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PROPOSED 11-STOREY + MEZZANINE MIXED-USE CONDO BUILDING
688, 694 & 698 BRANT STREET
CITY OF BURLINGTON

PROJECT No. : 21284

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

Prepared For:

ELITE 688 BRANT HOLDINGS INC.

Prepared By:

The Odan/Detech Group Inc.

Original: January 13th, 2023

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APPENDIX A

Site Plan	by Chamberlain Architect Services Limited
Statistics	by Chamberlain Architect Services Limited

APPENDIX B

Pre-Development Sanitary Sewer Catchment Plan
Pre-Development Downstream Sanitary Sewer Analysis Sheet
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APPENDIX C

Orifice Discharge Calculator
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APPENDIX C

Site Servicing Plan
Site Grading Plan

1.0 INTRODUCTION

The property under study is an approximately 0.76 Ha (1.88 acre) site located at 688, 694 & 698 Brant Street in the City of Burlington. The site is bound by the following:

- Brant Street to the north
- An existing 3-storey apartment building to the west
- An existing single-detached homes to the south along Alfred Crescent
- An existing commercial building to the east

Refer to the Figure 1 for the site's layout and adjacent developments.

The site presently comprises a 1-storey commercial building, two 2-storey commercial building, landscape areas, and an above grade parking structure.

For detailed topography of the existing site conditions as of January 7, 2022, refer to the topographic survey prepared by A.T. McLaren Limited.

It is proposed to construct 11-storey + Mezzanine mixed-use condo building with three levels of below grade parking. The proposed development comprises a driveway access from Brant St. at the site's northwest corner. Refer to the Site Plan by Chamberlain Architect Services Limited in Appendix A for the proposed development's layout. The development comprises 293 units, 12 townhouse units and a total of 1,551 m^2 of commercial space.

This report will evaluate the serviceability of the site with respect to sanitary waste water, storm water management and water.

2.0 SCOPE OF WORK

THE ODAN/DETECH GROUP INC. was retained by **Elite 688 Brant Holdings Inc.** to review the Site, collect data, evaluate the Site for the proposed use and present the findings in a Functional Servicing and Stormwater Management Report in support of a Rezoning Application.

a) Collecting existing servicing drawings from the CITY in order to establish availability and feasibility of Site servicing;
b) Meetings/conversations with CITY Engineers and Design Team.
c) Evaluation of the data and presentation of the findings in a Functional Servicing & Stormwater Management Report in support of a Rezoning Application.

Figure 1 – Site Context Map



3.0 SANITARY SEWERS

i) Existing Infrastructure

The following sanitary sewers are located within the streets bordering the subject site. Refer to the Site Servicing Plan for the layout of the existing sewers adjacent to the subject site.

- Brant Street: There is an existing 300mm (south) and 400mm (north) diameter sanitary sewer flowing south easterly. The 300 mm diameter sanitary will eventually connect to the 400mm diameter sanitary sewer on the intersection of Brant St. and Blairholm Avenue and flow southerly along Brant St. towards the 1800mm diameter sanitary trunk sewer on Elgin St.

ii) Proposed Sanitary Servicing

Refer to the Servicing Plan for the proposed Sanitary Service Connection. Sanitary flows are calculated as follows.

The sanitary sewer design criteria and unit flow is provided in the Regional Municipality of Halton's *Water and Wastewater Linear Design Manual* (April 2019) and is summarized as follows. The following information is provided in Tables 3-1 and 3-2 of the foregoing manual.

- I/I = Unit of peak inflow/infiltration = 0. 286 L/s/ha
- Single Family: 55p/Ha and 0.003183L/person/s
- Light Commercial Areas: 90p/Ha and 0.28646L/ha/s
- Apartment (over 6-storey): 285 p/Ha and 0.003183L/person/s
- Townhouse/Apartment (6-storeys or less): 135 p/Ha and 0.003183L/person/s
- Notwithstanding the above unit population, however, a unit population of 2.7 P/unit is assumed for the post-development 11-storey apartment because the Region standard 285 P/Ha unit population would result in a unit population of approximately 0.73 P/unit for the foregoing proposed statistics, which is unrealistic.
- The Harmon Formula is to be used to calculate the Peak Wastewater Flow Factor for residential land use:

$$M = 1 + \frac{14}{4 + \sqrt{P}}$$

- The modified Harmon Formula is to be used to calculate the Peak Wastewater Flow Factor for commercial land use:

$$M = 0.8\,x\,(1 + \frac{14}{4 + \sqrt{P}})$$

The pre-development sanitary flows are as follows. A unit population of 2.7 P/unit is assumed for the pre-development as mentioned above. Refer to the detailed calculation on the following pages.

Table 1 – Pre-Development Sanitary Flows

Component	Population (P)	Average Flow (l/s)	Peaking Factor(M)	Peak Sanitary Flow (l/s)	Area (ha)	Inflow & Infiltration (l/s)	Total Flow (l/s)
Commercial	68	0.22	3.43	0.75	0.76	0.22	0.96
Total							***0.96***

The proposed sanitary flows are as follows. A unit population of 2.7 P/unit is assumed for the post-development as mentioned above. Refer to the detailed calculation on the following pages.

Table 2 – Post-Development Sanitary Flows

Component	Population (P)	Average Flow (l/s)	Peak Sanitary Flow (l/s)	Peaking Factor (M)	Inflow & Infiltration (l/s)	Total Flow (l/s)
Residential	824 (293+12 Units)	2.62	10.10	3.85	0.22	10.32
Commercial	14	0.05	0.16	3.52		0.16
						10.48

A 200mm diameter PVC lateral at 2.0% (capacity 65 L/s) is proposed to convey the sanitary flows from the subject development to the existing 300mm diameter sanitary sewer beneath Brant St. The net increase of flows when comparing the post-development with the pre-development is ***9.52 L/s***.

Note, manning n = 0.013 in all sanitary pipes.

iii) Downstream Analysis

The following downstream sanitary sewer analysis shows that the receiving sanitary sewers have capacity for the proposed development and no offsite infrastructure improvements are necessary to accommodate the flows from the proposed development.

The Odan/Detech Group subsequently prepared an original analysis. The methodology for the analysis is as follows.

1) The Pre & Post downstream sewer catchment plan on Appendix B was prepared to show the tributary catchment areas for sanitary flow, path of the sewer pipe, etc. down to the 1800mm Trunk sewer on Elgin Street.
2) Population density and unit flow was established as given in Tables 3-1 and 3-2 in the Regional Municipality of Halton's Water and Wastewater Linear Design Manual (April 2019).
3) Downstream sewer design sheets were prepared in pre-development and post-development scenarios as shown on Appendix B.

Pre-development Conditions

Under pre-development conditions, the subject site is drain towards the existing 300mm sanitary sewer beneath Brant St. (south side) then eventually connects to the 450mm sanitary on Brant St. (north side). Which then flows southeasterly towards 1800mm sanitary trunk sewer on Elgin Street. See Appendix B for the Pre-Development sanitary sewer catchment plan, and for the Pre-Development sanitary sewer design sheet.

Post-Development Conditions

As explained in Section ii above, sanitary calculations for the proposed 11-storey mixed-use condo building will used a unit population of 2.7 P/unit for Residential only. A total population of (824+14) 838 persons shall be used for this catchment area (see page 8 for the calculation of the no. of persons). See Appendix B for the Post-Development sanitary sewer catchment plan, and the Post-Development sanitary sewer design sheet.

Table 3 below shows a summary of the existing and proposed sanitary flow calculations.

Table 3 - Sanitary Flow Calculations

	Existing	**Proposed**
Area (Ha)	0.76	0.76 (0.15Ha COMMERCIAL)
Population Density	90 P/Ha	2.7 P/unit (RESIDENTIAL) 90 P/Ha (COMMERCIAL)
Equivalent Population	68	824 (RESIDENTIAL) 14 (COMMERCIAL)
Unit Sewage Flow	0.28646 L/Ha/s	0.003183 L/P/s (RESIDENTIAL) 0.28646 L/Ha/s (COMMERCIAL)

Dry Weather Flow (L/s)	0.22	2.62 (RESIDENTIAL) 0.05 (COMMERCIAL)
Peaking Factor	3.43	3.85 (RESIDENTIAL) 3.52 (COMMERCIAL)
Peak Flow (L/s)	0.75	10.10 (RESIDENTIAL) 0.16 (COMMERCIAL)
Infiltration (L/s)	0.22	0.22
Total Flow = Peak Flow + Infiltration (L/s)	0.96	10.48
Sanitary Flow before the 1800mm Trunk sewer on Elgin St. (L/s)	***120.23***	***127.23***
% of Capacity Used before the 1800mm Trunk sewer on Elgin St. (L/s)	***21.76%***	***23.02%***

Existing flows in the 300mm sanitary on Brant St. down to the 600mm sanitary sewer on Elgin St. (just before the trunk sanitary sewer on Elgin St.) were calculated based on Halton Region's equivalent population densities.

As per the sanitary design sheets on Appendix B, the following comments are provided;

1) Pre-development, the last segment of pipe before the trunk sewer on Rebecca St. is flowing 23.02% of its capacity.

2) Post-development, with the additional flow from the subject development, the flow on the last segment of pipe before the trunk sewer on Rebecca St. is only increase by 1.26% from 21.76% to 23.02% of its capacity.

3) All flow from the downstream pipes up to the 600mm Sanitary sewer on Elgin St. (just before the trunk sanitary sewer on Elgin St.) are less than 85% of their capacity, therefore no infrastructure improvements are necessary to service the subject development.

SANITARY FLOW CALCULATIONS - PRE-DEVELOPMENT

This program calculates the sanitary discharge from various land use

PROJECT: 688, 694 & 698 Brant St.

SCENARIO: Pre-Development Sanitary Flow

RETAIL SITE AREA (ha) = 0.76
RESIDENTIAL SITE AREA (ha) =
TOTAL SITE AREA (ha) = 0.76

LAND USE	NUMBER OF UNITS	SITE AREA, (ha)	GROSS FLOOR AREA, m2	TOTAL POPULATION	TOTAL DAILY FLOW (LITERS)	AVERAGE DAILY FLOW l/sec	PEAKING FACTOR, M	TOTAL FLOW FROM LAND USE, l/sec
Residential Destached, using 55 person/site area		0.00		0	0	0.00	4.50	0.00
Residential Semi Houses, using 100 persons/site area				0	0	0.00	4.50	0.00
Residential Apt (6-storey or less), using 135 persons/site area				0	0	0.00	4.50	0.00
Residential Apt (> storeys), using 285 persons/site area				0	0	0.00	4.50	0.00
RESIDENTIAL Density 3, using 2.7 person/unit				0	0	0.00	4.50	0.00
Total Residential	0			0	0	0.00	4.50	0.00
Light Commercial Areas, using 90 person/ha and 24.75m3/ha/day		0.76		68	0	0.22	3.43	0.75
Total Commercial				68	0	0.22	3.43	0.75

TOTAL V1= 0 Q1= 0.00
Q2= 0.75
Q = (MqP/86400) + A * I (L/sec) Qinfil 0.22
Qtot 0.96

Q1= total flow from Residential Land Use (L/sec)
Q2= total flow from Commercial Land Use (L/sec)
Qinfil = total flow from infiltration (L/sec)
Qtot = total flow (Land use + infiltration)
V1= Total Volume from Land Use in liters

where :
P is population
q = 0.003183 L/person/s for residential and
q = 0.28646 L/ha/s for commercial and offices
A = gross site area
i = 0.286 L/sec/ha (infiltration rate)
Res Peaking Factor M = 1 + [14 / (4 + (P/1000,1/2))]
Com Peaking Factor M =0.8 x (1 + [14 / (4 + (P/1000,1/2)

SANITARY FLOW CALCULATIONS - POST-DEVELOPMENT

This program calculates the sanitary discharge from various land use

PROJECT: 688, 694 & 698 Brant St.

SCENARIO: Post-Development Sanitary Flow

RETAIL SITE AREA (ha) = 0.76
RESIDENTIAL SITE AREA (ha) =
TOTAL SITE AREA (ha) = 0.76

LAND USE	NUMBER OF UNITS	SITE AREA, (ha)	GROSS FLOOR AREA, m2	TOTAL POPULATION	TOTAL DAILY FLOW (LITERS)	AVERAGE DAILY FLOW l/sec	PEAKING FACTOR, M	TOTAL FLOW FROM LAND USE, l/sec
Residential Destached, using 55 person/site area		0.00		0	0	0.00	4.50	0.00
Residential Semi Houses, using 100 persons/site area				0	0	0.00	4.50	0.00
Residential Apt (6-storey or less), using 135 persons/site area				0	0	0.00	4.50	0.00
Residential Apt (> storeys), using 285 persons/site area				0	0	0.00	4.50	0.00
RESIDENTIAL Density 3, using 2.7 person/unit	305			824	0	2.62	3.85	10.10
Total Residential	305			824	0	2.62	3.85	10.10
Light Commercial Areas, using 90 person/ha and 24.75m3/ha/day		0.16		14	0	0.05	3.52	0.16
Total Commercial				14	0	0.05	3.52	0.16

TOTAL	V1=	0	Q1=	10.10	
			Q2=	0.16	
Q = (MqP/86400) + A * I (L/sec)			Qinfil	0.22	
			Qtot	10.48	

Q1= total flow from Residential Land Use (L/sec)
Q2= total flow from Commercial Land Use (L/sec)
Qinfil = total flow from infiltration (L/sec)
Qtot = total flow (Land use + infiltration)
V1= Total Volume from Land Use in liters

where :
P is population
q = 0.003183 L/person/s for residential and
q = 0.28646 L/ha/s for commercial and offices
A = gross site area
i = 0.286 L/sec/ha (infiltration rate)
Res Peaking Factor M = 1 + [14 / (4 + (P/1000,1/2))]
Com Peaking Factor M =0.8 x (1 + [14 / (4 + (P/1000,1/2)

4.0 WATER DISTRIBUTION

i) Background Information & Existing Infrastructure

The following watermain are located within the streets bordering the subject site. Refer to the Site Servicing Plan for the layout of the existing watermains adjacent to the property.

- Brant Street: There is an existing 350mm diameter watermain (north side).

ii) Design Considerations

Fire and domestic water service will be provided by the existing 350mm watermain beneath Brant St. Refer to the Servicing Plan for the proposed water services.

There is existing fire hydrant to the northeast and southeast of the property, along Brant Street. The existing hydrant is less than 45m from the proposed Siamese and therefore no new hydrant is needed on-site.

The pressures and volumes must be sufficient for Peak hour conditions and under fire conditions as established by the Ministry of Environment and the Fire Underwriters Survey booklet (1999). The minimal residual pressure under fire conditions is 140 kPa (20.3 psi).

The allowable pressures are as follows:

Condition	**Allowable Pressures (kpa)**	
	min.	**max.**
1) Min. Hour	275	700
2) Peak Hour	275	700
3) Peak Day + Fire Flow	140	700

The water demand for redeveloped Building is calculated as follows:

a)	Average Day domestic demand – using 275 L/cap/day (838 persons - Table 2)		2.67 L/s
b)	Peak day demand -	2.25 x average daily demand	6.0 L/s
c)	Peak hour demand -	4.0 x average daily demand	10.7 L/s
d)	Fire flow as per FUS 2020 manual		217 L/s

Table 4 – Fire Flow Demand for Proposed Development

	L/s	USGM
Peak Day Demand	6.0	95
Fire Flow (per FUS) Demand	217	3439
Total Development Water Demand	223	3534
Available flow at 20 PSI (Brant Street 350mm watermain) (Approximate, to be verified by Hydrant Flow Test)	**289***	**4577***

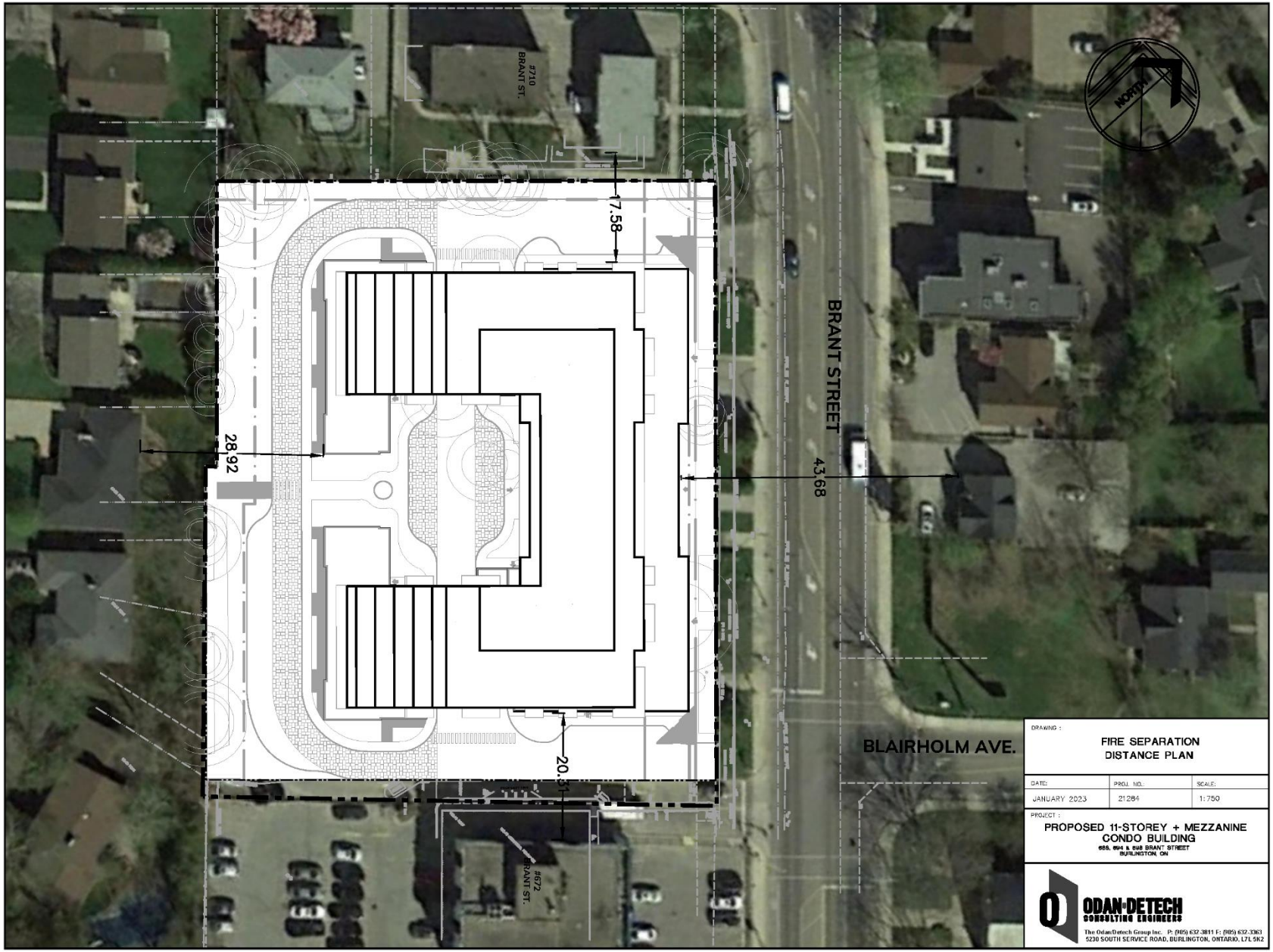
**Available flow is approximate, based on experience in the watermain pressure district. Hydrant flow test have been undertaken and this report will be revised in the future.*

In the following FUS calculations, the following assumptions were made:

a) The proposed building will be sprinklered and the sprinklers monitored according to the NFPA 13 criteria
b) The buildings will be of non-combustible construction material
c) The building's contents will be of non-combustible nature
d) The horizontal separation distance from the adjacent buildings is as shown on the following *Fire Separation Distance* Plan

The available fire flow of 289 L/s exceeds the calculated total fire flow demand of 223 L/s, therefore it follows that the existing watermain infrastructures is adequate to service the subject site.

