APPENDICES

Appendix A PROPOSED DRAFT PLAN

A.1 PROPOSED DRAFT PLAN

SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED ____________________20____
THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51 OF THE PLANNING ACT.
THIS____DAY OF_____________,20___.

____

DOUGLAS JAMES, MCIP, RPP, ACTING MANAGER
DEVELOPMENT REVIEW-CENTRAL
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

KEY PLAN *(NOT TO SCALE)*

DRAFT PLAN OF SUBDIVISION OF

LOTS 1, 2 & PART OF LOT 3 BLOCK C(SOUTH WALNUT STREET)
LOTS 1, 2, 3 & PART OF LOT 4 BLOCK C (NORTH WALNUT STREET)
LOTS 1, 2, 3, 4 & PART OF LOT 5 BLOCK C (SOUTH LARCH STREET)
LOTS 1, 2, 3, 4 & PART OF LOT 5 BLOCK C (NORTH LARCH STREET)
LOTS 1, 2, 3, 4 & 5 BLOCK C (SOUTH LAUREL STREET)
LOTS 1, 2, 3, 4 & 5 BLOCK B (NORTH LAUREL STREET)
LOTS 1, 2, 3, 4 & 5 BLOCK B (SOUTH OAK STREET)
PART OF LOTS 8, 9 & 10 (WEST CHAMPAGNE AVENUE)
PART OF LOTS 1, 2 & 3 BLOCK C (NORTH GLADSTONE AVENUE)
PART OF LOT 5A
PART OF OAK STREET (CLOSED BY JUDGE'S ORDER INST. NO. OC574103)
PART OF LAUREL STREET (CLOSED BY JUDGE'S ORDER INST. NO. CR574103)
PART OF LAUREL STREET (CLOSED BY JUDGE'S ORDER INST. NO. LT1402120)
PART OF LARCH STREET (CLOSED BY JUDGE'S ORDER INST. NO. OC574103)
PART OF WALNUT STREET (CLOSED BY JUDGE'S ORDER INST. NO. CR179807)
PART OF CHAMPAGNE AVENUE (CLOSED BY JUDGE'S ORDER INST. NO. LT1402120)
REGISTERED PLAN NO.73

CITY OF OTTAWA

Scale 1:300
5 0 5 10 15 20 METRES

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

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 OF THE PLANNING ACT.

(A)-AS SHOWN ON DRAFT PLAN
(B)-AS SHOWN ON DRAFT PLAN
(C)-AS SHOWN ON DRAFT AND KEY PLANS
(D)-
(E)-AS SHOWN ON DRAFT PLAN
(F)-AS SHOWN ON DRAFT PLAN
(G)-AS SHOWN ON DRAFT PLAN
(H)-
(I)-
(J)-AS SHOWN ON DRAFT PLAN
(K)-
(L)-AS SHOWN ON DRAFT PLAN

OWNER'S CERTIFICATE
I HEREBY AUTHORIZE STANTEC GEOMATICS LTD. TO SUBMIT THIS DRAFT PLAN OF SUBDIVISION ON MY BEHALF

DATE

*,PRESIDENT
####### ONTARIO LIMITED
I HAVE THE AUTHORITY TO BIND THE CORPORATION

SURVEYOR'S CERTIFICATE
I HEREBY CERTIFY THAT THE BOUNDARIES OF THE SUBJECT LANDS AND THEIR RELATIONSHIP TO ADJOINING LANDS HAVE BEEN ACCURATELY AND CORRECTLY SHOWN.

DATE

BRIAN J. WEBSTER
ONTARIO LAND SURVEYOR

Stantec Geomatics Ltd.
CANADA LANDS SURVEYORS
ONTARIO LAND SURVEYORS
1331 CLYDE AVENUE, SUITE 400
OTTAWA, ONTARIO, K2C 3G4
TEL. 613.722.4420 FAX. 613.722.2799
stantec.com

DRAWN: *	CHECKED: *	DATE: *	PROJECT No.: 161600000

A.2 PREFERRED DEVELOPMENT CONCEPT

*** CONCEPTUAL PLAN**

NOTE: *This is an Ottawa Community Housing concept plan depicting possible building massing and street/pathway connections. A comprehensive transportation study has yet to be undertaken to support this concept plan and its assumptions. This plan will be updated pursuant to (among other things) a neighbourhood scale transportation study and its findings, supporting appropriate street connections to Preston and Gladstone, coupled with possible traffic calming measures.*

