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PROPOSED RESIDENTIAL DEVELOPMENT
559 GARNER ROAD
HAMILTON, ONTARIO

PROJECT No. : 21215

FUNCTIONAL SERVICING & STORMWATER MANAGEMENT REPORT

Prepared For:

ELITE MD DEVELOPMENTS

Prepared By:

The Odan/Detech Group Inc.

Original: August 2021
Rezoning Resubmission: May 11, 2022
Rezoning Resubmission: February 07, 2023
Rezoning Resubmission: January 18, 2024

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1.0 INTRODUCTION

The property under study is a 0.37 ha (0.91 acre) site located at 559 Garner Road, intersection of Southcote Road and Garner Road in the City of Hamilton. It is proposed to construct a 7-storey residential development apartment building on the site with related underground parking.

The site is bound by the following:

- To the south: Garner Road East
- To the east: Existing Commercial lands.
- To the north: Vacant lands and a drainage channel.
- To the west: Southcote Road and an Existing Cemetery

The subject lands are currently designated “Low Density Residential (Infill/Residential)” in Meadowlands III Secondary Plan. The proposal seeks to permit a 7-Storey residential building which is considered a high-density development and therefore does not meet the current zoning. This report will evaluate the serviceability of the site with respect to sanitary waste water, water and storm water management (SWM) and will implement the SWM criteria identified by City staff in prior correspondence to allow for a change in use.

Criteria for the site engineering was provided by the City of Hamilton to Urban Solutions in the formal consultation application response letter dated February 16 2021. A copy of the letter is provided in Appendix A.

For detailed topography of the existing site conditions, as of April 14, 2022 refer to the topographic survey prepared by A.T. McLaren Limited in Appendix A.

Refer to the Site Plan by SRM Architects Inc. in Appendix A for the site’s layout and proposed Phasing Limits.

2.0 SCOPE OF WORK

THE ODAN/DETECH GROUP INC. was retained by **Elite MD Developments** to review the Site, collect data, evaluate the Site for the proposed use and present the findings in a Functional Servicing Report and Stormwater Management Report in support of a Rezoning Application. The scope of work in brief involves the following:

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 FSR and Storm Water Management Report in support of the Rezoning Application.

3.0 WATER DISTRIBUTION

Design Considerations

The following watermains presently exist beneath the streets bordering the site.

Garner Road East

- There is a 750 transmission main located on the north side of Garner Road East flanking the property. Direct connection to this main is not permitted.
- There is a 400mm dia. watermain on the south side of Garner Road East.

Southcote Road

- There is a 600mm dia. transmission main on the east side of Southcote Road, flanking the property. A direct connection to this main is not permitted.
- There is a 300mm dia watermain on the west side of Southcote Road.

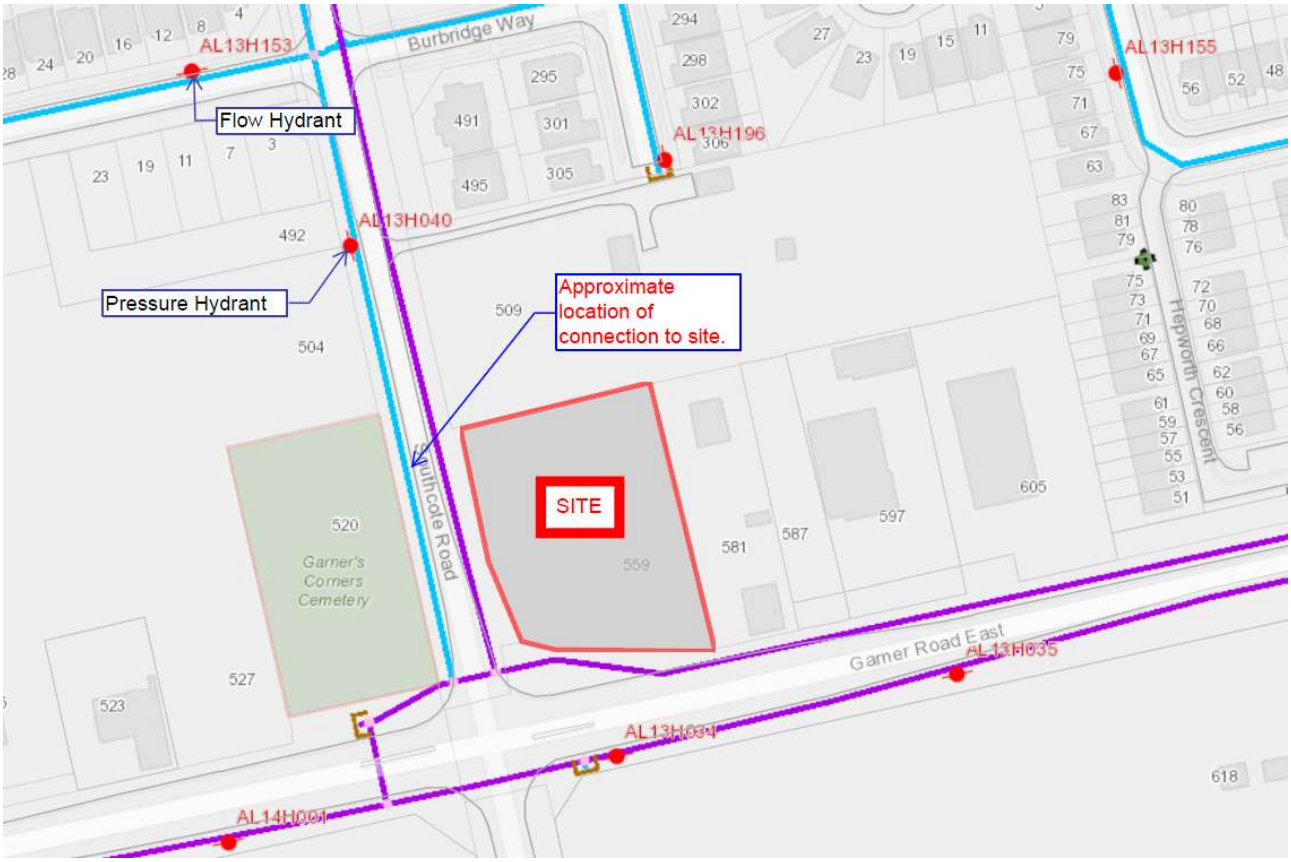
Based on the above watermain locations and the building layout the preferred connection point would be to the 300mm dia. water main on Southcote Road as this provides the most direct path to the proposed Mechanical room location.

The proposed development is located within Pressure Zone 18. Hydrant test data for the hydrants located on Southcote Road and Garner Road East were provided by the City of Hamilton and are shown in Table 1 below. ***A current flow test has been conducted to confirm the below flows and pressures***.

Table 1 – Pressure Zone 18 – Flow & Pressure Data

Hydrant ID	Address	Pressure Zone	Date of Most Recent HFI2 Test (Field work) (mm/dd/yy)	Static Pressure [psi]	Residual Pressure [psi]	Test Flow [Imp Gal/ min]	DSR [psi]	DSR2 [psi]	FAR20 [Imp Gal/ min]
AL13H034	618 GARNER RD E ANCASTER	18	2019-7-16 9:10 AM	72	66	1000	6	52	3210
AL13H040	504 SOUTHCOTE RD ANCASTER	18	2019-7-23 9:46 AM	70	67	1150	3	50	5254
AL14H001	534 GARNER RD E ANCASTER	18	2019-7-16 9:05 AM	70	64	1080	6	50	3394
AL13H039	468 SOUTHCOTE RD ANCASTER	18	2019-7-23 9:48 AM	72	66	1050	6	52	3370

Figure 1 – Hydrant Flow Test Mapping



As shown in the flow test on the following page, the available flow at 20 psi within the Southcote Road 300mm watermain is 4729 USGPM (298 L/s). This flow is similar to the hydrant flow data provided by the City of Hamilton and will be used for the subject analysis.

FLOWMETRIX
INDU-TECH
PROCESS
WESTCAN

Fire Flow Testing Report

Residual Hydrant # **AL13H040**
NFPA Colour Code **BLUE**

DATE	August 10, 2021
TIME	9:00 AM
ADDRESS	492 Southcote Rd
	Ancaster, ON
	L9G 3K9
SIZE-inches/mm	300
MATERIAL	DI
CONTACT INFO	The Odan/Detech Group Inc.
	Mark Harris
	C: (905) 632-3811 ext.122
	E: mark@odandetech.com

RESIDUAL HYDRANT INFO.

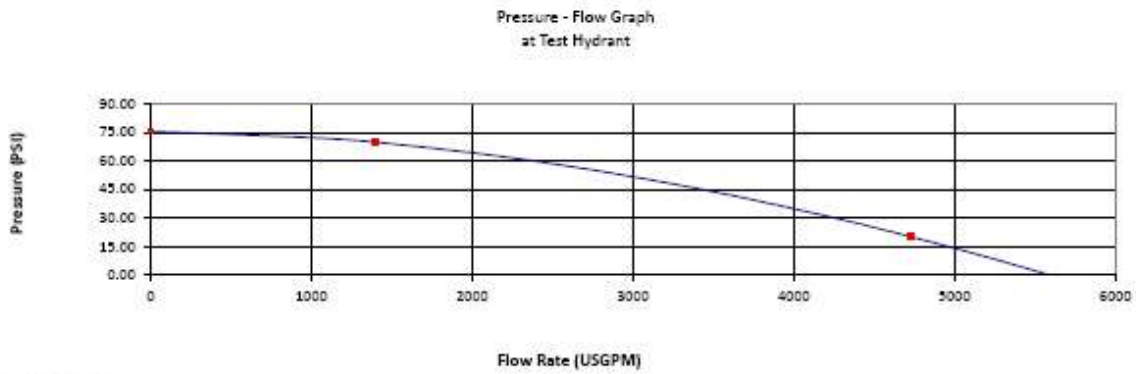
HYDRANT #	AL13H040	
N.F.P.A. COLOUR CODE	BLUE	
STATIC PRESSURE	75.4	psi
RESIDUAL PRESSURE	69.6	psi
PRESSURE DROP	5.8	psi
% PRESSURE DROP	7.7	% psi

Flow on Water Main At Test Hydrant - 20 psi 4729 USGPM

FLOW HYDRANT(S) INFO.

HYDRANT ASSET ID	HYD. # PORTS	OUTLET DIAMETER (INCHES)	NOZZLE COEFFICIENT	DIFFUSER TYPE	DIFFUSER COEFFICIENT	PITOT READING (psi)	PITOT FLOW (USGPM)	FLOW METER (USGPM)
AL13H153	2	2.5	Round	LPD250	0.90	21.5	701	0
		2.5	Round	LPD250	0.90	21.5	701	0
					Total Flow (USGPM)		1402	0
					Total Flow (USGPM)		1402	

FIRE FLOW CHART



COMMENTS

OPERATOR	FMX	Ryan Ritchie
OPERATOR	FMX	
OPERATOR		City of Hamilton Water

ODG_FireFlowTestingReport_GarnerRdEast_Hamilton

"If we don't measure it, how do you manage it?"

It is proposed to service the site with one domestic water service 100mm dia. and one fire service 200mm dia. connection. These are proposed to connect to the 300mm water main located on Southcote Road as preferred by the City of Hamilton. This preferred connection was noted within the pre-consultation notes. Refer Appendix E – Concept Site Servicing Plan for additional details regarding the water main layout.

The unit rate and peaking factors of water consumption, minimum pipe size and allowable pressure in line were established from the City Design Manual Standards. The pressures and volumes must be sufficient for peak hour conditions and under fire conditions as established by the Ontario Building Code 2006. The minimal residual pressure under fire conditions is 140 kpa. (or 20.3 psi).

In January 2020 the City of Hamilton water design criteria and requirements were updated. The City of Hamilton criteria for water fire flow and domestic usage are as follows for various developments.

The fire flow demands for this development will follow the target available fire flow (AFF) for the proposed land use, as per Table 2, below, which was provided by the City in their memorandum dated January 16, 2020. The proposed 7-storey Residential building will require a target AFF of 150 L/s, as highlighted below.

Table 2 – Water Land Use

Land Use	**Target AFF (L/s)**
Commercial*	150
Small ICI (<1800 m^3)	100
Industrial	250
Institutional	150
Residential Multi (greater than three units) *	150
Residential Medium (three or less units)	125
Residential Single	75
Residential Single (dead end)	50

* Land Use for Proposed development

The target AFF for the proposed development is 150 L/s.

Based on hydrant flow test data provided by SCG Flowmetrix, there is sufficient flow to provide fire service for the proposed development because the available fire flow 4729 USGM (298 l/sec) from the 300mm watermain is greater than the City of Hamilton requirement of 150 l/sec AFF.

A summary of the total water demands for the site and available flow in the vicinity of the development is presented in Table 3 on the following page.

The water demand is calculated as follows. Domestic water demand is calculated based on the AWWA M22 method, as per the table below. The development statistics and fixture counts on which the calculation is based are provided in Appendix A. Detailed fixture counts were not available at the time of the zoning submission, therefore the fixture counts in Appendix A are a estimated based on discussions with the Architect.

Table 3 – Water Demand Calculations

WATER DEMAND CALCULATIONS			
This program calculates the water demand from various fixtures			
As per the AWWA MANUAL M22 Modified Fixture Value Method - Sizing water lines and			
Fixture	**Fixture Value (GPM) at 60 psi**	**Number of Fxitures**	**Fixture Value (GPM)**
Bathtub	8	99	792
Bedpan Washers	10	0	0
Bidet	2	0	0
Dental Unit	2	0	0
Drinking Fountain - Public	2	0	0
Kitchen Sink	2.2	100	220
Lavatory	**1.5**	143	214.5
Showerhead (Shower Only)	2.5	41	102.5
Service Sink	4	1	4
Toilet - Flush Valve	35	0	0
Toilet - Tank Type	4	143	572
Urinal - Pedestal Flush Valve	35	0	0
Urinal - Wall Flush Valve	16	0	0
Wash Sink (each set of faucets)	4	0	0
Dishwasher	2	100	200
Washing Machine	6	99	594
Hose (50 ft Wash Down) 1/2 inch	5	0	0
Hose (50 ft Wash Down) 5/8 inch	9	0	0
Hose (50 ft Wash Down) 3/4inch	12	0	0
Total Fixture Value Total		**726**	**2699**
Demand (gpm) from Fig 4-2 of AWWA Manual M22 Second Editon			**78**

Table 4 – Pressure Adjustment

DOMESTIC WATER DEMAND CALCULATIONS			
This following calculates the domestic water demand from various fixtures as per the AWWA MANUAL M22 Modified Fixture Value Method - Sizing water lines and meters			
Project:			
Fixture	**Fixture Value (GPM) at 60 psi**	**Number of Fxitures**	**Fixture Value (GPM)**
The following fixture count and fixture values have been provided by project architectural consultant			
Total Fixture Value			**2699**
Demand (gpm) from Fig 4.2 of AWWA Manual M22 Second Editon			**78**
Pressure Adjustment			
Peak Hour Pressure	67	psi	
Pressure Adjustment Factor	0.94		
Pressure Adjustment (Demand x Pressure Adjustment Factor)			73
Total Domestic Demand (L/s)			**4.63**

Fire flow demand is calculated using the City of Hamilton standards as follows:

a) Peak Hour Domestic Demand (AWWA M22) 73 GPM or 4.6 L/sec

b) Required Fire flow as per City (150 l/sec) 2377 USGPM or 150 L/sec

The MOE design criteria states that the peak hour domestic demand is 3.0x the average day demand and the max day demand is 1.9x the average day demand. As such, the max day demand is 0.63x the peak hour demand, and will be used to calculate the total water demand for the site.

Table 5 – Total Water Demand

	L/sec	USGPM
Max Day Domestic Flow Demand	2.9 (4.6*0.63)	46
Fire Flow Demand	150	2377
Total Water Demand	152.9	2423
AFF - Available Flow at 20 PSI Residual Pressure	298	4729

Based on the flow data there is sufficient flow to provide fire service for the proposed development. The available fire flow is 4729 USGPM (298.4 l/sec) from the 300mm water main, which is greater than the total water demand 2423 USGM (153 l/sec) and the Supply is greater than the City of Hamilton requirement of 150 l/sec AFF.

4.0 SANITARY WASTEWATER

i) Available & Existing Infrastructure

The following sewers presently exist beneath the streets bordering the subject site. Refer to the Appendix C – Concept Site Servicing Plan for the layout of the sewers bordering the subject site.

- Garner Road East
  - There is no sanitary sewer fronting the proposed development.
- Southcote Road
  - There is no sanitary sewer fronting the proposed development. 115m to the north of the proposed site is San MH 21A, which drains west down Secinaro Avenue by a 250mm sewer. At San MH 18A, the sewer begins to flow north to San MH 1A, which then exists to a sanitary pump station.
- Future Garner Road Extension
  - There is a future Trunk Main proposed within the AEGD Master Water & Wastewater that is proposed for Garner Road. Timing to construct this sewer is unknown. There may be potential to connect to this sewer in the future.

See Appendix B for the sanitary sewer network on Southcote Road.

City staff have provided criteria for consideration of these existing sewers in the preconsultation as follows (see Appendix A);

Sanitary Sewer Servicing

- The existing Southcote sewer design basis assumed a population density of 60 ppha for the subject property. The proposed density is substantially higher. In support of the application for OP and zoning amendment, the proponent will be required to complete hydraulic capacity assessment of the Southcote Road sanitary sewer and demonstrate adequate capacity for the proposed increase in flow. Consultation with Growth Management & Hamilton Water will be needed to confirm assumptions for existing conditions and area population densities.

- For future Zoning application, the applicant is required to provide the following:
    - Calculations/analysis to demonstrate that flows generated from the proposed development will not adversely impact the sewer capacity and hydraulic performance of the City's sanitary

- For future Site Plan Control application, the applicant is required to provide the following:
    - A servicing plan showing the sanitary connection to the municipal sewer
    - A wastewater generation calculation based on Part 8 of the latest edition of the Code and Guide for Sewage Systems in order to establish an equivalent population density

ii) Proposed Sanitary Servicing

It is proposed to install 149m of a 250mm diameter sanitary sewer beneath Southcote Road from the intersection of Southcote Road & Garner Road East to San MH A6, 52m south of the Secinaro Avenue and Southcote Road intersection. This sewer will cross beneath the existing 375mm culvert, and will have nearly two meters of separation. The proposed site will outlet using a 200mm dia sewer at 2.0%, crossing beneath the existing 600mm water main and connecting to the proposed sanitary sewer beneath Southcote Road.

The Southcote Woodlands Subdivision has prepared a downstream sanitary analysis for the areas contributing to the Southcote Woodlands Pumping Station. The Evergreen subdivision has also prepared a Sanitary Catchment Plan for a portion of Southcote Road, from Garner Road East to Bookjans Drive. Refer to Appendix B for the related Sanitary Tributary Area Plans. These plans have been combined and updated to include the additional flows from the subject development. Refer to Appendix B for the updated Sanitary Tributary Area Plan and related calculations. The calculations have been provided for two scenarios, stage 2 and 3 of the Southcote Woodlands Pumping Station.

The Southcote Woodlands Pumping Station has a capacity of 106 L/s, as per the Southcote Woodlands Pumping Station Design brief, dated July 2008. The brief has provided available pump station capacities for 3 stages of development in the area. For stage 2, with the addition of our development, the proposed flow to the pumping station is 95.79 L/s. For the future stage 3 development, with an additional 13.50ha of area contributing to the pump station, the flow rate will be increased to 103.92 L/s, which is below the 106L/s capacity of the pump station.

Refer to Appendix A for the proposed development statistics.

City staff have stated that sanitary flows are to be calculated by Part 8 of the Ontario Building Code. Calculations are provided below.

Additionally, City standards for population densities and flow rates will be used. The following are provided in the City of Hamilton *Comprehensive Development Guidelines and Financial Policies Manual* (2019), Section E.1.4. *Design Flows*.

Residential

- Townhouses and maisonettes (30 upha) – 110 persons per hectare
- High Density Apartments (100 upha) – varies (subject to detailed plans)
- Commercial varies 125 to 750 ppha
- Per person flow – 360 L/person/day

The population for Apartment/Condo buildings have been taken from the Development Charges Background Study in the Township of Hamilton, by Watson & Associates Economists Ltd. From Schedule 8b of the report, on page A-11, the population density per unit is as follows:

- 1 bedroom unit – 1.364 persons per unit
- 2 bedrooms unit – 1.787 persons per unit
- 3 bedrooms unit – 2.372 persons per unit

Inflow/Infiltration

For areas where there will be storm sewers beneath the weeping tiles of the development, infiltration allowance is 0.4 L/s per hectare

Peaking Factor

$$M = \frac{5}{p^{0.2}}$$

Where *p* is population in thousands. 2<M<5.

Groundwater

The proposed below-grade structure will be constructed as water-tight. Therefore, there will be no long-term dewatering required for the site.

The peak sanitary flow from the proposed development is thus calculated as follows, in Table 6.

Table 6 – Proposed Sanitary Flows – Based on Population

	Site Area (ha)	Infiltration Allowance (L/s/ha)	Peak Factor	Total Average Flow	Peak Flow (l/sec)	Infiltration Allowance (l/s)	Total Flow (l/s)
Residential Tower	0.37	0.40	5.0	0.98	4.027	0.148	**4.175**

Note: refer to Appendix for detailed calculation.

A 250mm @ 2.0% sanitary sewer connection is proposed to the proposed sanitary sewer on Southcote Road. The pipe has a capacity of 84.1 L/s, which is adequate to convey the above post-development sanitary flow. Note that the minimum sewer size for Hamilton is 250mm for residential lands.

The sanitary average flow calculation was based on the Ontario Building Code is 1.42 L/s and was calculated as follows:

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PROJECT: ***Proposed Residential Development***
559 Garner Road East
Hamilton, Ontario

CLIENT: Elite MD Developments
DATE: May 03 2022
PROJECT No.: 21215
DRAWING REF.:

	A	B	C	D	E	F	G	H	I	J
	Floor Area (sq.ft.)	Floor Area (sq.m.)	Establishment Type (OBC 8.2.1.3.B.)	Based on Floor Area	Volume (litres)	Total Volume (litres) (B/DxE)	Volume (litres)	Establishment Type (OBC 8.2.1.3.B.)	Based on Number of Beds or Units (ea.)	Volume (litres) (G x I)
Residential							750	1 Bedroom Dwelling	18	*13500*
Residential							1100	2 Bedroom Dwelling	40	*44000*
Residential							1600	3 Bedroom Dwelling	41	*65600*
Commercial			Office	per 9.3 sq.m. floor area	75	*0*				*0*
Total Floor Area	***0***	***0***	***Total Based on Floor Area***			**0**	***Total Based on Number of Beds/Units***			**123100**
Total Volume (Average per day)										***123100***
Total (l/sec)										***1.42***

Applying a peaking factor of 5.0 the OBC flow would be 7.1 l/sec + 0.15 L/sec infiltration for a total of 7.25 l/sec which is marginally higher than the flows calculated using population at 5.06 l/sec. Therefore, a population of 342 people will be used in the downstream sanitary calculations (123,100L/day / 360L/day/cap).

