26.98	0.00	22.71	0.00	19.80	19.80	0.21	0.05	0.329

****
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
WETLAND_OUTLET	OUTFALL	0.00	0.00	254.50	0 00:00	0.00
LOWER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
WEIR_OUTLET	OUTFALL	0.00	0.00	259.80	0 00:00	0.00
HIGHER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
SWM_POND	STORAGE	0.72	1.38	258.23	0 03:00	1.38

****
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

```
-------------------------------------------------------------------------------------------------
WETLAND_OUTLET       OUTFALL      0.049    0.049     0  03:00       0.211       0.211       0.000
LOWER_ORIFICE_OUTLET OUTFALL      0.000    0.047     0  03:00           0       0.294       0.000
WEIR_OUTLET          OUTFALL      0.000    0.000     0  00:00           0           0       0.000 ltr
HIGHER_ORIFICE_OUTLET OUTFALL      0.000    0.000     0  00:00           0           0       0.000 ltr
SWM_POND             STORAGE      2.004    2.004     0  01:05         4.1         4.1       0.006


**********************
Node Surcharge Summary
**********************

No nodes were surcharged.


**********************
Node Flooding Summary
**********************

No nodes were flooded.


**********************
Storage Volume Summary
**********************

-------------------------------------------------------------------------------------------------
                        Average     Avg  Evap Exfil       Maximum     Max    Time of Max    Maximum
                         Volume    Pcnt  Pcnt  Pcnt        Volume    Pcnt     Occurrence    Outflow
Storage Unit           1000 m3    Full  Loss  Loss       1000 m3    Full    days hr:min        CMS
-------------------------------------------------------------------------------------------------
SWM_POND                 1.893      17     0     0         3.811      34       0  03:00      0.047


************************
Outfall Loading Summary
************************

-----------------------------------------------------------
                        Flow       Avg       Max       Total
                        Freq      Flow      Flow      Volume
Outfall Node            Pcnt       CMS       CMS    10^6 ltr
-----------------------------------------------------------
WETLAND_OUTLET         61.22     0.032     0.049       0.211
LOWER_ORIFICE_OUTLET   89.20     0.030     0.047       0.294
WEIR_OUTLET             0.00     0.000     0.000       0.000
HIGHER_ORIFICE_OUTLET   0.00     0.000     0.000       0.000
-----------------------------------------------------------
System                 37.60     0.062     0.096       0.505
```

```
**********
Link Flow Summary
**********

-----------------------------------------------------------------------------
                              Maximum  Time of Max   Maximum    Max/    Max/
                              |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type        CMS  days hr:min     m/sec    Flow   Depth
-----------------------------------------------------------------------------
LOWER_ORIFICE        ORIFICE   0.047     0  03:00                     1.00
HIGHER_ORIFICE       ORIFICE   0.000     0  00:00                     0.00
WEIR                 WEIR      0.000     0  00:00                     0.00


**************************
Flow Classification Summary
**************************

-------------------------------------------------------------------------------------
                    Adjusted    ---------- Fraction of Time in Flow Class ----------