Figure 2 – Fire Separation Distance Plan



WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

F = 220 x C x √ A
Where:

F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

LOCATION: Burlington
OBC OCCUPANCY: Residential
BUILDING FOOT PRINT (m2): 6406
OF STOREYS: 11

PROJECT: 688, 684 & 698 Brant Street
PROJECT No:21284

Contents	Charge
Non-Combustible	-25%
limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

CONSTRUCTION CLASS: Non-combustible

AUTOMATED SPRINKLER PROTECTION

		Credit	Total
NFPA 13 sprinkler standard	yes	30%	50%
Standard Water Supply	yes	10%	
Fully Supervised System	yes	10%	
		50%	

CONTENTS FACTOR: Non-combustible CHARGE: -25%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%

EXPOSURE 1 (south) Exisitng Residential	Distance to Exposure Building (m)	28.92	10%
	Length - Height		
EXPOSURE 2 (east) Existing Commercial	Distance to Exposure Building (m)	20.31	10%
	Length - Height		
EXPOSURE 3 (west) Exisiting 2-storey Bldg.	Distance to Exposure Building (m)	17.58	15%
	Length - Height		
EXPOSURE 4 (north) Existing Residential	Distance to Exposure Building (m)	43.68	5%
	Length - Height		
		Total:	40%

no more than 75%

ARE BUILDINGS CONTIGUOUS: Yes

FIRE RESISTANT BUILDING Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rat: Yes

CALCULATIONS

	C =	0.8		Non-combustible
	A =	11532	m2	2 Largest Floors + 50% floors above up to 8
	F =	18900	L/min	
Round to Nearest 1000 L/min	F =	19000	L/min	must be > 2000 L/min

STOREY AREAS m2	
2621.27	
2621.27	2
2096.4	3
2096.4	4
2096.4	5
2096.4	6
2096.4	7
2096.4	8

CORRECTION FACTORS:

OCCUPANCY	-4750	L/min
FIRE FLOW ADJUSTED FOR OCCUPANCY	14250	L/min
REDUCTION FOR SPRINKLER	-7125	L/min
EXPOSURE CHARGE	5700	L/min

REQUIRED FIRE FLOW	**F =**	12825	L/min		
Round to Nearest 1000 L/min	**F =**	13000	L/min	3434	usgm
	F =	217	L/sec		

5.0 STORM WATER MANAGEMENT

i) Urban Spill Flood Plain

The site is subject to floodplain spill event during the Regulatory Storm (i.e. Hurricane Hazel). Preliminary Analysis by the City and Conservation Halton is the site will be encroached by water during the Regulatory Storm. A floodplain analysis is necessary to support the proposed development. Odan/Detech was retained by the owner to review the Flood Plain. Refer to Odan/Detech 688, 694 & 698 Brant Street Urban Spill Flood Plain - Burlington, Ontario - Flood Analysis Report (January 13, 2023).

ii) Existing Infrastructure

The following storm sewers are located within the streets bordering the subject site. Refer to the Servicing Plan for the layout of the existing sewers adjacent to the property.

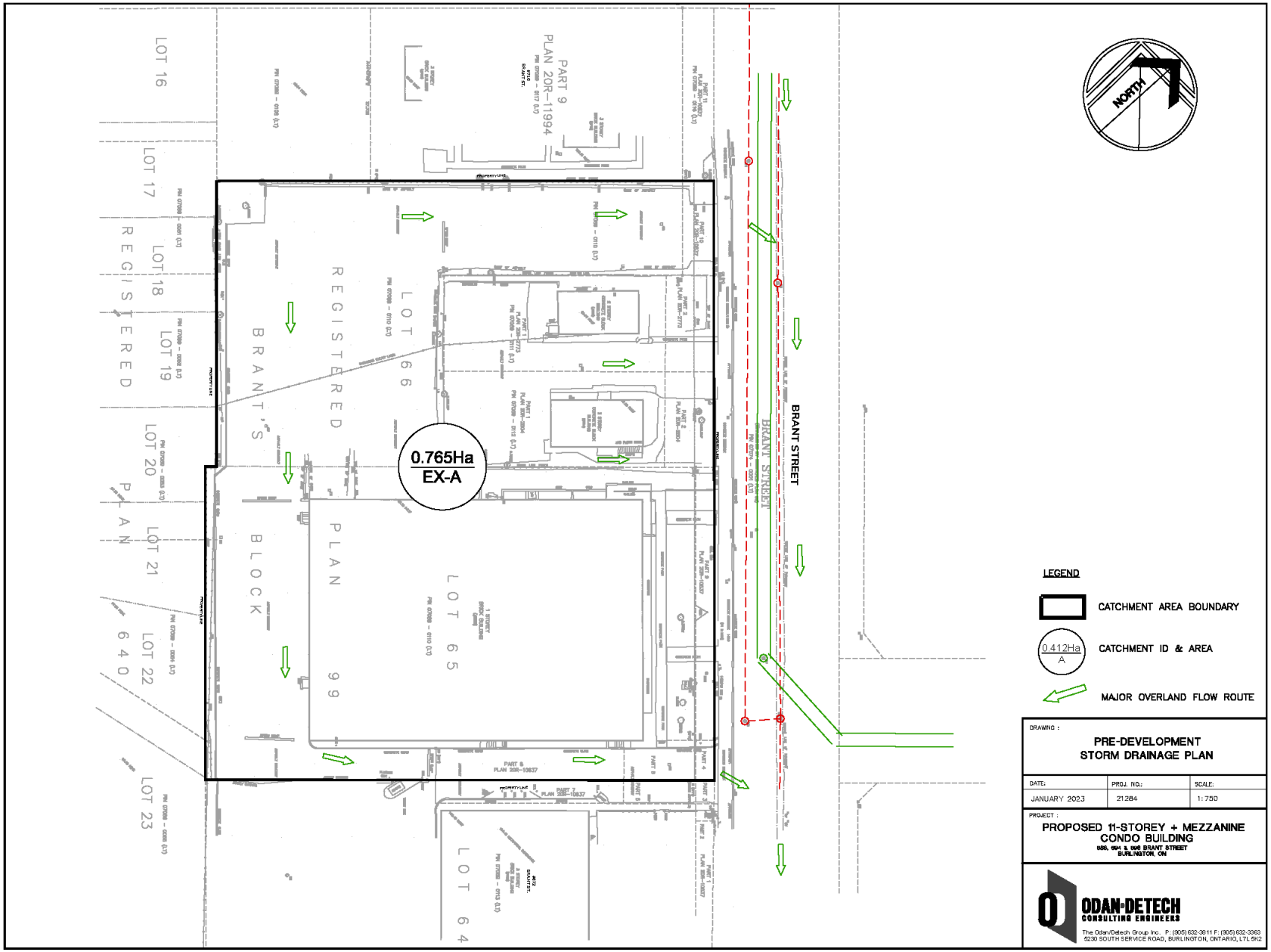
- Brant Street: There is an existing 1650mm concrete diameter storm sewer flowing southerly.

Existing drainage patterns are identified on the Pre-Development Drainage Plan on the following page. The site presently comprises a 1-storey commercial building, two 2-storey commercial building, landscape areas, and an above grade parking structure. Overland flow routes are identified on the Pre-Development Drainage Plan.

Pre-development storm drainage patterns are described as follows. Refer to Figure 3.

- Catchment Ex-A: comprises paved ground-level areas, landscapes and roofs of the existing buildings which drain to the existing internal catchbasin’s which is connected to the existing 1650mm concrete storm sewer beneath Brant St.

Figure 3 – Pre-Development Storm Drainage Plan



iii) Design Criteria

Stormwater management design criteria were established through the City of Burlington Stormwater Management Design Guidelines (May2020), and MECP Stormwater Management Planning and Design Manual.

1. Quantity Control: 100-year post development flows controlled to 5-year pre-development flow rates.
2. Quality Control: 80% TSS Removal with a treatment train approach.

Storm water management criteria is given in the City of Burlington's manual *Stormwater Management Design Guidelines* (May 21, 2020).

City of Burlington IDF curves are provided in Appendix B of the above manual. They are provided as follows and will be used in the below Visual OTTHYMO.

IDF-Curve	***Intensity when t, time of concentration, is 10 minutes:***
$I_2 = 681.52 / (6 + t)^{0.780}$	$I_2 = 78.4$ mm/hr
$I_5 = 802.04 / (5 + t)^{0.764}$	$I_5 = 101.3$ mm/hr
$I_{10} = 918.28 / (5 + t)^{0.763}$	$I_{10} = 116.3$ mm/hr
$I_{25} = 1065.95 / (5 + t)^{0.762}$	$I_{25} = 135.4$ mm/hr
$I_{50} = 1172.34 / (5 + t)^{0.761}$	$I_{50} = 149.3$ mm/hr
$I_{100} = 1281.34 / (5 + t)^{0.761}$	$I_{100} = 163.2$ mm/hr

iv) Pre-Development (Allowable) Discharge Flow Rate

As per the design criteria outlined above, allowable discharge from the site will be determined by calculating the pre-development flow for the 5-year design storms using the rational method. The runoff coefficient C = 0.50 will be used for pre-development sites and where a site discharges to a storm sewer according to the design criteria of the City of Burlington's manual Stormwater Management Design Guidelines (May 21,2020).

The allowable release rate is therefore taken as 108 L/s, as follows.

Table 5 – Allowable Stormwater Catchment Characteristics

Area	Run-off Coefficient	Rainfall Intensity (mm/hr)	Area of Development (ha)	Site Allowable Flow (L/s)
Site Area	0.5	101.3	0.765	**108**

v) Post-Development Flow Analysis

The proposed development will control the post-development flows to the allowable release rate calculated above; on-site storage will be required.

The site's storm drainage and stormwater quantity controls will be provided as follows:
Refer to Figure 4 for Catchment areas.

- Storm runoff from catchment A(roof) will drain by mechanical storm drains to the 100-year storm tank located in the P1 level.

- Storm runoff from catchment B will drain by mechanical storm drains to the 100-year storm tank located in the P1 level. An OGS (Oil grit separator) will be used to treat the open-to-above driving surface prior to entering the SWM tank. A 150mm orifice tube will be utilized to control the post-development flows from the SWM tank.

- Storm runoff from Catchment C will drain uncontrolled to Brant Street before discharging to the existing 1650mm storm sewer on beneath Brant St.

- Controlled discharge form catchment A & B will thereafter drain by a proposed 250mm @ 2.0% storm sewer connection to the 1650mm storm sewer beneath Brant Street.

Visual OTTHYMO 2.3.2. will be used to model and determine the detention volume required. For drainage areas with significant imperviousness the calculation of effective rainfall in Visual OTTHYMO is accomplished using the "Standhyd" method. This method is used in urban watersheds to simulate runoff by combining two parallel standard unit hydrographs resulting from the effective rainfall intensity over the pervious and impervious surfaces. For pervious surfaces, losses are calculated using the SCS modified CN method.

The following table summarizes the parameters used in Visual OTTHYMO to characterize the post development catchment areas. Refer to the Post-Development Visual OTTHYMO Model in Fig. 5, below, and the output in Appendix C.

Post-Development catchment areas appear in the Post-Development Catchment plan, below. Refer to Figure 4 for Catchment areas.

Table 6 – Post-Development Stormwater Catchment Characteristics

Area I.D.	Area (ha)	Hydrograph Method	% impervious	imperviousness directly connected %	Loss Method for Pervious Area	CN for Pervious Area	Initial Abstraction for Pervious (mm)	Time to peak (T_p)
Catchment A – Controlled Roof	0.339	StandHYD	98	98	SCS	80	5	-
Catchment B – controlled Paved & landscape Areas	0.389	StandHYD	80	80	SCS	80	5	-
Catchment C – Uncontrolled Paved Areas	0.037	StandHYD	98	98	SCS	80	5	-

Figure 4 – Post-Development Storm Drainage Plan

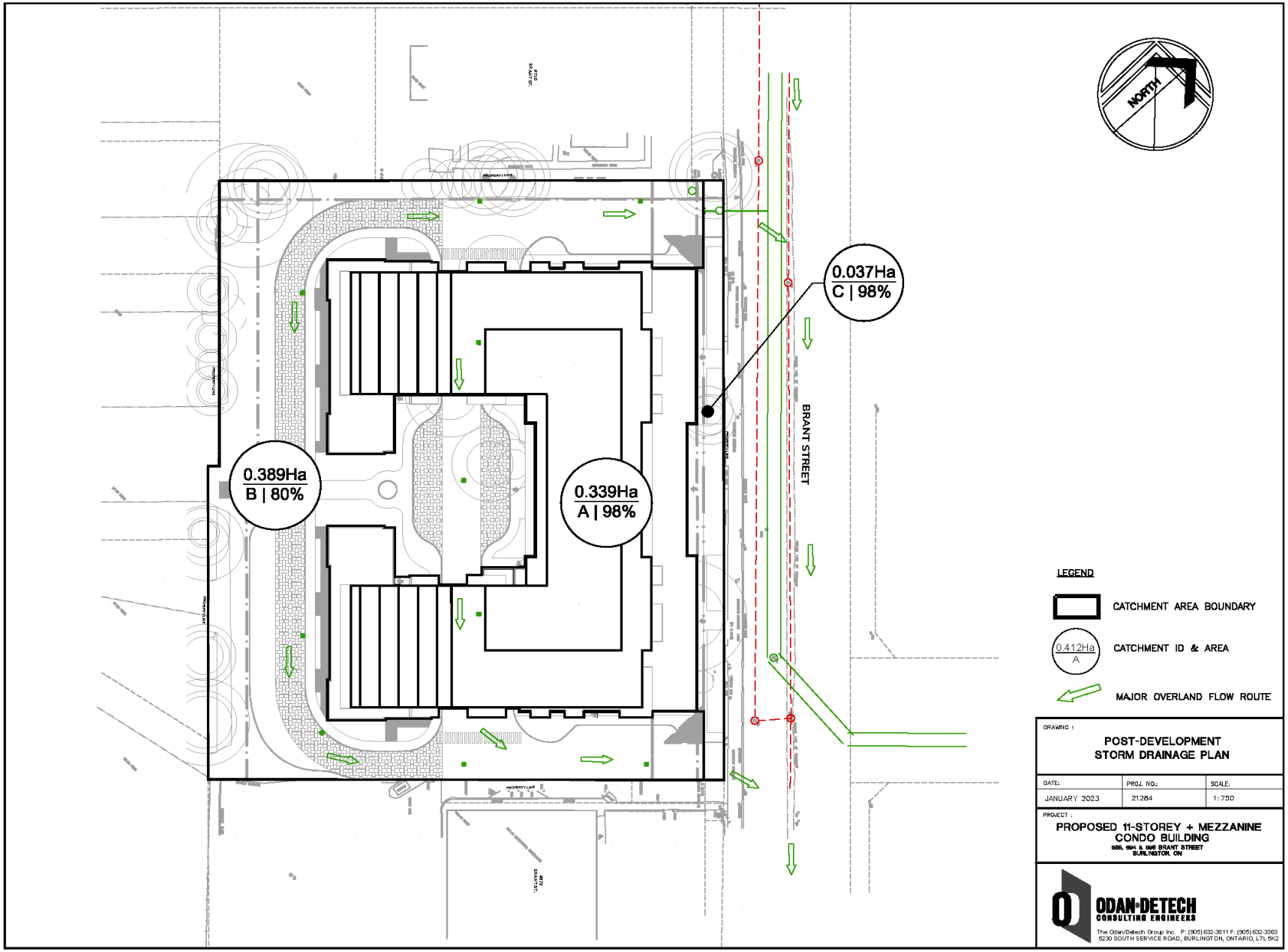
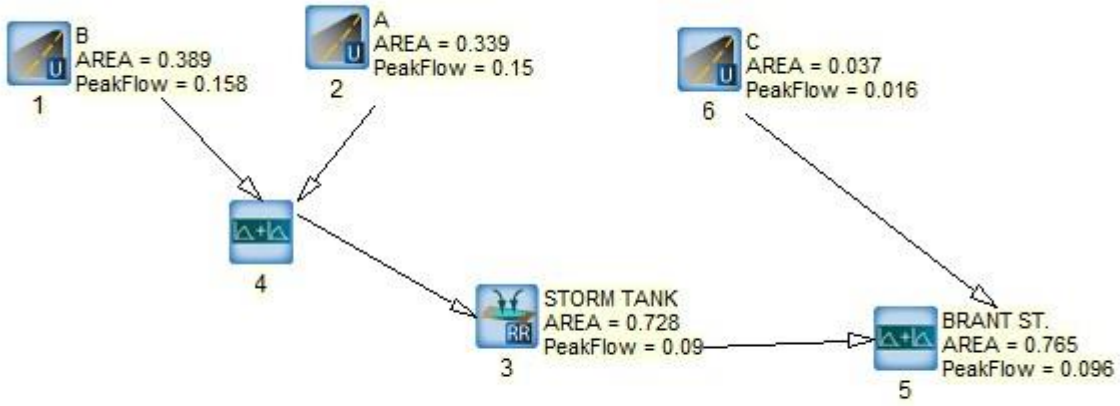


Figure 5 – Visual OTTHYMO Model (Showing Flows in 100-Year Storm)



The visual OTTHYMO Model above shows the peak flow in the 100-year storm event. Refer to the Visual OTTHYMO output in Appendix C for further details.

The following tables summarize the post-development flows and storage on-site. The 100-year storm flows are controlled to 108 L/s.

Table 7 – Summary of Stormwater Flows from Site

	5 Yr. Storm (L/s)	**100 Yr. Storm** (L/s)
Total Controlled Flow	***69***	***96***
Allowable Flow Rate	***108***	

The stormwater storage that occurs in 5-year and 100-year storms are as follows.

Table 8 – On-site Stormwater Flows from Site

	5 Yr. Storm (m^3)	**100 Yr. Storm** (m^3)
Required Storage Volume	127	197
Provided Volume (100-Y Storm tank)	200	

The proposed stormwater quantity control is such that the controlled discharge in a 100-year storm is equal-to or less than the allowable release rate. The stormwater storage is provided such that the volume provided is greater than the required 100-year storm volume.

Refer to the Servicing Plan for the location of the OGS (Oil Grit Separator) unit, storm tank, storm connection and control manhole.

vi) Water Balance

The primary objective of the Water Balance Targets/Criteria is to capture and manage annual rainfall on the development site itself to preserve the pre-development hydrology (or "water balance", which typically consists of three components: runoff, infiltration, and evapotranspiration) through a combination of infiltration, evapotranspiration, landscaping, rainwater reuse and/or other low impact development practices.

The water balance target volume is as follows.

Table 9 – Water Balance Summary

	Initial Abstraction (mm)	Area (m^2)	Volume (m^3)
Target Volume given by Site Area	5	7600	38
Less Impervious Surfaces	1	6370	6.4
Required Cistern (Retention) Volume			***31.6***
Storage in a below-grade cistern for reuse by irrigation			32

A cistern of 32m^3 has been specified to store the required volume of water. The cistern will function such that in minor storm events, runoff draining from the site's mechanical drains will first drain into the cistern for storage and reuse.

In storm events greater than 5mm, the cistern will fill-up and stormwater will occupy the larger storage area allocated for 100-year storm storage before draining via the site's quantity controls. Refer to the Servicing Plan and cross-sections.