5.0 STORM WATER MANAGEMENT

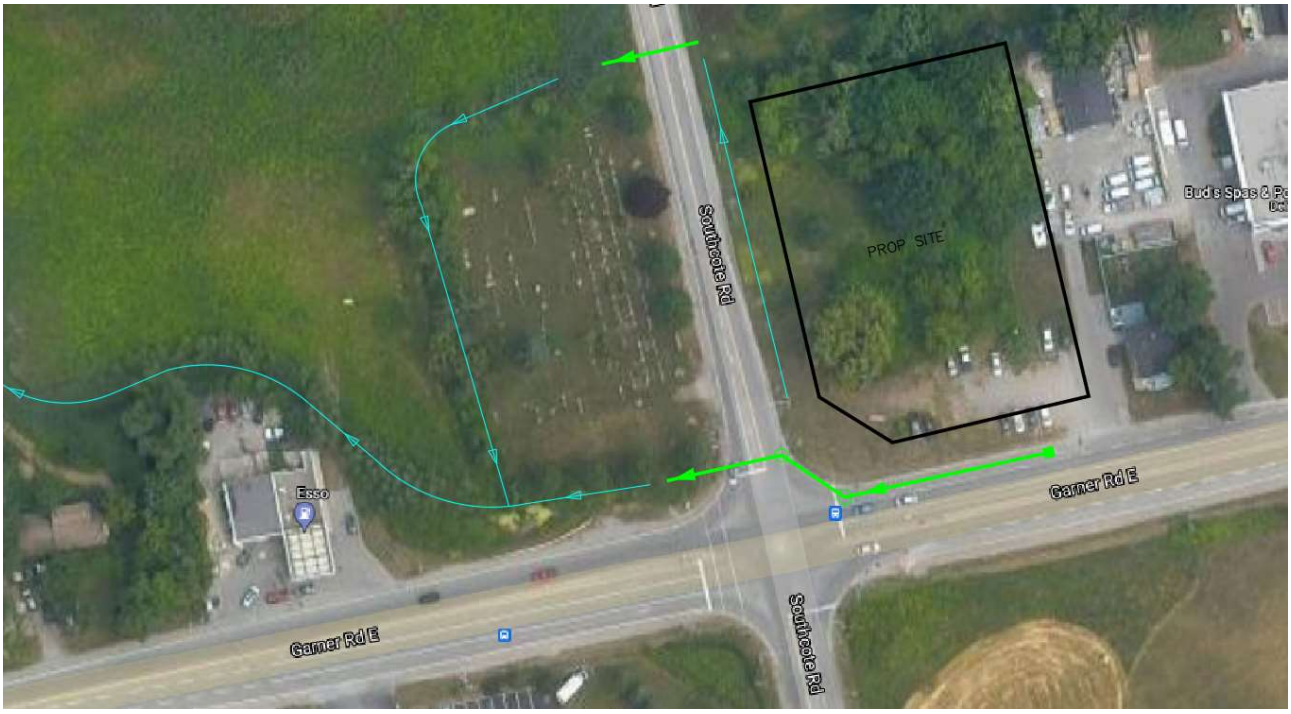
i) Terms of Reference & Available Infrastructure

The following sewers presently exist beneath the streets bordering the subject site. Refer to the Concept site service plan for the storm layout of the sewers bordering the subject site.

- Garner Road East.
  - There is a 375mm storm sewer flowing westerly, discharging into a culvert beneath Southcote Road. This sewer has been installed as a temporary measure and will be removed during the urbanization of Garner Road.
- Southcote Road
  - There is an existing ditch flowing northernly, discharging into a culvert beneath Southcote Road.
  - There is an existing 300mm storm sewer 67.0m north of the site, flowing northernly to Secinaro Avenue.

The site's existing storm runoff flows overland to the temporary storm sewer beneath Garner Road and the ditch along Southcote Road, which converge at the south west corner of the Cemetery lands and continue to flow in a northwesterly direction. This drainage pattern is shown below in Figure 2.

Figure 2 – Existing Storm Drainage Pattern



Refer to Appendix C for the site's Pre-Development Catchment Plan.

City engineering review staff provided criteria for stormwater management design in the criteria memo. The stormwater section of the memo is provided here in Appendix A.

Storm Water Quantity Control

- The proponent needs to demonstrate a legal storm outlet for the subject development. The proponent shall submit a legal opinion to confirm riparian rights for the drainage through the private lands

.
Storm Water Quality Control

- The quality control criteria is to provide Level 1 quality control

Through additional correspondence with The City, four options were suggested as adequate outlets for the site's stormwater:

Option 1: Drain through the existing culvert across Southcote Road to the cemetery lands.
This option is not feasible due to the minimal cover over the Southcote Road culvert. It is not possible for the subject site to tie into this culvert with below grade sewers.

Option 2: Install a storm sewer following the recommendations of the Class EA. This shall mean that the existing storm sewers at the Southcote Garner intersection which are currently just meant for road side drainage shall be replaced and upgrade with the Garner Road storm sewer outletting to the creek north of Garner Road.
This option was investigated however it was found that there is a small body of water at the outlet of the future Garner Road EA storm sewers which would need to be rectified to allow for a free flow outlet. To rectify this situation it would take agreements with multiple land owners to grade on their lands which has resulted in this option not being feasible.

Option 3: Outlet through the adjacent property to the north (509 Southcote Road) connecting to the storm sewer to the north.
This option was investigated however an agreement could not be made with the adjacent landowner and the City's schedule for the construction of the Garner Road EA storm sewers was at a similar time frame as when the northern property would develop. Therefore it would be preferred to wait for the City to construct the Garner Road EA storm sewers and outlet stormwater from the subject site to these future sewers.

Option 4: Postpone construction until the completion of Garner Road EA storm sewers by the City and outlet stormwater from the site to these future storm sewers.
This option has been selected as the only viable solution.

As such, the site will postpone construction until the Garner Road EA storm sewers are installed by The City, which will be used as the site's stormwater outlet. (Option 4).

The Hamilton Mount Hope 2 and 100-year Chicago Intensity-Duration-Frequency (IDF) design storms were used for stormwater runoff analysis for this site using the Rational Method. The Mount Hope 2 year and 100 year storm Intensity-Duration-Frequency equations are shown below

2 Year Storm: $I_2 = 646.0 / (T + 6)^{0.781}$ where: I = intensity (mm/hr)
I_2 = 74.1 mm/hr T = time of concentration (10min)

100 Year Storm: $I_{100} = 2317.4 / (T + 11)^{0.836}$
I_{100}=181.81 mm/hr

The mount hope IDF Parameters can be seen below.

Table 7 – IDF Parameters – Mount Hope

IDF PARAMETERS – MOUNT HOPE						
Parameter	2	5	10	25	50	100
A	646.0	1049.5	1343.7	1719.5	1954.8	2317.4
B	6.0	8.0	9.0	10.0	10.0	11.0
C	0.781	0.803	0.814	0.823	0.826	0.836

ii) Allowable & Pre-Development Discharge Rate

Allowable discharge from the site will be determined by calculating the flow for the 2 to 100-year design storm events using the rational method, for the existing site area directed towards the ditch to the northwest of the Garner Road East and Southcote Road intersection. The existing site area (prior to road widenings) has been used to calculate the pre and post-development allowable stormwater release rates. Refer to Appendix C for the pre-development storm tributary plan. As shown in figure 2 above, all surface runoff from the existing site converges at the ditch to the northwest of the Garner Road East and Southcote Road intersection.

Table 8 – Rational Method Parameters

Rational Method Parameters			
Parameter	C	I (mm/h)	A (ha)
2 YEAR	0.25	74.1	0.422
5 YEAR		103.0	
10 YEAR		122.3	
25 YEAR		146.1	
50 YEAR		164.6	
100 YEAR		181.8	

The following Table 9 summarizes the allowable release rate for the site.

Table 9 – Allowable Flows

Storm Event	Allowable Flow
2 YEAR	21.6
5 YEAR	30.1
10 YEAR	35.7
25 YEAR	42.6
50 YEAR	48.0
100 YEAR	53.1

iii) Post-Development Flow Analysis

Stormwater runoff from the proposed development will drain primarily by mechanical storm drains to a storm tank located at the south west edge of the P1 Parking level. The runoff to the exterior of the parking garage limits will be captured and brought to the SWM tank. The land to the west and south of the proposed building will flow overland to Southcote Road and Garner Read East respectively, matching the pre-development conditions. A comparison table of the pre and post development overland flow to Southcote Road and Garner Road East is shown below. In summary, the post-development overland flow CA value (runoff coefficient x area) is less than the pre-development, and therefore the post-development overland flow rate is below the existing to both Southcote Road and Garner Road East. Refer to Appendix C for the Post-Development Drainage Plan.

Table 10 – Pre & Post-Development CA Comparison

Scenario	Southcote Road			Garner Road East		
	C	A (ha)	CA	C	A (ha)	CA
Pre-Dev	0.25	0.332	**0.083**	0.25	0.090	**0.022**
Post-Dev	0.30	0.048	**0.014**	0.25	0.042	**0.011**

It is noted that the City would like to mitigate the emergency overland flow directed toward the culvert to the north of the site, beneath Southcote Road. In both the pre-development and post-development, the site's emergency overland flow is directed toward the Southcote Road culvert due to the existing topography of the area. The subject development is mitigating future impacts to the downstream culvert by directing the majority of stormwater runoff from storm events up to the 100-year storm to the future Garner Road storm sewer. This drastically reduces the stormwater volume that is directed to the Southcote Road culvert when compared to the pre-development.

In the post-development, the overland flow from the site to Garner Road East and Southcote Road has been calculated using the rational method as follows:

Table 11 – Post-Development Overland Flow Rate to Southcote

Storm Event	CA	I (mm/h)	Q (L/s)
2 YEAR	0.014	74.1	2.88
5 YEAR		103.0	4.01
10 YEAR		122.3	4.76
25 YEAR		146.1	5.69
50 YEAR		164.6	6.41
100 YEAR		181.8	7.08

Table 12 – Post-Development Overland Flow Rate to Garner Road East

Storm Event	CA	I (mm/h)	Q (L/s)
2 YEAR	0.011	74.1	2.27
5 YEAR		103.0	3.15
10 YEAR		122.3	3.74
25 YEAR		146.1	4.47
50 YEAR		164.6	5.03
100 YEAR		181.8	5.56

To control the post-development flows to the allowable flow rate, on-site storage and attenuation will be required. 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.

Rooftop controls are to provided on the Level 7 rooftop and the mechanical penthouse. To define the storage capacity of the rooftops, constant area storage method was used. Rooftop controls will be implemented on both proposed building additions. Control drains are to be ZCF-121 by Zurn Drainage and Control Systems Ltd with a notch rating of 0.38 L/s per 25.4mm of head. A maximum of 0.15m of ponding is allocated on each roof with scuppers for emergency overflow. To be conservative in calculated the available volume on the roof areas, half the area of the roof is multiplied by the maximum depth of ponding (0.15m) to account for slopes on the roof areas. Therefore, the roof area value inputted into the model is half of the actual roof area. The rating values were calculated as shown on below.

THE ODAN DETECH GROUP INC.
5230 SOUTH SERVICE RD, BURLINGTON, ONTARIO L7L 5K2
TELEPHONE: (905)632-3811 FAX: (905)632-3363
Email: detech@odandetech.com

ROOFTOP STORAGE - Level 7 Roof & Mech Penthouse

PROJECT: 559 Garner Road
Hamilton, ON

CLIENT: Elite MD Developments
DATE: 16-Jan-24
PROJECT No.: 21215
DRAWING REF.:

Relationship for Rooftop Control Devices
Conventional Roof

Area of Roof = 880 m^2
Number of Weirs = 18 1 Roof Drains

Head (m)	Volume (m^3)	Discharge (l/s)	Volume (ha-m)	Discharge (m^3/s)
0.00	0.00	0.00	0.00000	0.00000
0.05	22.00	13.46	0.00220	0.01346
0.10	44.00	26.93	0.00440	0.02693
0.15	66.00	40.39	0.00660	0.04039

Discharge Sample Calculation:

H= 150mm
Q= # Weirs x (Head(mm)/25.4mm) x Weir Discharge (l/sec)
Q= 18 x (150/25.4) x 0.38
Q= 40.39 l/sec

The following Table 13 summarizes the parameters used in Visual OTTHYMO to characterize the post development catchment areas. Refer to the Post-Development Drainage Plan in Appendix C and the Post-Development Visual OTTHYMO Model below.

Table 13 – Catchment Characteristics for the Post-Developed Site

Area	Area (ha)	Hydrograph Method	% impervious	imperviousness directly connected %	Loss Method for Pervious Area	CN for pervious Area	Initial Abstraction for Pervious (mm)
Rooftop	0.088	STANHYD	99	99	SCS	98	1
Parking/Site	0.244	STANHYD	84	84	SCS	98	1

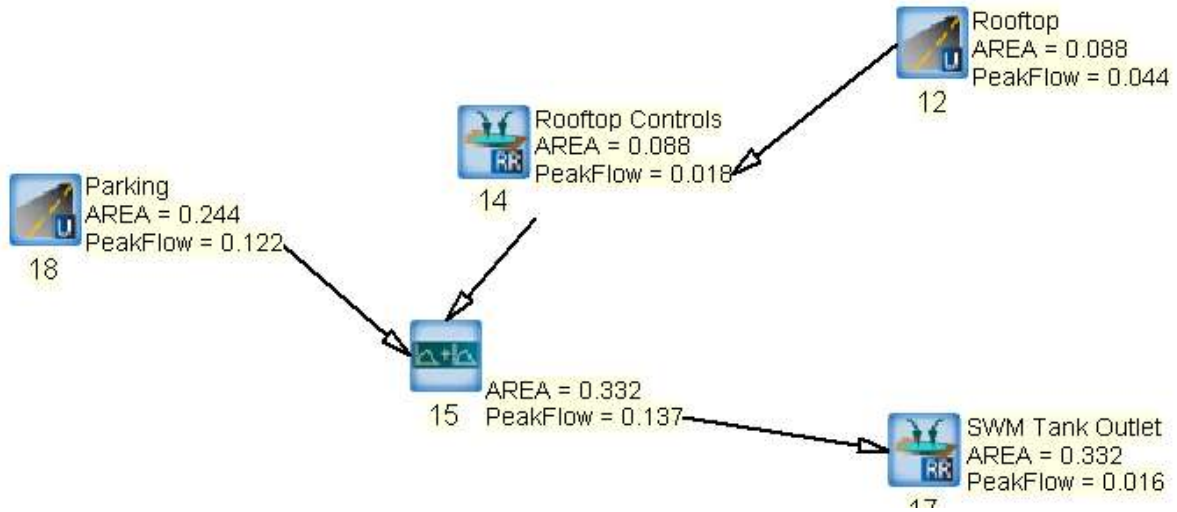
The subject site SWM tank will have a volume of 214m3 and will be pumped to the future Garner Road EA storm sewers at 16 L/s. The stage storage relationship for the SWM tank is shown as follows:

Table 14 – SWM Tank Stage Storage Relationship

Elevation (m)	Head (m)	Volume (m3)	Discharge (L/s)
242.29	0.00	0	0
242.39	0.10	3.4	16
243.29	1.00	34.0	16
245.29	3.00	102.0	16
248.59	6.30	214.2	16

The foregoing catchment areas appear in the post-development Visual OTTHYMO Model, as follows. The model shows flows in a 100-year storm. Refer to the detailed Visual OTTHYMO Output in Appendix C

Figure 3 – Post-Development Visual OTTHYMO Model (100Y Storm) (Chicago 3hr.)



The following Table 15 is a summary of the total peak storm flows for the SWM tank during the 2 to 100-year storm events.

Table 15 – Post-Development Stormwater Flows from SWM Tank

Storm Event	Post Development Flow
2 YEAR	16
5 YEAR	16
10 YEAR	16
25 YEAR	16
50 YEAR	16
100 YEAR	16

The following Table 16 summarizes the SWM Tank volume requirements during the 2 to 100-year storm events. An access and emergency overflow manhole has been provide for the SWM tank such that in an extreme storm event greater than the 100-year storm the stormwater would spill out of the overflow manhole towards the municipal right-of-way.

Table 16 – SWM Tank Volume Requirements.

Storm Event	Required Volume (m3)	Provided Volume (m3)
2 YEAR	29	214
5 YEAR	56	214
10 YEAR	77	214
25 YEAR	106	214
50 YEAR	127	214
100 YEAR	151	214

The total stormwater release rate from the site is calculated as follows In Table 17. It can be seen in Table 18 that the post-development flow is equal to or less than the allowable flow rate for all storm events.

Table 17 – Post-Development Stormwater Release Rate from Site

Storm Event	Overland Flow Rate to Southcote Road (L/s)	Overland Flow Rate to Garner Road East (L/s)	Flow Rate from SWM tank (L/s)	Post-Dev Flow Rate from Site (L/s)
2 YEAR	2.88	2.27	16	21.2
5 YEAR	4.01	3.15	16	23.2
10 YEAR	4.76	3.74	16	24.5
25 YEAR	5.69	4.47	16	26.2
50 YEAR	6.41	5.03	16	27.4
100 YEAR	7.08	5.56	16	28.6

Table 18 – Post to Pre Development Stormwater Flow Comparison

Storm Event	Post to Pre Development Comparison	
	Mount Hope Chicago 3 hr.	
	Pre	Post
2 YEAR	21.6	21.2
5 YEAR	30.1	23.2
10 YEAR	35.7	24.5
25 YEAR	42.6	26.2
50 YEAR	48.0	27.4
100 YEAR	53.1	28.6

It is proposed to install a 300mm PVC pipe at 1.00% (capacity 96.7 L/s) located at the north west of the property, from the control manhole to the future Garner Road EA storm sewers. The SWM tank will be pumped to the control manhole by mechanical and will be further detailed at the SPA stage. The site's proposed storm outlet will cross above an existing 750mm watermain, which has been daylighted to verify its depth at the crossing location. Refer to Appendix C for the daylighting results. It is assumed that the material of the 750mm watermain is steel encased in concrete, thus there are no joints for leaks. As such, the storm pipe is proposed to cross 0.3m above the existing watermain and the crossing will be enclosed in concrete to protect the new storm lateral. The PVC storm segment will be centered above the watermain in this location.

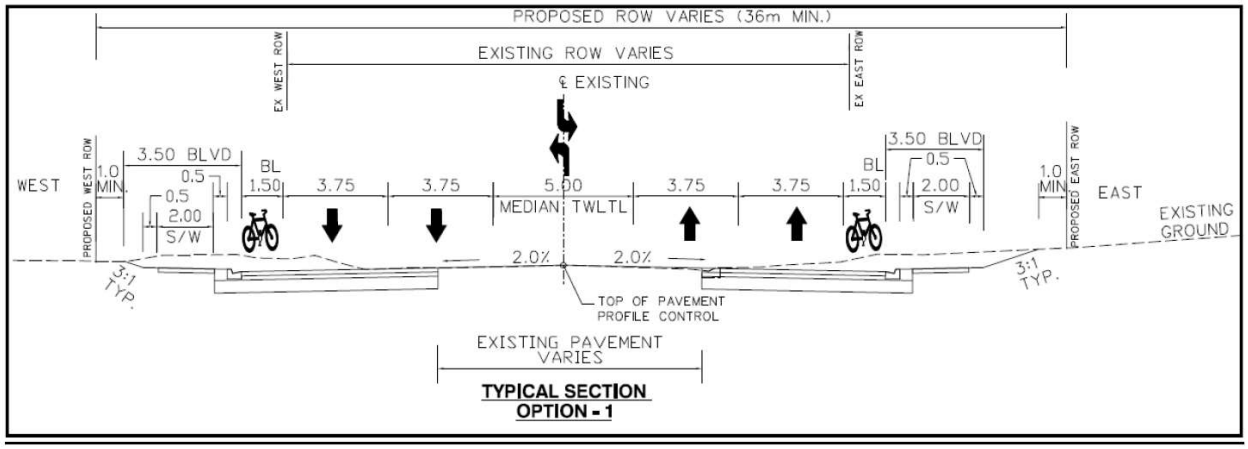
iv) Future Municipal Storm Sewer

As per the Garner Road EA, The City is proposing to install 375mm-600mm diameter storm sewers beneath the Garner Road East right-of-way, flowing westerly, in the future. The existing catch basins on Garner Road East will be reconnected to the future storm sewers and an oil grit separator (unit to be determined by the City) will be installed prior to the outlet to the existing ditch. Refer to the Concept Site Servicing Plan In Appendix E and the Garner Road Class EA Plan & Profile in Appendix C. The subject development will postpone construction until The City installs the Garner Road East storm sewers, providing a suitable stormwater outlet for the site.

The City has asked for an analysis of the future Garner Road EA storm sewers to ensure they have enough capacity to accept the flow from the subject development. The analysis of the future municipal storm sewer, under the assumption that the storm sewer will only be capturing stormwater runoff from the right-of-way, as noted by The City, is as follows.

Figure 5.1 from the Garner Road/Rymal Road and Garth Street Environmental Study Report has been used to calculate the runoff coefficient for the future Garner Road East right-of-way. 6m of the 36m right of way will be landscaping, which equates to a percentage imperviousness of 83% and a runoff coefficient of 0.78.

Figure 5.1: Proposed Typical Cross-Section



Refer to Appendix D for the Future Garner Road EA Storm Sewers Catchment Plan and Storm Sewer Design Sheets. It can be seen that all future storm sewer segments are operating below capacity during the 5-year storm event, with the largest percentage full being from FUT OGS to FUT MH7A at 94%.

The future Culvert 15, which is proposed to be upsized by The City from 800mm in diameter to 1000mm in diameter, has a future 100-year flow rate of 1.744m3/s (calculated in the Garner Road EA study). The subject development will add 0.028m3/s to the Garner Road EA storm sewers and Culvert 15, which is a 1.6% increase in flow to Culvert 15. As such this increase is considered negligible and based on the Garner Road EA, Culvert 15 would have enough capacity to accept the additional flow from the subject development.

It is noted that Odan Detech has flagged to the City that there is a small body of water located at the Garner Road EA storm sewer's future outlet, at the intersection of Garner Road East and Southcote Road. It is expected that once the Garner Road EA storm sewers are constructed by The City this will be rectified and there would be a free flow outlet as per the Garner Road EA design.

v) Erosion Control

Erosion and sediment control will be implemented on-site prior to construction and be maintained through the entire duration of construction. Erosion control measures to be implemented are:

- silt fence around the entire site
- sediment socks within existing and proposed catchbasins
- an entrance mud mat for trucks
- daily cleaning and weekly washing of roads

vi) Site Grading (Emergency Overflow)

As shown in the Pre-Development Storm Tributary Plan in Appendix C, the existing site directs stormwater toward Garner Road East, Southcote Road and the adjacent property to the north.

The post-development grading has been designed to direct the majority of the site's emergency overland flow to Southcote Road, which is a suitable emergency overland flow outlet as per the City's guidelines. In an emergency situation stormwater from the subject development will not be directed to the adjacent property to the north. Being that the site drained to Southcote Road in pre-development conditions, it is acceptable for the post-development emergency overland flow route to be directed toward Southcote Road. The emergency overland flow route from Southcote Road directs stormwater towards a culvert, which flows easternly following the drainage pattern shown in Figure 2. It is not possible to alter this emergency overland flow route as the Southcote Road culvert is at a low point.

It is noted that the City would like to mitigate the emergency overland flow directed toward the culvert to the north of the site, beneath Southcote Road. However, in both the pre-development and post-development the site's emergency overland flow is directed toward the Southcote Road culvert due to the existing topography of the area. The subject development is mitigating future impacts to the downstream culvert since the majority of stormwater runoff on the site from the storms up to the 100-year storm will be directed toward the future Garner Road East storm sewer. This drastically reduces the stormwater volume that is directed to the Southcote Road culvert when compared to the pre-development.

vii) Stormwater Quality Control

Hamilton City staff identified the stormwater quality control criteria applying to the runoff from this site to be Level 1 quality control.

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 filtration is thus required.

An oil grit separate will be designed at the SPA stage to provide quality control for the driving and ground-level pedestrian area. This will provide 80% total suspended solids removal In accordance with the City's standards.

6.0 CONCLUSIONS

From the foregoing investigation, the site is serviceable utilizing existing sanitary and watermain infrastructure adjacent to the site. The subject development will postpone construction until The City constructs the storm sewers beneath Garner Road East as per the Class EA recommendations, which will provide the site with a suitable stormwater outlet.

The following Table 19 on the following page summarizes the SWM and Servicing components of the proposed development.