                     /Actual         Up    Down  Sub   Sup   Up    Down  Norm  Inlet
Conduit               Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd   Ctrl
-------------------------------------------------------------------------------------


************************
Conduit Surcharge Summary
************************

No conduits were surcharged.


Analysis begun on:  Thu Jun 10 13:47:15 2021
Analysis ended on:  Thu Jun 10 13:47:15 2021
Total elapsed time: < 1 sec
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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 For 5 Year Post-Development Storm Event
****************
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 ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
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 ........ 30.00 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 ......         0.884        44.958
Outfall Runon ............         0.062         3.130
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.171         8.708
Surface Runoff ...........         0.653        33.232
Final Storage ............         0.122         6.213
Continuity Error (%) .....        -0.133
```

```
**************************        Volume         Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.652          6.516
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........         0.000          0.000
External Outflow .........         0.111          1.113
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......         0.540          5.403
Continuity Error (%) .....         0.001


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


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :    29.50 sec
Average Time Step           :    29.92 sec
Maximum Time Step           :    30.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
   30.000 - 13.228 sec      :   100.00 %
   13.228 -  5.833 sec      :     0.00 %
    5.833 -  2.572 sec      :     0.00 %
    2.572 -  1.134 sec      :     0.00 %
    1.134 -  0.500 sec      :     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
A204	44.96	0.00	0.00	4.23	30.21	6.86	37.08	1.00	0.61	0.825
A203	44.96	0.00	0.00	4.23	30.81	7.61	38.42	0.27	0.22	0.855
A202	44.96	0.00	0.00	5.71	26.53	10.21	36.74	0.53	0.41	0.817
A201	44.96	14.05	0.00	7.41	28.29	18.08	46.36	5.96	3.01	0.786
A205	44.96	0.00	0.00	27.62	0.00	8.91	8.91	0.08	0.02	0.198
A206	44.96	57.18	0.00	27.62	0.00	45.86	45.86	0.49	0.14	0.449

****
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
WETLAND_OUTLET	OUTFALL	0.00	0.00	254.50	0 00:00	0.00
LOWER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
WEIR_OUTLET	OUTFALL	0.00	0.00	259.80	0 00:00	0.00
HIGHER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
SWM_POND	STORAGE	0.98	1.80	258.65	0 03:00	1.80

****
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

WETLAND_OUTLET	OUTFALL	0.138	0.138	0	03:00	0.487	0.487	0.000
LOWER_ORIFICE_OUTLET	OUTFALL	0.000	0.054	0	03:00	0	0.351	0.000
WEIR_OUTLET	OUTFALL	0.000	0.000	0	00:00	0	0	0.000 ltr
HIGHER_ORIFICE_OUTLET	OUTFALL	0.000	0.091	0	03:00	0	0.275	0.000
SWM_POND	STORAGE	3.006	3.006	0	01:05	6.03	6.03	0.001

****
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
SWM_POND	2.808	25	0	0	5.403	48	0 03:00	0.145

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
WETLAND_OUTLET	63.99	0.071	0.138	0.487
LOWER_ORIFICE_OUTLET	90.86	0.036	0.054	0.351
WEIR_OUTLET	0.00	0.000	0.000	0.000
HIGHER_ORIFICE_OUTLET	44.04	0.058	0.091	0.275
System	49.72	0.164	0.283	1.113