HOBIN

Gladstone Village

Site Plan

Site Plan
scale = 1:1500

DECEMBER 22st, 2020

A.3 SITE STATISTICS

GLADSTONE VILLAGE - DEVELOPMENT STATS

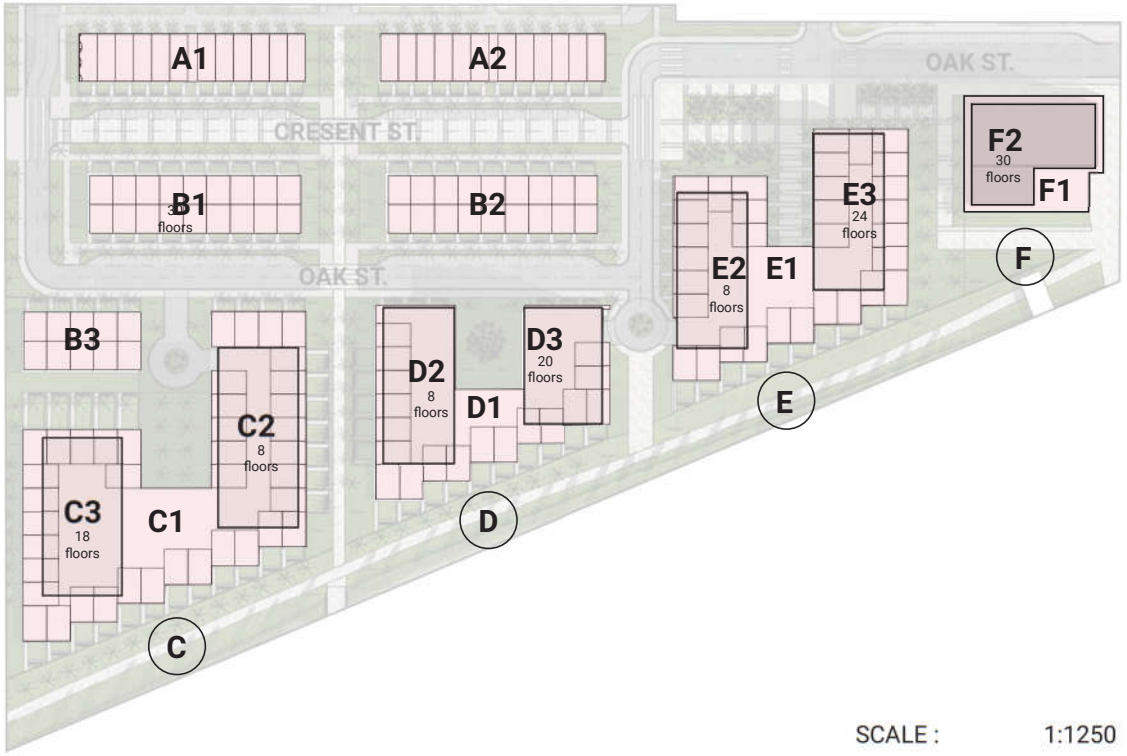
CURRENT OPTION

	GFA		UNITS +/-
BLOCK A1 - TOWNHOMES			
TOTAL	21,384	SQ.FT.	12
BLOCK A2 - TOWNHOMES			
TOTAL	21,384	SQ.FT.	12
BLOCK B1 - STACKED TOWNHOMES			
TOTAL	34,848	SQ.FT.	36
BLOCK B2 - STACKED TOWNHOMES			
TOTAL	34,848	SQ.FT.	36
BLOCK B3 - STACKED TOWNHOMES			
TOTAL	19,360	SQ.FT.	20
BLOCK C - MIXED USE			
C1 PODUIM RES	49,640	SQ.FT.	40
C1 PODIUM RETAIL / COMMERCIAL / INSTITUTIONAL	25,000	SQ.FT.	
C2 MID-RISE	59,412	SQ.FT.	67
C3 HIGH RISE	137,776	SQ.FT.	156
TOTAL	271,828	SQ.FT.	263
BLOCK D - MIXED USE			
D1 PODUIM RES	17,938	SQ.FT.	18
D1 PODIUM RETAIL / COMMERCIAL / INSTITUTIONAL	25,000	SQ.FT.	
D2 MID-RISE	46,500	SQ.FT.	53
D3 HIGH RISE	115,326	SQ.FT.	131
TOTAL	204,764	SQ.FT.	201
BLOCK E - MIXED USE			
E1 PODUIM RES	31,330	SQ.FT.	32
E1 PODIUM RETAIL / COMMERCIAL / INSTITUTIONAL	25,000	SQ.FT.	
E2 MID-RISE	46,500	SQ.FT.	53
E3 HIGH RISE	170,500	SQ.FT.	193
TOTAL	273,330	SQ.FT.	278
BLOCK F - MIXED USE			
F1 PODUIM RES	16,714	SQ.FT.	-
F1 PODIUM RETAIL / COMMERCIAL	25,000	SQ.FT.	
F2 HIGH RISE, RES / OFFICE	166,629	SQ.FT.	189
TOTAL GROSS	208,343	SQ.FT.	189