Given the foregoing strategy, it will be feasible to retain the required volume of stormwater on-site. The reuse strategy will be developed in detail at the SPA stage.

vii) Water Quality

The site was divided according to surface conditions and the effective TSS removal for each surface condition was considered based on the treatment it would receive. The general basis of the effective TSS removal rates are as follows:

1. Rooftop areas are subject only to airborne particles and insignificant amounts of sediment transported by foot traffic. As such, an effective removal efficiency of 80% is utilized on a conventional roof to reflect the inherent runoff quality from a conventional roof.

2. Balconies and sodded areas are subject to insignificant amounts of sediment transport by foot traffic. An effective removal rate of 80% is used as it is the City limit for roofs.

3. Driving and ground-level pedestrian surfaces which are open-to-above would be subject to winter maintenance, therefore they would have an effective removal efficiency of 0% and treatment is thus required.

An Oil Grit Separator will be specified at the SPA stage to provide filtration of the driving surfaces. Refer to the OGS location on the Functional Servicing Plan.

6.0 CONCLUSIONS

From the foregoing investigation, the site is serviceable utilizing existing sanitary sewer, storm sewer and watermain infrastructure adjacent to the site. Storm water management can be accommodated with on-site storage as described in this report.

The following table summarizes the SWM and Servicing components of the proposed development.

Table 10 – Summary

	Proposed Building
Peak Sanitary Discharge(L/s)	10.48
Proposed Sanitary Service	200mm @ 2.0%
Receiving Sanitary Sewer	Brant St. 300mm sanitary sewer
Development Water Demand (Fire + Domestic)	223 L/s
Available Flow Rate	289 L/s
Proposed Fire Service	200mm
Proposed Domestic Service	Branch 150mm
Allowable release rate from Proposed Apartment(L/s) [based on 5-year storm]	108 L/s
Proposed release rate from site (L/s) (100-year storm)	96 L/s

7.0 REFERENCES

1. Regional Municipality of Halton's *Water and Wastewater Linear Design Manual* (April 2019)
2. City of Burlington's manual *Stormwater Management Design Guidelines* (May 21, 2020)
3. Visual OTTHYMO v2.0 Reference Manual, JULY 2022

Respectfully Submitted;
The Odan Detech Group Inc.

January 13, 2023

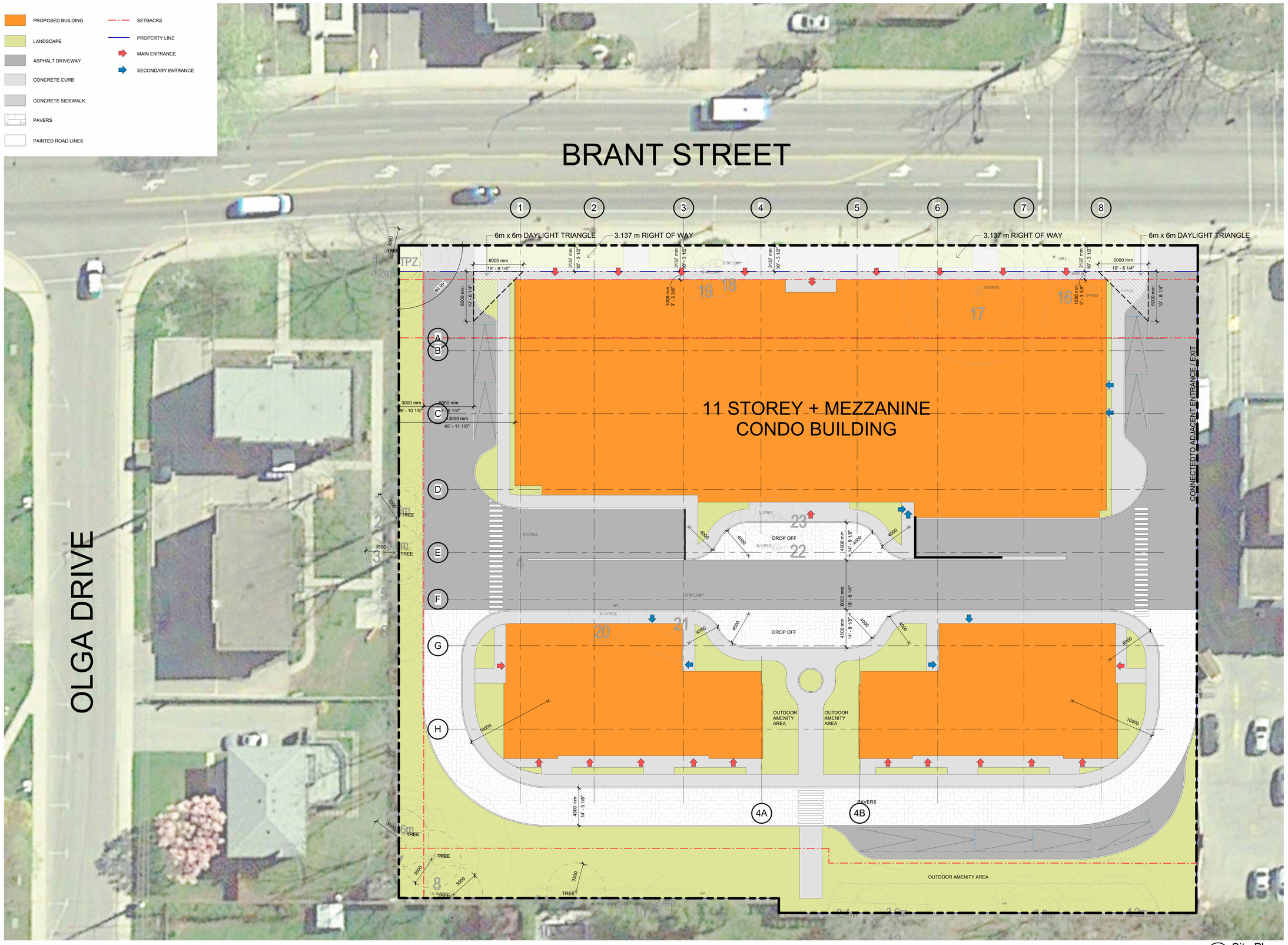


John Krpan, P.Eng., M.S.C.E.

Harold Ortal, E.I.T.

APPENDIX A

Site Plan	by Chamberlain Architect Services Limited
Statistics	by Chamberlain Architect Services Limited



1 / A.001 Site Plan
1 : 200

Chamberlain Architects Constructors Managers

Chamberlain Architect Services Limited

4671 Palladium Way (Unit 1)
Burlington, Ontario. L7M 0W9
CANADA

Phone: 905.631.7777

www.chamberlainIPD.com

NO.	ISSUED	DATE
1	CLIENT REVIEW	2022-06-30
2	CLIENT REVIEW	2022-07-11
3	CLIENT REVIEW	2022-10-14
4	CLIENT REVIEW	2022-11-01
5	CLIENT REVIEW	2022-11-11

DO NOT SCALE DRAWINGS. USE ONLY DRAWINGS MARKED "ISSUED FOR CONSTRUCTION". VERIFY CONFIGURATIONS AND DIMENSIONS ON SITE BEFORE BEGINNING WORK. NOTIFY ARCHITECT IMMEDIATELY OF ANY ERRORS, OMISSIONS OR DISCREPANCIES.

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SEAL

CONSTRUCTION NORTH TRUE NORTH

BRANT CONDOS

688 Brant St
Burlington, ON
L7R 2H5

SHEET NAME

SITE PLAN

START DATE	MARCH 2022
DRAWN BY	CMC / HK
CHECKED BY	JM
SCALE	As indicated
PROJECT NO.	122023
DRAWING	A.001

C:\Users\hkarami\Documents\122023 - Brant - Site File - SPA - 2022-12-05 - Current_hkaramiCMHP.rvt
2022-12-16 3:42:25 PM

APPENDIX B

Pre-Development Sanitary Sewer Catchment Plan
Pre-Development Downstream Sanitary Sewer Analysis Sheet
Post-Development Sanitary Sewer Catchment Plan
Post-Development Downstream Sanitary Sewer Analysis Sheet

CATCHMENT 48
COMMERCIAL
2.46ha
POP = 222

INFLOW Z
0.32ha

CATCHMENT 47
COMMERCIAL
0.43ha
POP = 39

INFLOW Y
0.26ha

CATCHMENT 49
COMMERCIAL
1.75ha
POP = 158

INFLOW X
0.29ha

INFLOW W
0.23ha

CATCHMENT 50
COMMERCIAL
3.19ha
POP = 288

INFLOW V
0.29ha

INFLOW U
0.27ha

INFLOW T
0.35ha

CATCHMENT 51
APARTMENT (over 6-Stories)
1.86ha
POP = 530

INFLOW S
0.18ha

INFLOW R
0.18ha

INFLOW Q
0.29ha

CATCHMENT 52
COMMERCIAL
3.85ha
POP = 347

INFLOW P
0.31ha

INFLOW O
0.34ha

CATCHMENT 53
4 - DETACHED HOME
0.35ha
POP = 20

CATCHMENT 54
COMMERCIAL
0.37ha
POP = 34

CATCHMENT 13
76 - DETACHED HOME
7.93ha
POP = 436

CATCHMENT 9
COMMERCIAL
2.38ha
POP = 215

INFLOW N
0.30ha

CATCHMENT 10
FUTURE APARTMENT
6-STORIES
0.42ha
POP = 411

CATCHMENT 55
DETACHED
0.10ha
POP = 6

CATCHMENT 8
COMMERCIAL
0.87ha
POP = 79

CATCHMENT 7
COMMERCIAL
0.26ha
POP = 23

INFLOW H
0.42ha

INFLOW I
0.32ha

INFLOW J
0.58ha

INFLOW G
0.37ha

INFLOW F
0.23ha

INFLOW E
0.34ha

CATCHMENT 3
COMMERCIAL
0.52ha
POP = 47

INFLOW D
0.13ha

INFLOW C
0.30ha

CATCHMENT 6
COMMERCIAL
0.28ha
POP = 26

INFLOW K
0.53ha

INFLOW L
0.39ha

INFLOW M
0.15ha

CATCHMENT 5
COMMERCIAL
3.62ha
POP = 326

CATCHMENT 4
COMMERCIAL
1.99ha
POP = 180

CATCHMENT 1
TOWNHOUSE
1.94ha
POP = 262

INFLOW B
0.30ha

INFLOW A
0.24ha

CATCHMENT 2
COMMERCIAL
0.32ha
POP = 29

CATCHMENT 11
COMMERCIAL
1.58ha
POP = 143

INFLOW 1
0.28ha

INFLOW 2
0.26ha

INFLOW 25
0.07ha

CATCHMENT 12
APARTMENT (UNDER 6-S)
0.47ha
POP = 63

CATCHMENT 15
7.89ha - COMMERCIAL
POP = 711

CATCHMENT 16
1.27ha - TOWNHOUSE
0.99ha - APARTMENT (over 6-S)
3.48ha - UNDEVELOPED
POP = 455

INFLOW 3
0.12ha

INFLOW 4
0.11ha

INFLOW 5
0.11ha

CATCHMENT 17
5.34ha - DETACHED HOME (37units)
5.35ha - TOWNHOUSE & APARTMENT
3.4ha - PARK
0.14ha - COMMERCIAL
POP = 1166

CATCHMENT 14
1.89ha - DETACHED HOME (9units)
2.57ha - TOWNHOUSE & APARTMENT
1.97ha - APARTMENT (over 6-S)
0.81ha - COMMERCIAL
POP = 1049

CATCHMENT 18
MIXED-USE
1.67ha
POP = 221

CATCHMENT 19
COMMERCIAL
0.51ha
POP = 47

INFLOW 6
0.04ha

CATCHMENT 44
#1433 BALDWIN ST.
SCHOOL
6.37ha
POP = 574

CATCHMENT 45
0.765ha - COMMERCIAL
POP = 69

CATCHMENT 46
4.72ha - DETACHED HOME (54units)
0.14ha - APARTMENT (UNDER 6-S)
POP = 279

INFLOW 7
0.07ha

CATCHMENT 43
COMMERCIAL
0.25ha
POP = 23

INFLOW 9
0.19ha

INFLOW 11
0.04ha

INFLOW 12
0.16ha

CATCHMENT 20
1.50ha - SEMI-DETACHED(38units)
0.42ha - DETACHED(4units)
POP = 174

CATCHMENT 21
1.82ha - DETACHED(16units)
POP = 101

CATCHMENT 22
0.29ha - DETACHED(2units)
POP = 15

CATCHMENT 23
SCHOOL
1.82ha
POP = 164

INFLOW 8
0.15ha

INFLOW 10
0.15ha

CATCHMENT 24
COMMERCIAL
0.92ha
POP = 83

INFLOW 13
0.23ha

CATCHMENT 42
COMMERCIAL
0.28ha
POP = 26

CATCHMENT 41
COMMERCIAL
0.33ha
POP = 30

CATCHMENT 25
COMMERCIAL (4units)
0.66ha
POP = 60

CATCHMENT 26
COMMERCIAL
1.57ha
POP = 142

INFLOW 14
0.24ha

CATCHMENT 40
COMMERCIAL
0.49ha
POP = 45

CATCHMENT 27
COMMERCIAL
0.38ha
POP = 35

CATCHMENT 28
COMMERCIAL
0.41ha
POP = 37

INFLOW 16
0.14ha

INFLOW 17
0.03ha

CATCHMENT 39
COMMERCIAL
0.27ha
POP = 25

CATCHMENT 38
DETACHED
0.17ha
POP = 5

CATCHMENT 37
COMMERCIAL
0.20ha
POP = 19

CATCHMENT 29
COMMERCIAL
0.30ha
POP = 28

CATCHMENT 30
COMMERCIAL
0.27ha
POP = 25

INFLOW 19
0.11ha

CATCHMENT 31
COMMERCIAL
0.48ha
POP = 44

CATCHMENT 32
COMMERCIAL
0.27ha
POP = 25

CATCHMENT 33
COMMERCIAL
0.31ha
POP = 29

INFLOW 22
0.11ha

INFLOW 23
0.04ha

INFLOW 21
0.12ha

INFLOW 20
0.16ha

CATCHMENT 35
COMMERCIAL
0.41ha
POP = 37

CATCHMENT 36
COMMERCIAL
0.20ha
POP = 19

INFLOW 18
0.10ha

INFLOW 24
0.05ha

CATCHMENT 34
COMMERCIAL
0.89ha
POP = 81

INFLOW 15
0.23ha

EX 1800mm TRUNK SAN

MH1 MH2 MH3 MH4 MH5 MH6 MH7 MH8 MH9 MH10 MH11 MH12 MH13 MH14 MH15 MH16 MH17 MH18 MH19 MH20 MH21 MH22 MH23 MH24 MH25 MH26 MH27 MH28 MH29 MH30 MH31 MH32 MH33 MH34 MH35 MH36 MH37 MH38 MH39 MH40 MH41 MH42 MH43 MH44 MH45 MH46 MH47 MH48 MH49 MH50 MH51 MH52 MH53 MH54 MH55 MH56 MH57 MH58 MH59 MH60 MH61 MH62 MH63 MH64 MH65 MH66

PLAINS RD. E.
BRANT ST.
FAIRVIEW ST.
EDINBURCH DR.
MAPLEWOOD DR.
PROSPECT ST.
GHENT AVE.
GROVETREE LN.
ROBINSON ST.
GRAHAMS LN.
RAMBO CRESCENT
BLAIRHOLM AVE.
OLGA DR.
VICTORIA AVE.
BLENHEIM ST.
BALDWIN ST.
BIRCH AVE.
CAROLINE ST.
JAMES ST.
ELGIN ST.
ONTARIO ST.

LEGEND

DENOTES SUBJECT SITES DRAINAGE AREA

SANITARY CATCHMENT ID & DETAILS
DENOTES SANITARY MH TO WHICH FLOWS DRAIN INTO
DENOTES AREA FLOWS ORIGINATE FROM
RESIDENTIAL
0.30ha
POP = 156

PROJ. NO.: 21284	DATE: JAN 2023
SCALE: 1:3000	SHEET:

DRAWING :

PRE-DEVELOPMENT SANITARY DRAINAGE PLAN

PROJECT :

PROPOSED 11-STOREY APARTMENT
888, 894 & 898 BRANT ST.
BURLINGTON, ONTARIO

ODAN-DETECH CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-2811 F: (905) 632-2382
3310 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7N 3M6

EXISTING DOWNSTREAM SANITARY SEWER ANALYSIS SHEET - PRE-DEVELOPMENT WWF (I/I=0.286 L/s/Ha)

Site location:

Ref# PN 21284

q = average daily per capita flow = 0.003183(L/cap/s) (RESIDENTIAL)
q = average daily per capita flow = 0.28646(L/ha/s) (COMMERCIAL)
I = Unit of peak extraneous flow = 0.286 L/s/Ha 0.286 L/s/Ha thereafter
Q(p) = peak population flow (L/s)
Q(I) = peak extraneous flow (L/s) Subject Site Area = 0.765 Ha
Q(d) = peak design flow (L/s)

Mannings Equation:

Qcap=(D/1000)^2.667*(S/100)^0.5/(3.211*n)*1000(L/s)
D: pipe size (mm)
S: slope (grade) of pipe (%)
n = Manning roughness coefficient = 0.013