```
**********
Link Flow Summary
**********

-------------------------------------------------------------------------
                              Maximum  Time of Max   Maximum    Max/    Max/
                              |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type        CMS  days hr:min     m/sec    Flow   Depth
-------------------------------------------------------------------------
LOWER_ORIFICE        ORIFICE   0.054     0  03:00                     1.00
HIGHER_ORIFICE       ORIFICE   0.091     0  03:00                     1.00
WEIR                 WEIR      0.000     0  00:00                     0.00


**************************
Flow Classification Summary
**************************

-------------------------------------------------------------------------------------
                    Adjusted    ---------- Fraction of Time in Flow Class ----------
                     /Actual         Up    Down  Sub   Sup   Up    Down  Norm  Inlet
Conduit               Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd   Ctrl
-------------------------------------------------------------------------------------


************************
Conduit Surcharge Summary
************************

No conduits were surcharged.


Analysis begun on:  Thu Jun 10 13:47:53 2021
Analysis ended on:  Thu Jun 10 13:47:53 2021
Total elapsed time: < 1 sec
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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 For 10 Year Post-Development Storm Event
****************
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 ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
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 ........ 30.00 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 ......         1.037        52.756
Outfall Runon ............         0.094         4.796
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.183         9.285
Surface Runoff ...........         0.817        41.583
Final Storage ............         0.133         6.765
Continuity Error (%) .....        -0.140
```

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.815	8.153
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.177	1.767
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.639	6.387
Continuity Error (%)	0.000	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	29.50 sec
Average Time Step	:	29.92 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
30.000 - 13.228 sec	:	100.00 %
13.228 - 5.833 sec	:	0.00 %
5.833 - 2.572 sec	:	0.00 %
2.572 - 1.134 sec	:	0.00 %
1.134 - 0.500 sec	:	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
A204	52.76	0.00	0.00	4.45	35.70	8.78	44.48	1.20	0.75	0.843
A203	52.76	0.00	0.00	4.45	36.37	9.59	45.96	0.33	0.26	0.871
A202	52.76	0.00	0.00	6.00	31.31	12.88	44.19	0.64	0.50	0.838
A201	52.76	16.86	0.00	7.78	33.55	22.75	56.30	7.24	3.72	0.809
A205	52.76	0.00	0.00	30.38	0.00	13.45	13.45	0.11	0.02	0.255
A206	52.76	87.61	0.00	30.38	0.00	76.08	76.08	0.82	0.19	0.542

****
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
WETLAND_OUTLET	OUTFALL	0.00	0.00	254.50	0 00:00	0.00
LOWER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
WEIR_OUTLET	OUTFALL	0.00	0.00	259.80	0 00:00	0.00
HIGHER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
SWM_POND	STORAGE	1.13	2.03	258.88	0 03:00	2.03

****
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

```
-------------------------------------------------------------------------------------------------
WETLAND_OUTLET       OUTFALL      0.194    0.194     0  03:00         0.81        0.81       0.000
LOWER_ORIFICE_OUTLET OUTFALL      0.000    0.058     0  03:00            0       0.382       0.000
WEIR_OUTLET          OUTFALL      0.000    0.000     0  00:00            0           0       0.000 ltr
HIGHER_ORIFICE_OUTLET OUTFALL      0.000    0.134     0  03:00            0       0.575       0.000
SWM_POND             STORAGE      3.726    3.726     0  01:05         7.34        7.34       0.000


**********************
Node Surcharge Summary
**********************

No nodes were surcharged.


**********************
Node Flooding Summary
**********************

No nodes were flooded.


**********************
Storage Volume Summary
**********************

-------------------------------------------------------------------------------------------------
                        Average     Avg  Evap Exfil       Maximum     Max    Time of Max    Maximum
                         Volume    Pcnt  Pcnt  Pcnt        Volume    Pcnt     Occurrence    Outflow
Storage Unit            1000 m3    Full  Loss  Loss       1000 m3    Full    days hr:min        CMS
-------------------------------------------------------------------------------------------------
SWM_POND                  3.396      30     0     0         6.387      57       0  03:00      0.192


**********************
Outfall Loading Summary
**********************

-----------------------------------------------------------
                        Flow       Avg       Max       Total
                        Freq      Flow      Flow      Volume
Outfall Node            Pcnt       CMS       CMS    10^6 ltr
-----------------------------------------------------------
WETLAND_OUTLET         65.10     0.115     0.194       0.810
LOWER_ORIFICE_OUTLET   91.69     0.039     0.058       0.382
WEIR_OUTLET             0.00     0.000     0.000       0.000
HIGHER_ORIFICE_OUTLET  52.35     0.102     0.134       0.575
-----------------------------------------------------------
System                 52.29     0.256     0.386       1.767
```

```
**********
Link Flow Summary
**********

-----------------------------------------------------------------------------
                                Maximum  Time of Max   Maximum    Max/    Max/
                                |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type          CMS  days hr:min     m/sec    Flow   Depth
-----------------------------------------------------------------------------
LOWER_ORIFICE        ORIFICE     0.058     0  03:00                     1.00
HIGHER_ORIFICE       ORIFICE     0.134     0  03:00                     1.00
WEIR                 WEIR        0.000     0  00:00                     0.00


**************************
Flow Classification Summary
**************************

-------------------------------------------------------------------------------------
                    Adjusted    ---------- Fraction of Time in Flow Class ----------
                     /Actual         Up    Down  Sub   Sup   Up    Down  Norm  Inlet
Conduit               Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd   Ctrl
-------------------------------------------------------------------------------------


************************
Conduit Surcharge Summary
************************

No conduits were surcharged.