Table 19 – Summary

Peak Sanitary Discharge (L/s)	4.2 L/s (City criteria) or 7.1 L/s (OBC Section 8)
Proposed Sanitary Service	250mm at 2.00%
Receiving Sanitary Sewer	Southcote Sanitary Sewer Extension
Development Water Demand (Fire + Domestic)	2423 USGM
Proposed Fire Service	200mm dia.
Proposed Domestic Service	100mm dia.
Allowable release rate from site	Refer to Comparison Table Page 21
Proposed release rate from site	Refer to Comparison Table Page 21
Quantity Control	Via Rooftop controls & Storm Tank (16 L/s pump rate)
Quality Control	Oil Grit Separator (To be detailed at SPA)
Proposed Storm Service	300mm at 1.00%

7.0 REFERENCES

1. City of Hamilton *Comprehensive Development Guidelines and Financial Policies Manual* (2016).

2. Storm water Management Planning and Design Manual, Ontario Ministry of the Environment, March 2003.

3. Visual OTTHYMO v2.0 Reference Manual, July 2002

Respectfully Submitted;
The Odan Detech Group Inc.

John Krpan, P.Eng.

Mitchell Bufalino, Civil E.I.T.

APPENDIX A

Existing Site Topographical Survey	by A.T. McLaren Limited
Site Plan	by SRM Architects Inc.
Fixture Count	by SRM Architects Inc.
City Engineering Criteria	

TOPOGRAPHIC PLAN
OF PART OF
LOT 48
CONCESSION 3
GEOGRAPHIC
TOWNSHIP OF ANCASTER
IN THE
CITY OF HAMILTON
SCALE 1:300 METRIC

6 3 0 6 12 18 metres

S.D. McLAREN, O.L.S. – 2022

LEGEND:

□	DENOTES	MONUMENT SET
■	"	MONUMENT FOUND
IB	"	IRON BAR
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
ø	"	DIAMETER
824	"	A.T. McLAREN, O.L.S.
DHO	"	DEPARTMENT OF HIGHWAYS OF ONTARIO
MTO	"	MINISTRY OF TRANSPORTATION OF ONTARIO
OU	"	ORIGIN UNKNOWN
Msd	"	MEASURED
CC	"	CUT CROSS
CB	"	CATCH BASIN
MH	"	MANHOLE
WV	"	WATER VALVE
GW	"	GUY WIRE
BMH	"	BELL MANHOLE
WMH	"	WATER MANHOLE
TL	"	TRAFFIC LIGHT
LS	"	LIGHT STANDARD
HP	"	HYDRO POLE
RRW	"	ROCK RETAINING WALL
WCRB	"	WOODEN CURB
INV	"	INVERT
EVG	"	EVERGREEN

246.43 DENOTES ELEVATIONS TAKEN BY A.T. McLAREN LIMITED

248.15 DENOTES ELEVATION FROM PREVIOUS TOPOGRAPHIC SURVEY BY BARICH GRENKIE SURVEYING LTD.

BENCHMARK:

MONUMENT 00819890294

SIB WITH BRASS CAP
CONTROL POINT IS LOCATED ON THE SOUTHEAST CORNER OF HIGHWAY 53 AND SOUHCOTE ROAD

ELEVATION: 247.65 metres CGVD–1928:1978

NOTE:

UNDERGROUND SERVICE AND UTILITY LOCATIONS MUST BE VERIFIED PRIOR TO CONSTRUCTION

INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION

NOTE:

BOUNDARY IS COMPILED FROM PLAN BY BARICH GRENKIE SURVEYING LTD, DATED FEBRUARY 4, 2020

SECINARO AVENUE

BURBRIDGE WAY

SOUTHCOTE ROAD
(FORMERLY HOSTEN ROAD)
(ORIGINAL ROAD ALLOWANCE BETWEEN LOTS 47 & 48)
(ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 2 & 3)
PIN 17565–0969(LT)

PART 2
PLAN 62R–4741

PART 1
PLAN 62R–4741
PIN 17565–0425 (LT)

PART 1
PLAN CM2054

LOT 48
CONCESSION 3
GEOGRAPHIC TOWNSHIP OF ANCASTER

PIN 17565–4013 (LT)

PIN 17565–0424 (LT)

41.310

N13°14'25"W

GARNER ROAD EAST
(NAME CHANGED BY BY–LAW R99–056, REGISTERED AS INSTRUMENT LT566239)
(ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 3 & 4)
PIN 17565–0972(LT)

SITE BENCH MARK
NAIL ON HP
ELEV = 248.50

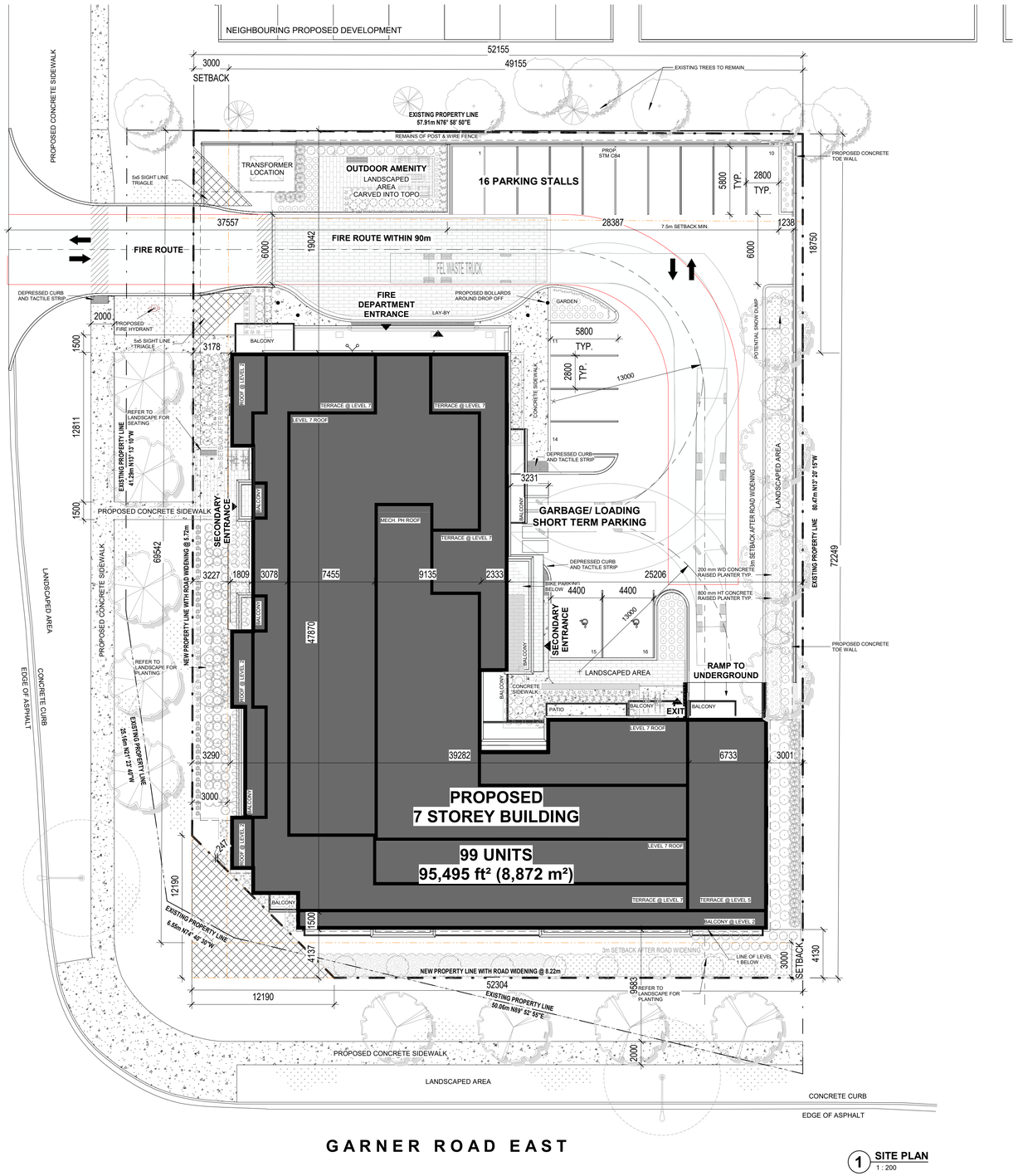
METRIC NOTE
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

APRIL 14, 2022
DATE

S.D. McLAREN, O.L.S.

A.T. McLaren Limited
LEGAL AND ENGINEERING SURVEYS
69 JOHN STREET SOUTH, SUITE 230
HAMILTON, ONTARIO, L8N 2B9
PHONE (905) 527–8559 FAX (905) 527–0032

Drawn	Checked	Crew Chief	Scale	Dwg.No.
JB	DG	JK	1:300	36951



1 **SITE PLAN**
1 : 200

PRELIMINARY ZONING INFORMATION

559 Garner Road, Ancaster, ON

DATA		REQUIRED	PROVIDED
ZONING		AGRICULTURAL - ZONE A	REQUIRES REZONING TO RESIDENTIAL MULTIPLE "RM6" ZONE
LOT AREA (m²)		XX (m²)	BEFORE ROAD WIDENING = 4,216 m² AFTER ROAD WIDENING = 3,707 m²
SETBACKS	FRONT YARD - SOUTH - (GARNER RD. E.)	3.0 m	3.0 m
	SIDE YARD - WEST - (SOUTHCOTE RD.)	3.0 m	3.0 m
	SIDE YARD - EAST - (INTERIOR)	MEET 45 DEGREE	3.0 m
	REAR YARD - NORTH	7.5 m + MEET 45 DEGREE	17.86 m
ROAD WIDENING	FRONT YARD - SOUTH - (GARNER RD. E.)	8.22 m	8.22 m
	SIDE YARD - WEST - (SOUTHCOTE RD.)	5.72 m	5.72 m
	SIDE YARD - EAST - (INTERIOR)	N/A	N/A
	REAR YARD - NORTH	N/A	N/A
TOTAL LANDSCAPED AREA (m²) BEFORE ROAD WIDENING		25%	1,660.5 (m²) 40%
TOTAL LANDSCAPED AREA (m²) AFTER ROAD WIDENING			1,040 (m²) 28%
TOTAL HARDSCAPE (m²) AFTER ROAD WIDENING		MAX. 35%	32%
BUILDING AREA (m²) AFTER ROAD WIDENING			1,173 (m²) 40%

BUILDING DATA

DATA	REQUIRED	PROVIDED
TOTAL DENSITY (# of units)	250 DWELLING UNITS PER HECTARE	**99 UNITS** 1 BED = 18 UNITS (18.18%) 1 BED+D = 40 UNITS (40.40%) 2 BED+D = 41 UNITS (41.41%)
BUILDING AREA (m²)	---	16,081 ft² (1,494 m²)
GROSS FLOOR AREA (m²)	---	95,495 ft² (8,872 m²)
CONSTRUCTION FLOOR AREA (m²) Includes underground levels	---	170,531 ft² (15,842.0 m²)
NUMBER OF STOREYS	---	7 STOREYS
BUILDING HEIGHT (m)	24m	23m
AMENITY AREA (m²) - INDOOR	---	3,635 ft² (338 m²)
AMENITY AREA (m²) - OUTDOOR	---	1,092 ft² (101 m²)
BALCONY TERRACE PATIO	---	12,379 ft² (1,150 m²)
TOTAL AMENITY AREA		17,106 ft² (1,589 m²)
COMMERCIAL/RETAIL AREA (m²)		N/A

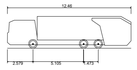
VEHICLE PARKING DATA

DATA	REQUIRED	PROVIDED
RESIDENTIAL PARKING	1.25 / unit = 99 x 1.25 = **124 STALLS**	UG = 131 STALLS (62+69) GRADE = 16 STALLS **TOTAL = 147 STALLS** **1.25 stalls / unit = 124 STALLS** **+23 ADDITIONAL STALLS**
BARRIER FREE PARKING	101-200 STALLS MIN 1 SPACE + 3% OF TOTAL # REQ **1 + (124*0.03) = 4.72**	**= 6 (INCLUDED)**
COMMERCIAL PARKING	1 / 50m² = N/A	N/A
TOTAL		**147**

BICYCLE PARKING DATA

DATA	REQUIRED	PROVIDED
BICYCLE PARKING - RESIDENTIAL OUTDOOR	5 STALLS	6 STALLS
BICYCLE PARKING - RESIDENTIAL INDOOR	49 STALLS	49 STALLS
TOTAL	---	**55**

True North is determined by survery prepared by:
Barich Grenkie Surveying Ltd.
297 HWY No.8 (Unit 101) - Stoney Creek,ON
Completed on: January 27, 2020
Signed on: Febrary 4, 2020 by Matthew Di Cosmo



FEL WASTE TRUCK

Overall Length	12,460m
Overall Width	2.540m
Overall Body Height	3.353m
Min Body Ground Clearance	0.425m
Track Width	2.540m
Lock-to-lock time	6.00s
Max Wheel Angle	45.00°

SITE LEGEND

- Property Line
- Existing Property line
- Squared off Property line
- Building Setback
- Entrance / Exit
- Underground Parking
- Property Setback

Project North

True North

GENERAL NOTES

1. **DO NOT SCALE DRAWINGS**. WRITTEN DIMENSIONS SHALL HAVE PRECEDENCE OVER SCALED DIMENSIONS.
2. ALL WORK SHALL COMPLY WITH THE 2012 ONTARIO BUILDING CODE AND AMENDMENTS.
3. CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND SPECIFICATIONS AND REPORT ANY DISCREPANCIES TO THE ARCHITECT BEFORE PROCEEDING WITH THE WORK.
4. ALL CONTRACTORS AND SUB-CONTRACTORS SHALL HAVE A SET OF APPROVED CONSTRUCTION DOCUMENTS ON SITE AT ALL TIMES.
5. ALL DOCUMENTS REMAIN THE PROPERTY OF THE ARCHITECT. UNAUTHORIZED USE, MODIFICATION, AND/OR REPRODUCTION OF THESE DOCUMENTS IS PROHIBITED WITHOUT WRITTEN PERMISSION. THE CONTRACT DOCUMENTS WERE PREPARED BY THE CONSULTANT FOR THE ACCOUNT OF THE OWNER.
6. THE MATERIAL CONTAINED HEREIN REFLECTS THE CONSULTANTS BEST JUDGEMENT IN LIGHT OF THE INFORMATION AVAILABLE TO HIM AT THE TIME OF PREPARATION. ANY USE WHICH A THIRD PARTY MAKES OF THE CONTRACT DOCUMENTS, OR ANY RELIANCE ON/OR DECISIONS TO BE MADE BASED ON THEM ARE THE RESPONSIBILITY OF SUCH THIRD PARTIES.
7. THE CONSULTANT ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY ANY THIRD PARTY AS A RESULT OF DECISIONS MADE OR ACTIONS BASED ON THE CONTRACT DOCUMENTS.

No.	Date	Revision
1	2021-08-20	ISSUED FOR OPA/ZBA

srm ARCHITECTS INC.

Project No: 21002
Project Date: 2023-06-07
Drawn by: WC/ECB
Checked by: GG
Plot Date / Time: 2024-01-18 3:44:35 PM

559 GARNER ROAD, ANCASTER, ONTARIO

SITE PLAN

PRELIMINARY

Drawing Scale: As indicated
Status:

Drawing No. A1.1 - r1
Revision No.

C:\Users\omohammed\Documents\21002_559 Garner Road, Ancaster_V16_2023_oMohammed.rFBUB.rvt

21002 - 559 Garner St., Ancaster ON

FIXTURE COUNTS

srm ARCHITECTS INC.

FIXTURE	Fixture Value GPM at 60 psi	No. of Fixtures	Fixture Value (GPM)
Bathtub		99	
Bedpan		0	
Bidet		0	
Dental unit		0	
Drinking Fountain		0	
Kitchen Sink		100	
Lavatory		143	
Showerhead (shower only)		41	
Service Sink (Mop Sink)		1	
Toilet - Flush Valve		0	
Toilet - Tank Type		143	
Urinal - Pedestal		0	
Urinal - Wall Flush Valve		0	
Wash Sink		0	
Dishwasher		100	
Washing Machine		99	
Hose (50' Wash Down) 1/2		0	
Hose (50' Wash Down) 5/8		0	
Hose (50' Wash Down) 3/4		0	
TOTAL FIXTURE VALUE		726	

DEMAND GPM

1 BEDROOM + 1 BATH UNITS	58
2 BEDROOM + 2 BATH UNITS	
(1 BATHTUB, 1 SHOWER)	41
AMENITY KITCHEN	1
AMENITY WASHROOMS	3

City Preconsultation Engineering Criteria

Building Zoning and Engineering **Kim Roberts**	
1. The current "A" zone pursuant to Ancaster Zoning By-law No. 87-57 does not permit the proposed a multiple dwelling. As such, a rezoning application is required prior to this use being permitted. 2. As the proposed zone has not been indicated, a comprehensive zone review could not be completed. 3. Section 7.29 "Adequate Services" of Ancaster Zoning By-law No. 87-57 states: *Except for Section 7.27 – Model Homes in Draft Plans of Subdivision, no buildings or structures may be erected, used or occupied unless:*	

Re: Formal Consultation Application by Urban Solutions C/O Sergio Manchia on behalf of Garner South M.D Developments C/O Hamid Hakimi for Lands Located at 559 Garner Road East, Ancaster (Ward 12)

Growth Management (Industrial and Airport) **Danielle Fama**	
It should be determined if the subject proposal will be of Condominium tenure. If a Draft Plan of Condominium application is submitted, a PIN Abstract would be required with the submission; 2. If a Draft Plan of Condominium application is submitted, it should be confirmed if the lockers shown on the underground parking plan are to be unitized; 3. The subject lands are located inside areas of cost recoveries, as per Development Engineering GIS website. Staff defer to Development Engineering Approvals for further comment; 4. A road widening for both Southcote Road and Garner Road East have been labelled on the plan. It should be determined if the dedication is sufficient. Staff defer to Development Planning and / or Development Engineering Approvals for further comment; and, 5. Per our previously provided comment for Formal Consultation application FC-20-065, the owner and agent should be made aware that official municipal addressing will be finalized when a Site Plan application is submitted.	
Development Engineering **Himanshi Juneja**	
Information: 1. The property is subject to a Right-of-Way widening on both Garner Rd. East and Southcote Road as described below: Existing Right-of-Way Width • Garner Road East– Major Arterial Road – 28.6 metres (approx.)	**Recommended Studies and Reports for the Future Planning Application:** The below noted studies and reports are required to be submitted with the future planning application:

Re: Formal Consultation Application by Urban Solutions C/O Sergio Manchia on behalf of Garner South M.D Developments C/O Hamid Hakimi for Lands Located at 559 Garner Road East, Ancaster (Ward 12) **Page 13 of 28**

- Southcote Road– Minor Arterial Road – 23.2 metres (approx.)

Future Right-of-Way Width (Urban Official Plan)

- Garner Road East– Major Arterial Road – 36.576 metres
- Southcote Road– Minor Arterial Road – 32.004 metres

The applicant will be required to dedicate sufficient lands to the City as a condition of future planning approval.

2. As the property is a corner lot between a minor and major arterial road, according to Chapter C of the Urban Hamilton Official Plan, the City shall require the conveyance of a 12.19 m x 12.19 m daylight triangle as a condition of future site plan approval.

3. Currently, the following municipal servicing infrastructure exists in the vicinity of the site:

Garner Road East

- 750 mm dia. transmission main on the north side of Garner Road East, flanking the property. A direct connection to the transmission is not permitted.
- 400 mm dia. watermain on the south side of Garner Road East.
- No sanitary sewers flanking the property.
- No storm sewers flanking the property.

Southcote Road

- 600 mm dia. transmission main on the east side of Southcote Road, flanking the property. A direct connection to the transmission is not permitted.
- 300 mm dia. watermain on the west side of Southcote Road.
- 300 mm dia. storm sewer (terminates in front of 495 Southcote Road)
- 250 mm dia. sanitary sewer (terminates in front of 495 Southcote Road)
- No sanitary sewers flanking the property.

1. Functional Servicing and SWM Report **(FSR & SWM)** c/w preliminary Grading and Site Servicing Plan to demonstrate adequate storm and sanitary outlet for the site;
2. Recommended that **two-hydrant flow tests** be conducted at the closest municipal hydrants by the proponent through a licensed private contractor;
3. The Adequate Water Services **– Required Fire Flow-RFF and Available Fire Flow-AFF Form** should be completed and submitted for the proposed development;
4. A **watermain hydraulic analysis (WHA)**, identifying the modelled system pressures at pressure district (PD18) level under various boundary conditions and demand scenarios, will be required to support the Official Plan Amendment, Zoning Bylaw Amendment and Site Plan Approval applications. This may be waived if it can be demonstrated that there is adequate service for the proposed development within the existing municipal system based on hydrant tests;
5. **Calculations/analysis to demonstrate that flows generated** from the proposed

Re: Formal Consultation Application by Urban Solutions C/O Sergio Manchia on behalf of Garner South M.D Developments C/O Hamid Hakimi for Lands Located at 559 Garner Road East, Ancaster (Ward 12) **Page 14 of 28**

• No storm sewers flanking the property. 4. The site is located north of the Airport Employment Growth District (AEGD) lands. As such, future municipal infrastructure construction along Garner Road East is expected. 5. Water service for the proposed development can be connected to the existing 400 mm diameter municipal watermain on Garner Road East, or the existing 300 mm diameter municipal watermain on Southcote Road. With the applications for Official Plan Amendment, Zoning Bylaw Amendment, and Site Plan Approval (updated as necessary to reflect the final design of the building), the proponent is required to provide a servicing report, prepared by a licensed Professional Engineer, providing water demand, fire flow calculations and hydrant flow test details. Further comments have been provided by Public Works (Hamilton Water) below. 6. The subject property is within the future drainage area of the Southcote Road 250 mm sanitary sewer, which currently ends approximately 65 metres north of the property (refer to City dwg 13-S-11_10). External works coordination with Growth Management will be required to extend the sewer to the subject property. Note that reconstruction of this segment of Southcote Road by Hamilton Public Works is scheduled for 2022. Sanitary sewer extension is not included in the 2022 project scope. The existing Southcote sewer design basis assumed a population density of 65 ppha for the subject property. The proposed density is substantially higher. In support of the application for OP and zoning amendment, the proponent will be required to complete hydraulic capacity assessment of the Southcote Road sanitary sewer and demonstrate	development will not adversely impact the sewer capacity and hydraulic performance of the City's sanitary sewer system based on City sanitary sewer criteria; 6. A **preliminary servicing plan** showing the sanitary connection to the municipal sewer; 7. A **wastewater generation calculation** based on Part 8 of the latest edition of the Code and Guide for Sewage Systems in order to establish an equivalent population density will be required at the SPA stage. 8. **Storm drainage plans** for pre- and post-development conditions. The plans shall include: a. Appropriate runoff coefficients, b. Location of outlet points to the City's receiving system(s), c. Controlled runoff release rate(s), and d. Illustration and/or details of runoff control measures. 9. **Geotechnical and/or Hydrogeological Reporting** will need to discuss soil/groundwater conditions onsite to better characterize potential dewatering needs. Discharge location (manhole ID), peak dewatering rate (L/s), and representative water quality will be required.

Re: Formal Consultation Application by Urban Solutions C/O Sergio Manchia on behalf of Garner South M.D Developments C/O Hamid Hakimi for Lands Located at 559 Garner Road East, Ancaster (Ward 12)

adequate capacity for the proposed increase in flow. 7. A Functional Servicing and SWM Report (FSR & SWM) c/w preliminary Grading and Site Servicing Plan will be required to demonstrate adequate sanitary outlet for the site. 8. In order to meet the needs of the proposed development, the Owner may be required to enter into an into an applicable Development Agreement (i.e. External Works Agreement), with and to the satisfaction of the City of Hamilton, to extend the municipal sewer services to front the subject lands, including full road urbanization etc. All costs associated with the extension of services, including engineering costs, administration costs, securities etc. would be the responsibility of the Owner. 9. The subject lands are not located within the storm sewer catchment boundary for the existing storm sewers along Southcote Road. 10. The proponent will be required to provide a SWM Brief to clarify how the existing drainage pattern from the subject lands is going to be maintained to pre-development levels. Please see Infrastructure Planning's comments for more details. The proponent shall complete a hydraulic capacity assessment for the existing culvert on Southcote Rd north of the subject land to determine the unitary flow rate (m^3/ha land) for all drainage areas that drain into this culvert. If the existing culvert cannot convey the flows from all drainages including ROW and the subject land at free flow condition for all ranges (2 to 100 year) storm events, then the existing culvert cannot be considered as a suitable storm outlet. In this case, there is no alternative storm outlet for the site at present.	10. Please note that as development approvals advance, a **Construction Management Plan** and **Shoring Agreement** may be required at the SPA stage. 11. As a general note, please note that the City does not support foundation drains and permanent dewatering.