TOTALS	GFA	UNITS
	1,090,089	1048

OVERALL UNIT TYPOLOGY BREAKDOWN

TRADITIONAL TOWNHOMES :	24	UNITS
BACK TO BACK STACKED TOWNHOMES :	92	UNITS
TOWNHOMES AT PODIUM BASE :	90	UNITS
MID-RISE APARTMENT/CONDO UNITS :	173	UNITS
HIGH-RISE APARTMENT/CONDO UNITS :	669	UNITS
	1048	**UNITS**



SCALE : 1:1250

Appendix B POTABLE WATER SERVICING

B.1 DOMESTIC WATER DEMAND CALCULATIONS

Gladstone Village (933 Gladstone Ave.) OCH Development - Domestic Water Demand Estimates

Based on conceptual development plans by Hobin Architecture (2021-03-15)
Last updated on March 16, 2021

Densities as per City Guidelines:		
Townhomes	2.7	ppu
Apartments	1.8	ppu

Development Block/Area ID	Commercial Area (m^2)	Number of Residential Units	Population	Daily Demand Rate (L/cap/day or L/ha/d)	Avg. Day Demand [1,2]		Max. Day Demand [1, 2]		Peak Hour Demand [1, 2]	
					(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Townhomes										
Block A1 (Block 8)	-	12	32	350	7.9	0.13	19.7	0.33	43.3	0.72
Block A2 (Block 10)	-	12	32	350	7.9	0.13	19.7	0.33	43.3	0.72
Stacked Townhomes										
Block B1 (Block 7)	-	36	97	350	23.6	0.39	59.1	0.98	129.9	2.17
Block B2 (Block 11)	-	36	97	350	23.6	0.39	59.1	0.98	129.9	2.17
Block B3 (Block 6)	-	20	54	350	13.1	0.22	32.8	0.55	72.2	1.20
Mixed Use - Block C (Block 6)										
C1 Podium Residential	-	40	108	350	26.3	0.44	65.6	1.09	144.4	2.41
C1 Podium Retail/Commercial/Institutional	2323	-	-	28000	45.2	0.8	67.7	1.1	121.9	2.03
C2 Midrise	-	67	121	350	29.3	0.49	73.3	1.22	161.2	2.69
C3 Highrise	-	156	281	350	68.3	1.14	170.6	2.84	375.4	6.26
Mixed Use - Block D (Block 4)										
D1 Podium Residential	-	18	49	350	11.8	0.20	29.5	0.49	65.0	1.08
D1 Podium Retail/Commercial/Institutional	2323	-	-	28000	45.2	0.8	67.7	1.1	121.9	2.03
D2 Midrise	-	53	95	350	23.2	0.4	58.0	1.0	127.5	2.13
D3 Highrise	-	131	236	350	57.3	1.0	143.3	2.4	315.2	5.25
Mixed Use - Block E (Block 2)										
E1 Podium Residential	-	32	86	350	21.0	0.35	52.5	0.88	115.5	1.93
E1 Podium Retail/Commercial/Institutional	2323	-	-	28000	45.2	0.8	67.7	1.1	121.9	2.03
E2 Midrise	-	53	95	350	23.2	0.4	34.8	0.6	76.5	1.28
E3 Highrise	-	193	347	350	84.4	1.41	126.7	2.1	278.6	4.64
Mixed Use - Block F (Block 1)										
F1 Podium Residential [4]	-	18	49	350	11.8	0.20	29.5	0.5	65.0	1.08
F1 Podium Retail/Commercial	2323	-	-	28000	45.2	0.8	67.7	1.1	121.9	2.03
F2 Highrise, Residential/Office	-	189	340	350	82.7	1.4	206.7	3.4	454.8	7.58
Block C1, C2, C3, and B3 Build-out [5]		21	38	350	9.2	0.2	23.0	0.4	50.5	0.84
Total Site :	**9290**	**1087**	**2158**	**-**	**705.2**	**11.75**	**1474.7**	**24.58**	**3136.1**	**52.27**

1 Water demand criteria used to estimate peak demand rates for residential areas are as follows:
maximum daily demand rate = 2.5 x average day demand rate
peak hour demand rate = 2.2 x maximum day demand rate

2 Water demand criteria used to estimate peak demand rates for commercial/amenity/lobby areas are as follows:
maximum daily demand rate = 1.5 x average day demand rate
peak hour demand rate = 1.8 x maximum day demand rate

3 Population density for all residential units based on an 'average apartment' population density from Table 4.1 of the City of Ottawa Water Distribution Design Guidelines (2010).