Location					Inlet Flow																		Pipe					
					Existing Commercial							Existing Residential																	
Sanitary Trib ID	Street Name	Pipe No. Main or Trib Branch	US MH	DS MH	Area (ha)	Population (Person)	Accumulative Population (Person)	CommercialP /F M	Average Commercial Sanitary Q (0.28646 L/ha/s) (L/s)	Accumulative Sanitary Q(p) (0.28646 L/ha/s) (L/s)	**Commercial Peak Sanitary Flow Q(p) (L/s)**	Area (ha)	DETACHED (Person)	SEMI-DETACHED (Person)	TOWNHOUSE / APARTMENT (under 6-S) (Person)	APARTMENT (over 6-S) (Person)	Accumulative Population (Person)	Residential P/F M	Average Residential Sanitary Q (0.003183 L/c/s) (L/s)	Accumulative Sanitary Q(p) (0.003183 L/c/s) (L/s)	**Residential Peak Sanitary Flow Q(p) (L/s)**	Inflow/ Infiltration Area (ha)	Segment Inflow/ Infiltration Q(i) (L/s)	Pumped Groundwater Fow Q (aw) (L/s)	**Accumulative Inflow/ Infiltration Q(i) (L/s)**	Segment Peak SAN Inflow Q(d) (L/s)	**Accumulative Sanitary Flow Q(d) (L/s)**	Length L (m)	Size (mm)	Slope S (%)	Shape	Full Flow Capacity Qcap (L/s)	**% Full Q(d)/Qcap**
CATCHMENT 2 & INFLOW A	PLAINS RD. E.	main	MH1	MH2	0.32	29	29	3.49	0.09	0.09	0.32	-	-	-	-	-	-	4.50	-	-	-	0.56	0.16		0.16	0.32	0.48	69.20	250	0.50	Circle	42.05	1.14%
CATCHMENT 1, 4 & INFLOW B	PLAINS RD. E.	main	MH2	MH3	1.99	179	208	3.31	0.57	0.66	2.19	1.94			262.00		262.00	4.10	0.83	0.83	3.42	4.23	1.21		1.37	5.61	6.98	105.70	250	0.50	Circle	42.05	16.61%
INFLOW C	PLAINS RD. E.	main	MH3	MH4	-	-	208	3.31	-	0.66	2.19	-	-	-	-	-	262.00	4.10	-	0.83	3.42	0.30	0.09		1.46	5.61	7.07	61.00	250	0.50	Circle	42.05	16.81%
INFLOW D	PLAINS RD. E.	main	MH4	MH5	-	-	208	3.31	-	0.66	2.19	-	-	-	-	-	262.00	4.10	-	0.83	3.42	0.13	0.04		1.49	5.61	7.11	40.31	250	0.50	Circle	42.05	16.90%
CATCHMENT 3, 6 & INFLOW E	PLAINS RD. E.	main	MH5	MH6	0.80	72	280	3.27	0.23	0.89	2.92	-	-	-	-	-	262.00	4.10	-	0.83	3.42	1.14	0.33		1.82	6.34	8.16	96.48	250	0.50	Circle	42.05	19.40%
CATCHMENT 7, 8 & INFLOW G	PLAINS RD. E.	main	MH8	MH7	1.13	102	102	3.39	0.32	0.32	1.10	-	-	-	-	-	-	4.50	-	-	-	1.50	0.43		0.43	1.10	1.53	92.81	300	0.50	Circle	68.38	2.23%
INFLOW F	PLAINS RD. E.	main	MH7	MH6	-	-	102	3.39	-	0.32	1.10	-			-		-	4.50	-	-	-	0.23	0.07		0.49	1.10	1.59	27.65	300	0.50	Circle	68.38	2.33%
INFLOW H	BRANT ST.	main	MH6	MH9	-	-	382	3.23	-	1.21	3.92	-	-	-	-	-	262.00	4.10	-	0.83	3.42	0.42	0.12		2.43	7.34	9.77	93.98	300	0.50	Circle	68.38	14.29%
INFLOW I	BRANT ST.	main	MH9	MH10	-	-	382	3.23	-	1.21	3.92	-			-		262.00	4.10	-	0.83	3.42	0.32	0.09		2.53	7.34	9.86	65.80	300	0.50	Circle	68.38	14.43%
INFLOW J	BRANT ST.	main	MH10	MH11	-	-	382	3.23	-	1.21	3.92	-			-		262.00	4.10	-	0.83	3.42	0.58	0.17		2.69	7.34	10.03	97.27	300	0.50	Circle	68.38	14.67%
INFLOW K	BRANT ST.	main	MH11	MH12	-	-	382	3.23	-	1.21	3.92	-			-		262.00	4.10	-	0.83	3.42	0.53	0.15		2.84	7.34	10.18	69.52	300	0.50	Circle	68.38	14.89%
CATCHMENT 5, 9 & INFLOW L	BRANT ST.	main	MH12	MH13	6.00	540	922	3.06	1.72	2.93	8.97	-			-		262.00	4.10	-	0.83	3.42	6.39	1.83		4.67	12.39	17.06	111.72	300	1.60	Circle	122.32	13.95%
CATCHMENT 47 & INFLOW Z	FAIRVIEW ST.	main	MH66	MH65	0.43	39	39	3.47	0.12	0.12	0.43	-	-	-	-	-	-	4.50	-	-	-	0.75	0.21		0.21	0.43	0.64	59.00	250	0.50	Circle	42.05	1.53%
CATCHMENT 48 & INFLOW Y	FAIRVIEW ST.	main	MH65	MH64	2.46	221	260	3.28	0.70	0.83	2.72	-			-		-	4.50	-	-	-	2.72	0.78		0.99	2.72	3.71	76.80	300	0.50	Circle	68.38	5.43%
CATCHMENT 49 & INFLOW X	FAIRVIEW ST.	main	MH64	MH63	1.75	158	418	3.21	0.50	1.33	4.27	-			-		-	4.50	-	-	-	2.04	0.58		1.58	4.27	5.84	74.50	300	0.50	Circle	68.38	8.55%
INFLOW W	FAIRVIEW ST.	main	MH63	MH62	-	-	418	3.21	-	1.33	4.27	-			-		-	4.50	-	-	-	0.23	0.07		1.64	4.27	5.91	65.30	300	0.50	Circle	68.38	8.64%
INFLOW V	FAIRVIEW ST.	main	MH62	MH61	-	-	418	3.21	-	1.33	4.27	-			-		-	4.50	-	-	-	0.29	0.08		1.72	4.27	5.99	80.60	450	0.50	Circle	201.60	2.97%
CATCHMENT50 & INFLOW U	FAIRVIEW ST.	main	MH61	MH60	3.19	287	705	3.11	0.91	2.24	6.99	-			-		-	4.50	-	-	-	3.46	0.99		2.71	6.99	9.70	78.20	450	0.50	Circle	201.60	4.81%
INFLOW T	FAIRVIEW ST.	main	MH60	MH59	-	-	705	3.11	-	2.24	6.99	-			-		-	4.50	-	-	-	0.35	0.10		2.81	6.99	9.80	88.50	450	0.50	Circle	201.60	4.86%
CATCHMENT51 & INFLOW S	FAIRVIEW ST.	main	MH59	MH58	-	-	705	3.11	-	2.24	6.99	1.86			-	530.00	530.00	3.96	1.69	1.69	6.68	2.04	0.58		3.40	13.67	17.07	44.26	450	0.50	Circle	201.60	8.46%
INFLOW R	FAIRVIEW ST.	main	MH58	MH57	-	-	705	3.11	-	2.24	6.99	-			-	-	530.00	3.96	-	1.69	6.68	0.18	0.05		3.45	13.67	17.12	43.00	450	0.50	Circle	201.60	8.49%
INFLOW Q	FAIRVIEW ST.	main	MH57	MH56	-	-	705	3.11	-	2.24	6.99	-			-	-	530.00	3.96	-	1.69	6.68	0.29	0.08		3.53	13.67	17.20	76.40	450	0.50	Circle	201.60	8.53%
CATCHMENT52 & INFLOW P	FAIRVIEW ST.	main	MH56	MH55	3.85	347	1,051	3.03	1.10	3.35	10.13	-			-	-	530.00	3.96	-	1.69	6.68	4.16	1.19		4.72	16.82	21.54	78.65	525	0.50	Circle	304.10	7.08%
INFLOW O	FAIRVIEW ST.	main	MH55	MH54	-	-	1,051	3.03	-	3.35	10.13	-			-	-	530.00	3.96	-	1.69	6.68	0.34	0.10		4.82	16.82	21.64	91.77	525	0.50	Circle	304.10	7.11%
INFLOW N	FAIRVIEW ST.	main	MH54	MH13	-	-	1,051	3.03	-	3.35	10.13	-			-	-	530.00	3.96	-	1.69	6.68	0.30	0.09		4.90	16.82	21.72	92.00	525	0.50	Circle	304.10	7.14%
INFLOW M	BRANT ST.	main	MH13	MH14	-	-	1,973	2.87	-	6.28	18.04	-	-	-	-	-	792.00	3.86	-	2.52	9.74	0.15	0.04		9.62	27.77	37.39	10.78	300	1.91	Circle	133.64	27.98%
INFLOW 1	BRANT ST.	main	MH14	MH15	-	-	1,973	2.87	-	6.28	18.04	-			-		792.00	3.86	-	2.52	9.74	0.28	0.08		9.70	27.77	37.47	60.21	300	0.97	Circle	95.24	39.35%
CATCHMENT 11 & INFLOW 2	BRANT ST.	main	MH15	MH17	1.58	142	2,115	2.85	0.45	6.73	19.21	-			-		792.00	3.86	-	2.52	9.74	1.84	0.53		10.22	28.95	39.17	80.61	375	0.33	Circle	100.72	38.89%
CATCHMENT 10, 13, 53	BRANT ST.	main	MH17	MH19	-	-	2,115	2.85	-	6.73	19.21	8.70	456.00	-	411.00	-	1,659.00	3.65	2.76	5.28	19.26	8.70	2.49		12.71	38.47	51.18	75.00	375	0.47	Circle	120.20	42.58%
CATCHMENT 54	BRANT ST.	main	MH19	MH21	0.37	33	2,148	2.85	0.11	6.84	19.48	-	-		-		1,659.00	3.65	-	5.28	19.26	0.37	0.11		12.82	38.74	51.56	77.10	375	0.46	Circle	118.91	43.36%
CATCHMENT 14	BRANT ST.	main	MH21	MH23	0.81	73	2,221	2.84	0.23	7.07	20.08	6.43	104.00		347.00	562.00	2,672.00	3.48	3.22	8.50	29.64	7.24	2.07		14.89	49.71	64.60	79.00	450	0.37	Circle	173.42	37.25%
CATCHMENT 55	BRANT ST.	main	MH23	MH25	-	-	2,221	2.84	-	7.07	20.08	0.10	6.00				2,678.00	3.48	0.02	8.52	29.70	0.10	0.03		14.92	49.77	64.69	74.60	450	0.52	Circle	205.59	31.47%
CATCHMENT 17	BRANT ST.	main	MH25	MH27	0.14	13	2,234	2.84	0.04	7.11	20.18	10.69	294.00		723.00		3,695.00	3.36	3.24	11.76	39.56	14.23	4.07		18.99	59.74	78.73	89.50	450	0.44	Circle	189.12	41.63%

Location					Existing Commercial							Existing Residential										Inflow/ Infiltration	Segment Inflow/ Infiltration	Pumped Groundwater Fow	Accumulative Inflow/ Infiltration	Segment Peak SAN Inflow	Accumulative Sanitary Flow	Pipe					
					Area	Population	Accumulative Population	CommercialP/F	Average Commercial Sanitary	Accumulative Sanitary	**Commercial Peak Sanitary Flow**	Area	DETACHED	SEMI-DETACHED	TOWNHOUSE / APARTMENT (under 6-S)	APARTMENT (over 6-S)	Accumulative Population	Residential P/F	Average Residential Sanitary	Accumulative Sanitary	**Residential Peak Sanitary Flow**							Length	Size	Slope	Shape	Full Flow Capacity	**% Full**
Sanitary Trib ID	Street Name	Pipe No. Main or Trib Branch	US MH	DS MH	(ha)	(Person)	(Person)	M	Q (0.28646 L/ha/s) (L/s)	Q(p) (0.28646 L/ha/s) (L/s)	**Q(p) (L/s)**	(ha)	(Person)	(Person)	(Person)	(Person)	(Person)	M	Q (0.003183 L/c/s) (L/s)	Q(p) (0.003183 L/c/s) (L/s)	**Q(p) (L/s)**	Area (ha)	Q(i) (L/s)	Q (pw) (L/s)	**Q(i) (L/s)**	Q(d) (L/s)	**Q(d) (L/s)**	L (m)	(mm)	S (%)		Qcap (L/s)	**Q(d)/Qcap**
	BRANT ST.	main	MH27	MH28	-	-	2,234	2.84	-	7.11	20.18	-	-		-		3,695.00	3.36	-	11.76	39.56	-	-		18.99	59.74	78.73	7.70	450	0.80	Circle	255.01	30.87%
CATCHMENT 20	BRANT ST.	main	MH28	MH30	-	-	2,234	2.84	-	7.11	20.18	1.92	24.00	150.00	-		3,869.00	3.35	0.55	12.32	41.21	1.92	0.55		19.54	61.39	80.93	76.30	450	0.48	Circle	197.53	40.97%
CATCHMENT 21	BRANT ST.	main	MH30	MH34	-	-	2,234	2.84	-	7.11	20.18	1.82	101.00		-		3,970.00	3.34	0.32	12.64	42.16	1.82	0.52		20.06	62.34	82.40	64.60	450	0.39	Circle	178.05	46.28%
CATCHMENT 22	BRANT ST.	main	MH34	MH35	-	-	2,234	2.84	-	7.11	20.18	0.29	15.00		-		3,985.00	3.33	0.05	12.68	42.30	0.29	0.08		20.14	62.48	82.62	69.70	450	0.29	Circle	153.53	53.81%
INFLOW 25	BRANT ST.	main	MH18	MH20	-	-	-	3.60	-	-	-	-	-	-	-	-	-	4.50	-	-	-	0.07	0.02		0.02	-	0.02	69.00	300	0.77	Circle	84.85	0.02%
CATCHMENT 12 & INFLOW 3	BRANT ST.	main	MH20	MH22	-	-	-	3.60	-	-	-	0.47	-		63.00		63.00	4.29	0.20	0.20	0.86	0.59	0.17		0.19	0.86	1.05	74.00	300	0.49	Circle	67.69	1.55%
CATCHMENT 15 & INFLOW 4	BRANT ST.	main	MH22	MH24	7.89	710	710	3.11	2.26	2.26	7.04	-	-		-		63.00	4.29	-	0.20	0.86	8.00	2.29		2.48	7.90	10.37	89.70	300	0.40	Circle	61.16	16.96%
INFLOW 5	BRANT ST.	main	MH24	MH26	-	-	710	3.11	-	2.26	7.04	-	-		-		63.00	4.29	-	0.20	0.86	0.11	0.03		2.51	7.90	10.40	68.30	300	0.41	Circle	61.92	16.80%
CATCHMENT 16 & 18	BRANT ST.	main	MH26	MH29	1.67	150	860	3.07	0.48	2.74	8.42	2.26	-		172.00	354.00	589.00	3.94	1.67	1.87	7.38	7.41	2.12		4.63	15.80	20.42	114.40	300	0.45	Circle	64.87	31.48%
CATCHMENT 19	BRANT ST.	main	MH29	MH31	0.51	46	906	3.06	0.15	2.88	8.83	-	-		-	-	589.00	3.94	-	1.87	7.38	0.51	0.15		4.77	16.21	20.99	55.00	300	0.43	Circle	63.41	33.09%
	BRANT ST.	main	MH31	MH32	-	-	906	3.06	-	2.88	8.83	-	-		-	-	589.00	3.94	-	1.87	7.38	-	-		4.77	16.21	20.99	10.40	300	0.08	Circle	27.35	76.73%
CATCHMENT 46 & INFLOW 6	BRANT ST.	main	MH32	MH33	-	-	906	3.06	-	2.88	8.83	4.86	260.00		19.00	-	868.00	3.84	0.89	2.76	10.61	4.90	1.40		6.17	19.44	25.61	35.90	300	0.11	Circle	32.07	79.86%
CATCHMENT 45 & INFLOW 7	BRANT ST.	main	MH33	MH36	0.76	68	975	3.05	0.22	3.10	9.45	-	-		-	-	868.00	3.84	-	2.76	10.61	0.83	0.24		6.41	20.05	26.47	88.40	300	0.45	Circle	64.87	40.80%
	BRANT ST.	main	MH36	MH35	-	-	975	3.05	-	3.10	9.45	-	-		-	-	868.00	3.84	-	2.76	10.61	-	-		6.41	20.05	26.47	7.27	300	5.40	Circle	224.71	11.78%
CATCHMENT 43 & INFLOW 8	BRANT ST.	main	MH35	MH37	0.25	23	3,231	2.73	0.07	10.28	28.09	-	-	-	-	-	4,853.00	3.26	-	15.45	50.31	0.40	0.11		26.67	78.41	105.07	68.00	450	0.35	Circle	168.67	62.29%
INFLOW 9	BRANT ST.	main	MH37	MH38	-	-	3,231	2.73	-	10.28	28.09	-	-		-		4,853.00	3.26	-	15.45	50.31	0.19	0.05		26.72	78.41	105.13	72.00	450	0.59	Circle	218.99	48.00%
CATCHMENT 24, 44 & INFLOW 10	BRANT ST.	main	MH38	MH39	7.29	656	3,887	2.68	2.09	12.37	33.10	-	-		-		4,853.00	3.26	-	15.45	50.31	7.44	2.13		28.85	83.41	112.26	52.60	450	0.25	Circle	142.55	78.75%
INFLOW 11	BRANT ST.	main	MH39	MH40	-	-	3,887	2.68	-	12.37	33.10	-	-		-		4,853.00	3.26	-	15.45	50.31	0.04	0.01		28.86	83.41	112.27	15.60	450	1.53	Circle	352.66	31.84%
INFLOW 12	BRANT ST.	main	MH40	MH41	-	-	3,887	2.68	-	12.37	33.10	-	-		-		4,853.00	3.26	-	15.45	50.31	0.16	0.05		28.91	83.41	112.32	31.30	450	2.30	Circle	432.38	25.98%
CATCHMENT 25, 42 & INFLOW 13	BRANT ST.	main	MH41	MH42	0.94	85	3,972	2.67	0.27	12.64	33.74	-	-		-		4,853.00	3.26	-	15.45	50.31	1.17	0.33		29.24	84.05	113.29	78.70	525	0.29	Circle	231.60	48.92%
CATCHMENT 26, 41 & INFLOW 14	BRANT ST.	main	MH42	MH43	1.90	171	4,143	2.66	0.54	13.19	35.02	-	-		-		4,853.00	3.26	-	15.45	50.31	2.14	0.61		29.85	85.33	115.18	83.10	525	0.41	Circle	275.37	41.83%
CATCHMENT 27, 40 & INFLOW 15	BRANT ST.	main	MH43	MH44	0.87	78	4,221	2.65	0.25	13.43	35.60	-	-		-		4,853.00	3.26	-	15.45	50.31	1.10	0.31		30.17	85.91	116.08	106.30	525	0.41	Circle	275.37	42.15%
CATCHMENT 28 39 & INFLOW 16	BRANT ST.	main	MH44	MH45	0.68	61	4,282	2.65	0.19	13.63	36.06	-	-		-		4,853.00	3.26	-	15.45	50.31	0.82	0.23		30.40	86.37	116.77	70.67	525	0.50	Circle	304.10	38.40%
CATCHMENT 38 & INFLOW 17	BRANT ST.	main	MH45	MH46	-	-	4,282	2.65	-	13.63	36.06	0.17	5.00		-		4,858.00	3.26	0.02	15.46	50.36	0.20	0.06		30.46	86.41	116.87	12.80	525	1.00	Circle	430.06	27.18%
CATCHMENT 29, 37 & INFLOW 18	BRANT ST.	main	MH46	MH47	0.50	45	4,327	2.64	0.14	13.77	36.39	-	-		-		4,858.00	3.26	-	15.46	50.36	0.60	0.17		30.63	86.75	117.38	54.30	525	0.91	Circle	410.25	28.61%
CATCHMENT 30, 36 & INFLOW 19	BRANT ST.	main	MH47	MH48	0.47	42	4,370	2.64	0.13	13.91	36.70	-	-		-		4,858.00	3.26	-	15.46	50.36	0.58	0.17		30.80	87.06	117.85	57.40	525	0.78	Circle	379.82	31.03%
CATCHMENT 31, 35 & INFLOW 20	BRANT ST.	main	MH48	MH49	0.89	80	4,450	2.63	0.25	14.16	37.29	-	-		-		4,858.00	3.26	-	15.46	50.36	1.05	0.30		31.10	87.65	118.75	84.20	600	0.25	Circle	307.01	38.68%
CATCHMENT 32 & INFLOW 21	BRANT ST.	main	MH49	MH50	0.27	24	4,474	2.63	0.08	14.24	37.47	-	-		-		4,858.00	3.26	-	15.46	50.36	0.39	0.11		31.21	87.83	119.04	65.70	600	0.21	Circle	281.38	42.31%
CATCHMENT 33, 34 & INFLOW 22	BRANT ST.	main	MH50	MH51	1.20	108	4,582	2.62	0.34	14.58	38.27	-	-		-		4,858.00	3.26	-	15.46	50.36	1.31	0.37		31.58	88.62	120.21	65.00	600	0.21	Circle	281.38	42.72%
INFLOW 23	BRANT ST.	main	MH51	MH52	-	-	4,582	2.62	-	14.58	38.27	-	-		-		4,858.00	3.26	-	15.46	50.36	0.04	0.01		31.59	88.62	120.22	21.80	600	0.81	Circle	552.61	21.75%
INFLOW 24	BRANT ST.	main	MH52	MH53	-	-	4,582	2.62	-	14.58	38.27	-	-		-		4,858.00	3.26	-	15.46	50.36	0.05	0.01		31.61	88.62	120.23	12.50	600	0.81	Circle	552.61	21.76%