Analysis begun on:  Thu Jun 10 13:48:20 2021
Analysis ended on:  Thu Jun 10 13:48:20 2021
Total elapsed time: < 1 sec
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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 For 25 Year Post-Development Storm Event
****************
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 ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
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 ........ 30.00 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 ......         1.227        62.408
Outfall Runon ............         0.127         6.444
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.194         9.878
Surface Runoff ...........         1.018        51.781
Final Storage ............         0.143         7.293
Continuity Error (%) .....        -0.144
```

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.015	10.154
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.244	2.444
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.771	7.710
Continuity Error (%)	0.000	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	29.50 sec
Average Time Step	:	29.92 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
30.000 - 13.228 sec	:	100.00 %
13.228 - 5.833 sec	:	0.00 %
5.833 - 2.572 sec	:	0.00 %
2.572 - 1.134 sec	:	0.00 %
1.134 - 0.500 sec	:	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
A204	62.41	0.00	0.00	4.66	42.51	11.20	53.71	1.45	0.93	0.861
A203	62.41	0.00	0.00	4.66	43.24	12.10	55.34	0.39	0.32	0.887
A202	62.41	0.00	0.00	6.29	37.23	16.26	53.49	0.78	0.62	0.857
A201	62.41	20.37	0.00	8.16	40.08	28.66	68.74	8.84	4.70	0.830
A205	62.41	0.00	0.00	33.35	0.00	19.59	19.59	0.17	0.04	0.314
A206	62.41	117.72	0.00	33.35	0.00	108.83	108.83	1.17	0.24	0.604

****
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
WETLAND_OUTLET	OUTFALL	0.00	0.00	254.50	0 00:00	0.00
LOWER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
WEIR_OUTLET	OUTFALL	0.00	0.00	259.80	0 00:00	0.00
HIGHER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
SWM_POND	STORAGE	1.32	2.32	259.17	0 03:00	2.32

****
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

WETLAND_OUTLET	OUTFALL	0.242	0.242	0	03:00	1.16	1.16	0.000	
LOWER_ORIFICE_OUTLET	OUTFALL	0.000	0.062	0	03:00	0	0.416	0.000	
WEIR_OUTLET	OUTFALL	0.000	0.000	0	00:00	0	0	0.000	ltr
HIGHER_ORIFICE_OUTLET	OUTFALL	0.000	0.173	0	03:00	0	0.869	0.000	
SWM_POND	STORAGE	4.712	4.712	0	01:05	8.99	8.99	-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
SWM_POND	4.155	37	0	0	7.710	68	0 03:00	0.235

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
WETLAND_OUTLET	65.65	0.164	0.242	1.160
LOWER_ORIFICE_OUTLET	92.52	0.042	0.062	0.416
WEIR_OUTLET	0.00	0.000	0.000	0.000
HIGHER_ORIFICE_OUTLET	57.06	0.141	0.173	0.869
System	53.81	0.346	0.477	2.444

```
**********
Link Flow Summary
**********

-----------------------------------------------------------------------------
                                Maximum  Time of Max   Maximum    Max/    Max/
                                |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type          CMS  days hr:min     m/sec    Flow   Depth
-----------------------------------------------------------------------------
LOWER_ORIFICE        ORIFICE     0.062     0  03:00                     1.00
HIGHER_ORIFICE       ORIFICE     0.173     0  03:00                     1.00
WEIR                 WEIR        0.000     0  00:00                     0.00


**************************
Flow Classification Summary
**************************

-------------------------------------------------------------------------------------
                    Adjusted    ---------- Fraction of Time in Flow Class ----------
                     /Actual         Up    Down  Sub   Sup   Up    Down  Norm  Inlet
Conduit               Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd   Ctrl
-------------------------------------------------------------------------------------


************************
Conduit Surcharge Summary
************************

No conduits were surcharged.