Re: Formal Consultation Application by Urban Solutions C/O Sergio Manchia on behalf of Garner South M.D Developments C/O Hamid Hakimi for Lands Located at 559 Garner Road East, Ancaster (Ward 12) **Page 16 of 28**

Public Works Section
 	
Our Public Works Department Department has advised the following respecting sewer and water servicing.
 	
Water Servicing
 	
Regarding the memo of January 22, 2012 requesting comments on the proposal to construct six-storey 95-unit multiple dwelling on the subject lands at 559 Garner Road East in Ancaster:
• Water service for the proposed development can be connected to the existing 300 mm diameter municipal watermain on Southcote Road or the existing 400 mm diameter municipal watermain on Garner Road East.
• To determine the approximate static pressure of the existing municipal watermain, and collect calibration data for hydraulic modelling if needed, it is recommended that two-hydrant flow tests be conducted at the closest municipal hydrants by the proponent through a licensed private contractor.
• The City of Hamilton undertakes a hydrant testing program for the purposes of colour coding hydrants as a requirement under the Ontario Fire Code. City hydrant testing data can be provided if required by contacting Udo Ehrenberg at udo.ehrenberg@hamilton.ca with carbon copy (cc) to hwapprovals@hamilton.ca.
• With the application for Official Plan Amendment, Zoning Bylaw Amendment and Site Plan Approval (updated as required to reflect the final design of the buildings) the proponent is required to provide a servicing report, prepared by a licensed Professional Engineer, addressing:
  ◦ How the proponent intends to provide water servicing for the new development.
  ◦ Intended occupancy, intended land use from the table below, and the anticipated water demands.	

- The required fire flow (RFF) for the building calculated per the Ontario Building Code (OBC) Water Supply Flow Rate Method (section A-3.2.5.7) falling under Part 3 and Part 9 of the OBC (sections 1.1.2.2 and 1.1.2.4). Details to support the RFF calculation (e.g. building volume, type of construction, major occupancy classifications and property line exposures) shall be clearly identified and properly documented.
- If the proponent intends to install sprinkler systems to ensure fire protection of the proposed building, the hydraulic parameters (flow and pressure) required by this system will need to be provided during the building permit application stage.
- Summary of the available fire flow in the area, based on two-hydrant flow tests, and a conclusion as to the adequacy of available flow from the municipal system for the proposal. The municipal system as is, or with enhancement, must be able to provide the greater of the RFF calculated using the OBC methodology, or the target available fire flow (AFF) for the proposed land use, as per the table below.

Land Use	Target AFF (L/s)
Commercial	150
Small ICI (<1800 m^3)	100
Industrial	250
Institutional	150
Residential Multi (greater than three units)	150

Residential Medium (three or less units)	125
Residential Single	75
Residential Single (dead end)	50

- The attached Adequate Water Services – Required Fire Flow-RFF and Available Fire Flow-AFF Form should be completed and submitted for the proposed development.
- A watermain hydraulic analysis (WHA), identifying the modelled system pressures at pressure district (PD18) level under various boundary conditions and demand scenarios, will be required to support the Official Plan Amendment, Zoning Bylaw Amendment and Site Plan Approval applications. Please note that the requirement for a WHA may be waived following review of the water demand and fire flow requirements if it can be demonstrated that there is adequate service for the proposed development within the existing municipal system based on hydrant tests.
- It will be the responsibility of the proponent to ensure that any unique hydraulic requirements to support private site appurtenances (such as process equipment, domestic or fire booster pumps, minimum suction side pressure, large volumes, etc.) have been accounted for.

Sanitary Sewer Servicing

The subject property is within the future drainage area of the Southcote Road 250 mm sanitary sewer, which currently ends approximately 65 metres north of the property (refer to City dwg 13-S-11_10). External works coordination with Growth Management will be required to extend the sewer to the subject property. Note that reconstruction of this segment of Southcote Road by Hamilton Public Works is scheduled for 2022. Sanitary sewer extension is not included in the 2022 project scope.

The existing Southcote sewer design basis assumed a population density of 65 ppha for the subject property. The proposed density is substantially higher. In support of the application for OP and zoning amendment, the proponent will be required to complete hydraulic capacity assessment of the Southcote Road sanitary sewer and demonstrate adequate capacity for the proposed increase in flow. Consultation with Growth Management & Hamilton Water will be needed to confirm assumptions for existing conditions and area population densities. For future Zoning application, the applicant is required to provide the following: • Calculations/analysis to demonstrate that flows generated from the proposed development will not adversely impact the sewer capacity and hydraulic performance of the City's sanitary sewer system For future Site Plan Control application, the applicant is required to provide the following: • A servicing plan showing the sanitary connection to the municipal sewer • A wastewater generation calculation based on Part 8 of the latest edition of the Code and Guide for Sewage Systems in order to establish an equivalent population density **Storm Sewer Servicing** There is currently no minor storm servicing on Garner Rd E or Southcote Rd to the subject site. There is a 300 mm storm sewer north of the subject site on Southcote Rd (drawing 13-S-11_01). Drainage from the subject property is to Garner Road. No storm sewers are planned for Garner or Southcote adjacent to this property, therefore Hamilton Water has no comments or submission requirements for stormwater servicing.	

Re: Formal Consultation Application by Urban Solutions C/O Sergio Manchia on behalf of Garner South M.D Developments C/O Hamid Hakimi for Lands Located at 559 Garner Road East, Ancaster (Ward 12)

Infrastructure Planning Section Infrastructure Planning section would like to provide following comments from stormwater management perspective: 1. A 'Stormwater Management Brief (SWM Brief) is required for this development proposal. The SWM Brief should be prepared in reference with - City of Hamilton, Comprehensive Development Guidelines and Financial Policies Manual, 2019. 2. The SWM Brief should demonstrate the followings: Storm Water Quantity Control Criteria: The proponent needs to demonstrate a legal storm outlet for the subject development. The proponent shall submit a legal opinion to confirm riparian rights for the drainage through the private lands downstream. It should be noted that the subject site is located within Garner Neighborhood Master Drainage Plan (MDP) (Philips Engineering, October 2006) study area. The above MDP document should be reviewed to establish an onsite stormwater management based on available storm outlet. In absence of a suitable storm outlet per MDP recommendation, the proponent shall complete a hydraulic capacity assessment for the existing culvert on Southcote Rd north of the subject land to determine the unitary flow rate (m^3/ha land) for all drainage areas that drain into this culvert. If the existing culvert cannot convey the flows from all drainages including ROW and the subject land at free flow condition for all ranges (2 to 100 year) storm	

events then the existing culvert cannot be considered as a suitable storm outlet. Storm Water Quality Control Criteria: Level 1 quality control as per the City standards should be provided. Implementation of LID features is recommended at the subject site to account for the erosion control target as per Garner Neighborhood Master Drainage Plan. The applicant is also required to provide the following: • Storm drainage plans for pre- and post-development conditions. The plans shall include: o Appropriate runoff coefficients, o Location of outlet points to the City's receiving system(s), o Controlled runoff release rate(s), and o Illustration and/or details of runoff control measures. **Source Water Protection Planning Section** We have received the following comments from the Source Water Protection Planning Section. 1. As a condition of approval to the satisfaction of Director, Hamilton Water, Source Water Protection would require a Hydrogeological Brief conducted by a qualified professional (P.Eng, P.Geo) that discusses soil/groundwater conditions to properly characterize potential dewatering needs. This brief should discuss seasonal high groundwater levels, excavation depths, dewatering calculations (on a L/s and L/day basis), and if dewatering is required, groundwater quality sampling to compare against Sewer Use Bylaw criteria. 2. As information, in order to comply with City of Hamilton Sewer Use Bylaw standards and Temporary Sewer Discharge Permit	

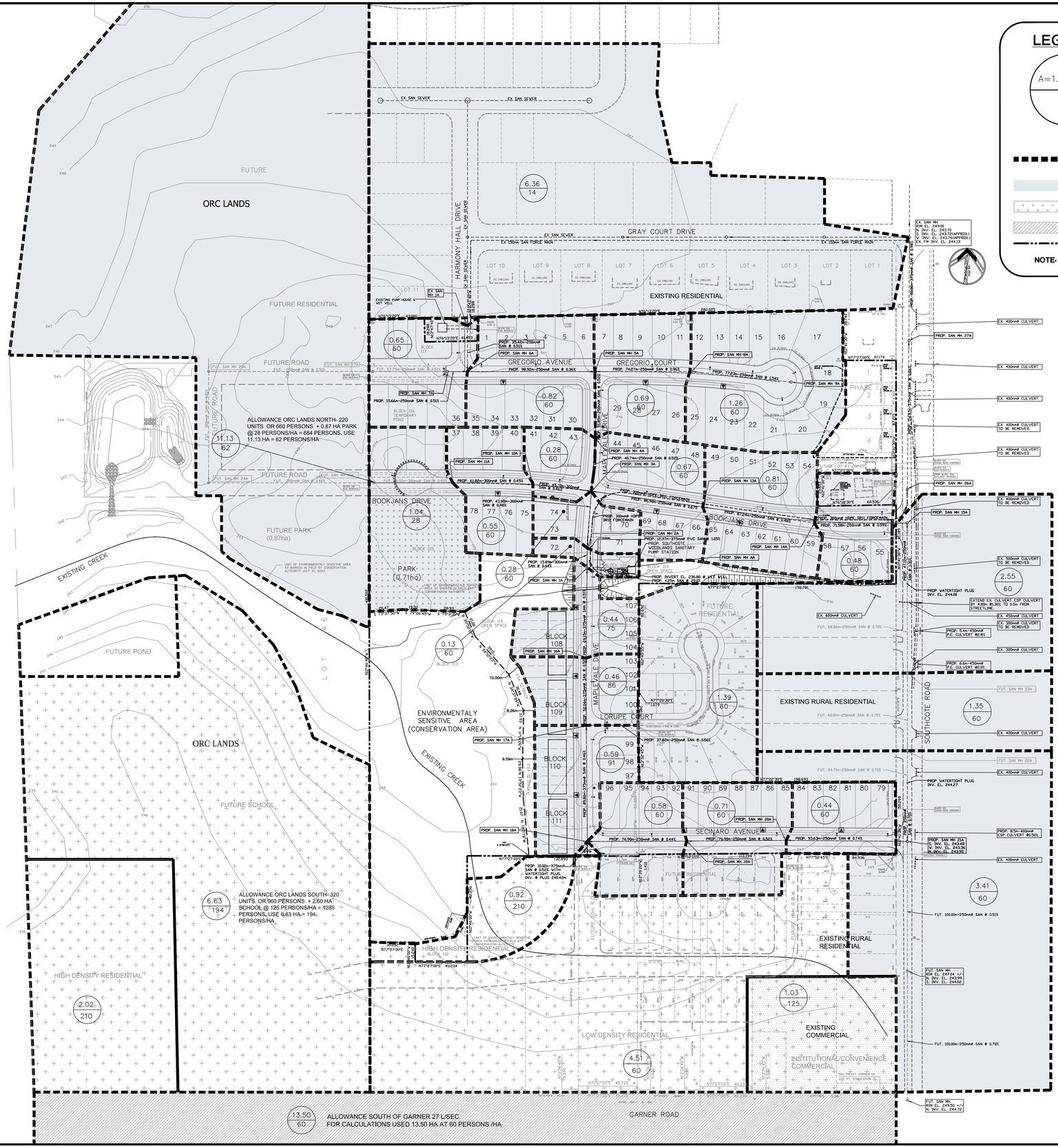
APPENDIX B

Southcote Sanitary Tributary Plan	by the Odan/Detech Group
Evergreen Subdivision Sanitary Drainage Plan	by A.J. Clarke and Associates Ltd.
559 Garner Road East Sanitary Tributary Plan	by the Odan/Detech Group

Sanitary Flow Calculations for 559 Garner Road

Sanitary Sewer Design Sheet (Stage 2 to Southcote Woodlands Pumping Station)

Sanitary Sewer Design Sheet (Stage 3 to Southcote Woodlands Pumping Station)



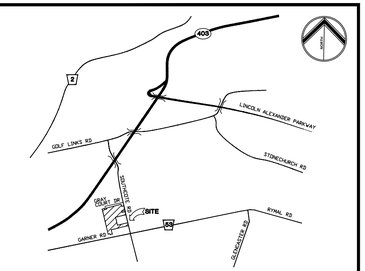
LEGEND

A=1.00 ha — TRIBUTARY AREA (Ha)

60 — POPULATION (PERSONS) BASED ON PERSONS PER HECTARE

- DENOTES LIMIT OF SANITARY TRIBUTARY AREA
- DENOTES STAGE 1 SANITARY TRIBUTARY AREA TO SANITARY PUMP STATION
- DENOTES STAGE 2 SANITARY TRIBUTARY AREA TO SANITARY PUMP STATION
- DENOTES STAGE 3 SANITARY TRIBUTARY AREA TO SANITARY PUMP STATION
- DENOTES PROPERTY BOUNDARY

NOTE: FOR DETAILS OF SANITARY SYSTEM SEE PLAN AND PROFILE DRAWINGS.



KEY PLAN Scale : N.T.S. — **SUBJECT LANDS**

NOTE :

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 INFORM HIMSELF 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.

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. McLAREN LIMITED.

BOUNDARY DATA DERIVED FROM INFORMATION FROM A.T. McLAREN LIMITED.

BENCH MARK:

75U075 DEEP BENCHMARK IN MANHOLE AT GARNERS CEMETERY, ALONG SOUTHCOTE ROAD 0.2km NORTH OF INTERSECTION OF HIGHWAY 53, 11.6m WEST OF CENTRELINE OF SOUTHCOTE ROAD, 21.9m NORTHWEST OF HYDRO POLE ON EAST SIDE OF ROADWAY, 1.8m SOUTH OF FENCE, AT ROAD LEVEL.

ELEVATION 1978 ADJUSTMENT – 246.851m 809.879ft.

BEARING NOTE

BEARINGS ARE ASTRONOMIC AND ARE REFERRED TO THE WESTERLY LIMIT OF SOUTHCOTE ROAD AS SHOWN ON PLAN 62R-2119 AS BEING N12°41'30"W

METRIC NOTE:

DISTANCES AND ELEVATIONS ON THIS PLAN ARE TYPICALLY SHOWN IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NO.	REVISIONS	DATE	BY
10	2ND SUBMISSION AS-BUILT	JAN 18/17	S.K.
9	AS-BUILT	FEB 23/15	S.K.
8	AS PER CITY OF HAMILTON COMMENTS FOR LINE PAINTING ON SOUTHCOTE RD.	SEP 9/09	D.R.
7	ISSUED FOR CONSTRUCTION	JAN/08	J.I.K.
6	AS PER CITY OF HAMILTON COMMENTS	OCT/07	J.I.K.
5	CHANGED STREET NAMES	SEP/07	J.I.K.
4	AS PER CITY OF HAMILTON COMMENTS	AUG/07	J.I.K.
3	AS PER CITY OF HAMILTON COMMENTS	JULY/07	J.I.K.
2	AS PER CITY OF HAMILTON COMMENTS	JUNE/07	J.I.K.
1	AS PER CITY OF HAMILTON COMMENTS	MAR/07	J.I.K.

SCALE: 0 5 10 20 30 40 50 100 150

DRAWING :

SANITARY TRIBUTARY AREA PLAN

CLIENT :

1520896 ONTARIO INC.

PROJECT: **DRAFT PLAN FILE NO. 25T-200401**

SOUTHCOTE WOODLANDS SUBDIVISION (PHASE II)

HAMILTON, ONTARIO

ODAN/DETECH
THE ODAN/DETECH GROUP · CONSULTING ENGINEERS
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO L7L 5K2
OFF: (905) 632-3811 FAX: (905) 632-3363

SCALE :	PROJ. NO.:	DATE:	DESIGN BY:
1:1500	02249	MAY/05	J.K.
			DRAWN BY: J.I.K.
02249-15L-II.DWG			CHECKED BY: D.C.S.
			APPROVED BY: J.K.
			DRWG. NO.: 15 OF 20

REGISTERED PROFESSIONAL ENGINEER — JAN 18/17 — I. KRPAN — PROVINCE OF ONTARIO

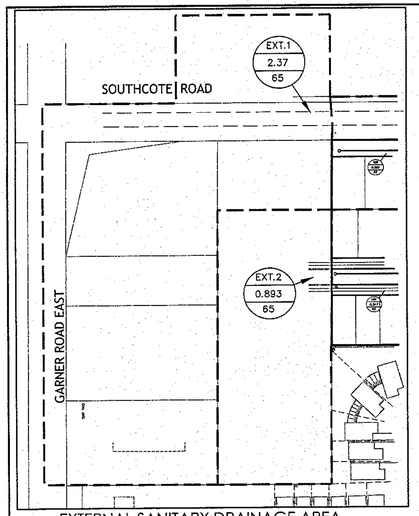
FILE NUMBER | ENGINEER

CERTIFICATION OF COMPLETION

"THIS CERTIFIES THAT THE WORK SHOWN ON THIS DRAWING RELATED TO SANITARY SEWERS HAS BEEN CONSTRUCTED IN THE FIELD AS REQUIRED BY THE CITY OF HAMILTON SUBDIVISION AGREEMENT. ALL UNDERGROUND SERVICES SHOWN ARE "AS CONSTRUCTED".

SIGNATURE OF JOHN KRPAN, P.ENG. — JAN/18/17 DATE

EVERGREEN SUBDIVISION (AS CONSTRUCTED)



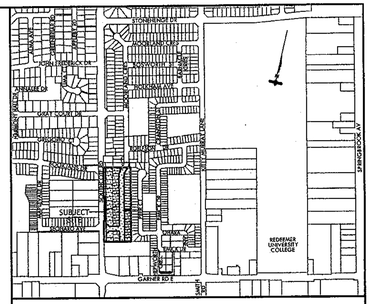
EXTERNAL SANITARY DRAINAGE AREA
SCALE 1:1500

LEGEND

101 / 0.560 / 65 — AREA IN HECTARES (TOTAL); POPULATION DENSITY (AVERAGE); DRAINAGE AREA NO.

DRAINAGE AREA BOUNDARY

SUB-AREA DRAINAGE BOUNDARY



KEYPLAN N.T.S.

BENCH MARK

Regional Bench Mark No. 75-U-075
Elevation : 246.851m (1978 ADJUSTMENT)
Description : Deep bench mark in manhole at Garners Cemetery, along Southcote Road 0.2km north of Intersection of Highway 53, 11.6m west of centerline of Southcote Road, 21.9m northwest of hydro pole on east side of roadway, 1.8m south of fence, at road level.

No.	Revision	Date	By
3	AS CONSTRUCTED FINAL SUBMISSION	2016.02.29	A.J.I.
2	AS CONSTRUCTED FIRST SUBMISSION	2015.02.10	A.J.I.
1	ISSUED FOR CONSTRUCTION	2013.04.12	C.G.

REVISIONS

CERTIFICATION OF COMPLETION

IT IS HEREBY DECLARED THAT THE WORKS SHOWN ON THIS DRAWING RELATED TO UNDERGROUND WORKS REQUIRED BY THE CITY OF HAMILTON HAVE BEEN COMPLETED IN THE FIELD AS PER THE SUBDIVISION AGREEMENTS. ALL SERVICES ARE AS CONSTRUCTED.

A. J. IRANI P.ENG. — FEB. 29, 2016 Date

ORIGINAL DESIGN SIGNED BY C. GIAMMARCO, P. ENG., DATED APRIL 15, 2013

ENGINEER

PROJECT OWNER:
DAWN VICTORIA HOMES

AS CONSTRUCTED

MUNICIPALITY:
CITY OF HAMILTON (ANCASTER)

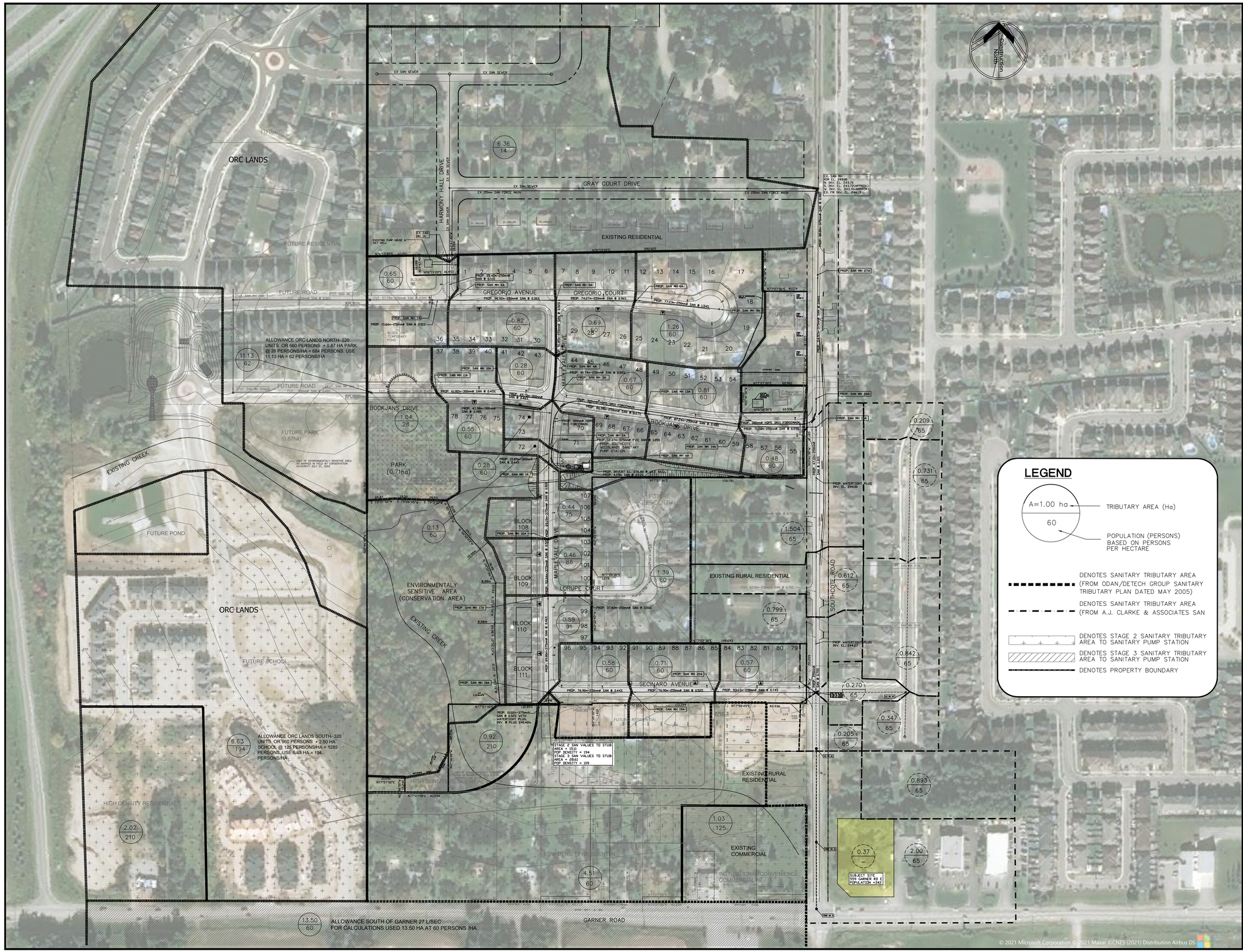
PROJECT NAME:
EVERGREEN SUBDIVISION

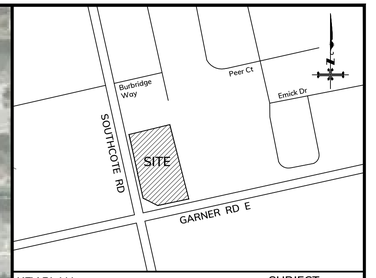
A. J. Clarke and Associates Ltd.
SURVEYORS • PLANNERS • ENGINEERS
25 MAIN STREET WEST, SUITE 300
HAMILTON, ONTARIO L8P 1H1
Tel: 905 528-8761 Fax: 905 528-2259
email: ajc@ajclarke.com

TITLE:
SANITARY DRAINAGE AREA PLAN

SCALE: 1:500	DATE: February 2010
DESIGN: A.J. IRANI / C. GIAMMARCO	DRAWN: T.L.
DWG: K-08-019	SHT: 10

EVERGREEN SUBDIVISION (AS CONSTRUCTED)
I:\Jobs\A-e-f\Evergreen Subdivision Dawn Developments\ENGG\Current\AS-BUILT\FINAL SUBMISSION\AS-SHT 10 - SAN DRAIN.dwg, Model, 2/5/2016 9:46:47 AM





KEY PLAN
Scale : N.T.S.