Notes:

PEAKING FACTOR, COMMERCIAL/INDUSTRIAL	M =0.8 * (1 + 14/(4+(P/1000^0.5)))
PEAKING FACTOR, RESIDENTIAL	M =1 + 14/(4+(P/1000^0.5))
AVERAGE DAILY PER CAPITA FLOW (RESIDENTIAL)	q = 0.003183 L/cap/s
AVERAGE DAILY PER CAPITA FLOW (COMMERCIAL & INDUSTRIAL)	q = 0.28646 L/ha/s
UNIT OF PEAK EXTRANEOUS FLOW,	0.286 L/s/ha
PEAK POPULATION FLOW,	Q (p) = q*P*M / 86400 L / Sec.
PEAK EXTRANEOUS FLOW.	Q(i) = I*A L / Sec.
PEAK DESIGN FLOW,	Q(d) = Q(p) + Q(i) L / Sec.
PIPE ROUGHGNESS,	n = 0.013 For Manning's Equation

Vmin. = 0.6m/s and Vmax. = 3m/s

DETACHED	55 person/ha
SEMI-DETACHE(	100 person/ha
TOWNHOUSE	135 person/ha
APARTMENT OVER 6-S	285 person/ha
LIGHT COMMERCIAL COMMUNITY SERVICES	90 person/ha 40 person/ha

CATCHMENT 48
COMMERCIAL
2.46ha
POP = 222

INFLOW Z
0.32ha

CATCHMENT 47
COMMERCIAL
0.43ha
POP = 39

INFLOW Y
0.26ha

CATCHMENT 49
COMMERCIAL
1.75ha
POP = 158

INFLOW X
0.29ha

INFLOW W
0.23ha

CATCHMENT 50
COMMERCIAL
3.19ha
POP = 288

INFLOW V
0.29ha

INFLOW U
0.27ha

INFLOW T
0.35ha

CATCHMENT 51
APARTMENT (over 6-Stories)
1.86ha
POP = 530

INFLOW S
0.18ha

INFLOW R
0.18ha

INFLOW Q
0.29ha

CATCHMENT 52
COMMERCIAL
3.85ha
POP = 347

INFLOW P
0.31ha

INFLOW O
0.34ha

CATCHMENT 53
4 - DETACHED HOME
0.35ha
POP = 20

CATCHMENT 54
COMMERCIAL
0.37ha
POP = 34

CATCHMENT 13
76 - DETACHED HOME
7.93ha
POP = 436

CATCHMENT 17
5.34ha - DETACHED HOME (37units)
5.35ha - TOWNHOUSE & APARTMENT
3.4ha - PARK
0.14ha - COMMERCIAL
POP = 1166

CATCHMENT 14
1.89ha - DETACHED HOME (9units)
2.57ha - TOWNHOUSE & APARTMENT
1.97ha - APARTMENT (over 6-S)
0.81ha - COMMERCIAL
POP = 1049

CATCHMENT 20
1.50ha - SEMI-DETACHED(38units)
0.42ha - DETACHED(4units)
POP = 174

CATCHMENT 21
1.82ha - DETACHED(16units)
POP = 101

CATCHMENT 22
0.29ha - DETACHED(2units)
POP = 15

CATCHMENT 23
SCHOOL
1.82ha
POP = 164

CATCHMENT 24
COMMERCIAL
0.92ha
POP = 83

CATCHMENT 25
COMMERCIAL (4units)
0.66ha
POP = 60

CATCHMENT 26
COMMERCIAL
1.57ha
POP = 142

CATCHMENT 27
COMMERCIAL
0.38ha
POP = 35

CATCHMENT 28
COMMERCIAL
0.41ha
POP = 37

CATCHMENT 29
COMMERCIAL
0.30ha
POP = 28

CATCHMENT 30
COMMERCIAL
0.27ha
POP = 25

CATCHMENT 31
COMMERCIAL
0.48ha
POP = 44

CATCHMENT 32
COMMERCIAL
0.27ha
POP = 25

CATCHMENT 33
COMMERCIAL
0.31ha
POP = 29

CATCHMENT 9
COMMERCIAL
2.38ha
POP = 215

INFLOW N
0.30ha

CATCHMENT 10
FUTURE APARTMENT
6-STORIES
0.42ha
POP = 411

CATCHMENT 55
DETACHED
0.10ha
POP = 6

CATCHMENT 8
COMMERCIAL
0.87ha
POP = 79

CATCHMENT 7
COMMERCIAL
0.26ha
POP = 23

INFLOW H
0.42ha

INFLOW I
0.32ha

INFLOW J
0.58ha

INFLOW G
0.37ha

INFLOW F
0.23ha

INFLOW E
0.34ha

CATCHMENT 3
COMMERCIAL
0.52ha
POP = 47

INFLOW D
0.13ha

INFLOW C
0.30ha

CATCHMENT 1
TOWNHOUSE
1.94ha
POP = 262

INFLOW B
0.30ha

INFLOW A
0.24ha

CATCHMENT 2
COMMERCIAL
0.32ha
POP = 29

CATCHMENT 6
COMMERCIAL
0.28ha
POP = 26

CATCHMENT 4
COMMERCIAL
1.99ha
POP = 180

INFLOW K
0.53ha

INFLOW L
0.39ha

INFLOW M
0.15ha

CATCHMENT 5
COMMERCIAL
3.62ha
POP = 326

CATCHMENT 11
COMMERCIAL
1.58ha
POP = 143

INFLOW 1
0.28ha

INFLOW 2
0.26ha

INFLOW 25
0.07ha

CATCHMENT 12
APARTMENT (UNDER 6-S)
0.47ha
POP = 63

CATCHMENT 15
7.89ha - COMMERCIAL
POP = 711

CATCHMENT 16
1.27ha - TOWNHOUSE
0.99ha - APARTMENT (over 6-S)
3.48ha - UNDEVELOPED
POP = 455

INFLOW 3
0.12ha

INFLOW 4
0.11ha

INFLOW 5
0.11ha

CATCHMENT 18
MIXED-USE
1.67ha
POP = 221

CATCHMENT 19
COMMERCIAL
0.51ha
POP = 47

INFLOW 6
0.04ha

CATCHMENT 46
4.72ha - DETACHED HOME (54units)
0.14ha - APARTMENT (UNDER 6-S)
POP = 279

CATCHMENT 45
PROPOSED 11-STOREY MIXED-USE
305units - RESIDENTIAL
0.16ha - COMMERCIAL
POP = 838

INFLOW 8
0.15ha

INFLOW 9
0.19ha

CATCHMENT 43
COMMERCIAL
0.25ha
POP = 23

INFLOW 7
0.07ha

CATCHMENT 44
#1433 BALDWIN ST.
SCHOOL
6.37ha
POP = 574

INFLOW 11
0.04ha

INFLOW 12
0.16ha

INFLOW 13
0.23ha

INFLOW 10
0.15ha

CATCHMENT 42
COMMERCIAL
0.28ha
POP = 26

CATCHMENT 41
COMMERCIAL
0.33ha
POP = 30

CATCHMENT 40
COMMERCIAL
0.49ha
POP = 45

INFLOW 14
0.24ha

INFLOW 15
0.23ha

CATCHMENT 39
COMMERCIAL
0.27ha
POP = 25

CATCHMENT 38
DETACHED
0.17ha
POP = 5

CATCHMENT 37
COMMERCIAL
0.20ha
POP = 19

INFLOW 16
0.14ha

INFLOW 17
0.03ha

INFLOW 19
0.11ha

INFLOW 21
0.12ha

INFLOW 20
0.16ha

CATCHMENT 35
COMMERCIAL
0.41ha
POP = 37

CATCHMENT 36
COMMERCIAL
0.20ha
POP = 19

INFLOW 18
0.10ha

INFLOW 22
0.11ha

INFLOW 23
0.04ha

INFLOW 24
0.05ha

CATCHMENT 34
COMMERCIAL
0.89ha
POP = 81

EX 1800mm TRUNK SAN

MH1 MH2 MH3 MH4 MH5 MH6 MH7 MH8 MH9 MH10 MH11 MH12 MH13 MH14 MH15 MH16 MH17 MH18 MH19 MH20 MH21 MH22 MH23 MH24 MH25 MH26 MH27 MH28 MH29 MH30 MH31 MH32 MH33 MH34 MH35 MH36 MH37 MH38 MH39 MH40 MH41 MH42 MH43 MH44 MH45 MH46 MH47 MH48 MH49 MH50 MH51 MH52 MH53 MH54 MH55 MH56 MH57 MH58 MH59 MH60 MH61 MH62 MH63 MH64 MH65 MH66

PLAINS RD. E.
BRANT ST.
FAIRVIEW ST.
EDINBURGH DR.
MAPLEWOOD DR.
ROBINSON ST.
PROSPECT ST.
GHENT AVE.
GROVETREE LN.
RAMBO CRESCENT
BLAIRHOLM AVE.
OLGA DR.
GRAHAMS LN.
VICTORIA AVE.
BLENHEIM ST.
BALDWIN ST.
BIRCH AVE.
CAROLINE ST.
JAMES ST.
ELGIN ST.
ONTARIO ST.

LEGEND

DENOTES SUBJECT SITES DRAINAGE AREA

SANITARY CATCHMENT ID & DETAILS
DENOTES SANITARY MH TO WHICH FLOWS DRAIN INTO
DENOTES AREA FLOWS ORIGINATE FROM
RESIDENTIAL 0.30ha POP = 156

PROJ. NO.: 21284	DATE: JAN 2023
SCALE: 1:3000	SHEET:

DRAWING :

POST-DEVELOPMENT SANITARY DRAINAGE PLAN

PROJECT :

PROPOSED 11-STOREY APARTMENT
688, 694 & 696 BRANT ST.
BURLINGTON, ONTARIO

ODAN-DETECH CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-2811 F: (905) 632-2382
5310 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

EXISTING DOWNSTREAM SANITARY SEWER ANALYSIS SHEET - POST-DEVELOPMENT WWF (I/I=0.286 L/s/Ha)

Site location:

Ref# PN 21284

q = average daily per capita flow = 0.003183(L/cap/s) (RESIDENTIAL)
q = average daily per capita flow = 0.28646(L/ha/s) (COMMERCIAL)
I = Unit of peak extraneous flow = 0.286 L/s/Ha 0.286 L/s/Ha thereafter
Q(p) = peak population flow (L/s)
Q(I) = peak extraneous flow (L/s) Subject Site Area = 0.765 Ha
Q(d) = peak design flow (L/s)

Mannings Equation:

Qcap=(D/1000)^2.667*(S/100)^0.5/(3.211*n)*1000(L/s)
D: pipe size (mm)
S: slope (grade) of pipe (%)
n = Manning roughness coefficient = 0.013

Location					Inlet Flow																		Pipe					
					Existing Commercial							Existing Residential																	
Sanitary Trib ID	Street Name	Pipe No. Main or Trib Branch	US MH	DS MH	Area (ha)	Population (Person)	Accumulative Population (Person)	CommercialP /F M	Average Commercial Sanitary Q (0.28646 L/ha/s) (L/s)	Accumulative Sanitary Q(p) (0.28646 L/ha/s) (L/s)	**Commercial Peak Sanitary Flow Q(p) (L/s)**	Area (ha)	DETACHED (Person)	SEMI-DETACHED (Person)	TOWNHOUSE / APARTMENT (under 6-S) (Person)	APARTMENT (over 6-S) (Person)	Accumulative Population (Person)	Residential P/F M	Average Residential Sanitary Q (0.003183 L/c/s) (L/s)	Accumulative Sanitary Q(p) (0.003183 L/c/s) (L/s)	**Residential Peak Sanitary Flow Q(p) (L/s)**	Inflow/ Infiltration Area (ha)	Segment Inflow/ Infiltration Q(i) (L/s)	Pumped Groundwater Fow Q (aw) (L/s)	**Accumulative Inflow/ Infiltration Q(i) (L/s)**	Segment Peak SAN Inflow Q(d) (L/s)	**Accumulative Sanitary Flow Q(d) (L/s)**	Length L (m)	Size (mm)	Slope S (%)	Shape	Full Flow Capacity Qcap (L/s)	**% Full Q(d)/Qcap**
CATCHMENT 2 & INFLOW A	PLAINS RD. E.	main	MH1	MH2	0.32	29	29	3.49	0.09	0.09	0.32	-	-	-	-	-	-	4.50	-	-	-	0.56	0.16		0.16	0.32	0.48	69.20	250	0.50	Circle	42.05	1.14%
CATCHMENT 1, 4 & INFLOW B	PLAINS RD. E.	main	MH2	MH3	1.99	179	208	3.31	0.57	0.66	2.19	1.94			262.00		262.00	4.10	0.83	0.83	3.42	4.23	1.21		1.37	5.61	6.98	105.70	250	0.50	Circle	42.05	16.61%
INFLOW C	PLAINS RD. E.	main	MH3	MH4	-	-	208	3.31	-	0.66	2.19	-	-	-	-	-	262.00	4.10	-	0.83	3.42	0.30	0.09		1.46	5.61	7.07	61.00	250	0.50	Circle	42.05	16.81%
INFLOW D	PLAINS RD. E.	main	MH4	MH5	-	-	208	3.31	-	0.66	2.19	-	-	-	-	-	262.00	4.10	-	0.83	3.42	0.13	0.04		1.49	5.61	7.11	40.31	250	0.50	Circle	42.05	16.90%
CATCHMENT 3, 6 & INFLOW E	PLAINS RD. E.	main	MH5	MH6	0.80	72	280	3.27	0.23	0.89	2.92	-	-	-	-	-	262.00	4.10	-	0.83	3.42	1.14	0.33		1.82	6.34	8.16	96.48	250	0.50	Circle	42.05	19.40%
CATCHMENT 7, 8 & INFLOW G	PLAINS RD. E.	main	MH8	MH7	1.13	102	102	3.39	0.32	0.32	1.10	-	-	-	-	-	-	4.50	-	-	-	1.50	0.43		0.43	1.10	1.53	92.81	300	0.50	Circle	68.38	2.23%
INFLOW F	PLAINS RD. E.	main	MH7	MH6	-	-	102	3.39	-	0.32	1.10	-			-		-	4.50	-	-	-	0.23	0.07		0.49	1.10	1.59	27.65	300	0.50	Circle	68.38	2.33%
INFLOW H	BRANT ST.	main	MH6	MH9	-	-	382	3.23	-	1.21	3.92	-	-	-	-	-	262.00	4.10	-	0.83	3.42	0.42	0.12		2.43	7.34	9.77	93.98	300	0.50	Circle	68.38	14.29%
INFLOW I	BRANT ST.	main	MH9	MH10	-	-	382	3.23	-	1.21	3.92	-			-		262.00	4.10	-	0.83	3.42	0.32	0.09		2.53	7.34	9.86	65.80	300	0.50	Circle	68.38	14.43%
INFLOW J	BRANT ST.	main	MH10	MH11	-	-	382	3.23	-	1.21	3.92	-			-		262.00	4.10	-	0.83	3.42	0.58	0.17		2.69	7.34	10.03	97.27	300	0.50	Circle	68.38	14.67%
INFLOW K	BRANT ST.	main	MH11	MH12	-	-	382	3.23	-	1.21	3.92	-			-		262.00	4.10	-	0.83	3.42	0.53	0.15		2.84	7.34	10.18	69.52	300	0.50	Circle	68.38	14.89%
CATCHMENT 5, 9 & INFLOW L	BRANT ST.	main	MH12	MH13	6.00	540	922	3.06	1.72	2.93	8.97	-			-		262.00	4.10	-	0.83	3.42	6.39	1.83		4.67	12.39	17.06	111.72	300	1.60	Circle	122.32	13.95%
CATCHMENT 47 & INFLOW Z	FAIRVIEW ST.	main	MH66	MH65	0.43	39	39	3.47	0.12	0.12	0.43	-	-	-	-	-	-	4.50	-	-	-	0.75	0.21		0.21	0.43	0.64	59.00	250	0.50	Circle	42.05	1.53%
CATCHMENT 48 & INFLOW Y	FAIRVIEW ST.	main	MH65	MH64	2.46	221	260	3.28	0.70	0.83	2.72	-			-		-	4.50	-	-	-	2.72	0.78		0.99	2.72	3.71	76.80	300	0.50	Circle	68.38	5.43%
CATCHMENT 49 & INFLOW X	FAIRVIEW ST.	main	MH64	MH63	1.75	158	418	3.21	0.50	1.33	4.27	-			-		-	4.50	-	-	-	2.04	0.58		1.58	4.27	5.84	74.50	300	0.50	Circle	68.38	8.55%
INFLOW W	FAIRVIEW ST.	main	MH63	MH62	-	-	418	3.21	-	1.33	4.27	-			-		-	4.50	-	-	-	0.23	0.07		1.64	4.27	5.91	65.30	300	0.50	Circle	68.38	8.64%
INFLOW V	FAIRVIEW ST.	main	MH62	MH61	-	-	418	3.21	-	1.33	4.27	-			-		-	4.50	-	-	-	0.29	0.08		1.72	4.27	5.99	80.60	450	0.50	Circle	201.60	2.97%
CATCHMENT50 & INFLOW U	FAIRVIEW ST.	main	MH61	MH60	3.19	287	705	3.11	0.91	2.24	6.99	-			-		-	4.50	-	-	-	3.46	0.99		2.71	6.99	9.70	78.20	450	0.50	Circle	201.60	4.81%
INFLOW T	FAIRVIEW ST.	main	MH60	MH59	-	-	705	3.11	-	2.24	6.99	-			-		-	4.50	-	-	-	0.35	0.10		2.81	6.99	9.80	88.50	450	0.50	Circle	201.60	4.86%
CATCHMENT51 & INFLOW S	FAIRVIEW ST.	main	MH59	MH58	-	-	705	3.11	-	2.24	6.99	1.86			-	530.00	530.00	3.96	1.69	1.69	6.68	2.04	0.58		3.40	13.67	17.07	44.26	450	0.50	Circle	201.60	8.46%
INFLOW R	FAIRVIEW ST.	main	MH58	MH57	-	-	705	3.11	-	2.24	6.99	-			-	-	530.00	3.96	-	1.69	6.68	0.18	0.05		3.45	13.67	17.12	43.00	450	0.50	Circle	201.60	8.49%
INFLOW Q	FAIRVIEW ST.	main	MH57	MH56	-	-	705	3.11	-	2.24	6.99	-			-	-	530.00	3.96	-	1.69	6.68	0.29	0.08		3.53	13.67	17.20	76.40	450	0.50	Circle	201.60	8.53%
CATCHMENT52 & INFLOW P	FAIRVIEW ST.	main	MH56	MH55	3.85	347	1,051	3.03	1.10	3.35	10.13	-			-	-	530.00	3.96	-	1.69	6.68	4.16	1.19		4.72	16.82	21.54	78.65	525	0.50	Circle	304.10	7.08%
INFLOW O	FAIRVIEW ST.	main	MH55	MH54	-	-	1,051	3.03	-	3.35	10.13	-			-	-	530.00	3.96	-	1.69	6.68	0.34	0.10		4.82	16.82	21.64	91.77	525	0.50	Circle	304.10	7.11%
INFLOW N	FAIRVIEW ST.	main	MH54	MH13	-	-	1,051	3.03	-	3.35	10.13	-			-	-	530.00	3.96	-	1.69	6.68	0.30	0.09		4.90	16.82	21.72	92.00	525	0.50	Circle	304.10	7.14%
INFLOW M	BRANT ST.	main	MH13	MH14	-	-	1,973	2.87	-	6.28	18.04	-	-	-	-	-	792.00	3.86	-	2.52	9.74	0.15	0.04		9.62	27.77	37.39	10.78	300	1.91	Circle	133.64	27.98%
INFLOW 1	BRANT ST.	main	MH14	MH15	-	-	1,973	2.87	-	6.28	18.04	-			-		792.00	3.86	-	2.52	9.74	0.28	0.08		9.70	27.77	37.47	60.21	300	0.97	Circle	95.24	39.35%
CATCHMENT 11 & INFLOW 2	BRANT ST.	main	MH15	MH17	1.58	142	2,115	2.85	0.45	6.73	19.21	-			-		792.00	3.86	-	2.52	9.74	1.84	0.53		10.22	28.95	39.17	80.61	375	0.33	Circle	100.72	38.89%
CATCHMENT 10, 13, 53	BRANT ST.	main	MH17	MH19	-	-	2,115	2.85	-	6.73	19.21	8.70	456.00	-	411.00	-	1,659.00	3.65	2.76	5.28	19.26	8.70	2.49		12.71	38.47	51.18	75.00	375	0.47	Circle	120.20	42.58%
CATCHMENT 54	BRANT ST.	main	MH19	MH21	0.37	33	2,148	2.85	0.11	6.84	19.48	-	-		-		1,659.00	3.65	-	5.28	19.26	0.37	0.11		12.82	38.74	51.56	77.10	375	0.46	Circle	118.91	43.36%
CATCHMENT 14	BRANT ST.	main	MH21	MH23	0.81	73	2,221	2.84	0.23	7.07	20.08	6.43	104.00		347.00	562.00	2,672.00	3.48	3.22	8.50	29.64	7.24	2.07		14.89	49.71	64.60	79.00	450	0.37	Circle	173.42	37.25%
CATCHMENT 55	BRANT ST.	main	MH23	MH25	-	-	2,221	2.84	-	7.07	20.08	0.10	6.00				2,678.00	3.48	0.02	8.52	29.70	0.10	0.03		14.92	49.77	64.69	74.60	450	0.52	Circle	205.59	31.47%
CATCHMENT 17	BRANT ST.	main	MH25	MH27	0.14	13	2,234	2.84	0.04	7.11	20.18	10.69	294.00		723.00		3,695.00	3.36	3.24	11.76	39.56	14.23	4.07		18.99	59.74	78.73	89.50	450	0.44	Circle	189.12	41.63%