4 Unit count not provided for Block F1 residential area (1553m²). Unit count taken from Block D1 podium residential area with comparable footprint.

5 Intended future revision/expansion to Block C1, C2, C3, and Block B3 unit counts. Total of 21 additional units to be added to these blocks .

B.2 FIRE FLOW DEMAND CALCULATIONS PER FUS GUIDELINES

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401614
Project Name: Gladstone Village OCH Development
Date: 2021-04-08
Fire Flow Calculation #: 1
Description: Residential Stacked Towns, Block B2

Notes: Stacked residential townhomes assuming 3-storeys above grade. Building information from Conceptual Architectural Drawings by Hobin Arcitecture. No fire seperation provided between adjacent units.

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit (m2)	Approx. area of a single storey of a single unit						49	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						18	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						3	-
4	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min						-	17000
5	Determine Occupancy Charge	Limited Combustible						-15%	14450
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						100%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	20.1 to 30	15	3	31-60	Wood Frame or Non-Combustible	8%	5925
		East	20.1 to 30	52	3	> 120	Wood Frame or Non-Combustible	10%	
		South	20.1 to 30	15	3	31-60	Wood Frame or Non-Combustible	8%	
		West	10.1 to 20	52	3	> 120	Wood Frame or Non-Combustible	15%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							20000
		Total Required Fire Flow in L/s							333.3
		Required Duration of Fire Flow (hrs)							4.50
		Required Volume of Fire Flow (m^3)							5400

FUS Fire Flow Calculation Sheet

Stantec Project #: 160401614
Project Name: Gladstone Village OCH Development
Date: 2021-04-08
Fire Flow Calculation #: 2
Description: Residential Stacked Towns, Block B2

Notes: Stacked residential townhomes assuming 3-storeys above grade. Building information from Conceptual Architectural Drawings by Hobin Arcitecture. Fire seperation provided seperating Block B2 into clusters of 8 units and 10 Units. Fire separation to reduce building footprint below 600m² as per building code requirements.

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit (m2)	Approx. area of a single storey of a single unit						49	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						10	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						3	-
4	Determine Required Fire Flow	(F = 220 x C x $A^{1/2}$). Round to nearest 1000 L/min						-	13000
5	Determine Occupancy Charge	Limited Combustible						-15%	11050
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						100%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	0 to 3	15	3	31-60	Ordinary or Fire Resistive (Blank Wall)	0%	3647
		East	20.1 to 30	52	3	> 120	Wood Frame or Non-Combustible	10%	
		South	20.1 to 30	15	3	31-60	Wood Frame or Non-Combustible	8%	
		West	10.1 to 20	52	3	> 120	Wood Frame or Non-Combustible	15%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							15000
		Total Required Fire Flow in L/s							250.0
		Required Duration of Fire Flow (hrs)							3.00
		Required Volume of Fire Flow (m^3)							2700

B.3 BOUNDARY CONDITIONS (MARCH 2021)

From: Wessel, Shawn
To: Mott, Peter
Cc: Paerez, Ana
Subject: Gladstone Village OCH Boundary Conditions Request Draft
Date: Tuesday, March 23, 2021 2:13:52 PM
Attachments: Gladstone Village OCH March 2021.pdf

Good afternoon Mr. Mott.

Please find water boundary conditions, as requested:

The following are boundary conditions, HGL, for the hydraulic analysis at Gladstone Village OCH (zone 1W) assumed to be internally looped and connected to the 406 mm on Champagne Avenue, 152 mm on Oak Street and 203 mm on Gladstone Avenue (see attached PDF for location).

All Connections:

Minimum HGL = 107.0 m

Maximum HGL = 114.9 m

Max Day + Fire Flow	Fire Demand (167 L/s)	Fire Demand (233 L/s)	Fire Demand (250 L/s)
Champagne 406mm Connection	109.1 m	108.4 m	108.2 m
Oak 152mm Connection	106.2 m	103.4 m	102.5 m
Gladstone 203mm Connection	106.4 m	103.7 m	102.9 m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

If you require additional information or clarification, please do not hesitate to contact me anytime.