Analysis begun on:  Thu Jun 10 13:48:53 2021
Analysis ended on:  Thu Jun 10 13:48:53 2021
Total elapsed time: < 1 sec
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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 For 50 Year Post-Development Storm Event
****************
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 ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
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 ........ 30.00 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 ......         1.367        69.546
Outfall Runon ............         0.147         7.456
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.201        10.249
Surface Runoff ...........         1.164        59.233
Final Storage ............         0.150         7.632
Continuity Error (%) .....        -0.146
```

```
**************************        Volume         Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         1.162         11.616
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........         0.000          0.000
External Outflow .........         0.287          2.874
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......         0.874          8.741
Continuity Error (%) .....         0.000


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


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :    29.50 sec
Average Time Step           :    29.92 sec
Maximum Time Step           :    30.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
   30.000 - 13.228 sec      :   100.00 %
   13.228 -  5.833 sec      :     0.00 %
    5.833 -  2.572 sec      :     0.00 %
    2.572 -  1.134 sec      :     0.00 %
    1.134 -  0.500 sec      :     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
A204	69.55	0.00	0.00	4.79	47.54	13.03	60.57	1.64	1.07	0.871
A203	69.55	0.00	0.00	4.79	48.33	13.98	62.31	0.44	0.37	0.896
A202	69.55	0.00	0.00	6.47	41.61	18.80	60.40	0.88	0.71	0.869
A201	69.55	22.97	0.00	8.38	44.91	33.10	78.02	10.03	5.47	0.843
A205	69.55	0.00	0.00	35.29	0.00	24.42	24.42	0.21	0.05	0.351
A206	69.55	136.21	0.00	35.29	0.00	130.25	130.25	1.40	0.27	0.633

****
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
WETLAND_OUTLET	OUTFALL	0.00	0.00	254.50	0 00:00	0.00
LOWER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
WEIR_OUTLET	OUTFALL	0.00	0.00	259.80	0 00:00	0.00
HIGHER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
SWM_POND	STORAGE	1.45	2.53	259.38	0 03:00	2.53

****
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

WETLAND_OUTLET	OUTFALL	0.271	0.271	0	03:00	1.39	1.39	0.000	
LOWER_ORIFICE_OUTLET	OUTFALL	0.000	0.065	0	03:00	0	0.439	0.000	
WEIR_OUTLET	OUTFALL	0.000	0.000	0	00:00	0	0	0.000	ltr
HIGHER_ORIFICE_OUTLET	OUTFALL	0.000	0.196	0	03:00	0	1.05	0.000	
SWM_POND	STORAGE	5.489	5.489	0	01:05	10.2	10.2	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
SWM_POND	4.738	42	0	0	8.742	78	0 03:00	0.261

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
WETLAND_OUTLET	66.20	0.194	0.271	1.389
LOWER_ORIFICE_OUTLET	93.07	0.044	0.065	0.439
WEIR_OUTLET	0.00	0.000	0.000	0.000
HIGHER_ORIFICE_OUTLET	59.00	0.164	0.196	1.046
System	54.57	0.402	0.532	2.874

****
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
LOWER_ORIFICE	ORIFICE	0.065	0	03:00			1.00
HIGHER_ORIFICE	ORIFICE	0.196	0	03:00			1.00
WEIR	WEIR	0.000	0	00:00			0.00

****
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

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Jun 10 13:49:12 2021
Analysis ended on: Thu Jun 10 13:49:12 2021
Total elapsed time: < 1 sec