Location					Existing Commercial							Existing Residential										Inflow/ Infiltration	Segment Inflow/ Infiltration	Pumped Groundwater Fow	Accumulative Inflow/ Infiltration	Segment Peak SAN Inflow	Accumulative Sanitary Flow	Pipe					
					Area	Population	Accumulative Population	CommercialP/F	Average Commercial Sanitary	Accumulative Sanitary	**Commercial Peak Sanitary Flow**	Area	DETACHED	SEMI-DETACHED	TOWNHOUSE / APARTMENT (under 6-S)	APARTMENT (over 6-S)	Accumulative Population	Residential P/F	Average Residential Sanitary	Accumulative Sanitary	**Residential Peak Sanitary Flow**							Length	Size	Slope	Shape	Full Flow Capacity	**% Full**
Sanitary Trib ID	Street Name	Pipe No. Main or Trib Branch	US MH	DS MH	(ha)	(Person)	(Person)	M	Q (0.28646 L/ha/s) (L/s)	Q(p) (0.28646 L/ha/s) (L/s)	**Q(p) (L/s)**	(ha)	(Person)	(Person)	(Person)	(Person)	(Person)	M	Q (0.003183 L/c/s) (L/s)	Q(p) (0.003183 L/c/s) (L/s)	**Q(p) (L/s)**	Area (ha)	Q(i) (L/s)	Q (pw) (L/s)	**Q(i) (L/s)**	Q(d) (L/s)	**Q(d) (L/s)**	L (m)	(mm)	S (%)		Qcap (L/s)	**Q(d)/Qcap**
	BRANT ST.	main	MH27	MH28	-	-	2,234	2.84	-	7.11	20.18	-	-		-		3,695.00	3.36	-	11.76	39.56	-	-		18.99	59.74	78.73	7.70	450	0.80	Circle	255.01	30.87%
CATCHMENT 20	BRANT ST.	main	MH28	MH30	-	-	2,234	2.84	-	7.11	20.18	1.92	24.00	150.00	-		3,869.00	3.35	0.55	12.32	41.21	1.92	0.55		19.54	61.39	80.93	76.30	450	0.48	Circle	197.53	40.97%
CATCHMENT 21	BRANT ST.	main	MH30	MH34	-	-	2,234	2.84	-	7.11	20.18	1.82	101.00		-		3,970.00	3.34	0.32	12.64	42.16	1.82	0.52		20.06	62.34	82.40	64.60	450	0.39	Circle	178.05	46.28%
CATCHMENT 22	BRANT ST.	main	MH34	MH35	-	-	2,234	2.84	-	7.11	20.18	0.29	15.00		-		3,985.00	3.33	0.05	12.68	42.30	0.29	0.08		20.14	62.48	82.62	69.70	450	0.29	Circle	153.53	53.81%
INFLOW 25	BRANT ST.	main	MH18	MH20	-	-	-	3.60	-	-	-	-	-	-	-	-	-	4.50	-	-	-	0.07	0.02		0.02	-	0.02	69.00	300	0.77	Circle	84.85	0.02%
CATCHMENT 12 & INFLOW 3	BRANT ST.	main	MH20	MH22	-	-	-	3.60	-	-	-	0.47	-		63.00		63.00	4.29	0.20	0.20	0.86	0.59	0.17		0.19	0.86	1.05	74.00	300	0.49	Circle	67.69	1.55%
CATCHMENT 15 & INFLOW 4	BRANT ST.	main	MH22	MH24	7.89	710	710	3.11	2.26	2.26	7.04	-	-		-		63.00	4.29	-	0.20	0.86	8.00	2.29		2.48	7.90	10.37	89.70	300	0.40	Circle	61.16	16.96%
INFLOW 5	BRANT ST.	main	MH24	MH26	-	-	710	3.11	-	2.26	7.04	-	-		-		63.00	4.29	-	0.20	0.86	0.11	0.03		2.51	7.90	10.40	68.30	300	0.41	Circle	61.92	16.80%
CATCHMENT 16 & 18	BRANT ST.	main	MH26	MH29	1.67	150	860	3.07	0.48	2.74	8.42	2.26	-		172.00	354.00	589.00	3.94	1.67	1.87	7.38	7.41	2.12		4.63	15.80	20.42	114.40	300	0.45	Circle	64.87	31.48%
CATCHMENT 19	BRANT ST.	main	MH29	MH31	0.51	46	906	3.06	0.15	2.88	8.83	-	-		-	-	589.00	3.94	-	1.87	7.38	0.51	0.15		4.77	16.21	20.99	55.00	300	0.43	Circle	63.41	33.09%
	BRANT ST.	main	MH31	MH32	-	-	906	3.06	-	2.88	8.83	-	-		-	-	589.00	3.94	-	1.87	7.38	-	-		4.77	16.21	20.99	10.40	300	0.08	Circle	27.35	76.73%
CATCHMENT 46 & INFLOW 6	BRANT ST.	main	MH32	MH33	-	-	906	3.06	-	2.88	8.83	4.86	260.00		19.00	-	868.00	3.84	0.89	2.76	10.61	4.90	1.40		6.17	19.44	25.61	35.90	300	0.11	Circle	32.07	79.86%
CATCHMENT 45 & INFLOW 7	BRANT ST.	main	MH33	MH36	0.16	14	921	3.06	0.05	2.93	8.96	0.60	824.00		-	-	1,692.00	3.64	2.62	5.39	19.61	0.83	0.24		6.41	28.57	34.98	88.40	300	0.45	Circle	64.87	53.93%
	BRANT ST.	main	MH36	MH35	-	-	921	3.06	-	2.93	8.96	-	-		-	-	1,692.00	3.64	-	5.39	19.61	-	-		6.41	28.57	34.98	7.27	300	5.40	Circle	224.71	15.57%
CATCHMENT 43 & INFLOW 8	BRANT ST.	main	MH35	MH37	0.25	23	3,177	2.74	0.07	10.11	27.68	-	-	-	-	-	5,677.00	3.19	-	18.07	57.71	0.40	0.11		26.67	85.38	112.05	68.00	450	0.35	Circle	168.67	66.43%
INFLOW 9	BRANT ST.	main	MH37	MH38	-	-	3,177	2.74	-	10.11	27.68	-	-		-		5,677.00	3.19	-	18.07	57.71	0.19	0.05		26.72	85.38	112.10	72.00	450	0.59	Circle	218.99	51.19%
CATCHMENT 24, 44 & INFLOW 10	BRANT ST.	main	MH38	MH39	7.29	656	3,833	2.68	2.09	12.20	32.70	-	-		-		5,677.00	3.19	-	18.07	57.71	7.44	2.13		28.85	90.40	119.25	52.60	450	0.25	Circle	142.55	83.65%
INFLOW 11	BRANT ST.	main	MH39	MH40	-	-	3,833	2.68	-	12.20	32.70	-	-		-		5,677.00	3.19	-	18.07	57.71	0.04	0.01		28.86	90.40	119.26	15.60	450	1.53	Circle	352.66	33.82%
INFLOW 12	BRANT ST.	main	MH40	MH41	-	-	3,833	2.68	-	12.20	32.70	-	-		-		5,677.00	3.19	-	18.07	57.71	0.16	0.05		28.91	90.40	119.31	31.30	450	2.30	Circle	432.38	27.59%
CATCHMENT 25, 42 & INFLOW 13	BRANT ST.	main	MH41	MH42	0.94	85	3,918	2.67	0.27	12.47	33.33	-	-		-		5,677.00	3.19	-	18.07	57.71	1.17	0.33		29.24	91.04	120.28	78.70	525	0.29	Circle	231.60	51.93%
CATCHMENT 26, 41 & INFLOW 14	BRANT ST.	main	MH42	MH43	1.90	171	4,089	2.66	0.54	13.01	34.61	-	-		-		5,677.00	3.19	-	18.07	57.71	2.14	0.61		29.85	92.32	122.17	83.10	525	0.41	Circle	275.37	44.37%
CATCHMENT 27, 40 & INFLOW 15	BRANT ST.	main	MH43	MH44	0.87	78	4,167	2.65	0.25	13.26	35.20	-	-		-		5,677.00	3.19	-	18.07	57.71	1.10	0.31		30.17	92.90	123.07	106.30	525	0.41	Circle	275.37	44.69%
CATCHMENT 28 39 & INFLOW 16	BRANT ST.	main	MH44	MH45	0.68	61	4,228	2.65	0.19	13.46	35.65	-	-		-		5,677.00	3.19	-	18.07	57.71	0.82	0.23		30.40	93.36	123.76	70.67	525	0.50	Circle	304.10	40.70%
CATCHMENT 38 & INFLOW 17	BRANT ST.	main	MH45	MH46	-	-	4,228	2.65	-	13.46	35.65	0.17	5.00		-		5,682.00	3.19	0.02	18.09	57.75	0.20	0.06		30.46	93.40	123.86	12.80	525	1.00	Circle	430.06	28.80%
CATCHMENT 29, 37 & INFLOW 18	BRANT ST.	main	MH46	MH47	0.50	45	4,273	2.65	0.14	13.60	35.99	-	-		-		5,682.00	3.19	-	18.09	57.75	0.60	0.17		30.63	93.74	124.37	54.30	525	0.91	Circle	410.25	30.32%
CATCHMENT 30, 36 & INFLOW 19	BRANT ST.	main	MH47	MH48	0.47	42	4,316	2.64	0.13	13.74	36.30	-	-		-		5,682.00	3.19	-	18.09	57.75	0.58	0.17		30.80	94.05	124.85	57.40	525	0.78	Circle	379.82	32.87%
CATCHMENT 31, 35 & INFLOW 20	BRANT ST.	main	MH48	MH49	0.89	80	4,396	2.64	0.25	13.99	36.89	-	-		-		5,682.00	3.19	-	18.09	57.75	1.05	0.30		31.10	94.64	125.74	84.20	600	0.25	Circle	307.01	40.96%
CATCHMENT 32 & INFLOW 21	BRANT ST.	main	MH49	MH50	0.27	24	4,420	2.64	0.08	14.07	37.07	-	-		-		5,682.00	3.19	-	18.09	57.75	0.39	0.11		31.21	94.82	126.03	65.70	600	0.21	Circle	281.38	44.79%
CATCHMENT 33, 34 & INFLOW 22	BRANT ST.	main	MH50	MH51	1.20	108	4,528	2.63	0.34	14.41	37.87	-	-		-		5,682.00	3.19	-	18.09	57.75	1.31	0.37		31.58	95.62	127.20	65.00	600	0.21	Circle	281.38	45.21%
INFLOW 23	BRANT ST.	main	MH51	MH52	-	-	4,528	2.63	-	14.41	37.87	-	-		-		5,682.00	3.19	-	18.09	57.75	0.04	0.01		31.59	95.62	127.21	21.80	600	0.81	Circle	552.61	23.02%
INFLOW 24	BRANT ST.	main	MH52	MH53	-	-	4,528	2.63	-	14.41	37.87	-	-		-		5,682.00	3.19	-	18.09	57.75	0.05	0.01		31.61	95.62	127.23	12.50	600	0.81	Circle	552.61	23.02%

Notes:

PEAKING FACTOR, COMMERCIAL/INDUSTRIAL	M =0.8 * (1 + 14/(4+(P/1000^0.5)))
PEAKING FACTOR, RESIDENTIAL	M =1 + 14/(4+(P/1000^0.5))
AVERAGE DAILY PER CAPITA FLOW (RESIDENTIAL)	q = 0.003183 L/cap/s
AVERAGE DAILY PER CAPITA FLOW (COMMERCIAL & INDUSTRIAL)	q = 0.28646 L/ha/s
UNIT OF PEAK EXTRANEOUS FLOW,	0.286 L/s/ha
PEAK POPULATION FLOW,	Q (p) = q*P*M / 86400 L / Sec.
PEAK EXTRANEOUS FLOW.	Q(i) = I*A L / Sec.
PEAK DESIGN FLOW,	Q(d) = Q(p) + Q(i) L / Sec.
PIPE ROUGHGNESS,	n = 0.013 For Manning's Equation

Vmin. = 0.6m/s and Vmax. = 3m/s

DETACHED	55 person/ha
SEMI-DETACHE(	100 person/ha
TOWNHOUSE	135 person/ha
APARTMENT OVER 6-S	285 person/ha
LIGHT COMMERCIAL COMMUNITY SERVICES	90 person/ha 40 person/ha

APPENDIX C

Orifice Discharge Calculator

Visual OTTHYMO Model Output – (2, 5, 10, 25, 50-Year & 100-Year storms)

ORIFICE DISCHARGE CALCULATOR

This program calculates the discharge from a circular orifice when given elevations and orifice diameters by the user.

Discharge based on orifice equ.: Q = CA x sqrt(2gh)

Orifice Diameter =		**0.150**	m ←	**Enter the orifice diameter in metres**
Area		**0.01767**	m2	
Discharge Coeff. =		**0.820**	←	**Enter discharge coeff. to use**
				Orifice Tube
Elev.	**Head**	**Discharge**	storage (m3)	storage (ha.m)
88.81	0	**0.0000**	0	0
89.31	0.50	**0.0454**	50	0.005
89.81	1.00	**0.0642**	100	0.01
90.31	1.50	**0.0786**	150	0.015
90.81	2.00	**0.0908**	200	0.02

Pre-Development Visual OTTHYMO Output (2-year to 100-year storms)

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO

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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: \\server\F\Autocad\public\2021\21284\Design and Reports\SPA Report\Visual OTTHYMO\Post-
Development.out
  Summary filename: \\server\F\Autocad\public\2021\21284\Design and Reports\SPA Report\Visual OTTHYMO\Post-
Development.sum


DATE: 12/20/2022                          TIME: 11:21:16 AM

USER:


COMMENTS: _____________________________________________________

----------------------------------------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   1 **
  ***************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 681.520
| Ptotal= 37.19 mm |                          B=   6.000
--------------------                          C=    .780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    2.54 |  1.17   19.72 |  2.17    5.98 |  3.17    3.02
                 .33    2.91 |  1.33   78.39 |  2.33    5.09 |  3.33    2.81
                 .50    3.42 |  1.50   25.74 |  2.50    4.45 |  3.50    2.62
                 .67    4.20 |  1.67   13.74 |  2.67    3.96 |  3.67    2.46
                 .83    5.53 |  1.83    9.48 |  2.83    3.58 |  3.83    2.33
                1.00    8.38 |  2.00    7.31 |  3.00    3.27 |  4.00    2.21


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      15.70        40.00
     Mannings n             =     .013         .250
```

```
        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .083    2.54 | 1.083   19.72 | 2.083    5.98 |  3.08    3.02
               .167    2.54 | 1.167   19.72 | 2.167    5.98 |  3.17    3.02
               .250    2.91 | 1.250   78.39 | 2.250    5.09 |  3.25    2.81
               .333    2.91 | 1.333   78.39 | 2.333    5.09 |  3.33    2.81
               .417    3.42 | 1.417   25.74 | 2.417    4.45 |  3.42    2.62
               .500    3.42 | 1.500   25.74 | 2.500    4.45 |  3.50    2.62
               .583    4.20 | 1.583   13.74 | 2.583    3.96 |  3.58    2.46
               .667    4.20 | 1.667   13.74 | 2.667    3.96 |  3.67    2.46
               .750    5.53 | 1.750    9.48 | 2.750    3.58 |  3.75    2.33
               .833    5.53 | 1.833    9.48 | 2.833    3.58 |  3.83    2.33
               .917    8.38 | 1.917    7.31 | 2.917    3.27 |  3.92    2.21
              1.000    8.38 | 2.000    7.31 | 3.000    3.27 |  4.00    2.21

     Max.Eff.Inten.(mm/hr)=      78.39       168.88
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       .93 (ii)    3.32 (ii)
     Unit Hyd. Tpeak (min)=      5.00         5.00
     Unit Hyd. peak  (cms)=       .34          .26
                                                      *TOTALS*
     PEAK FLOW       (cms)=       .01          .00          .008 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=     36.19        13.14         35.04
     TOTAL RAINFALL   (mm)=     37.19        37.19         37.19
     RUNOFF COEFFICIENT   =       .97          .35           .94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=    .34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .32          .02
     Dep. Storage     (mm)=      1.00         1.00
     Average Slope     (%)=      1.00         2.00
     Length            (m)=     47.50        40.00
     Mannings n           =      .013         .250

     Max.Eff.Inten.(mm/hr)=      78.39        84.44
               over (min)        5.00         5.00
     Storage Coeff.  (min)=      1.80 (ii)    4.20 (ii)
     Unit Hyd. Tpeak (min)=      5.00         5.00
     Unit Hyd. peak  (cms)=       .32          .24
                                                      *TOTALS*
     PEAK FLOW       (cms)=       .07          .00          .071 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=     36.19        13.14         35.04
     TOTAL RAINFALL   (mm)=     37.19        37.19         37.19
     RUNOFF COEFFICIENT   =       .97          .35           .94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  80.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .31          .08
```

```
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      50.90        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=      78.39        24.44
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.88 (ii)    6.35 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .32          .15
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .07          .00          .071 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      36.19        13.14         31.58
     TOTAL RAINFALL   (mm)=      37.19        37.19         37.19
     RUNOFF COEFFICIENT   =        .97          .35           .85