Thank you

Regards,

Shawn Wessel, A.Sc.T.,rcji

Project Manager - Infrastructure Approvals
Gestionnaire de projet – Approbation des demandes d'infrastructures

Development Review Central Branch | Direction de l'examen des projets d'aménagement, Centrale
Planning, Infrastructure and Economic Development Department | Direction générale de la planification de l'infrastructure et du développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Ave. W. | 110, avenue Laurier Ouest, Ottawa ON K1P 1J1
(613) 580 2424 Ext. | Poste 33017
Int. Mail Code | Code de Courrier Interne 01-14
shawn.wessel@ottawa.ca

*****Please also note that, while my work hours may be affected by the current situation and am working from home, I still have access to email, video conferencing and telephone. Feel free to schedule video conferences and/or telephone calls, as necessary.*****

From: Mott, Peter <Peter.Mott@stantec.com>
Sent: March 17, 2021 11:10 AM
To: Wessel, Shawn <shawn.wessel@ottawa.ca>
Cc: Paerez, Ana <Ana.Paerez@stantec.com>
Subject: RE: Gladstone Village OCH Boundary Conditions Request Draft

Hello Mr. Wessel,

I would like to request the hydraulic boundary conditions for the proposed Gladstone Village OCH Development (933 Gladstone Avenue). Please find attached the concept plan, the key map showing the location of the proposed development, domestic water demand calculations, and fire flow calculations.

A summary of the proposed site is provided below:

We anticipate that three (3) connections to the existing watermain infrastructure will be required to service the site. The following connections are expected for servicing:

➢Connection to existing 152 mm (PVC) watermain on Oak Street;
➢Connection to existing 403 mm (UCI) watermain on the North West corner of property (Champagne Avenue);
➢Connection to existing 203 mm (PVC) watermain on Gladstone Avenue.

*Existing hydrants on Somerset Street West, Laurel, Larch and Balsam Street, and Gladstone Avenue.

For the purpose of the boundary conditions request, may you please provide us with the boundary conditions for the following servicing options:

i. Watermain connections to the existing 152 mm (PVC) watermain on Oak Street, the existing 403 mm (UCI) watermain on the North West corner of property (Champagne Avenue), and to the existing 203 mm (PVC) watermain on Gladstone Avenue; assuming a fire flow requirement of **10,000 L/min** for the site in addition to the domestic water demands provided below.

ii. Watermain connections to the existing 152 mm (PVC) watermain on Oak Street, the existing 403 mm (UCI) watermain on the North West corner of property (Champagne Avenue), and to the existing 203 mm (PVC) watermain on Gladstone Avenue; assuming a fire flow of **14,000 L/min** for the site in addition to the domestic water demands provided below.

- The intended land use is a combination of commercial and residential, per the summary provided in the Domestic Demands spreadsheet. (See attached Concept Plan with project stats)
- Estimated fire flow demand per the FUS methodology: 14000 L/min (250 L/s) for the worst-case scenario (Block B2)
- Domestic water demands for the entire development:
    - **Average day: 681.6 L/min (11.36 L/s)**
    - **Maximum day: 1415.7 L/min (23.59 L/s)**
    - **Peak hour: 2941.5 L/min (49.03 L/s)**

Thank you for your time and please contact me at your earliest convenience if any additional information or clarification is required.