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

Belmont Subdivision


***********************************************************
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 For 100 Year Post-Development Storm Event
****************
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 ............ 05/20/2021 00:00:00
Ending Date .............. 05/20/2021 03:00:00
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 ........ 30.00 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 ......         1.509        76.749
Outfall Runon ............         0.164         8.349
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.208        10.579
Surface Runoff ...........         1.311        66.706
Final Storage ............         0.156         7.938
Continuity Error (%) .....        -0.147
```

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.308	13.082
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.326	3.264
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.982	9.818
Continuity Error (%)	0.001	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	29.50 sec
Average Time Step	:	29.92 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
30.000 - 13.228 sec	:	100.00 %
13.228 - 5.833 sec	:	0.00 %
5.833 - 2.572 sec	:	0.00 %
2.572 - 1.134 sec	:	0.00 %
1.134 - 0.500 sec	:	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
A204	76.75	0.00	0.00	4.90	52.63	14.90	67.53	1.83	1.21	0.880
A203	76.75	0.00	0.00	4.90	53.46	15.91	69.37	0.49	0.41	0.904
A202	76.75	0.00	0.00	6.62	46.02	21.39	67.41	0.98	0.80	0.878
A201	76.75	25.62	0.00	8.58	49.80	37.64	87.44	11.25	6.23	0.854
A205	76.75	0.00	0.00	37.05	0.00	29.52	29.52	0.25	0.07	0.385
A206	76.75	152.52	0.00	37.05	0.00	150.08	150.08	1.61	0.30	0.655

****
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
WETLAND_OUTLET	OUTFALL	0.00	0.00	254.50	0 00:00	0.00
LOWER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
WEIR_OUTLET	OUTFALL	0.00	0.00	259.80	0 00:00	0.00
HIGHER_ORIFICE_OUTLET	OUTFALL	0.00	0.00	256.85	0 00:00	0.00
SWM_POND	STORAGE	1.58	2.74	259.59	0 03:00	2.74

****
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

WETLAND_OUTLET	OUTFALL	0.297	0.297	0	03:00	1.6	1.6	0.000
LOWER_ORIFICE_OUTLET	OUTFALL	0.000	0.067	0	03:00	0	0.46	0.000
WEIR_OUTLET	OUTFALL	0.000	0.000	0	00:00	0	0	0.000 ltr
HIGHER_ORIFICE_OUTLET	OUTFALL	0.000	0.217	0	03:00	0	1.2	0.000
SWM_POND	STORAGE	6.258	6.258	0	01:05	11.5	11.5	0.001

****
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
SWM_POND	5.341	47	0	0	9.819	87	0 03:00	0.284

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
WETLAND_OUTLET	66.76	0.222	0.297	1.601
LOWER_ORIFICE_OUTLET	93.35	0.046	0.067	0.460
WEIR_OUTLET	0.00	0.000	0.000	0.000
HIGHER_ORIFICE_OUTLET	60.39	0.184	0.217	1.202
System	55.12	0.452	0.581	3.264

```
**********
Link Flow Summary
**********

-------------------------------------------------------------------------
                              Maximum  Time of Max   Maximum    Max/    Max/
                              |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type        CMS  days hr:min     m/sec    Flow   Depth
-------------------------------------------------------------------------
LOWER_ORIFICE        ORIFICE   0.067     0  03:00                     1.00
HIGHER_ORIFICE       ORIFICE   0.217     0  03:00                     1.00
WEIR                 WEIR      0.000     0  00:00                     0.00


**************************
Flow Classification Summary
**************************

-------------------------------------------------------------------------------------
                    Adjusted    ---------- Fraction of Time in Flow Class ----------
                     /Actual         Up    Down  Sub   Sup   Up    Down  Norm  Inlet
Conduit               Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd   Ctrl
-------------------------------------------------------------------------------------


************************
Conduit Surcharge Summary
************************

No conduits were surcharged.


Analysis begun on:  Thu Jun 10 13:49:36 2021
Analysis ended on:  Thu Jun 10 13:49:36 2021
Total elapsed time: < 1 sec
```