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0002):      .34    .071     1.33    35.04
        + ID2= 2 (0001):      .39    .071     1.33    31.58
          ================================================
          ID = 3 (0004):      .73    .142     1.33    33.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000    |    .0790       .0150
                           .0450      .0050    |    .0910       .0200
                           .0640      .0100    |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0004)      .728       .142        1.33       33.19
     OUTFLOW: ID= 1 (0003)      .728       .056        1.42       33.16

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 39.62
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0080

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):      .04    .008     1.33    35.04
        + ID2= 2 (0003):      .73    .056     1.42    33.16
          ================================================
          ID = 3 (0005):      .76    .059     1.42    33.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 802.040
| Ptotal= 47.95 mm |                          B=   5.000
--------------------                          C=    .764
                         used in:   INTENSITY =  A / (t + B)^C
```

```
                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    3.43 |  1.17   24.57 |  2.17    7.80 |  3.17    4.05
                 .33    3.91 |  1.33  101.31 |  2.33    6.69 |  3.33    3.77
                 .50    4.57 |  1.50   31.90 |  2.50    5.88 |  3.50    3.54
                 .67    5.56 |  1.67   17.28 |  2.67    5.26 |  3.67    3.33
                 .83    7.23 |  1.83   12.11 |  2.83    4.77 |  3.83    3.15
                1.00   10.76 |  2.00    9.44 |  3.00    4.38 |  4.00    2.99


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      15.70        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                             ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    3.43 | 1.083   24.57 | 2.083    7.80 |  3.08    4.05
                .167    3.43 | 1.167   24.57 | 2.167    7.80 |  3.17    4.05
                .250    3.91 | 1.250  101.31 | 2.250    6.69 |  3.25    3.77
                .333    3.91 | 1.333  101.31 | 2.333    6.69 |  3.33    3.77
                .417    4.57 | 1.417   31.90 | 2.417    5.88 |  3.42    3.54
                .500    4.57 | 1.500   31.90 | 2.500    5.88 |  3.50    3.54
                .583    5.56 | 1.583   17.28 | 2.583    5.26 |  3.58    3.33
                .667    5.56 | 1.667   17.28 | 2.667    5.26 |  3.67    3.33
                .750    7.23 | 1.750   12.11 | 2.750    4.77 |  3.75    3.15
                .833    7.23 | 1.833   12.11 | 2.833    4.77 |  3.83    3.15
                .917   10.76 | 1.917    9.44 | 2.917    4.38 |  3.92    2.99
               1.000   10.76 | 2.000    9.44 | 3.000    4.38 |  4.00    2.99

     Max.Eff.Inten.(mm/hr)=     101.31        48.87
               over (min)         5.00         5.00
     Storage Coeff.  (min)=        .84 (ii)    3.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .28
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .010 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      46.95        19.96         45.60
     TOTAL RAINFALL   (mm)=      47.95        47.95         47.95
     RUNOFF COEFFICIENT   =        .98          .42           .95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=    .34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .32          .02
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.50        40.00
     Mannings n           =       .013         .250
```

```
     Max.Eff.Inten.(mm/hr)=     101.31        38.28
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.63 (ii)    3.79 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .32          .25
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .09          .00          .092 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33         1.33
     RUNOFF VOLUME    (mm)=      46.95        19.96        45.60
     TOTAL RAINFALL   (mm)=      47.95        47.95        47.95
     RUNOFF COEFFICIENT   =        .98          .42          .95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  80.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .08
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      50.90        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     101.31        38.28
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.69 (ii)    5.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .32          .15
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .09          .01          .093 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      46.95        19.96        41.54
     TOTAL RAINFALL   (mm)=      47.95        47.95        47.95
     RUNOFF COEFFICIENT   =        .98          .42          .87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0002):      .34    .092     1.33    45.60
        + ID2= 2 (0001):      .39    .093     1.33    41.54
          ================================================
          ID = 3 (0004):      .73    .185     1.33    43.43

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .0790       .0150
                          .0450      .0050    |    .0910       .0200
                          .0640      .0100    |    .0000       .0000

                               AREA      QPEAK       TPEAK       R.V.
                               (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0004)      .728       .185        1.33       43.43
     OUTFLOW: ID= 1 (0003)      .728       .066        1.42       43.40
```

```
                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 35.61
                  TIME SHIFT OF PEAK FLOW          (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=   .0107

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):      .04    .010     1.33    45.60
       + ID2= 2 (0003):      .73    .066     1.42    43.40
         ================================================
         ID = 3 (0005):      .76    .069     1.42    43.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 918.280
| Ptotal= 55.20 mm |                          B=   5.000
--------------------                          C=    .763
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    3.96 |  1.17   28.29 |  2.17    9.00 |  3.17    4.68
                 .33    4.51 |  1.33  116.31 |  2.33    7.72 |  3.33    4.36
                 .50    5.28 |  1.50   36.70 |  2.50    6.78 |  3.50    4.09
                 .67    6.42 |  1.67   19.91 |  2.67    6.07 |  3.67    3.85
                 .83    8.35 |  1.83   13.96 |  2.83    5.51 |  3.83    3.64
                1.00   12.41 |  2.00   10.89 |  3.00    5.06 |  4.00    3.46


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--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      15.70        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    3.96 | 1.083   28.29 | 2.083    9.00 |  3.08    4.68
                .167    3.96 | 1.167   28.29 | 2.167    9.00 |  3.17    4.68
                .250    4.51 | 1.250  116.31 | 2.250    7.72 |  3.25    4.36
                .333    4.51 | 1.333  116.31 | 2.333    7.72 |  3.33    4.36
                .417    5.28 | 1.417   36.70 | 2.417    6.78 |  3.42    4.09
                .500    5.28 | 1.500   36.70 | 2.500    6.78 |  3.50    4.09
                .583    6.42 | 1.583   19.91 | 2.583    6.07 |  3.58    3.85
                .667    6.42 | 1.667   19.91 | 2.667    6.07 |  3.67    3.85
                .750    8.35 | 1.750   13.96 | 2.750    5.51 |  3.75    3.64
                .833    8.35 | 1.833   13.96 | 2.833    5.51 |  3.83    3.64
                .917   12.41 | 1.917   10.89 | 2.917    5.06 |  3.92    3.46
               1.000   12.41 | 2.000   10.89 | 3.000    5.06 |  4.00    3.46

     Max.Eff.Inten.(mm/hr)=     116.31        76.57
                over (min)        5.00         5.00
     Storage Coeff.  (min)=        .79 (ii)    2.84 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .28
```

```
                                                                    *TOTALS*
     PEAK FLOW       (cms)=        .01          .00           .012 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      54.20        24.96          52.74
     TOTAL RAINFALL   (mm)=      55.20        55.20          55.20
     RUNOFF COEFFICIENT   =        .98          .45            .96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=    .34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .32          .02
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.50        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     116.31        48.50
                over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.54 (ii)    3.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .26
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .10          .00           .106 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      54.20        24.96          52.74
     TOTAL RAINFALL   (mm)=      55.20        55.20          55.20
     RUNOFF COEFFICIENT   =        .98          .45            .96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  80.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .08
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      50.90        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     116.31        48.50
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.60 (ii)    5.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .32          .16
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .10          .01           .108 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      54.20        24.96          48.34
     TOTAL RAINFALL   (mm)=      55.20        55.20          55.20
     RUNOFF COEFFICIENT   =        .98          .45            .88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0002):       .34     .106     1.33    52.74
       + ID2= 2 (0001):       .39     .108     1.33    48.34
         ================================================
         ID = 3 (0004):       .73     .214     1.33    50.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000    |    .0790       .0150
                           .0450      .0050    |    .0910       .0200
                           .0640      .0100    |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0004)       .728       .214        1.33       50.39
     OUTFLOW: ID= 1 (0003)       .728       .072        1.50       50.36

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 33.72
                   TIME SHIFT OF PEAK FLOW         (min)= 10.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0127

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):       .04     .012     1.33    52.74
       + ID2= 2 (0003):       .73     .072     1.50    50.36
         ================================================
         ID = 3 (0005):       .76     .076     1.33    50.48

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1065.950
| Ptotal= 64.43 mm |                          B=   5.000
--------------------                          C=    .762
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    4.64 |  1.17   33.01 |  2.17   10.53 |  3.17    5.48
                 .33    5.29 |  1.33  135.38 |  2.33    9.03 |  3.33    5.11
                 .50    6.18 |  1.50   42.80 |  2.50    7.94 |  3.50    4.79
                 .67    7.52 |  1.67   23.26 |  2.67    7.11 |  3.67    4.51
                 .83    9.77 |  1.83   16.31 |  2.83    6.45 |  3.83    4.27
                1.00   14.51 |  2.00   12.73 |  3.00    5.92 |  4.00    4.05


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .00
     Dep. Storage     (mm)=       1.00         1.00
```

```
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      15.70        40.00
     Mannings n          =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                            ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
               .083    4.64 | 1.083   33.01 | 2.083   10.53 |  3.08    5.48
               .167    4.64 | 1.167   33.01 | 2.167   10.53 |  3.17    5.48
               .250    5.29 | 1.250  135.38 | 2.250    9.03 |  3.25    5.11
               .333    5.29 | 1.333  135.38 | 2.333    9.03 |  3.33    5.11
               .417    6.18 | 1.417   42.80 | 2.417    7.94 |  3.42    4.79
               .500    6.18 | 1.500   42.80 | 2.500    7.94 |  3.50    4.79
               .583    7.52 | 1.583   23.26 | 2.583    7.11 |  3.58    4.51
               .667    7.52 | 1.667   23.26 | 2.667    7.11 |  3.67    4.51
               .750    9.77 | 1.750   16.31 | 2.750    6.45 |  3.75    4.27
               .833    9.77 | 1.833   16.31 | 2.833    6.45 |  3.83    4.27
               .917   14.51 | 1.917   12.73 | 2.917    5.92 |  3.92    4.05
              1.000   14.51 | 2.000   12.73 | 3.000    5.92 |  4.00    4.05

     Max.Eff.Inten.(mm/hr)=     135.38        97.01
                 over (min)        5.00         5.00
     Storage Coeff.  (min)=        .75 (ii)    2.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .29
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .014 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      63.43        31.70         61.84
     TOTAL RAINFALL   (mm)=      64.43        64.43         64.43
     RUNOFF COEFFICIENT   =        .98          .49           .96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=    .34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .32          .02
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.50        40.00
     Mannings n          =       .013         .250

     Max.Eff.Inten.(mm/hr)=     135.38        62.48
                 over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.45 (ii)    3.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .26
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .12          .00          .124 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      63.43        31.70         61.84
     TOTAL RAINFALL   (mm)=      64.43        64.43         64.43
     RUNOFF COEFFICIENT   =        .98          .49           .96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .39
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  80.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .08
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      50.90        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     135.38        62.48
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.51 (ii)    5.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .33          .16
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .12          .01          .127 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      63.43        31.70         57.08
     TOTAL RAINFALL   (mm)=      64.43        64.43         64.43
     RUNOFF COEFFICIENT   =        .98          .49           .89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0002):      .34    .124     1.33    61.84
        + ID2= 2 (0001):      .39    .127     1.33    57.08
          ================================================
          ID = 3 (0004):      .73    .251     1.33    59.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0790       .0150
                           .0450      .0050   |    .0910       .0200
                           .0640      .0100   |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0004)      .728       .251        1.33       59.30
     OUTFLOW: ID= 1 (0003)      .728       .080        1.50       59.26

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 31.91
                   TIME SHIFT OF PEAK FLOW         (min)= 10.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0155

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):      .04    .014     1.33    61.84
        + ID2= 2 (0003):      .73    .080     1.50    59.26
          ================================================
          ID = 3 (0005):      .76    .084     1.50    59.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   5 **
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| CHICAGO STORM    |    IDF curve parameters: A=1172.340
| Ptotal= 71.25 mm |                          B=   5.000
--------------------                          C=    .761
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    5.16 |  1.17   36.50 |  2.17   11.67 |  3.17    6.08
                 .33    5.87 |  1.33  149.30 |  2.33   10.01 |  3.33    5.67
                 .50    6.86 |  1.50   47.31 |  2.50    8.81 |  3.50    5.31
                 .67    8.34 |  1.67   25.73 |  2.67    7.89 |  3.67    5.01
                 .83   10.83 |  1.83   18.06 |  2.83    7.16 |  3.83    4.74
                1.00   16.07 |  2.00   14.10 |  3.00    6.57 |  4.00    4.50


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      15.70        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    5.16 | 1.083   36.50 | 2.083   11.67 |  3.08    6.08
                .167    5.16 | 1.167   36.50 | 2.167   11.67 |  3.17    6.08
                .250    5.87 | 1.250  149.30 | 2.250   10.01 |  3.25    5.67
                .333    5.87 | 1.333  149.30 | 2.333   10.01 |  3.33    5.67
                .417    6.86 | 1.417   47.31 | 2.417    8.81 |  3.42    5.31
                .500    6.86 | 1.500   47.31 | 2.500    8.81 |  3.50    5.31
                .583    8.34 | 1.583   25.73 | 2.583    7.89 |  3.58    5.01
                .667    8.34 | 1.667   25.73 | 2.667    7.89 |  3.67    5.01
                .750   10.83 | 1.750   18.06 | 2.750    7.16 |  3.75    4.74
                .833   10.83 | 1.833   18.06 | 2.833    7.16 |  3.83    4.74
                .917   16.07 | 1.917   14.10 | 2.917    6.57 |  3.92    4.50
               1.000   16.07 | 2.000   14.10 | 3.000    6.57 |  4.00    4.50

     Max.Eff.Inten.(mm/hr)=     149.30       124.96
               over (min)         5.00         5.00
     Storage Coeff.  (min)=        .72 (ii)    2.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .29
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .015 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      70.25        36.90         68.58
     TOTAL RAINFALL   (mm)=      71.25        71.25         71.25
     RUNOFF COEFFICIENT   =        .99          .52           .96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=    .34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .32          .02
     Dep. Storage     (mm)=       1.00         1.00
```

```
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      47.50        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     149.30        73.31
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.39 (ii)    3.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .27
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .13          .00          .137 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      70.25        36.90         68.58
     TOTAL RAINFALL   (mm)=      71.25        71.25         71.25
     RUNOFF COEFFICIENT   =        .99          .52           .96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  80.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31          .08
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      50.90        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     149.30        73.31
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.45 (ii)    4.90 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .22
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .13          .01          .144 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      70.25        36.90         63.58
     TOTAL RAINFALL   (mm)=      71.25        71.25         71.25
     RUNOFF COEFFICIENT   =        .99          .52           .89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0002):      .34    .137     1.33    68.58
        + ID2= 2 (0001):      .39    .144     1.33    63.58
          ================================================
          ID = 3 (0004):      .73    .281     1.33    65.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .0790       .0150
                          .0450      .0050    |    .0910       .0200
                          .0640      .0100    |    .0000       .0000
```

```
                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0004)      .728       .281        1.33       65.91
     OUTFLOW: ID= 1 (0003)      .728       .085        1.50       65.88

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 30.28
                   TIME SHIFT OF PEAK FLOW         (min)= 10.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0177

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):      .04    .015     1.33    68.58
        + ID2= 2 (0003):      .73    .085     1.50    65.88
          ================================================
          ID = 3 (0005):      .76    .091     1.33    66.01

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1281.340
| Ptotal= 77.88 mm |                          B=   5.000
--------------------                          C=    .761
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    5.63 |  1.17   39.89 |  2.17   12.75 |  3.17    6.65
                 .33    6.41 |  1.33  163.18 |  2.33   10.94 |  3.33    6.20
                 .50    7.49 |  1.50   51.70 |  2.50    9.62 |  3.50    5.81
                 .67    9.11 |  1.67   28.13 |  2.67    8.62 |  3.67    5.47
                 .83   11.83 |  1.83   19.74 |  2.83    7.83 |  3.83    5.18
                1.00   17.56 |  2.00   15.41 |  3.00    7.18 |  4.00    4.92


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=    .04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      15.70        40.00
     Mannings n           =       .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    5.63 | 1.083   39.89 | 2.083   12.75 |  3.08    6.65
                .167    5.63 | 1.167   39.89 | 2.167   12.75 |  3.17    6.65
                .250    6.41 | 1.250  163.18 | 2.250   10.94 |  3.25    6.20
                .333    6.41 | 1.333  163.18 | 2.333   10.94 |  3.33    6.20
                .417    7.49 | 1.417   51.70 | 2.417    9.62 |  3.42    5.81
                .500    7.49 | 1.500   51.70 | 2.500    9.62 |  3.50    5.81
                .583    9.11 | 1.583   28.13 | 2.583    8.62 |  3.58    5.47
                .667    9.11 | 1.667   28.13 | 2.667    8.62 |  3.67    5.47
                .750   11.83 | 1.750   19.74 | 2.750    7.83 |  3.75    5.18
                .833   11.83 | 1.833   19.74 | 2.833    7.83 |  3.83    5.18
                .917   17.56 | 1.917   15.41 | 2.917    7.18 |  3.92    4.92
               1.000   17.56 | 2.000   15.41 | 3.000    7.18 |  4.00    4.92

     Max.Eff.Inten.(mm/hr)=     163.18       146.63
```

```
               over (min)        5.00          5.00
     Storage Coeff.  (min)=        .69 (ii)    2.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=        .34           .29
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .02           .00          .016 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.33          1.33
     RUNOFF VOLUME    (mm)=      76.88         42.10         75.14
     TOTAL RAINFALL   (mm)=      77.88         77.88         77.88
     RUNOFF COEFFICIENT   =        .99           .54           .96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=    .34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .32           .02
     Dep. Storage     (mm)=       1.00          1.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      47.50         40.00
     Mannings n           =       .013          .250

     Max.Eff.Inten.(mm/hr)=     163.18         84.44
               over (min)        5.00          5.00
     Storage Coeff.  (min)=       1.34 (ii)    3.13 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=        .33           .27
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .15           .00          .150 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.33          1.33
     RUNOFF VOLUME    (mm)=      76.88         42.10         75.14
     TOTAL RAINFALL   (mm)=      77.88         77.88         77.88
     RUNOFF COEFFICIENT   =        .99           .54           .96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  80.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .31           .08
     Dep. Storage     (mm)=       1.00          1.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      50.90         40.00
     Mannings n           =       .013          .250

     Max.Eff.Inten.(mm/hr)=     163.18         84.44
               over (min)        5.00          5.00
     Storage Coeff.  (min)=       1.40 (ii)    4.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=        .33           .22
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .14           .02          .158 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.33          1.33
     RUNOFF VOLUME    (mm)=      76.88         42.10         69.92
     TOTAL RAINFALL   (mm)=      77.88         77.88         77.88
     RUNOFF COEFFICIENT   =        .99           .54           .90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0002):      .34    .150     1.33    75.14
        + ID2= 2 (0001):      .39    .158     1.33    69.92
          ================================================
          ID = 3 (0004):      .73    .308     1.33    72.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0790       .0150
                           .0450      .0050   |    .0910       .0200
                           .0640      .0100   |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0004)      .728       .308        1.33       72.35
     OUTFLOW: ID= 1 (0003)      .728       .090        1.50       72.32

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 29.17
                   TIME SHIFT OF PEAK FLOW         (min)= 10.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0197

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):      .04    .016     1.33    75.14
        + ID2= 2 (0003):      .73    .090     1.50    72.32
          ================================================
          ID = 3 (0005):      .76    .096     1.33    72.46