Best regards,

Peter Mott EIT
Engineering Intern, Community Development

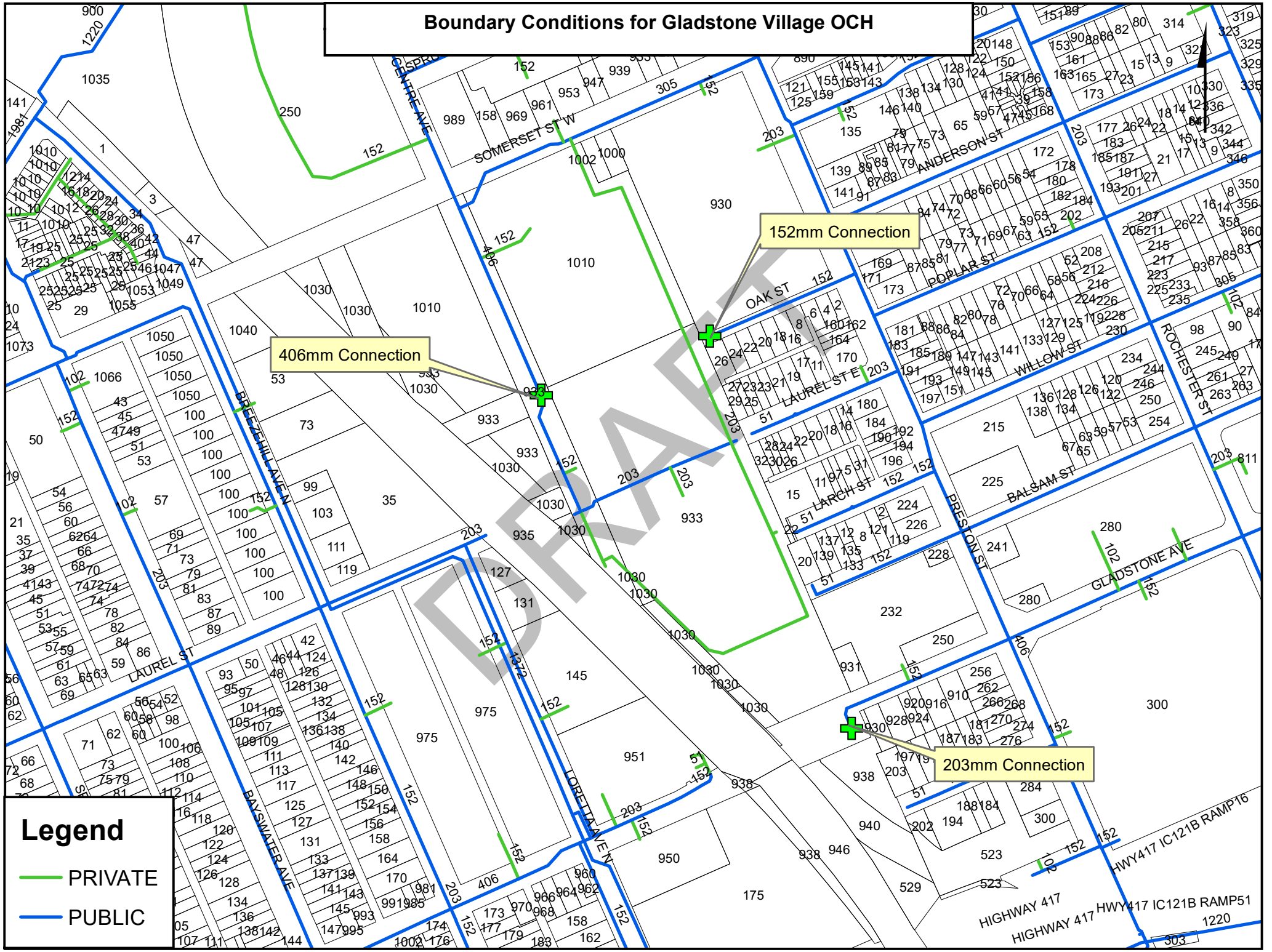
Mobile: 613-897-0445

Peter.Mott@stantec.com
Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

'

'

Boundary Conditions for Gladstone Village OCH



Appendix C WASTEWATER SERVICING

C.1 FUNCTIONAL SANITARY SEWER DESIGN SHEET

Stantec

SUBDIVISION:

Gladstone Village - 933 Gladstone Avenue

DATE: 4/14/2021
REVISION: 2
DESIGNED BY: WAJ
CHECKED BY: AMP

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401614
Functional Sewer Design for Draft Plan Submission

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 L/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 L/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 L/ha/day	MANNINGS n	0.013
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 L/ha/day	BEDDING CLASS	B
PERSONS / SINGLE	3.4	INSTITUTIONAL	28,000 L/ha/day	MINIMUM COVER	2.50 m
PERSONS / TOWNHOME	2.7	INFILTRATION	0.33 L/s/ha	HARMON CORRECTION FACTOR	0.8
PERSONS / APARTMENT	1.8				