SUBJECT LANDS

LEGEND

A=1.00 ha
60

TRIBUTARY AREA (Ha)

POPULATION (PERSONS) BASED ON PERSONS PER HECTARE

DENOTES SANITARY TRIBUTARY AREA (FROM ODAN/DETECH GROUP SANITARY TRIBUTARY PLAN DATED MAY 2005)

DENOTES SANITARY TRIBUTARY AREA (FROM A.J. CLARKE & ASSOCIATES SAN

DENOTES STAGE 2 SANITARY TRIBUTARY AREA TO SANITARY PUMP STATION

DENOTES STAGE 3 SANITARY TRIBUTARY AREA TO SANITARY PUMP STATION

DENOTES PROPERTY BOUNDARY

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 BARICH GRENKIE SURVEYING LTD. DATED FEBRUARY 4, 2020 AND A.T. MCLAREN LTD. DATED [illegible]

BENCH MARK:

ELEVATIONS ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978) AND ARE DERIVED FROM CITY OF HAMILTON BENCHMARK No. 00819890294 HAVING AN ELEVATION OF 247.65 m.

BEARING NOTE:

BEARINGS ARE UTM GRID, REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 17 (81° 00' WEST LONGITUDE) NAD83 (CSRS) (2010.0).

OBSERVED REFERENCE POINTS DERIVED FROM GPS USING REAL TIME NETWORK (RTN) OBSERVATIONS UTM ZONE 17, NAD83 (CSRS)(2010.0). COORDINATES TO URBAN ACCURACY PER SEC 14(2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
A	4784300.879	584734.633
B	4784250.641	584873.210

METRIC NOTE:

DISTANCES AND ELEVATIONS ON THIS PLAN ARE TYPICALLY SHOWN IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NO.	REVISIONS	DATE	BY
8	ISSUED FOR OPA/ZBA	2023-01-17	M.L.B.
7	ISSUED FOR OPA/ZBA	2022-05-17	M.L.B.
6	ISSUED REVIEW & COORD	2022-05-11	M.L.B.
5	ISSUED FOR REVIEW & COORD	2022-05-06	M.L.B.
4	ISSUED FOR OPA/ZBA	2021-08-20	M.H.H.
3	ISSUED FOR REVIEW & COORD	2021-06-17	M.L.B.
2	ISSUED FOR REVIEW & COORD (WIP)	2021-05-28	M.L.B.
1	ISSUED FOR REVIEW & COORD (WIP)	2021-05-19	M.L.B.

SCALE(S):

DRAWING TITLE:

SANITARY TRIBUTARY AREA PLAN

PROJECT:

PROPOSED RESIDENTIAL DEVELOPMENT
559 GARNER ROAD
HAMILTON, ON
CITY FILE NO. (ZAC-21-047)

CLIENT:

ELITE MD DEVELOPMENTS
102 - 3410 SOUTH SERVICE ROAD
BURLINGTON, ON

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-17-2022
I. KRPAN
PROVINCE OF ONTARIO

ENGINEER

DESIGNED BY: M.H.H.	21215
DRAWN BY: M.L.B.	DATE STARTED: MAY 2021
CHECKED BY: J.K.	DRAWING No.:
APPROVED BY: J.K.	

ODAN/DETECH GROUP

SANITARY FLOW CALCULATIONS

SCENARIO: Proposed Site

This program calculates the sanitary discharge from various land use
As per the City of Hamilton Guidelines

FILL IN COLOURED CELLS AS REQUIRED

RESIDENTIAL SITE AREA (ha) = 0.37
COMMERCIAL SITE AREA (ha) = 0
TOTAL SITE AREA (ha) = 0.37

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 Apartment/Condo, using 1.364 persons/unit (Studio/1BR)	18			25	8839	0.10	5.00	0.51
RESIDENTIAL Apartment/Condo, using 1.787 persons/unit (2BR)	40			71	25733	0.30	5.00	1.49
RESIDENTIAL Apartment/Condo, using 2.372 persons/unit (3BR)	41			97	35011	0.41	5.00	1.35
Total Residential	99			193	69582	**0.81**	5.00	4.03
COMMERCIAL, Using 125 persons/ha				0	0	0.00	4.50	0.00

TOTAL **0.000**

V1= 69582

Q1=	4.027
Q2=	0.00
Qinfil	0.148
Qtot	4.175

Q = (MqP/86400) + A * I (L/sec)

where : P is population
q = 360 L/cap/day
q = 360 L/cap/day

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)

A = gross site area
i = 0.40 L/sec/ha (infiltration rate)

V1= Total Volume from Land Use in liters

Peaking Factor M = 5/((P/1000)^0.2) (2<M<5)

SANITARY SEWER CALCULATIONS

PLEASE ENTER THE INFILTRATION MULTIPLIER: ----> **0.4**

NOTE: FLOW CALCULATED @ 360 l/PERSON/DAY

STREET NAME	FROM MANHOLE	TO MANHOLE	POP. DENSITY	AREA (hect.)	CUM. AREA (hect.)	POP. INCR.	CUM. POP.	PEAKING FACTOR	Q. AVG L.P.S.	Q. PEAK L.P.S.	Q. INFILT. L.P.S.	TOTAL FLOW L.P.S.	DIAMETER (mm)	GRADE PER CENT	CAPACITY L.P.S	VELOCITY M.P.S.	% OF CAP USED
SOUTHCOTE RD	Prop 5	Prop 3	65	2.000	2.000	130	130	5.00	0.54	2.70	0.80	3.50	250	0.50	36.44	0.74	9.60
SOUTHCOTE RD (SITE)	Prop 3	A6	-	0.370	2.370	**342**	472	5.00	1.97	9.85	0.95	10.80	250	0.50	36.44	0.74	29.64
SOUTHCOTE RD	A6	21A	65	0.205	2.205	13	143	5.00	0.60	3.00	0.88	3.88	250	0.70	43.12	0.88	9.00
BURBRIDGE WAY	A4	21A	65	2.399	2.399	156	156	5.00	0.65	3.25	0.96	4.21	250	0.58	39.25	0.80	10.73
SOUTHCOTE RD	23A	21A	65	1.411	1.411	92	92	5.00	0.38	1.90	0.56	2.46	250	0.70	43.12	0.88	5.71
SECINARO AVENUE	21A	20A	60	0.570	6.585	34	425	5.00	1.77	8.85	2.63	11.48	250	0.74	44.34	0.90	25.89
SECINARO AVENUE	20A	19A	60	0.710	7.295	43	468	5.00	1.95	9.75	2.92	12.67	250	0.52	37.16	0.76	34.10
SECINARO AVENUE	19A	18A	60	0.580	7.875	35	503	5.00	2.10	10.50	3.15	13.65	250	0.44	34.19	0.70	39.92
MAPLEVALE DRIVE	STUB	18A	194	15.110	15.110	2931	2931	4.03	12.22	49.25	6.04	55.29	375	0.50	107.45	0.97	51.46
MAPLEVALE DRIVE	18A	17A	91	0.590	23.575	54	3488	3.89	14.54	56.56	9.43	65.99	375	0.46	103.06	0.93	64.03
LORUPE COURT	FUT MH	17A	60	1.390	1.390	83	83	5.00	0.35	1.75	0.56	2.31	250	0.50	36.44	0.74	6.34
MAPLEVALE DRIVE	17A	16A	86	0.460	25.425	40	3611	3.87	15.06	58.28	10.17	68.45	375	0.52	109.57	0.99	62.47
MAPLEVALE DRIVE	16A	1A	75	0.440	25.865	33	3644	3.86	15.20	58.67	10.35	69.02	375	0.51	108.52	0.98	63.60
HARMONY HALL	EX1A	6A	14	6.360	6.360	89	89	5.00	0.37	1.85	2.54	4.39	250	0.51	36.81	0.75	11.93
GREGORIO AVENUE	7A	6A	60	0.650	0.650	39	39	5.00	0.16	0.80	0.26	1.06	250	0.51	36.81	0.75	2.88
GREGORIO AVENUE	6A	5A	60	0.820	7.830	49	177	5.00	0.74	3.70	3.13	6.83	250	0.36	30.92	0.63	22.09
GREGORIO COURT	9A	8A	60	1.260	1.260	76	76	5.00	0.32	1.60	0.50	2.10	250	1.54	63.96	1.30	3.28
GREGORIO COURT	8A	5A	60	0.690	1.950	41	117	5.00	0.49	2.45	0.78	3.23	250	0.96	50.50	1.03	6.40
MAPLEVALE DRIVE	5A	4A	60	0.000	9.780	0	294	5.00	1.23	6.15	3.91	10.06	250	0.52	37.16	0.76	27.07
MAPLEVALE DRIVE	4A	3A	60	0.000	9.780	0	294	5.00	1.23	6.15	3.91	10.06	250	0.52	37.16	0.76	27.07
									P								
BOOKJANS DRIVE	FUT MH	12A	62	11.130	11.130	690	690	5.00	2.88	14.40	4.45	18.85	300	0.40	53.00	0.75	35.57
BOOKJANS DRIVE	12A	11A	28	1.040	12.170	29	719	5.00	3.00	15.00	4.87	19.87	300	0.45	56.22	0.80	35.34
BOOKJANS DRIVE	11A	10A	60	0.550	12.720	33	752	5.00	3.14	15.70	5.09	20.79	300	0.45	56.22	0.80	36.98
BOOKJANS DRIVE	10A	3A	60	0.280	13.000	17	769	5.00	3.21	16.05	5.20	21.25	300	0.46	56.84	0.80	37.39
SOUTHCOTE RD	23A	15A	60	1.504	1.504	90	90	5.00	0.38	1.90	0.60	2.50	250	0.75	44.63	0.91	5.60
BOOKJANS DRIVE	15A	14A	60	0.480	1.984	29	119	5.00	0.50	2.50	0.79	3.29	250	0.59	39.59	0.81	8.31
BOOKJANS DRIVE	14A	13A	60	0.810	2.794	49	168	5.00	0.70	3.50	1.12	4.62	250	0.48	35.71	0.73	12.94
BOOKJANS DRIVE	13A	3A	60	0.670	3.464	40	208	5.00	0.87	4.35	1.39	5.74	250	0.67	42.19	0.86	13.61
MAPLEVALE DRIVE	3A	2A	60	0.280	26.524	17	1288	4.75	5.37	25.51	10.61	36.12	300	0.48	58.06	0.82	62.21
MAPLEVALE DRIVE	2A	1A	60	0.130	26.654	8	1296	4.75	5.40	25.65	10.66	36.31	300	0.44	55.59	0.79	65.32
PUMP STATION	1A	AA		0.000	52.519	0	4940	3.63	20.60	74.78	21.01	95.79	375	1.05	155.71	1.41	61.52

13.5
60

Note: Maplevale Drive catchment from Stub to MH 18A includes the stage 2 sanitary tributary areas to the sanitary pump station

REGISTERED PROFESSIONAL ENGINEER
JAN 09/23
I. KRPAN
PROVINCE OF ONTARIO

John Krpan, P.Eng.

SANITARY SEWER CALCULATIONS

PLEASE ENTER THE INFILTRATION MULTIPLIER: ----> **0.4**

NOTE: FLOW CALCULATED @ 360 l/PERSON/DAY

STREET NAME	FROM MANHOLE	TO MANHOLE	POP. DENSITY	AREA (hect.)	CUM. AREA (hect.)	POP. INCR.	CUM. POP.	PEAKING FACTOR	Q. AVG L.P.S.	Q. PEAK L.P.S.	Q. INFILT. L.P.S.	TOTAL FLOW L.P.S.	DIAMETER (mm)	GRADE PER CENT	CAPACITY L.P.S	VELOCITY M.P.S.	% OF CAP USED
SOUTHCOTE RD	Prop 5	Prop 3	65	2.000	2.000	130	130	5.00	0.54	2.70	0.80	3.50	250	0.50	36.44	0.74	9.60
SOUTHCOTE RD (SITE)	Prop 3	A6	-	0.370	2.370	**342**	472	5.00	1.97	9.85	0.95	10.80	250	0.50	36.44	0.74	29.64
SOUTHCOTE RD	A6	21A	65	0.205	2.205	13	143	5.00	0.60	3.00	0.88	3.88	250	0.70	43.12	0.88	9.00
BURBRIDGE WAY	A4	21A	65	2.399	2.399	156	156	5.00	0.65	3.25	0.96	4.21	250	0.58	39.25	0.80	10.73
SOUTHCOTE RD	23A	21A	65	1.411	1.411	92	92	5.00	0.38	1.90	0.56	2.46	250	0.70	43.12	0.88	5.71
SECINARO AVENUE	21A	20A	60	0.570	6.585	34	425	5.00	1.77	8.85	2.63	11.48	250	0.74	44.34	0.90	25.89
SECINARO AVENUE	20A	19A	60	0.710	7.295	43	468	5.00	1.95	9.75	2.92	12.67	250	0.52	37.16	0.76	34.10
SECINARO AVENUE	19A	18A	60	0.580	7.875	35	503	5.00	2.10	10.50	3.15	13.65	250	0.44	34.19	0.70	39.92
MAPLEVALE DRIVE	STUB	18A	109	28.880	28.880	3148	3148	3.98	13.13	52.26	11.55	63.81	375	0.50	107.45	0.97	59.39
MAPLEVALE DRIVE	18A	17A	91	0.590	37.345	54	3705	3.85	15.45	59.48	14.94	74.42	375	0.46	103.06	0.93	72.21
LORUPE COURT	FUT MH	17A	60	1.390	1.390	83	83	5.00	0.35	1.75	0.56	2.31	250	0.50	36.44	0.74	6.34
MAPLEVALE DRIVE	17A	16A	86	0.460	39.195	40	3828	3.82	15.96	60.97	15.68	76.65	375	0.52	109.57	0.99	69.96
MAPLEVALE DRIVE	16A	1A	75	0.440	39.635	33	3861	3.82	16.10	61.50	15.85	77.35	375	0.51	108.52	0.98	71.28
HARMONY HALL	EX1A	6A	14	6.360	6.360	89	89	5.00	0.37	1.85	2.54	4.39	250	0.51	36.81	0.75	11.93
GREGORIO AVENUE	7A	6A	60	0.650	0.650	39	39	5.00	0.16	0.80	0.26	1.06	250	0.51	36.81	0.75	2.88
GREGORIO AVENUE	6A	5A	60	0.820	7.830	49	177	5.00	0.74	3.70	3.13	6.83	250	0.36	30.92	0.63	22.09
GREGORIO COURT	9A	8A	60	1.260	1.260	76	76	5.00	0.32	1.60	0.50	2.10	250	1.54	63.96	1.30	3.28
GREGORIO COURT	8A	5A	60	0.690	1.950	41	117	5.00	0.49	2.45	0.78	3.23	250	0.96	50.50	1.03	6.40
MAPLEVALE DRIVE	5A	4A	60	0.000	9.780	0	294	5.00	1.23	6.15	3.91	10.06	250	0.52	37.16	0.76	27.07
MAPLEVALE DRIVE	4A	3A	60	0.000	9.780	0	294	5.00	1.23	6.15	3.91	10.06	250	0.52	37.16	0.76	27.07
									P								
BOOKJANS DRIVE	FUT MH	12A	62	11.130	11.130	690	690	5.00	2.88	14.40	4.45	18.85	300	0.40	53.00	0.75	35.57
BOOKJANS DRIVE	12A	11A	28	1.040	12.170	29	719	5.00	3.00	15.00	4.87	19.87	300	0.45	56.22	0.80	35.34
BOOKJANS DRIVE	11A	10A	60	0.550	12.720	33	752	5.00	3.14	15.70	5.09	20.79	300	0.45	56.22	0.80	36.98
BOOKJANS DRIVE	10A	3A	60	0.280	13.000	17	769	5.00	3.21	16.05	5.20	21.25	300	0.46	56.84	0.80	37.39
SOUTHCOTE RD	23A	15A	60	1.504	1.504	90	90	5.00	0.38	1.90	0.60	2.50	250	0.75	44.63	0.91	5.60
BOOKJANS DRIVE	15A	14A	60	0.480	1.984	29	119	5.00	0.50	2.50	0.79	3.29	250	0.59	39.59	0.81	8.31
BOOKJANS DRIVE	14A	13A	60	0.810	2.794	49	168	5.00	0.70	3.50	1.12	4.62	250	0.48	35.71	0.73	12.94
BOOKJANS DRIVE	13A	3A	60	0.670	3.464	40	208	5.00	0.87	4.35	1.39	5.74	250	0.67	42.19	0.86	13.61
MAPLEVALE DRIVE	3A	2A	60	0.280	26.524	17	1288	4.75	5.37	25.51	10.61	36.12	300	0.48	58.06	0.82	62.21
MAPLEVALE DRIVE	2A	1A	60	0.130	26.654	8	1296	4.75	5.40	25.65	10.66	36.31	300	0.44	55.59	0.79	65.32
PUMP STATION	1A	AA		0.000	66.289	0	5157	3.60	21.50	77.40	26.52	103.92	375	1.05	155.71	1.41	66.74

Note: Maplevale Drive catchment from Stub to MH 18A includes the stage 3 sanitary tributary areas to the sanitary pump station

REGISTERED PROFESSIONAL ENGINEER
JAN 09/23
I. KRPAN
PROVINCE OF ONTARIO

John Krpan, P.Eng.

APPENDIX C

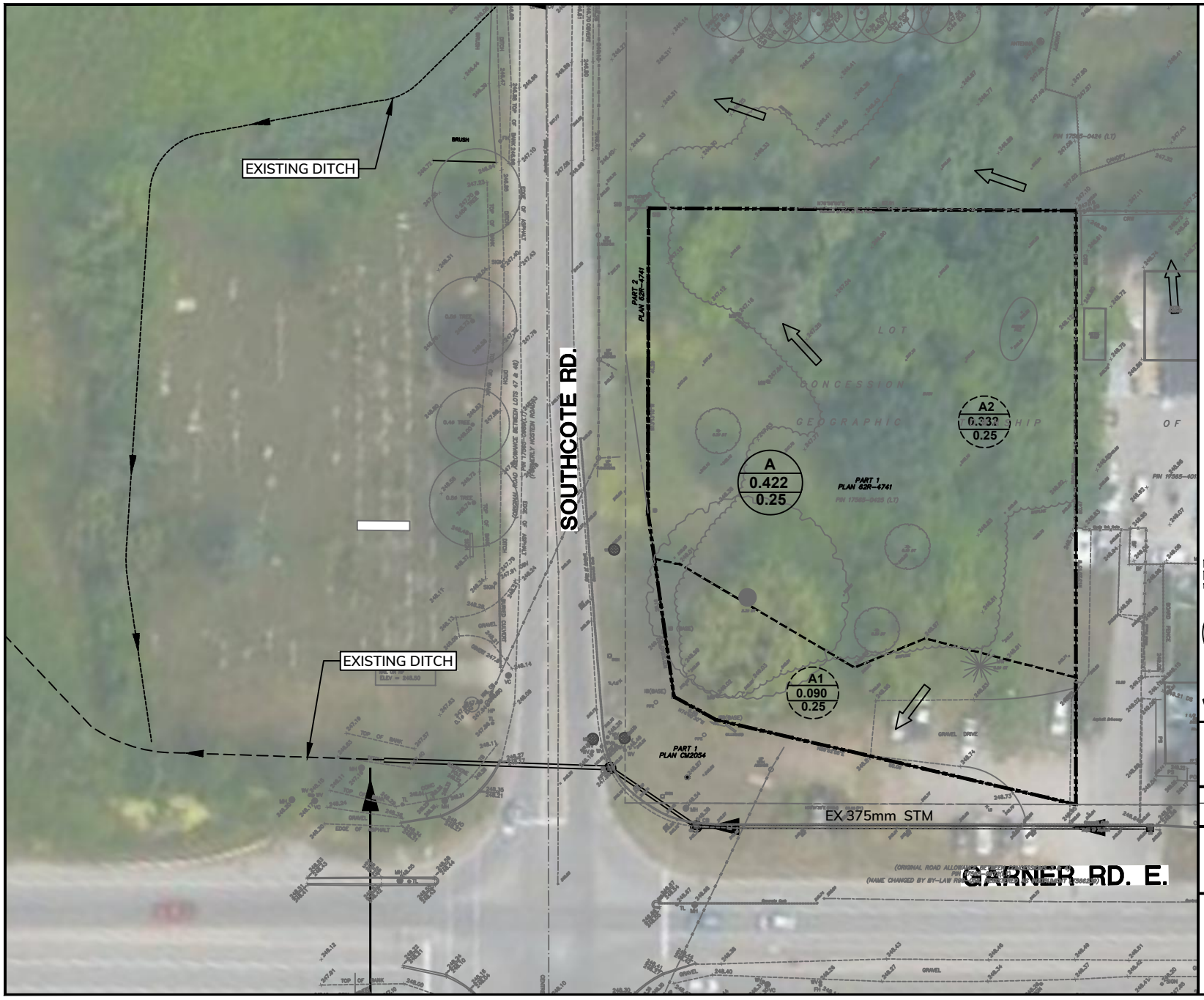
Pre-Development Storm Catchment Plan

Post-Development Storm Catchment Plan

750mm Watermain Daylighting Results

Garner Road Class EA Plan & Profile

Post-Development Visual OTTHYMO Model Output (2 to 100-year Storms)



LEGEND

CATCHMENT AREA BOUNDARY

A
0.20
0.25

CATCHMENT ID
AREA (ha)
RUNOFF COEFFICIENT

MAJOR OVERLAND FLOW ROUTE

DRAWING :