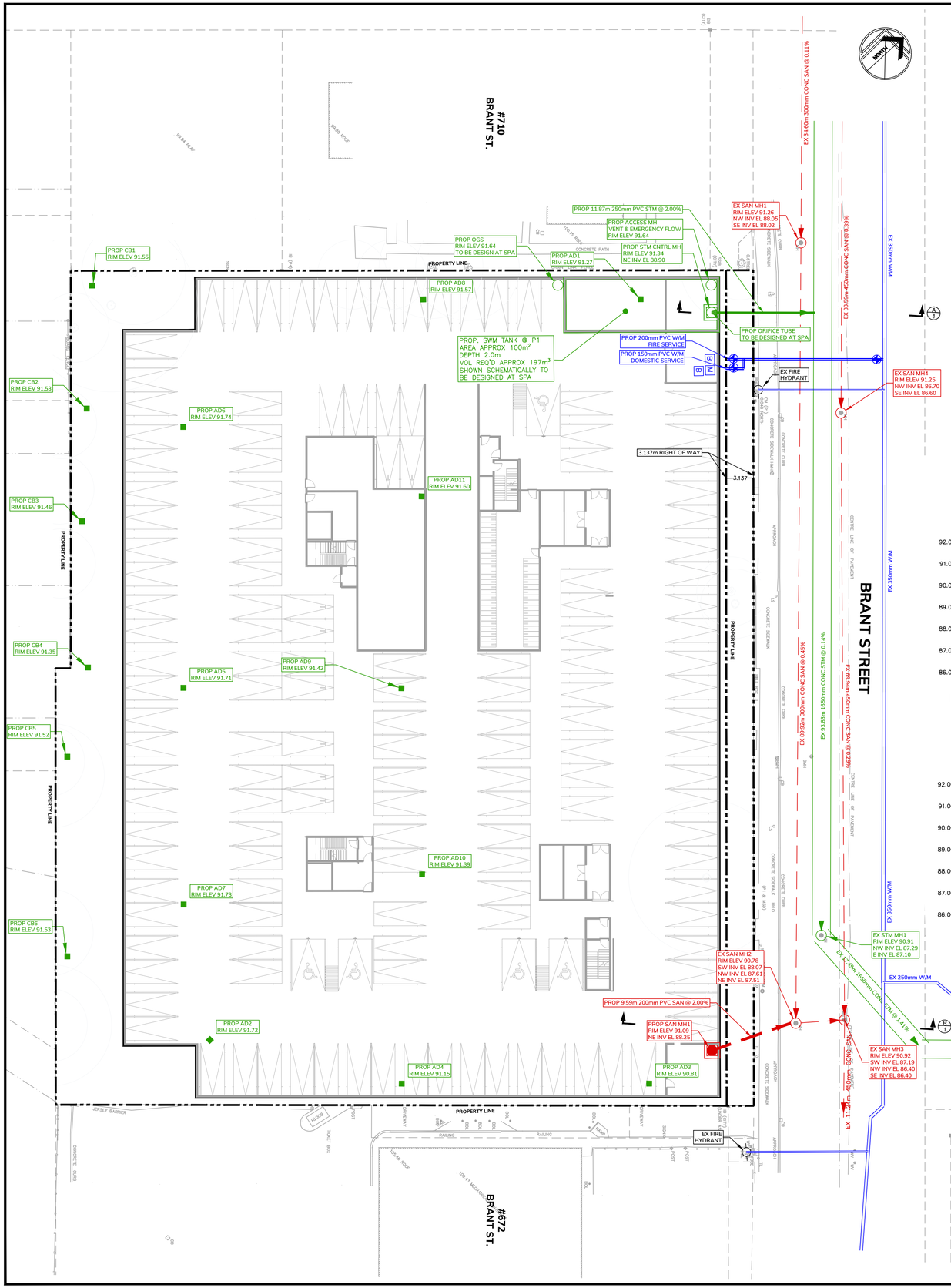
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

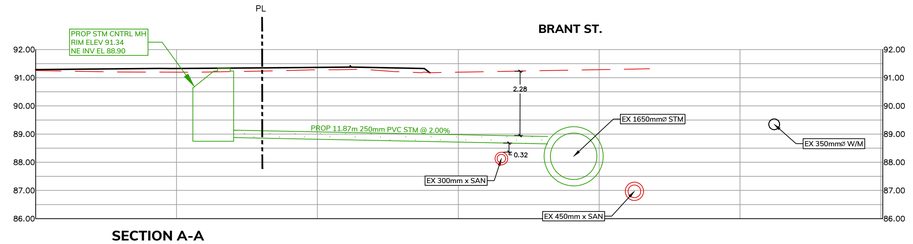
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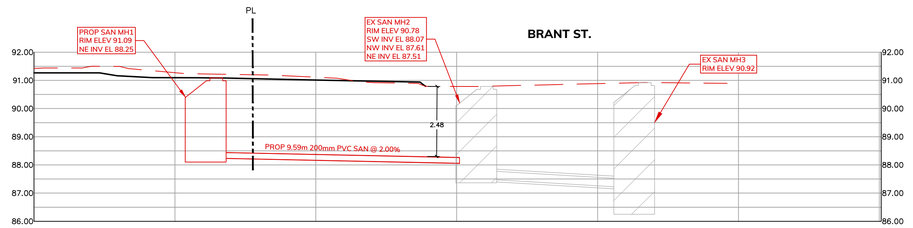
APPENDIX D

Functional Servicing Plan
Functional Grading Plan





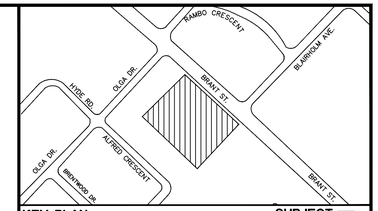
SECTION A-A
PROP. STORM SERVICE CONNECTION
SCALE 1:100



SECTION B-B
PROP. SANITARY SERVICE CONNECTION
SCALE 1:100

GRADING LEGEND:

- DENOTES EXISTING STORM MANHOLE
- DENOTES PROPOSED STORM MANHOLE
- DENOTES EXISTING CATCH BASIN
- DENOTES PROPOSED CATCHBASIN
- DENOTES PROPOSED STORMCEPTOR
- DENOTES EXISTING SANITARY MANHOLE
- DENOTES PROPOSED SANITARY MANHOLE
- DENOTES PROPOSED HYDRANT
- DENOTES EXISTING HYDRANT
- DENOTES PROPOSED WATER VALVE & BOX
- DENOTES EXISTING WATER VALVE & BOX
- DENOTES PROPOSED WATER METER
- DENOTES PROPOSED SIAMESE CONNECTION
- 115.87 100.00 DENOTES EXISTING SPOT ELEVATION
- (100.00) DENOTES PROPOSED ELEVATION
- (100.00)T/C DENOTES PROPOSED TOP OF CURB ELEVATION
- (100.00)G/L DENOTES PROPOSED GUTTER LINE ELEVATION
- (100.00) HP DENOTES PROPOSED HIGH POINT
- (100.00) DENOTES PROPOSED SWALE INVERT ELEVATION
- [100.00] DENOTES PROPOSED ELEVATION BY OTHERS
- DENOTES PROPOSED FLOW ARROW AND SLOPE
- DENOTES PROPOSED FLOW ARROW
- DENOTES EMERGENCY OVERLAND FLOW
- DENOTES PROPOSED SLOPE (3:1 OR HIGHER)
- TBS SC DENOTES EXISTING CONTOUR
- DENOTES PROPOSED SILT FENCE
- DENOTES PROPOSED ENTRANCE LOCATION
- DENOTES EXTENT OF MAX. PONDING (0.30m) 100 YEAR STORM.
- DENOTES PROPOSED LIMIT OF CONSTRUCTION
- DENOTES PROPOSED HEAVY DUTY ASPHALT AREA



KEY PLAN
Scale : N.T.S.

SUBJECT LANDS

NOTES:

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND UNDERGROUND AND ABOVE GROUND UTILITIES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING THE WORK, THE CONTRACTOR SHALL CONFIRM OF THE EXACT LOCATION OF ALL UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS ON THE JOB AND REPORT ANY DISCREPANCY TO THE ARCHITECTS/ENGINEERS BEFORE PROCEEDING WITH THE WORKS.

ALL DRAWINGS AND SPECIFICATIONS ARE INSTRUMENTS OF SERVICE AND THE PROPERTY OF THE ENGINEER WHICH MUST BE RETURNED AT THE COMPLETION OF WORK.

THIS DRAWING IS NOT TO BE SCALED. CONTRACTOR TO USE DIGITAL FILES FOR LAYOUT PROVIDED BY ENGINEER. THIS PLAN MUST NOT BE USED TO SITE THE PROPOSED BUILDINGS.

THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S CONTRACTOR FROM OBTAINING, BUT NOT LIMITED TO THE FOLLOWING PERMITS: ROAD CUT, SEWER PERMITS, RELOCATION OF SERVICES, ENCROACHMENT AGREEMENTS, APPROACH APPROVAL PERMITS, ETC..

EXISTING TOPOGRAPHICAL INFORMATION SUPPLIED BY A.T. MACLAREN LTD. ON JANUARY 02, 2022.

BEARING NOTE:

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B BY REAL TIME NETWORK OBSERVATIONS, UTM ZONE 17, NAD83 (CRSRS) (2010.0)

NOTE:

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.99970618.

OBSERVED REFERENCE POINTS (ORP's): UTM ZONE 17, NAD83 (CSRS) (2010.0).
COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O.REG. 216/10

POINT ID.	NORTHING	EASTING
ORP A	4798357.813	596710.470
ORP B	4798143.371	596947.089

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

BENCHMARK NOTE:

STATION: CITY OF BURLINGTON BENCHMARK 368

BRASS PLAQUE ON THE NORTHEAST WING WALL OF THE CONCRETE HEAD WALL OF A CULVERT ON THE NORTH SIDE OF BLAIRHOLM AVENUE, 50M WEST OF COURTLAND AVENUE AND 150M EAST OF BRANT STREET.

ELEVATION: 89.578 METRES CGVD-1928:1978

METRIC NOTE:

DISTANCES AND COORDINATES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

NO.	REVISIONS	DATE	BY
1	ISSUED FOR REZONING	JAN. 13,2023	H.O.

SCALE(S):
1: 250 (0 5 10 15 20 25)

DRAWING TITLE:

FUNCTIONAL SERVICING PLAN

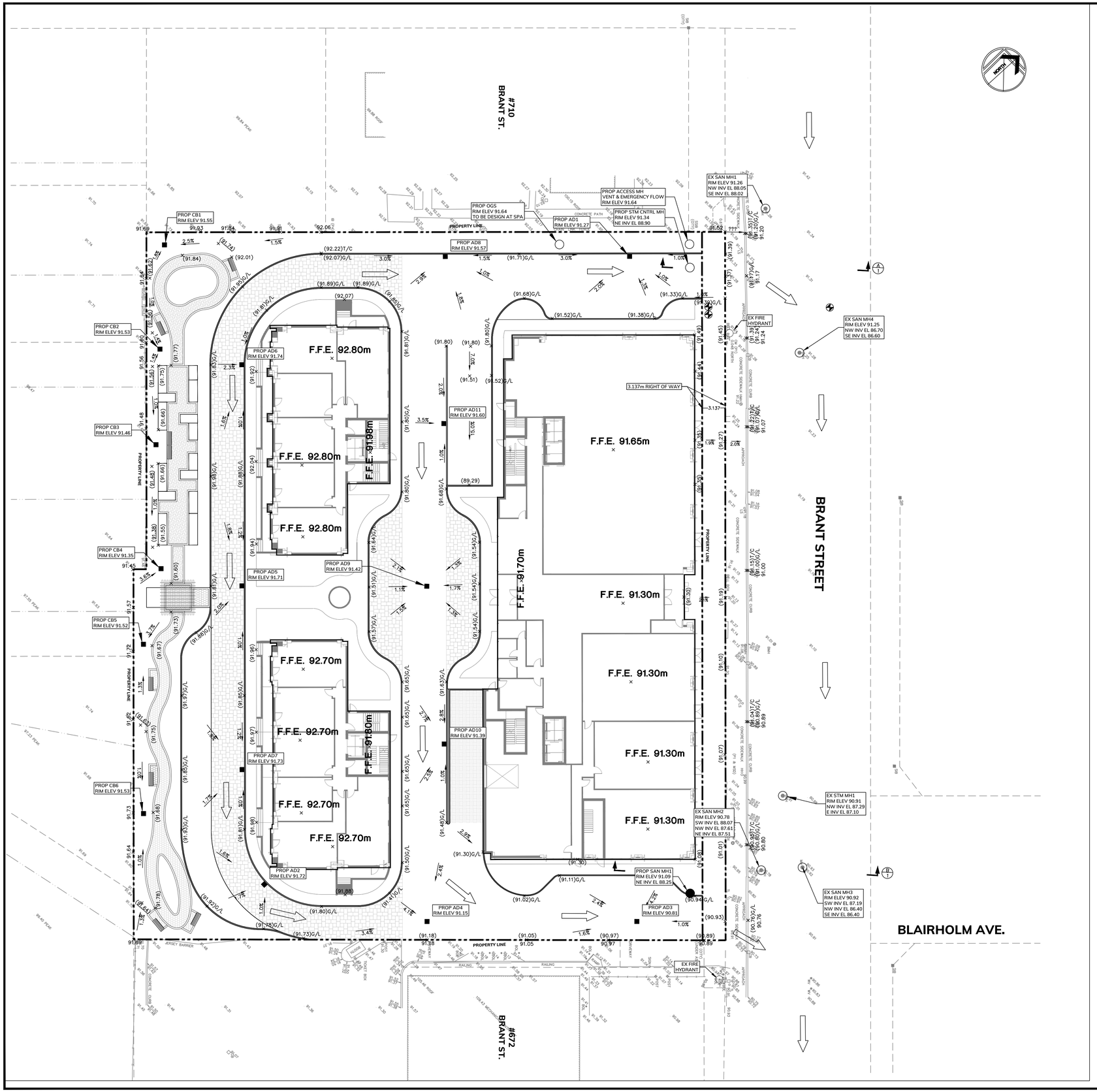
PROJECT:
PROPOSED 11-STOREY + MEZZANINE MIXED-USE CONDO BUILDING
688, 694 & 698 BRANT STREET
BURLINGTON, ON

CLIENT:
ELITE 688 BRANT HOLDINGS INC.

ODAN·DETECH CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

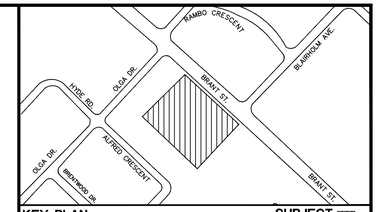
REGISTERED PROFESSIONAL ENGINEER
JAN. 13,2023
I. KRPAN
PROVINCE OF ONTARIO
ENGINEER

DESIGNED BY: HO	PROJECT No.: 21284
DRAWN BY: HO	
CHECKED BY: KO	DATE: NOV 2022
APPROVED BY: JK	DRAWING No.: 1 of 2



GRADING LEGEND:

- DENOTES EXISTING STORM MANHOLE
- DENOTES PROPOSED STORM MANHOLE
- DENOTES EXISTING CATCH BASIN
- DENOTES PROPOSED CATCHBASIN
- DENOTES PROPOSED STORMCEPTOR
- DENOTES EXISTING SANITARY MANHOLE
- DENOTES PROPOSED SANITARY MANHOLE
- DENOTES PROPOSED HYDRANT
- DENOTES EXISTING HYDRANT
- DENOTES PROPOSED WATER VALVE & BOX
- DENOTES EXISTING WATER VALVE & BOX
- DENOTES PROPOSED WATER METER
- DENOTES PROPOSED SIAMESE CONNECTION
- 115.60 100.00 DENOTES EXISTING SPOT ELEVATION
- (100.00) DENOTES PROPOSED ELEVATION
- (100.00)T/C DENOTES PROPOSED TOP OF CURB ELEVATION
- (100.00)G/L DENOTES PROPOSED GUTTER LINE ELEVATION
- (100.00) HP DENOTES PROPOSED HIGH POINT
- (100.00) DENOTES PROPOSED SWALE INVERT ELEVATION
- (100.00) DENOTES PROPOSED ELEVATION BY OTHERS
- DENOTES PROPOSED FLOW ARROW AND SLOPE
- DENOTES PROPOSED FLOW ARROW
- DENOTES EMERGENCY OVERLAND FLOW
- DENOTES PROPOSED SLOPE (3:1 OR HIGHER)
- 195.50 DENOTES EXISTING CONTOUR
- DENOTES PROPOSED SILT FENCE
- DENOTES PROPOSED ENTRANCE LOCATION
- DENOTES EXTENT OF MAX. PONDING (0.30m) 100 YEAR STORM.
- DENOTES PROPOSED LIMIT OF CONSTRUCTION
- DENOTES PROPOSED HEAVY DUTY ASPHALT AREA



KEY PLAN Scale : N.T.S.

SUBJECT LANDS

NOTES:

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND UNDERGROUND AND ABOVE GROUND UTILITIES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING THE WORK, THE CONTRACTOR SHALL CONFIRM OF THE EXACT LOCATION OF ALL UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS ON THE JOB AND REPORT ANY DISCREPANCY TO THE ARCHITECTS/ENGINEERS BEFORE PROCEEDING WITH THE WORKS.

ALL DRAWINGS AND SPECIFICATIONS ARE INSTRUMENTS OF SERVICE AND THE PROPERTY OF THE ENGINEER WHICH MUST BE RETURNED AT THE COMPLETION OF WORK.

THIS DRAWING IS NOT TO BE SCALED. CONTRACTOR TO USE DIGITAL FILES FOR LAYOUT PROVIDED BY ENGINEER. THIS PLAN MUST NOT BE USED TO SITE THE PROPOSED BUILDINGS.

THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S CONTRACTOR FROM OBTAINING, BUT NOT LIMITED TO THE FOLLOWING PERMITS: ROAD CUT, SEWER PERMITS, RELOCATION OF SERVICES, ENCROACHMENT AGREEMENTS, APPROACH APPROVAL PERMITS, ETC..

EXISTING TOPOGRAPHICAL INFORMATION SUPPLIED BY A.T. MACLAREN LTD. ON JANUARY 02, 2022.

BEARING NOTE:

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B, BY REAL TIME NETWORK OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0)

NOTE:

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.99970618.

OBSERVED REFERENCE POINTS (ORP's): UTM ZONE 17, NAD83 (CSRS) (2010.0). COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O.REG. 216/10		
POINT ID.	NORTHING	EASTING
ORP A	4798357.813	596710.470
ORP B	4798143.371	596947.089
COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN		

BENCHMARK NOTE:

STATION: CITY OF BURLINGTON BENCHMARK 368

BRASS PLAQUE ON THE NORTHEAST WING WALL OF THE CONCRETE HEAD WALL OF A CULVERT ON THE NORTH SIDE OF BLAIRHOLM AVENUE, 50M WEST OF COURTLAND AVENUE AND 150M EAST OF BRANT STREET.

ELEVATION: 89.578 METRES CGVD-1928:1978

METRIC NOTE:

DISTANCES AND COORDINATES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

NO.	REVISIONS	DATE	BY
1	ISSUED FOR REZONING	JAN. 13,2023	H.O.

SCALE(S):

1: 250 (0 5 10 15 20 25)

DRAWING TITLE:

FUNCTIONAL GRADING PLAN

PROJECT:

PROPOSED 11-STOREY + MEZZANINE MIXED-USE CONDO BUILDING
688, 694 & 698 BRANT STREET
BURLINGTON, ON

CLIENT:

ELITE 688 BRANT HOLDINGS INC.

ODAN·DETECH CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

REGISTERED PROFESSIONAL ENGINEER
JAN. 13,2023
I. KRPAN
PROVINCE OF ONTARIO

ENGINEER

DESIGNED BY:	PROJECT No.:
HO	21284
DRAWN BY: HO	
CHECKED BY: KO	DATE: NOV 2022
APPROVED BY: JK	DRAWING No.: 2 of 2