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / STREET		C+I+I	INFILTRATION			TOTAL	PIPE							
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA	UNITS SINGLE	UNITS TOWN	UNITS APT	POP.	CUMULATIVE AREA	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	PEAK FLOW	TOTAL AREA	ACCU. AREA	INFILT. FLOW	FLOW	LENGTH	DIA	MATERIAL	CLASS	SLOPE	CAP. (FULL)	CAP. V PEAK FLOW	VEL. (FULL)	VEL. (ACT.)
			(ha)					(ha)			(l/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(m)	(mm)			(%)	(L/s)	(%)	(m/s)	(m/s)
Larch Street Connection																																		
R206A (Street 4), C206B (Block 1)**	206	205	0.00	0	18	189	388.8	0.00	389	3.42	4.3	0.23	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.1	0.43	0.43	0.1	4.6	94.6	200	PVC	SDR 35	0.32	18.9	**24.15%**	0.60	0.41
R208C (Walkway), C208B (Block 4), R208A (Street 2)	208	207	0.07	0	18	184	379.8	0.07	380	3.43	4.2	0.23	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.15	0.1	0.45	0.45	0.1	4.5	38.8	200	PVC	SDR 35	0.32	18.9	**23.68%**	0.60	0.40
C207B (Block 2), R207A (Street 3)	207	205	0.24	0	32	246	529.2	0.31	909	3.26	9.6	0.23	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.26	0.2	0.58	1.03	0.3	10.2	55.9	200	PVC	SDR 35	0.32	18.9	**53.78%**	0.60	0.52
	205	204	0.00	0	0	0	0.0	0.31	1298	3.18	13.4	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.3	0.00	1.46	0.5	14.2	19.9	200	PVC	SDR 35	0.32	18.9	**75.04%**	0.60	0.58
Champagne Avenue Connection																												450						
R209B (Walkway), R209A* (Block 6)	209	3	0.39	0	60	244	601.2	0.39	601	3.35	6.5	0.23	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07	0.1	0.69	0.69	0.2	6.9	20.4	200	PVC	SDR 35	0.50	23.6	**29.01%**	0.74	0.54
R3A (Street 2)	3	2	0.00	0	0	0	0.0	0.39	601	3.35	6.5	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.22	0.1	0.15	0.84	0.3	6.9	94.1	1500	CONCRETE	100-D	0.37	4533.5	**0.15%**	2.49	0.40
	2	1	0.00	0	0	0	0.0	0.39	601	3.35	6.5	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.1	0.00	0.84	0.3	6.9	58.1	1500	CONCRETE	100-D	0.37	4533.5	**0.15%**	2.49	0.40
Laurel Street Connection																												1500						
R203D (Blk11), R203C (Road), R203A(Walkway), R203B (Blk10)	203	202	0.29	0	48	0	129.6	0.29	130	3.57	1.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.16	0.0	0.45	0.45	0.1	1.6	35.4	200	PVC	SDR 35	0.50	23.6	**6.97%**	0.74	0.36
Oak Street Connection																												675						
R201B (Blk8), R201C (Road), R201A (Street 1), R201D (Blk7)	201	200	0.28	0	48	0	129.6	0.28	130	3.57	1.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.0	0.48	0.48	0.2	1.7	32.1	200	PVC	SDR 35	0.50	23.6	**7.01%**	0.74	0.36
					224	**863**	**2158**																**3.23**					375						

*Intended future revision/expansion to Block 6 unit counts. Total of 21 additional units to be added to this block .
**Unit count not provided for Block 1 residential area (1553m²). Unit count taken from Block D1 podium residential area with comparable footprint.

C.2 CORRESPONDENCE AND BACKGROUND

1 INTRODUCTION

The City of Ottawa has retained Stantec Consulting to prepare a detailed design for the rehabilitation of Preston Street, Albert St. to Carling Ave. The project involves the complete road reconstruction and replacement of old watermains and sewers. This design brief has been prepared as supporting documentation for the Ministry of Environment Certificate of Approval for Sewage. Covered in this design brief and application are the trunk sewers scheduled for replacement as part of the Preston Street Rehabilitation project. The installation of catchbasin inlet control devices outside of the Preston St right of way will be covered in a separate application.

The project is scheduled for construction in six parts over the years 2008-2010. Because of the stormwater management component and the large scale of the project the planning and design of the whole project proceeded in accordance with the requirements of a Municipal Class Environmental Assessment and more specifically according to the Schedule B Class EA process. A Technical Advisory Committee and Public Advisory Group have been formed to provide guidance during the design and construction process.

1.1 Background

1.1.1 Previous Studies

Preston Street Drainage Flooding Remediation, Environmental Assessment Summary Report (Stantec, March 2004)

Stantec undertook this project to complete the 2003 study and advance both the Class EA process and the Canadian Environmental Assessment Act (CEAA) process. The report outlines the existing conditions, the problem identification, the evaluation of alternatives, the selection of the preferred alternative, the environmental impacts and the required monitoring and mitigation measures. The report also included agency, stakeholder and public consultation information.

At the time, the evaluation of alternatives concluded that the combined trunk sewer upgrade alternatives do not provide adequate or cost-effective improvements to the existing level of service.

The preferred alternative identified in the EA document included:

- Installation of inlet control devices in catch-basins to restrict flows into the minor system;
- Minor street re-grading and curb modifications to ensure that private property is protected from overland flow;
- Local high-level relief sewers to drain excess storm runoff from low-lying areas to Brown's Inlet;
- Diversion of flow to the Booth Street system at Laurel Street to improve the hydraulic conditions in the Preston Street Sewer; and,

- Improvements to the existing Spruce Street diversion structure to improve local hydraulics in the Preston Street Sewer.

Preston Street Drainage Area Flooding Remediation, Preliminary Design Report (Stantec, August 2004)

This report outlines the preliminary design for the preferred alternatives outlined in the Preston Street Drainage Flooding Remediation EA Summary Report (Stantec, March 2004).