PRE-DEVELOPMENT DRAINAGE PLAN

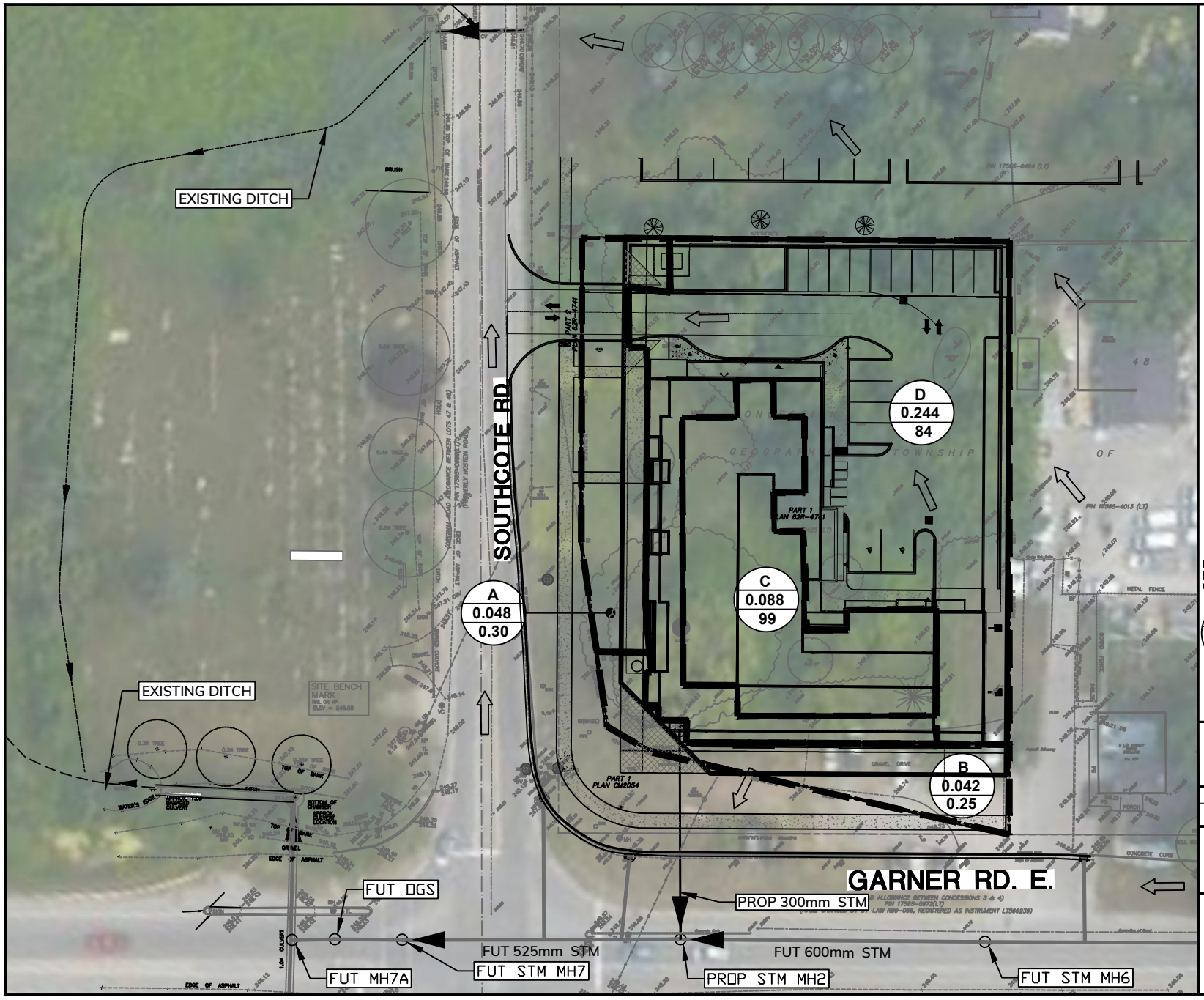
	PROJ. NO.:	SCALE:
MAY 2021	21215	1:500

PROJECT :

PROPOSED RESIDENTIAL DEVELOPMENT

559 GARNER ROAD
HAMILTON, ON

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



LEGEND

CATCHMENT AREA BOUNDARY

A
0.10
80/0.90

CATCHMENT ID
AREA (ha)
% IMPERVIOUS / RUNOFF COEFFICIENT

MAJOR OVERLAND FLOW ROUTE

DRAWING :

POST-DEVELOPMENT DRAINAGE PLAN

	PROJ. NO.:	SCALE:
MAY 2021	21215	1:500

PROJECT :

PROPOSED RESIDENTIAL DEVELOPMENT

559 GARNER ROAD
HAMILTON, ON

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

SKETCH TO ILLUSTRATE WATERMAIN ELEVATION

AT NORTHEAST CORNER OF

GARNER ROAD EAST

AND

SOUTHCOTE ROAD

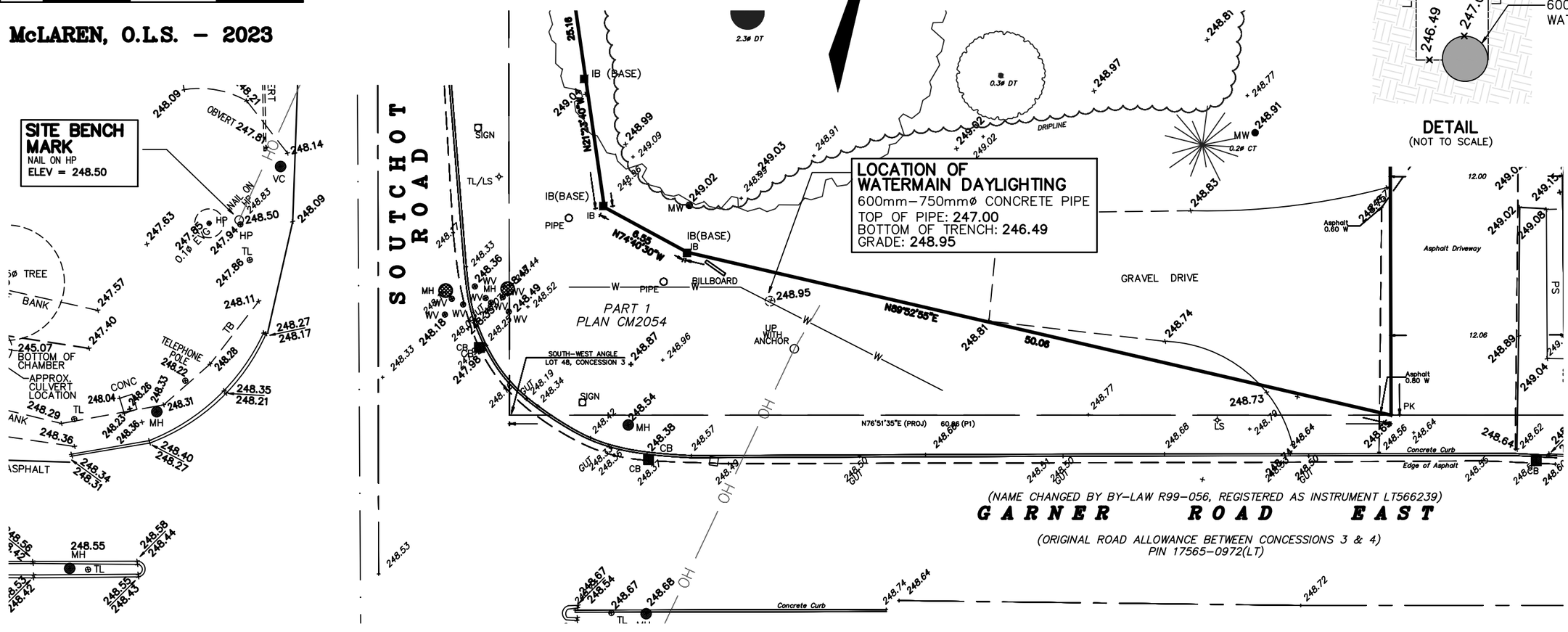
IN THE

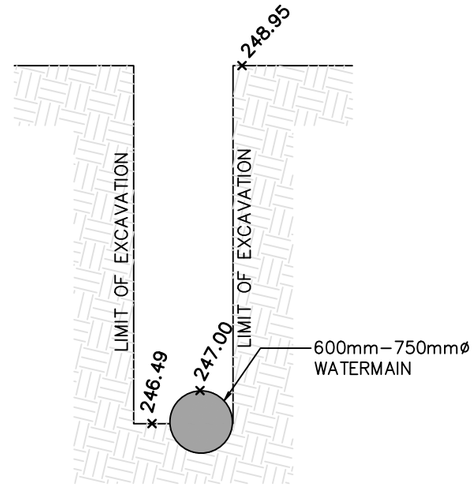
CITY OF HAMILTON

SCALE 1:300 METRIC

6 3 0 6 12 18 metres

R.A. McLAREN, O.L.S. – 2023





DETAIL
(NOT TO SCALE)

NOTE:

BOUNDARY IS COMPILED FROM PLAN BY BARICH GRENKIE SURVEYING LTD, DATED FEBRUARY 4, 2020

BENCHMARK:

MONUMENT 00819890294
SIB WITH BRASS CAP
CONTROL POINT IS LOCATED ON THE SOUTHEAST CORNER OF HIGHWAY 53 AND SOUHCOTE ROAD

ELEVATION: 247.65 metres CGVD–1928:1978

CAUTION:

THIS IS NOT A PLAN OF SURVEY, AND SHALL NOT BE USED EXCPET FOR THE PURPOSE INDICATED IN THE TITLE BLOCK.

THIS SKETCH IS PROTECTED BY COPYRIGHT ©.

METRIC NOTE

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

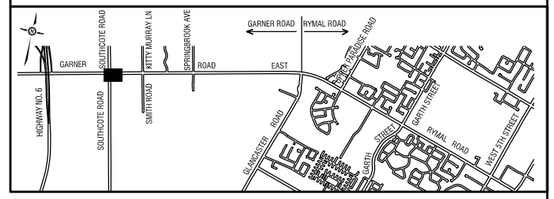
A.T. McLaren Limited
LEGAL AND ENGINEERING SURVEYS
69 JOHN STREET SOUTH, SUITE 230
HAMILTON, ONTARIO, L8N 2B9
PHONE (905) 527–8559 FAX (905) 527–0032

Drawn	Checked	Crew Chief	Scale	Dwg.No.
JP	RAM	JK	1:300	36951–SK

GARNER ROAD EAST

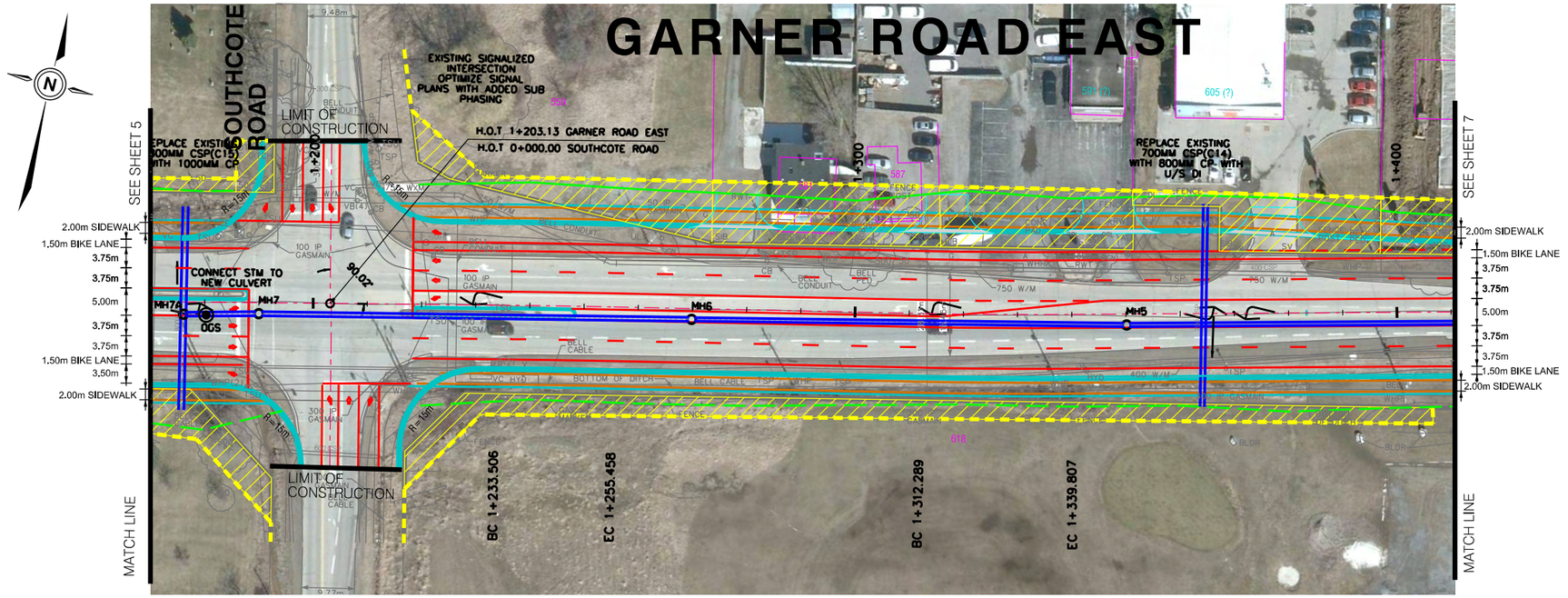
FILE No.	CONTRACT No. DRAWING No.	SHEET No. 6 OF 35

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED



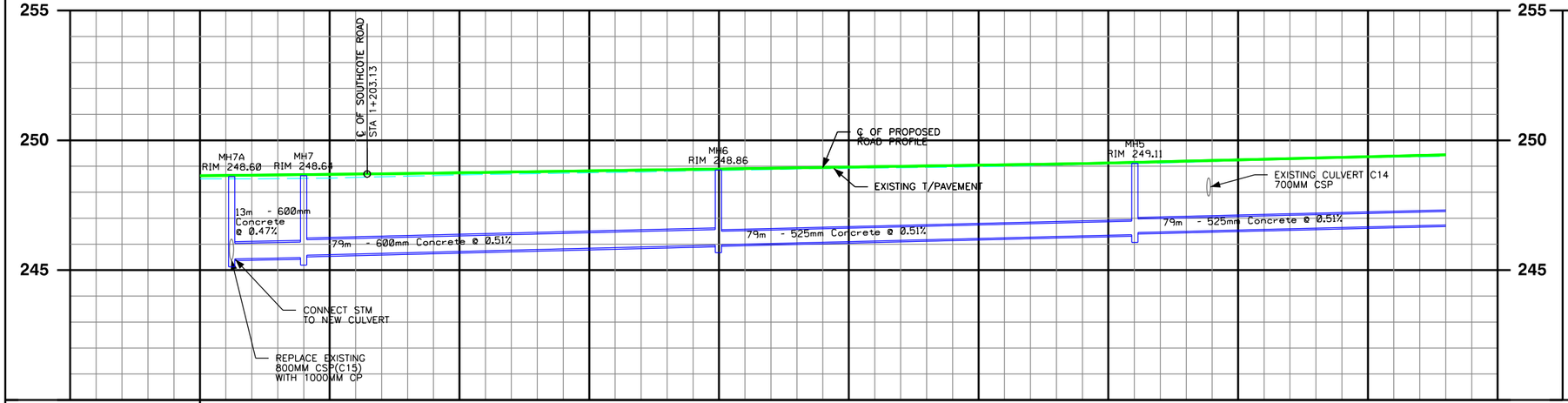
KEY PLAN INDEX

GARNER ROAD EAST



LEGEND:

- PROPERTY REQUIRED
- PROPOSED C&G
- TRAFFIC MARKING
- PROPOSED GRADING LIMIT – FILL
- PROPOSED GRADING LIMIT – CUT
- EXISTING PROPERTY LINE
- STORM SEWER
- MH
- OGS
- MAJOR SYSTEM OUTLET



SEWER REPAIRS and OVERFLOWS
C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES

PROPOSED SANITARY SEWER																	*PROPOSED SANITARY SEWER*
PROPOSED STORM SEWER																	*PROPOSED STORM SEWER*
PROPOSED ℄ OF ROAD PROFILE ELEVATIONS	248.64	248.67	248.70	248.74	248.78	248.82	248.87	248.91	248.95	249.00	249.04	249.09	249.15	249.22	249.30	249.37	249.44	*PROPOSED ℄ OF ROAD PROFILE ELEVATIONS*
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	248.52	248.53	248.57	248.64	248.70	248.75	248.80	248.86	248.91	248.94	248.98	249.04	249.11	249.19	249.28	249.34	249.38	EXISTING ℄ OF ROAD PROFILE ELEVATIONS
STATION	1+170	1+185	1+200	1+215	1+230	1+245	1+260	1+275	1+290	1+305	1+320	1+335	1+350	1+365	1+380	1+395	1+410	EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE

DRAWN BY: D.S

DATE: NOV 18, 2013

SCALES

HORIZONTAL 1:1000 (0, 5m, 10m, 20m)

VERTICAL 1:50 (0, 1m, 2m, 4m)

Project Manager (Design)

Peter Wowk, P. Eng.

SNC·LAVALIN

CITY OF HAMILTON
Public Works Department

GARNER ROAD/RYMAL ROAD AND GARTH STREET SCHEDULE C CLASS EA

From : Highway No 6
To : West 5th Street

Post-Development Visual OTTHYMO Output (2 to 100-year Storms) : Mount Hope

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================================================================================================================

       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: C:\Users\Mitchell Bufalino\Desktop\OTTHYMO\21215 599 Garner\599 Garner Road (rev 0.2) - WIP\559 Garner 3 hour
CHI.out
  Summary filename: C:\Users\Mitchell Bufalino\Desktop\OTTHYMO\21215 599 Garner\599 Garner Road (rev 0.2) - WIP\559 Garner 3 hour
CHI.sum


DATE: 1/18/24                             TIME: 9:56:40 AM

USER:


COMMENTS: _____________________________________________________


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

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 646.000
| Ptotal= 32.70 mm |                          B=   6.000
--------------------                          C=    .781
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.00 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    3.22 |  1.00   74.10 |  1.83    5.63 |  2.67    3.08
                 .33    3.95 |  1.17   24.28 |  2.00    4.79 |  2.83    2.84
                 .50    5.20 |  1.33   12.94 |  2.17    4.18 |  3.00    2.63
                 .67    7.89 |  1.50    8.92 |  2.33    3.73 |
                 .83   18.60 |  1.67    6.87 |  2.50    3.37 |


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--------------------
| CALIB            |
| STANDHYD  (0018) |   Area    (ha)=    .24
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .04
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      40.30        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    3.22 |  .833   18.60 | 1.583    6.87 |  2.33    3.73
                .167    3.22 |  .917   74.10 | 1.667    6.87 |  2.42    3.37
                .250    3.95 | 1.000   74.10 | 1.750    5.63 |  2.50    3.37
                .333    3.95 | 1.083   24.28 | 1.833    5.63 |  2.58    3.08
                .417    5.20 | 1.167   24.28 | 1.917    4.79 |  2.67    3.08
                .500    5.20 | 1.250   12.94 | 2.000    4.79 |  2.75    2.84
```

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                .583    7.89 | 1.333   12.94 | 2.083    4.18 |  2.83    2.84
                .667    7.89 | 1.417    8.92 | 2.167    4.18 |  2.92    2.63
                .750   18.60 | 1.500    8.92 | 2.250    3.73 |  3.00    2.63

     Max.Eff.Inten.(mm/hr)=      74.10        65.98
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      1.67 (ii)    5.77 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=       .32          .15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       .04          .01          .047 (iii)
     TIME TO PEAK    (hrs)=      1.00         1.08          1.00
     RUNOFF VOLUME    (mm)=     31.70        27.25         30.97
     TOTAL RAINFALL   (mm)=     32.70        32.70         32.70
     RUNOFF COEFFICIENT   =       .97          .83           .95

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  98.0    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  (0012) |   Area    (ha)=    .09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .09          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      24.20        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=      74.10       527.85
               over (min)        5.00         5.00
     Storage Coeff.  (min)=      1.23 (ii)    2.50 (ii)
     Unit Hyd. Tpeak (min)=      5.00         5.00
     Unit Hyd. peak  (cms)=       .33          .29
                                                        *TOTALS*
     PEAK FLOW       (cms)=       .02          .00          .018 (iii)
     TIME TO PEAK    (hrs)=      1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=     31.70        27.25         31.65
     TOTAL RAINFALL   (mm)=     32.70        32.70         32.70
     RUNOFF COEFFICIENT   =       .97          .83           .97

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  98.0    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.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0014) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .0000      .0000   |    .0269       .0044
                            .0135      .0022   |    .0404       .0066

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0012)       .088       .018        1.00       31.65
     OUTFLOW: ID= 1 (0014)       .088       .007        1.08       31.26

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 37.94
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0011

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--------------------
| ADD HYD   (0015) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0018):      .24    .047     1.00    30.97
        + ID2= 2 (0014):      .09    .007     1.08    31.26
          ================================================
          ID = 3 (0015):      .33    .053     1.00    31.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0017) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
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```
                          .0000      .0000   |    .0161       .0102
                          .0159      .0003   |    .0162       .0214
                          .0160      .0034   |    .0000       .0000

                               AREA      QPEAK       TPEAK       R.V.
                               (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0015)     .332       .053        1.00       31.05
     OUTFLOW: ID= 1 (0017)     .332       .016        1.33       31.04

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 30.13
                  TIME SHIFT OF PEAK FLOW         (min)= 20.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=   .0029

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

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1049.500
| Ptotal= 46.95 mm |                          B=   8.000
--------------------                          C=    .803
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  3.00 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    4.43 |  1.00  103.04 |  1.83    8.05 |  2.67    4.22
                 .33    5.51 |  1.17   36.87 |  2.00    6.77 |  2.83    3.87
                 .50    7.40 |  1.33   19.46 |  2.17    5.86 |  3.00    3.58
                 .67   11.55 |  1.50   13.16 |  2.33    5.18 |
                 .83   28.14 |  1.67    9.97 |  2.50    4.65 |


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--------------------
| CALIB            |
| STANDHYD  (0018) |   Area    (ha)=    .24
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .04
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      40.30        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    4.43 |  .833   28.14 | 1.583    9.97 |  2.33    5.18
                .167    4.43 |  .917  103.04 | 1.667    9.97 |  2.42    4.65
                .250    5.51 | 1.000  103.04 | 1.750    8.05 |  2.50    4.65
                .333    5.51 | 1.083   36.87 | 1.833    8.05 |  2.58    4.22
                .417    7.40 | 1.167   36.87 | 1.917    6.77 |  2.67    4.22
                .500    7.40 | 1.250   19.46 | 2.000    6.77 |  2.75    3.87
                .583   11.55 | 1.333   19.46 | 2.083    5.86 |  2.83    3.87
                .667   11.55 | 1.417   13.16 | 2.167    5.86 |  2.92    3.58
                .750   28.14 | 1.500   13.16 | 2.250    5.18 |  3.00    3.58

     Max.Eff.Inten.(mm/hr)=     103.04        96.49
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.46 (ii)    5.06 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .33          .16
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .06          .01          .067 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.08          1.00
     RUNOFF VOLUME    (mm)=      45.95        41.30         45.20
     TOTAL RAINFALL   (mm)=      46.95        46.95         46.95
     RUNOFF COEFFICIENT   =        .98          .88           .96

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  98.0    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  (0012) |   Area    (ha)=    .09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .09          .00
```

```
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      24.20        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     103.04       771.89
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.08 (ii)    2.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .31
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .02          .00          .025 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      45.95        41.30         45.90
     TOTAL RAINFALL   (mm)=      46.95        46.95         46.95
     RUNOFF COEFFICIENT   =        .98          .88           .98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  98.0    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.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0014) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0269       .0044
                           .0135      .0022   |    .0404       .0066

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0012)       .088       .025        1.00       45.90
     OUTFLOW: ID= 1 (0014)       .088       .010        1.08       45.53

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 38.91
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0016

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

--------------------
| ADD HYD   (0015) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0018):      .24    .067     1.00    45.20
        + ID2= 2 (0014):      .09    .010     1.08    45.53
          ================================================
          ID = 3 (0015):      .33    .075     1.00    45.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR (0017) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0161       .0102
                           .0159      .0003   |    .0162       .0214
                           .0160      .0034   |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0015)       .332       .075        1.00       45.29
     OUTFLOW: ID= 1 (0017)       .332       .016        1.50       45.28

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.38
                   TIME SHIFT OF PEAK FLOW         (min)= 30.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0056

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

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1343.700
| Ptotal= 56.51 mm |                          B=   9.000
--------------------                          C=    .814
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  3.00 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    5.21 |  1.00  122.29 |  1.83    9.68 |  2.67    4.96
                   .33    6.54 |  1.17   45.40 |  2.00    8.09 |  2.83    4.54
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                .50    8.87 |  1.33   23.91 |  2.17    6.97 |  3.00    4.19
                .67   14.04 |  1.50   16.05 |  2.33    6.13 |
                .83   34.63 |  1.67   12.06 |  2.50    5.48 |


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--------------------
| CALIB            |
| STANDHYD  (0018) |   Area    (ha)=    .24
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .04
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      40.30        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    5.21 |  .833   34.63 | 1.583   12.06 |  2.33    6.13
                .167    5.21 |  .917  122.29 | 1.667   12.06 |  2.42    5.48
                .250    6.54 | 1.000  122.29 | 1.750    9.68 |  2.50    5.48
                .333    6.54 | 1.083   45.40 | 1.833    9.68 |  2.58    4.96
                .417    8.87 | 1.167   45.40 | 1.917    8.09 |  2.67    4.96
                .500    8.87 | 1.250   23.91 | 2.000    8.09 |  2.75    4.54
                .583   14.04 | 1.333   23.91 | 2.083    6.97 |  2.83    4.54
                .667   14.04 | 1.417   16.05 | 2.167    6.97 |  2.92    4.19
                .750   34.63 | 1.500   16.05 | 2.250    6.13 |  3.00    4.19

     Max.Eff.Inten.(mm/hr)=     122.29       116.51
                over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.37 (ii)    4.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .22
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .07          .01          .081 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00         1.00
     RUNOFF VOLUME    (mm)=      55.51        50.76        54.74
     TOTAL RAINFALL   (mm)=      56.51        56.51        56.51
     RUNOFF COEFFICIENT   =        .98          .90          .97

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  98.0    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  (0012) |   Area    (ha)=    .09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .09          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      24.20        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     122.29       932.07
                over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.01 (ii)    2.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .31
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .03          .00          .030 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00         1.00
     RUNOFF VOLUME    (mm)=      55.51        50.76        55.46
     TOTAL RAINFALL   (mm)=      56.51        56.51        56.51
     RUNOFF COEFFICIENT   =        .98          .90          .98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  98.0    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.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0014) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0269       .0044
```

```
                          .0135      .0022   |    .0404       .0066

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0012)       .088       .030        1.00       55.46
     OUTFLOW: ID= 1 (0014)       .088       .012        1.08       55.08

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 39.33
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0019

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--------------------
| ADD HYD   (0015) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0018):      .24    .081     1.00    54.74
       + ID2= 2 (0014):      .09    .012     1.08    55.08
         ==========================================================
         ID = 3 (0015):      .33    .091     1.00    54.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0017) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0161       .0102
                           .0159      .0003   |    .0162       .0214
                           .0160      .0034   |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0015)       .332       .091        1.00       54.83
     OUTFLOW: ID= 1 (0017)       .332       .016        1.58       54.83

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.63
                   TIME SHIFT OF PEAK FLOW         (min)= 35.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0077

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

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1719.500
| Ptotal= 68.68 mm |                          B=  10.000
--------------------                          C=    .823
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  3.00 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    6.25 |  1.00  146.10 |  1.83   11.80 |  2.67    5.94
                   .33    7.89 |  1.17   56.24 |  2.00    9.82 |  2.83    5.42
                   .50   10.80 |  1.33   29.66 |  2.17    8.42 |  3.00    4.99
                   .67   17.27 |  1.50   19.80 |  2.33    7.38 |
                   .83   42.92 |  1.67   14.79 |  2.50    6.58 |


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0018) |   Area    (ha)=    .24
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .04
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      40.30        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    6.25 |  .833   42.92 | 1.583   14.79 |  2.33    7.38
                  .167    6.25 |  .917  146.10 | 1.667   14.79 |  2.42    6.58
                  .250    7.89 | 1.000  146.10 | 1.750   11.80 |  2.50    6.58
                  .333    7.89 | 1.083   56.24 | 1.833   11.80 |  2.58    5.94
                  .417   10.80 | 1.167   56.24 | 1.917    9.82 |  2.67    5.94
                  .500   10.80 | 1.250   29.66 | 2.000    9.82 |  2.75    5.42
                  .583   17.27 | 1.333   29.66 | 2.083    8.42 |  2.83    5.42
                  .667   17.27 | 1.417   19.80 | 2.167    8.42 |  2.92    4.99
```

```
                .750   42.92 | 1.500   19.80 | 2.250    7.38 |  3.00    4.99

     Max.Eff.Inten.(mm/hr)=     146.10       141.10
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.27 (ii)    4.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .23
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .08          .01          .097 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      67.68        62.86         66.90
     TOTAL RAINFALL   (mm)=      68.68        68.68         68.68
     RUNOFF COEFFICIENT   =        .99          .92           .97

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  98.0    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  (0012) |   Area    (ha)=    .09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .09          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      24.20        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     146.10      1128.80
               over (min)         5.00         5.00
     Storage Coeff.  (min)=        .94 (ii)    1.90 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .32
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .04          .00          .036 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      67.68        62.86         67.63
     TOTAL RAINFALL   (mm)=      68.68        68.68         68.68
     RUNOFF COEFFICIENT   =        .99          .92           .98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  98.0    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.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0014) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000    |    .0269       .0044
                           .0135      .0022    |    .0404       .0066

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0012)       .088       .036        1.00       67.63
     OUTFLOW: ID= 1 (0014)       .088       .014        1.08       67.25

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 39.78
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0023

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

--------------------
| ADD HYD   (0015) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0018):      .24    .097     1.00    66.90
        + ID2= 2 (0014):      .09    .014     1.08    67.25
          ==========================================================
          ID = 3 (0015):      .33    .109     1.00    66.99

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0017) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000    |    .0161       .0102
                           .0159      .0003    |    .0162       .0214
```

```
                          .0160      .0034   |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0015)      .332       .109        1.00       66.99
     OUTFLOW: ID= 1 (0017)      .332       .016        1.75       66.99

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 14.71
                   TIME SHIFT OF PEAK FLOW         (min)= 45.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0106

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1954.800
| Ptotal= 76.86 mm |                          B=  10.000
--------------------                          C=    .826
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  3.00 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    6.91 |  1.00  164.61 |  1.83   13.11 |  2.67    6.57
                 .33    8.74 |  1.17   63.07 |  2.00   10.90 |  2.83    5.99
                 .50   11.99 |  1.33   33.14 |  2.17    9.34 |  3.00    5.51
                 .67   19.23 |  1.50   22.06 |  2.33    8.17 |
                 .83   48.07 |  1.67   16.45 |  2.50    7.28 |


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0018) |   Area    (ha)=    .24
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .04
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      40.30        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    6.91 |  .833   48.07 | 1.583   16.45 |  2.33    8.17
                .167    6.91 |  .917  164.61 | 1.667   16.45 |  2.42    7.28
                .250    8.74 | 1.000  164.61 | 1.750   13.11 |  2.50    7.28
                .333    8.74 | 1.083   63.07 | 1.833   13.11 |  2.58    6.57
                .417   11.99 | 1.167   63.07 | 1.917   10.90 |  2.67    6.57
                .500   11.99 | 1.250   33.14 | 2.000   10.90 |  2.75    5.99
                .583   19.23 | 1.333   33.14 | 2.083    9.34 |  2.83    5.99
                .667   19.23 | 1.417   22.06 | 2.167    9.34 |  2.92    5.51
                .750   48.07 | 1.500   22.06 | 2.250    8.17 |  3.00    5.51

     Max.Eff.Inten.(mm/hr)=     164.61       159.95
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       1.21 (ii)    4.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .33          .24
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .09          .02          .110 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      75.86        71.00         75.07
     TOTAL RAINFALL   (mm)=      76.86        76.86         76.86
     RUNOFF COEFFICIENT   =        .99          .92           .98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  98.0    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  (0012) |   Area    (ha)=    .09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .09          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
```

```
     Length            (m)=      24.20        40.00
     Mannings n          =        .013         .250

     Max.Eff.Inten.(mm/hr)=     164.61      1279.59
               over (min)        5.00         5.00
     Storage Coeff.  (min)=        .89 (ii)    1.81 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .32
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .04          .00           .040 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      75.86        71.00         75.81
     TOTAL RAINFALL   (mm)=      76.86        76.86         76.86
     RUNOFF COEFFICIENT   =        .99          .92           .99

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  98.0    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.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0014) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0269       .0044
                           .0135      .0022   |    .0404       .0066

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0012)       .088       .040        1.00       75.81
     OUTFLOW: ID= 1 (0014)       .088       .016        1.08       75.39

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 39.72
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=   .0026

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

--------------------
| ADD HYD   (0015) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0018):      .24    .110     1.00    75.07
        + ID2= 2 (0014):      .09    .016     1.08    75.39
          ================================================
          ID = 3 (0015):      .33    .124     1.00    75.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0017) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000      .0000   |    .0161       .0102
                           .0159      .0003   |    .0162       .0214
                           .0160      .0034   |    .0000       .0000

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0015)       .332       .124        1.00       75.16
     OUTFLOW: ID= 1 (0017)       .332       .016        1.83       75.15

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.05
                  TIME SHIFT OF PEAK FLOW         (min)= 50.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=   .0127

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

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=2317.400
| Ptotal= 86.08 mm |                          B=  11.000
--------------------                          C=    .836
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  3.00 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    7.60 |  1.00  181.81 |  1.83   14.69 |  2.67    7.21
                   .33    9.69 |  1.17   71.90 |  2.00   12.15 |  2.83    6.56
                   .50   13.40 |  1.33   37.82 |  2.17   10.36 |  3.00    6.01
                   .67   21.77 |  1.50   25.04 |  2.33    9.04 |
```

```
                .83   54.83 |  1.67   18.55 |  2.50    8.02 |


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0018) |   Area    (ha)=    .24
|ID= 1 DT= 5.0 min |   Total Imp(%)=  84.00   Dir. Conn.(%)=  84.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .20          .04
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      40.30        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    7.60 |  .833   54.83 | 1.583   18.55 |  2.33    9.04
                .167    7.60 |  .917  181.81 | 1.667   18.55 |  2.42    8.02
                .250    9.69 | 1.000  181.81 | 1.750   14.69 |  2.50    8.02
                .333    9.69 | 1.083   71.90 | 1.833   14.69 |  2.58    7.21
                .417   13.40 | 1.167   71.90 | 1.917   12.15 |  2.67    7.21
                .500   13.40 | 1.250   37.82 | 2.000   12.15 |  2.75    6.56
                .583   21.77 | 1.333   37.82 | 2.083   10.36 |  2.83    6.56
                .667   21.77 | 1.417   25.04 | 2.167   10.36 |  2.92    6.01
                .750   54.83 | 1.500   25.04 | 2.250    9.04 |  3.00    6.01

     Max.Eff.Inten.(mm/hr)=     181.81       177.59
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.17 (ii)    4.03 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .24
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .10          .02          .122 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      85.08        80.19         84.29
     TOTAL RAINFALL   (mm)=      86.08        86.08         86.08
     RUNOFF COEFFICIENT   =        .99          .93           .98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  98.0    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  (0012) |   Area    (ha)=    .09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .09          .00
     Dep. Storage     (mm)=       1.00         1.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      24.20        40.00
     Mannings n           =       .013         .250

     Max.Eff.Inten.(mm/hr)=     181.81      1420.68
               over (min)        5.00         5.00
     Storage Coeff.  (min)=        .86 (ii)    1.74 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .34          .32
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .04          .00          .044 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.00          1.00
     RUNOFF VOLUME    (mm)=      85.08        80.19         85.03
     TOTAL RAINFALL   (mm)=      86.08        86.08         86.08
     RUNOFF COEFFICIENT   =        .99          .93           .99

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  98.0    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.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0014) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .0269      .0044
                          .0135      .0022    |    .0404      .0066
```

```
                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0012)       .088       .044        1.00       85.03
     OUTFLOW: ID= 1 (0014)       .088       .018        1.08       84.65

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 40.08
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0029

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

--------------------
| ADD HYD   (0015) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0018):      .24    .122     1.00    84.29
        + ID2= 2 (0014):      .09    .018     1.08    84.65
          ================================================
          ID = 3 (0015):      .33    .137     1.00    84.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0017) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          .0000      .0000    |    .0161       .0102
                          .0159      .0003    |    .0162       .0214
                          .0160      .0034    |    .0000       .0000

                                AREA      QPEAK       TPEAK       R.V.
                                (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0015)       .332       .137        1.00       84.38
     OUTFLOW: ID= 1 (0017)       .332       .016        1.92       84.38

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 11.80
                   TIME SHIFT OF PEAK FLOW         (min)= 55.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0151

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

 FINISH
================================================================================================================
```

APPENDIX D

Future Garner Road EA Storm Sewers Catchment Plan

Future Garner Road EA Storm Sewer Design Sheets

Garner Road EA Table 5.2: Culverts Downstream Flow

SOUTHCOTE RD.

559 GARNER ROAD EAST

GARNER RD. E.

PROP 28.20m 300mm @ 1.00%

P2	F6	F5	F4	F3	F2	F1
0.189	0.149	0.285	0.285	0.285	0.285	0.285
0.78	0.78	0.78	0.78	0.78	0.78	0.78

36.00m

36.00m

36.00m

FUT 79.00m 525mm @ 0.51%

FUT 79.00m 525mm @ 0.51%

FUT 79.00m 450mm @ 0.51%

FUT 79.00m 450mm @ 0.51%

FUT 79.00m 375mm @ 0.51%

FUT MH7A

FUT STM MH6

FUT STM MH5

FUT STM MH4

FUT STM MH3

FUT STM MH2

FUT STM MH1

FUT 41.26m 600mm @ 0.51%

PROP STM MH2

FUT 37.72m 525mm @ 0.51%

FUT STM MH7

FUT 9.12m 600mm @ 0.47%

FUT OGS

FUT 5.80m 600mm @ 0.34%

LEGEND

CATCHMENT AREA BOUNDARY

A
0.20
0.25

CATCHMENT ID
AREA (ha)
RUNOFF COEFFICIENT

MAJOR OVERLAND FLOW ROUTE

DRAWING :

FUTURE GARNER ROAD EA STORM SEWERS CATCHMENT PLAN

DATE:	PROJ. NO.:	SCALE.:
JANUARY 2024	21215	1:1500

PROJECT :

PROPOSED RESIDENTIAL DEVELOPMENT

559 GARNER ROAD HAMILTON, ON

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

ODAN·DETECH
CONSULTING ENGINEERS

PROJECT: **PROPOSED RESIDENTIAL DEVELOPMENT**
PROJECT No.: **21215**
LOCATION: **559 GARNER RD. E.**
MUNICIPALITY: **HAMILTON**
DESIGNED BY: **MLB**
CHECKED BY: **MH**
DATE: **Jan 17 2024**

DESIGN PARAMETERS:

Min. Pipe Size=	300	mm
Mannings, n=	0.013	
Minimum Tc =	10	min
Max. Percent Full=	85	%
Min. Pipe Cover=	1.2	m
Min. Full Flow Velocity=	0.8	m/s
Max. Full Flow Velocity=	3.65	m/s

RAINFALL DATA:

	LOCATION	FORMULA
5 Yr Storm:	Mount Hope	i=A/(B+Tc)^C
100 Yr Storm:	Mount Hope	i=A/(B+Tc)^C

5 Yr IDF		100 Yr IDF	
A=	1049.5	A=	2317.4
B=	8	B=	11
C=	0.803	C=	0.836

LOCATION				STORM WATER ANALYSIS										STORM SEWER DATA					
TRIBUTARY ID #	STREET NAME	UPPER MANHOLE	LOWER MANHOLE	AREA (ha)	RUNOFF COEFFICIENT (C)	A*C	ACCUMULATED A*C	INITIAL TIME OF CONCENTRATION (min)	Flow Time (min)	ACCUMULATED TIME OF CONCENTRATION (min)	5 YR RAINFALL INTENSITY (mm/hr)	5 YR PEAK FLOW (L/s)	ACCUMULATIVE 5 YEAR PEAK FLOW (L/s)	LENGTH (m)	HEIGHT/ DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	PERCENT FULL (%)
F1	Garner Road East	FUT MH1	FUT MH2	0.285	0.78	0.222	0.222	10.00	1.16	10.00	103.04	64	64	79.0	375	0.51	125.21	1.13	51%
F2	Garner Road East	FUT MH2	FUT MH3	0.285	0.78	0.222	0.445	11.16	1.03	11.16	97.99	61	121	79.0	450	0.51	203.61	1.28	59%
F3	Garner Road East	FUT MH3	FUT MH4	0.285	0.78	0.222	0.667	12.19	1.03	12.19	93.96	58	174	79.0	450	0.51	203.61	1.28	86%
F4	Garner Road East	FUT MH4	FUT MH5	0.285	0.78	0.222	0.889	13.22	0.93	13.22	90.29	56	223	79.0	525	0.51	307.13	1.42	73%
F5	Garner Road East	FUT MH5	FUT MH6	0.285	0.78	0.222	1.112	14.15	0.93	14.15	87.24	54	270	79.0	525	0.51	307.13	1.42	88%
F6	Garner Road East	FUT MH6	PROP MH2	0.149	0.78	0.116	1.228	15.07	0.44	15.07	84.41	27	288	41.3	600	0.51	438.49	1.55	66%
SITE	Garner Road East	559 GARNER	PROP MH2	Taken from Page 21 of FSR								23	23						
P2	Garner Road East	PROP MH2	FUT MH7	0.189	0.78	0.147	1.375	15.52	0.41	15.52	83.13	34	341	37.7	600	0.51	438.49	1.55	78%
	Garner Road East	FUT MH7	FUT OGS				1.375	15.92	0.10	15.92	82.00		336	9.1	600	0.47	420.95	1.49	80%
	Garner Road East	FUT OGS	FUT MH7A				1.375	16.03	0.08	16.03	81.72		335	5.8	600	0.34	358	1.27	94%

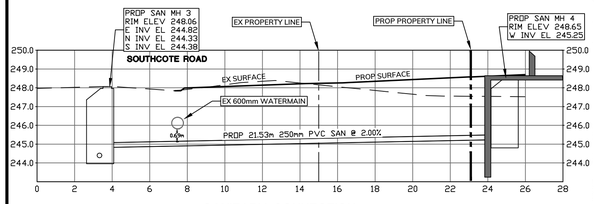
Table 5.2: Garner Road Ancaster Creek Culverts - Downstream Flows

No.	Sta.	Case	Cchmt Area	Design Event							Comments
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Reg. Storm	
			(ha)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	
Outlets to East Ancaster Creek East Tributary											
C14	1+364	Exist.	2.42	0.090	0.160	0.203	0.261	0.301	0.347		Future storm sewers to C15
		Future	1.52	0.028	0.053	0.073	0.130	0.122	0.144		
C15	1+176	Exist.	23.58	0.375	0.679	0.912	1.240	1.477	1.724	2.737	Future includes diversion to Kitty Murray Lane of local major system and 0.055 m^3/s to existing storm sewers. Peak flow control not required based on study of East Tributary of Ancaster Creek.
		Future	24.28	0.475	0.773	0.965	1.258	1.495	1.744	2.805	
C16		Exist.	14.06	0.213	0.383	0.514	0.699	0.832	0.977	1.598	Southcote Rd. south of Garner.
		Future	12.85	0.191	0.353	0.476	0.649	0.702	0.907	1.473	Future storm sewers to C15
C17	0+851	Exist.	2.69	0.083	0.149	0.192	0.251	0.292	0.338		Future storm sewers to C19
		Future	2.73	0.040	0.075	0.101	0.140	0.168	0.197		
Outlets to East Ancaster Creek											
C18	0+665	Exist.	2.23	0.089	0.160	0.203	0.262	0.303	0.350	-	Future storm sewers to C19
		Future	2.28	0.029	0.055	0.075	0.015	0.127	0.150	-	
C19	0+338	Exist.	121.91	1.441	2.895	4.023	5.627	6.798	8.028	14.046	Future condition includes Garner Rd. storm sewer drainage from Sta 0+000 to Sta 1+170 (west of Southcote Rd.)
		Future	125.35	1.456	2.921	4.054	5.668	6.843	8.081	14.167	
		Future Mitiga-tion	122.25	1.424	2.870	3.984	5.569	6.724	7.942	13.861	Diversion of Q5 and ½ of major system flows to John Frederick Dr. (Ancaster Glen Phase 2)

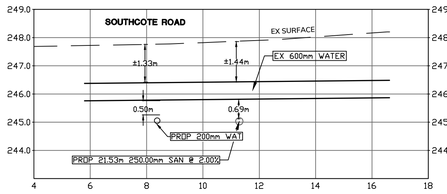
APPENDIX E

Concept Servicing Plan

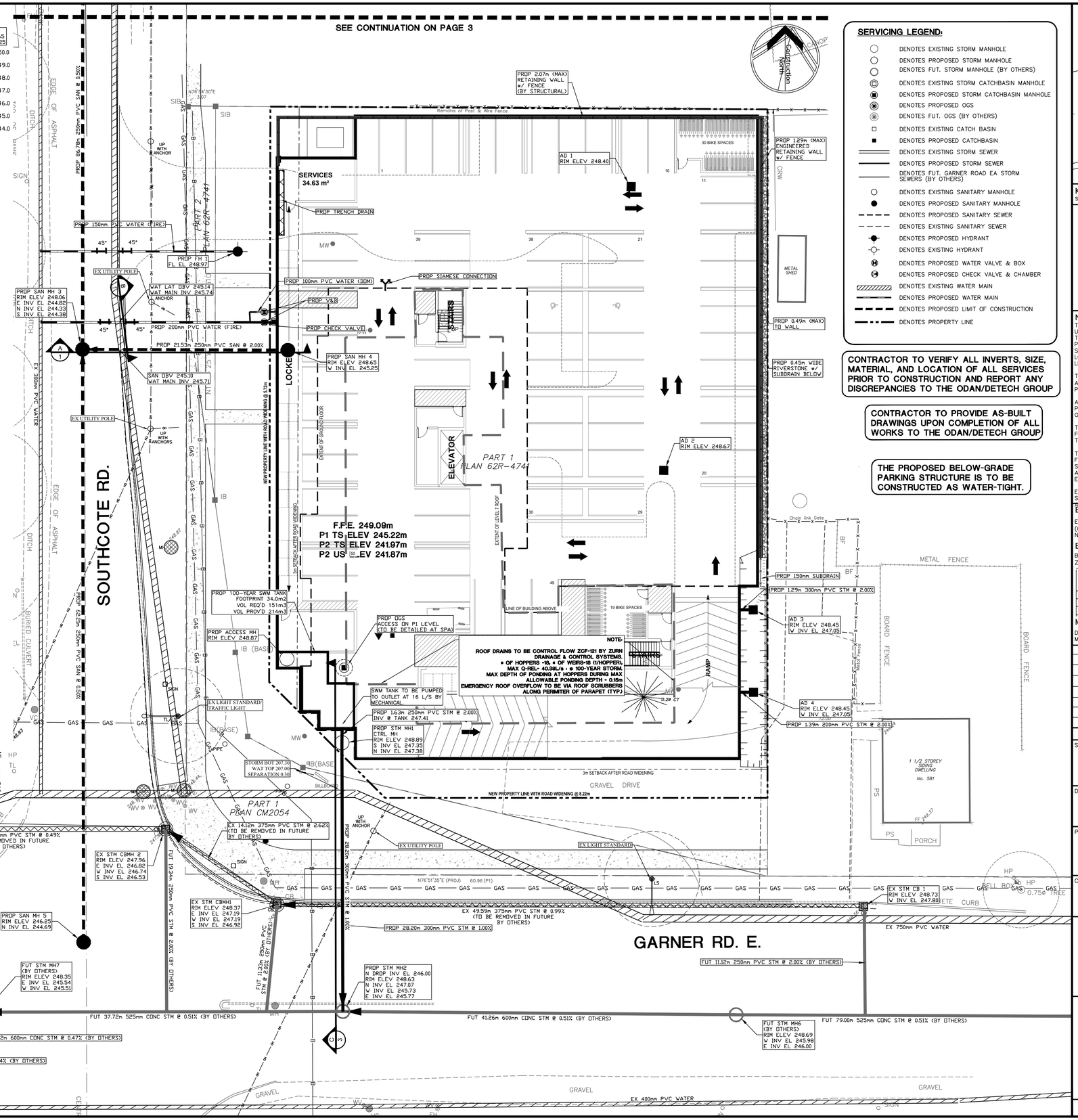
Concept Grading Plan

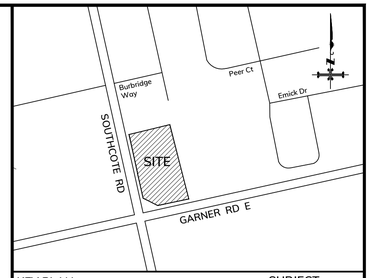


SANITARY CONNECTION
SECTION A
SCALE 1:150



WATERMAIN/SANITARY CROSSING
SECTION B
SCALE 1:100





KEY PLAN
Scale : N.T.S.

SUBJECT LANDS

SERVICING LEGEND:

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- DENOTES PROPOSED STORM MANHOLE
- DENOTES FUT. STORM MANHOLE (BY OTHERS)
- DENOTES EXISTING STORM CATCHBASIN MANHOLE
- DENOTES PROPOSED STORM CATCHBASIN MANHOLE
- DENOTES PROPOSED OGS
- DENOTES FUT. OGS (BY OTHERS)
- DENOTES EXISTING CATCH BASIN
- DENOTES PROPOSED CATCHBASIN
- DENOTES EXISTING STORM SEWER
- DENOTES PROPOSED STORM SEWER
- DENOTES FUT. GARNER ROAD EA STORM SEWERS (BY OTHERS)
- DENOTES EXISTING SANITARY MANHOLE
- DENOTES PROPOSED SANITARY MANHOLE
- DENOTES PROPOSED SANITARY SEWER
- DENOTES EXISTING SANITARY SEWER
- DENOTES PROPOSED HYDRANT
- DENOTES EXISTING HYDRANT
- DENOTES PROPOSED WATER VALVE & BOX
- DENOTES PROPOSED CHECK VALVE & CHAMBER
- DENOTES EXISTING WATER MAIN
- DENOTES PROPOSED WATER MAIN
- DENOTES PROPOSED LIMIT OF CONSTRUCTION
- DENOTES PROPERTY LINE

CONTRACTOR TO VERIFY ALL INVERTS, SIZE, MATERIAL, AND LOCATION OF ALL SERVICES PRIOR TO CONSTRUCTION AND REPORT ANY DISCREPANCIES TO THE ODAN/DETECH GROUP

CONTRACTOR TO PROVIDE AS-BUILT DRAWINGS UPON COMPLETION OF ALL WORKS TO THE ODAN/DETECH GROUP

THE PROPOSED BELOW-GRADE PARKING STRUCTURE IS TO BE CONSTRUCTED AS WATER-TIGHT.

NOTES:

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BEARING NOTE:

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POINT ID	NORTHING	EASTING
A	4784300.879	584734.633
B	4784250.641	584873.210

METRIC NOTE:

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4	ISSUED FOR OPA/ZBA	2021-08-20	M.H.H.
3	ISSUED FOR REVIEW & COORD	2021-06-17	M.L.B.
2	ISSUED FOR REVIEW & COORD (WIP)	2021-05-28	M.L.B.

SCALE(S):

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1:200

DRAWING TITLE:

CONCEPT SITE SERVICING PLAN (P1 LEVEL)

PROJECT:

PROPOSED RESIDENTIAL DEVELOPMENT
559 GARNER ROAD
HAMILTON, ON
CITY FILE NO. (ZAC-21-047)

CLIENT:

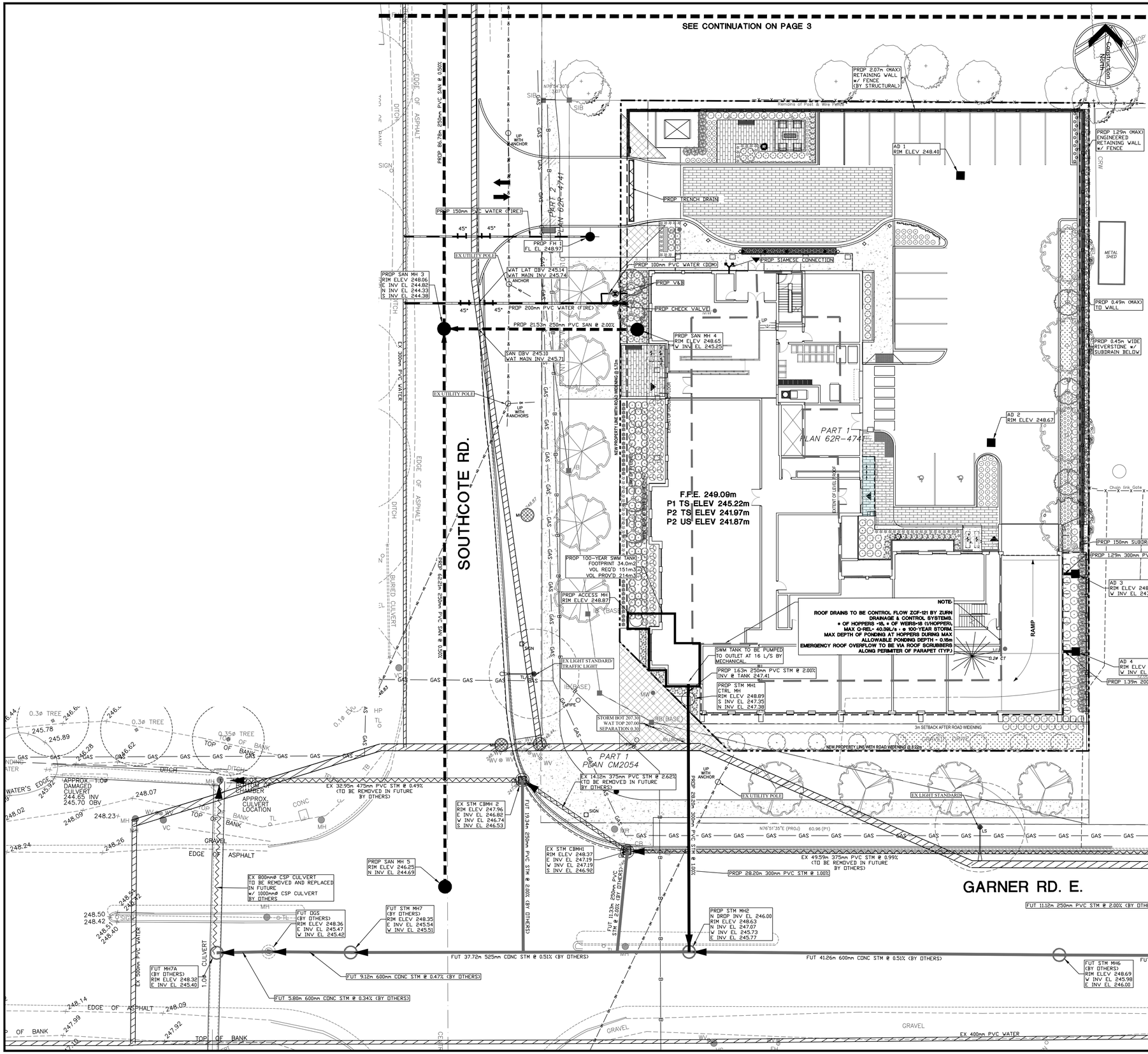
ELITE MD DEVELOPMENTS
102 - 3410 SOUTH SERVICE ROAD
BURLINGTON, ON

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-18-2024
I. KRPAN
PROVINCE OF ONTARIO

ENGINEER

DESIGNED BY: M.H.H.	21215
DRAWN BY: M.L.B.	DATE STARTED: MAY 2021
CHECKED BY: J.K.	DRAWING No.: 1 OF 4
APPROVED BY: J.K.	



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- DENOTES EXISTING SANITARY SEWER
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- DENOTES EXISTING HYDRANT
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- DENOTES PROPOSED CHECK VALVE & CHAMBER
- DENOTES EXISTING WATER MAIN
- DENOTES PROPOSED WATER MAIN
- DENOTES PROPOSED LIMIT OF CONSTRUCTION
- DENOTES PROPERTY LINE

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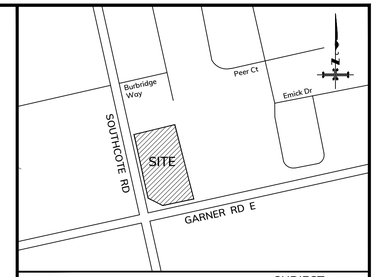

KEY PLAN
Scale : N.T.S.

SUBJECT LANDS

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2	ISSUED FOR REVIEW & COORD (WIP)	2021-05-28	M.L.B.

SCALE(S):

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DRAWING TITLE:

CONCEPT SITE SERVICING PLAN (GROUND LEVEL)

PROJECT:

PROPOSED RESIDENTIAL DEVELOPMENT
559 GARNER ROAD
HAMILTON, ON
CITY FILE NO. (ZAC-21-047)

CLIENT:

ELITE MD DEVELOPMENTS
102 – 3410 SOUTH SERVICE ROAD
BURLINGTON, ON

ODAN·DETECH CONSULTING ENGINEERS
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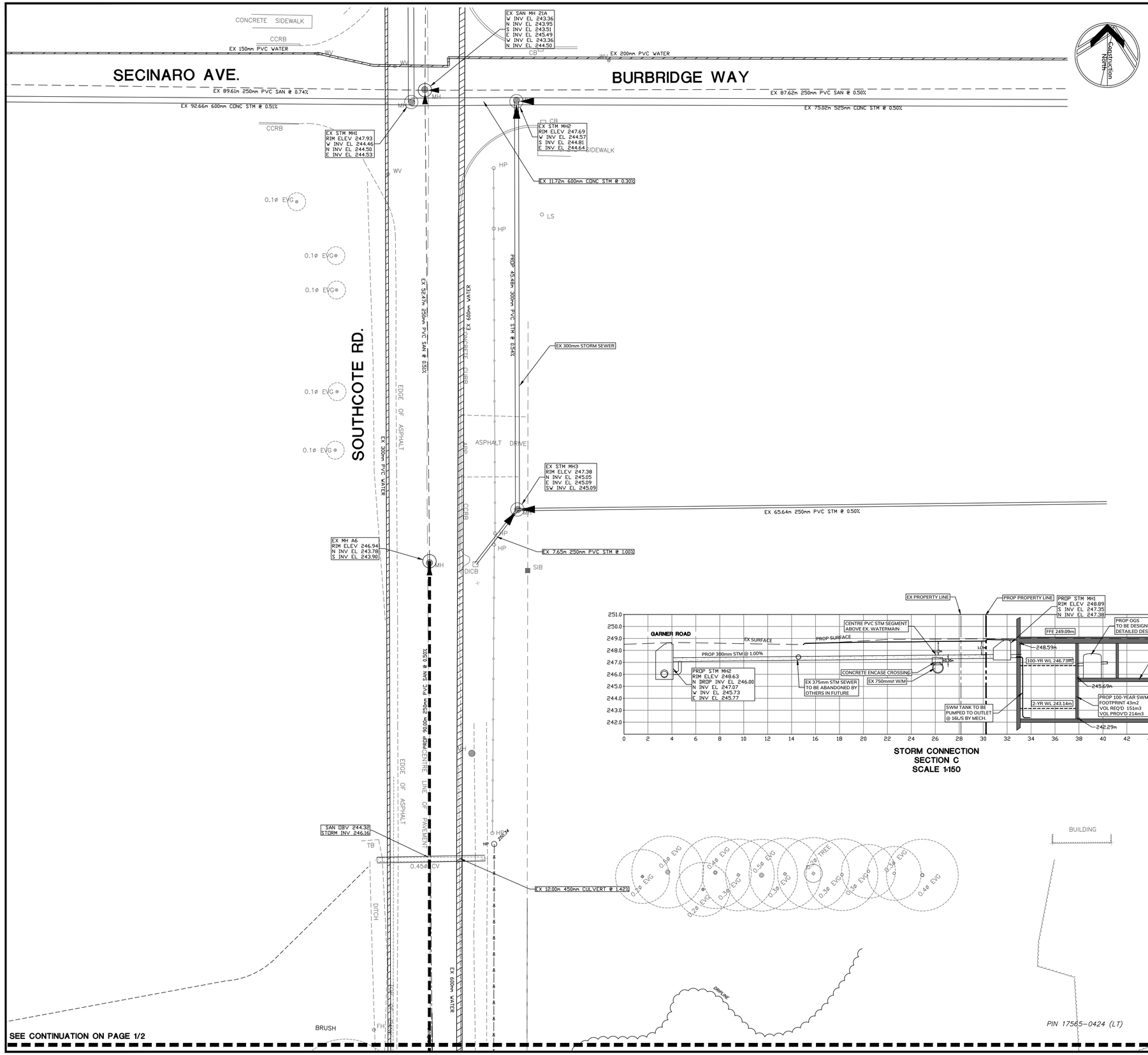
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

REGISTERED PROFESSIONAL ENGINEER
JAN-18-2024
I. KRPAN
PROVINCE OF ONTARIO
ENGINEER

DESIGNED BY: M.H.H.	21215
DRAWN BY: M.L.B.	DATE STARTED: MAY 2021
CHECKED BY: J.K.	DRAWING No.: 2 OF 4
APPROVED BY: J.K.	



STORM CONNECTION SECTION C SCALE 1:150

SERVICING LEGEND:

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- DENOTES PROPOSED STORM MANHOLE
- DENOTES EXISTING STORM CATCHBASIN MANHOLE
- DENOTES PROPOSED STORM CATCHBASIN MANHOLE
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- DENOTES PROPOSED PERMEABLE PAVERS

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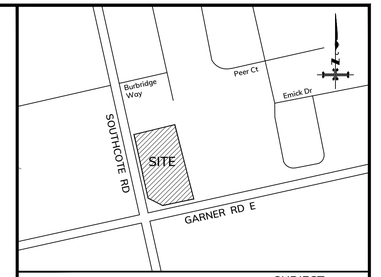

KEY PLAN
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SCALE(S):

0 4 8 12 16 20
1:200

DRAWING TITLE:

CONCEPT SITE SERVICING PLAN

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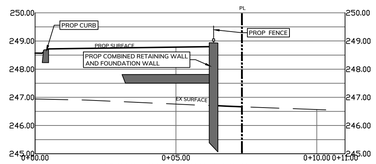
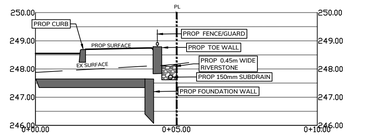
REGISTERED PROFESSIONAL ENGINEER
JAN-18-2024
I. KRPAN
PROVINCE OF ONTARIO
ENGINEER

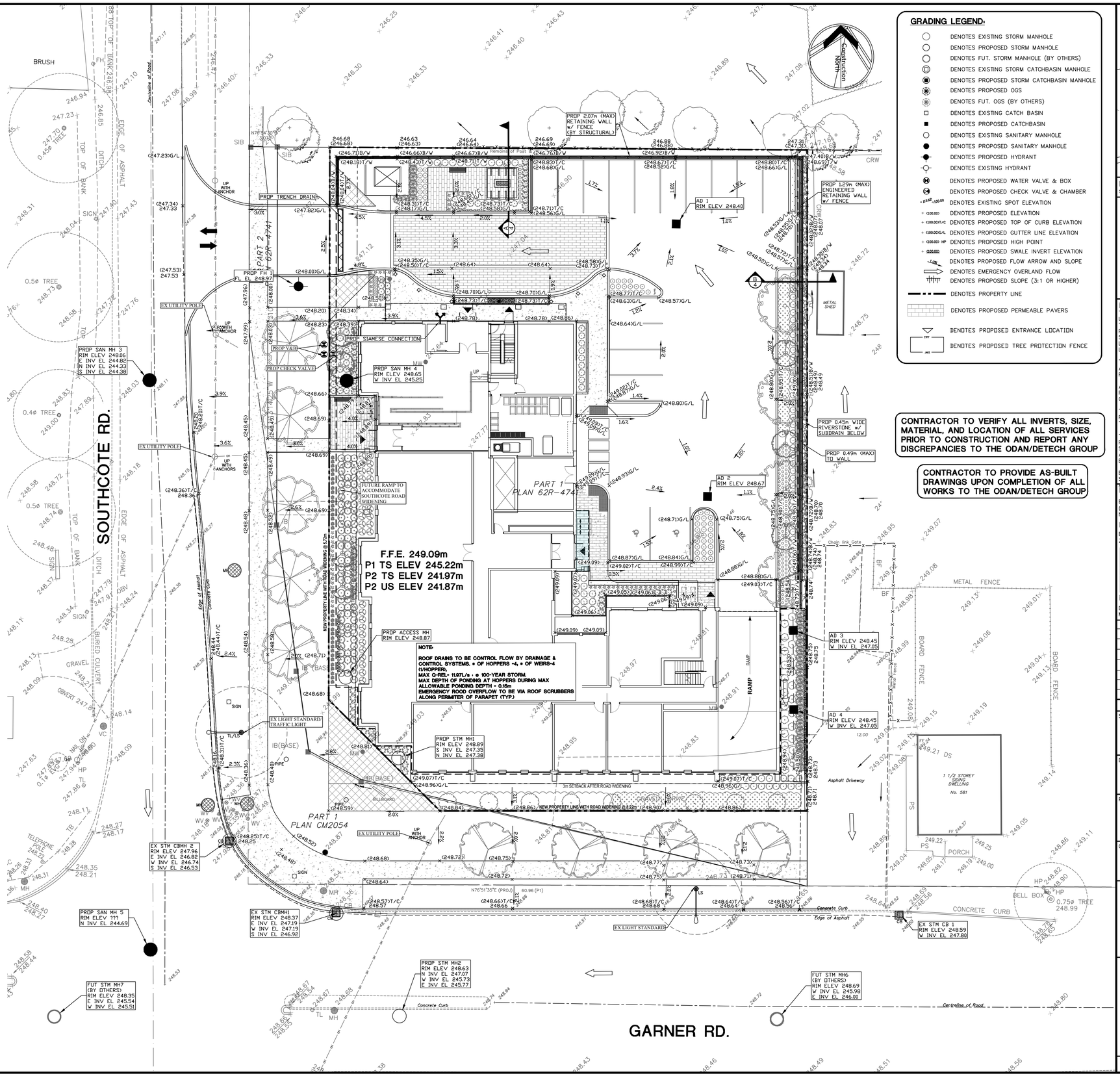
DESIGNED BY: M.H.H.	21215
DRAWN BY: M.L.B.	DATE STARTED: MAY 2021
CHECKED BY: J.K.	DRAWING No.: 3 OF 4
APPROVED BY: J.K.	



NORTH PROPERTY LINE
RETAINING WALL
SECTION A
SCALE 1:100



EAST PROPERTY LINE
RETAINING WALL
SECTION B
SCALE 1:100

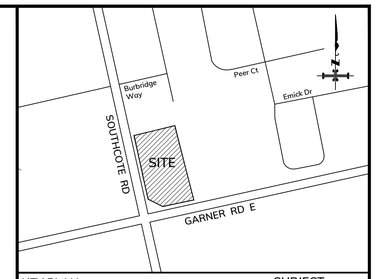


GRADING LEGEND:

- DENOTES EXISTING STORM MANHOLE
- DENOTES PROPOSED STORM MANHOLE
- DENOTES FUT. STORM MANHOLE (BY OTHERS)
- DENOTES EXISTING STORM CATCHBASIN MANHOLE
- DENOTES PROPOSED STORM CATCHBASIN MANHOLE
- DENOTES PROPOSED OGS
- DENOTES FUT. OGS (BY OTHERS)
- DENOTES EXISTING CATCH BASIN
- DENOTES PROPOSED CATCHBASIN
- DENOTES EXISTING SANITARY MANHOLE
- DENOTES PROPOSED SANITARY MANHOLE
- DENOTES PROPOSED HYDRANT
- DENOTES EXISTING HYDRANT
- DENOTES PROPOSED WATER VALVE & BOX
- DENOTES PROPOSED CHECK VALVE & CHAMBER
- DENOTES EXISTING SPOT ELEVATION
- DENOTES PROPOSED ELEVATION
- DENOTES PROPOSED TOP OF CURB ELEVATION
- DENOTES PROPOSED GUTTER LINE ELEVATION
- DENOTES PROPOSED HIGH POINT
- DENOTES PROPOSED SWALE INVERT ELEVATION
- DENOTES PROPOSED FLOW ARROW AND SLOPE
- DENOTES EMERGENCY OVERLAND FLOW
- DENOTES PROPOSED SLOPE (3:1 OR HIGHER)
- DENOTES PROPERTY LINE
- DENOTES PROPOSED PERMEABLE PAVERS
- DENOTES PROPOSED ENTRANCE LOCATION
- DENOTES PROPOSED TREE PROTECTION FENCE

CONTRACTOR TO VERIFY ALL INVERTS, SIZE, MATERIAL, AND LOCATION OF ALL SERVICES PRIOR TO CONSTRUCTION AND REPORT ANY DISCREPANCIES TO THE ODAN/DETECH GROUP

CONTRACTOR TO PROVIDE AS-BUILT DRAWINGS UPON COMPLETION OF ALL WORKS TO THE ODAN/DETECH GROUP



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 BARICH GRENKIE SURVEYING LTD. DATED FEBRUARY 4, 2020 AND A.T. MCLAREN LTD. DATED [illegible]

BENCH MARK:

ELEVATIONS ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928:1978) AND ARE DERIVED FROM CITY OF HAMILTON BENCHMARK No. 00819890294 HAVING AN ELEVATION OF 247.65 m.

BEARING NOTE:

BEARINGS ARE UTM GRID, REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 17 (81° 00' WEST LONGITUDE) NAD83 (CSRS) (2010.0).

OBSERVED REFERENCE POINTS DERIVED FROM GPS USING REAL TIME NETWORK (RTN) OBSERVATIONS UTM ZONE 17, NAD83 (CSRS)(2010.0). COORDINATES TO URBAN ACCURACY PER SEC 14(2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
A	4784300.879	584734.633
B	4784250.641	584873.210

METRIC NOTE:

DISTANCES AND ELEVATIONS ON THIS PLAN ARE TYPICALLY SHOWN IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NO.	REVISIONS	DATE	BY
9	ISSUED FOR OPA/ZBA	2024-01-18	M.L.B.
8	ISSUED FOR OPA/ZBA	2023-02-07	M.L.B.
7	ISSUED FOR OPA/ZBA	2022-05-17	M.L.B.
6	ISSUED REVIEW & COORD	2022-05-11	M.L.B.
5	ISSUED FOR REVIEW & COORD	2022-05-06	M.L.B.
4	ISSUED FOR OPA/ZBA	2021-08-20	M.H.H.
3	ISSUED FOR REVIEW & COORD	2021-06-17	M.L.B.
2	ISSUED FOR REVIEW & COORD (WIP)	2021-05-28	M.L.B.

SCALE(S):

0 4 8 12 16 20
1:200

DRAWING TITLE:

CONCEPT SITE GRADING PLAN

PROJECT:

PROPOSED RESIDENTIAL DEVELOPMENT
559 GARNER ROAD
HAMILTON, ON
CITY FILE NO. (ZAC-21-047)

CLIENT:

ELITE MD DEVELOPMENTS
102 - 3410 SOUTH SERVICE ROAD
BURLINGTON, ON

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-18-2024
I. KRPAN
PROVINCE OF ONTARIO

ENGINEER

DESIGNED BY: M.H.H.	21215
DRAWN BY: M.L.B.	DATE STARTED: MAY 2021
CHECKED BY: J.K.	DRAWING No.: 4 OF 4
APPROVED BY: J.K.	