Specifically detailed in the report are the following flood control measures:

- Installation of inlet control devices in catch-basins throughout most of the Preston Street Drainage Area;
- High-level sewers in Brown's Inlet area to convey excess surface runoff;
- Major Drainage Improvements in Brown's Inlet area;
- Reinstatement of the Laurel Street diversion to relieve the PSCTS during periods of surcharge; and,
- Modifications to the Spruce Street flow control chamber to divert all of the PSCTS flows to the Booth Street sewer.

Storage of excess surface runoff in the portion North of Carling Ave was not addressed as part of the original EA or Pre-design study, given that the measures proposed in the EA did not lead to a worsening of existing ponding.

Preston Street Drainage Area Flooding Remediation Environmental Assessment Summary Report Addendum (November 2007)

This addendum has recently been completed and is within a 30 day review period. The addendum addresses the mitigation of existing and future surface flooding risks near the Preston Street sag (near Anderson Street). The recommended solution is to lower Plouffe Park (located to the north west of the Preston and Oak Street intersection) to provide storage of excess surface runoff. The proposed works would provide flooding relief for runoff events between the 1:10 and 1:50-yr return period. It is the City's intention to initiate the design of the recommended works in 2008.

1.1.2 In Summary

The capacity of the existing combined trunk sewer along Preston St. between Carling Ave. and Albert St. is deficient and there have been numerous reports of basement flooding along Preston St. and a few of the side streets. Since the filing of the original Environmental Assessment (EA) in 2004, the City has reconsidered the combined sewer upgrade alternatives for the segment between Carling Ave. and Albert St. in combination with implementation of the inlet control devices to limit sewer inflows to the 1:5-year level. Assessments undertaken by the City Water Resources Group indicated that such a combination would result in a higher level of service than each alternative implemented separately.

It is the intention of the City of Ottawa that the portion of the PSCTS drainage area north of Somerset Street will be, to the extent possible, separated (Combined Sewer Area Pollution

Control Planning Study, City of Ottawa/MOE, 1993). This separation process has already started and is progressing as part of infrastructure rehabilitation projects.

2 EXISTING CONDITIONS

The tributary area to the Preston Street Combined Trunk Sewer (PSCTS) within the proposed project limits is bounded by Cambridge St. to the east, Albert St. to the north, the O-Train corridor to the west and Brown's Inlet/Dow's Lake to the south (**refer to Figure 1**). The land use within the project limits can be described primarily as a mix of residential and commercial.

The existing PSCTS, which was constructed in 1899, is of brick construction between 1200 and 1500 mm in diameter and, with the exception of the section to the north of Somerset St., is installed with approximately 2m of cover. A sewer condition assessment (GA Clark, 2006) of the existing trunk sewer south of Somerset St. revealed that this section is in poor condition.

The majority of the sewers along the side streets have been replaced in conjunction with previous infrastructure renewal projects and are relatively new. Some exceptions are Larch St., Laurel St., Norfolk St., Young St. and Sidney St. which will be rehabilitated as part of the Preston Street Rehabilitation project. Note separate C of A applications will be submitted for the side streets.

There is an existing 1500 mm dia. combined sewer within the Laurel R-O-W that received the combined flows from the Willow St. catchment and also serves as an overflow for the Preston Combined sewer. This sewer, known as the Booth St. Sewer (BSS), runs west along Laurel Street; then under federally owned lands (Public Works Canada partially vacant warehouses); then runs north along Champagne to Spruce Street; then runs east along Spruce St. to Booth St. To our knowledge, there are currently only a few sanitary connections to the BBS from the federally owned lands. This land is poised for redevelopment and will ultimately be serviced by new outlets toward Larch, Laurel Streets.

PSCTS wet weather flows are diverted to the BSS at Spruce Street through the use of a bulkhead in the PSCTS and an overflow weir to the BSS. Under extreme runoff events, the PSCTS and BSS currently operate under surcharge conditions due to capacity constraints of both the PSCTS and the BSS (1800 diameter sewer d/s of Preston St.). As confirmed by the recent CCTV inspections, the BSS is in good structural condition.

3 DESCRIPTION OF PROPOSED WORKS

The proposed sewerage works included as part of this application are:

- the upgrade of the PSCTS, Carling Ave to Spruce St.;
- the lowering of the PSCTS between Young and Spruce Streets;
- the conversion of the existing PSCTS from Spruce St to Albert St. to a storm sewer;
- the provision of a new sanitary sewer from Somerset St. to Albert St.;

- the provision of a new high-level storm relief sewer between Laurel and Spruce Streets including an in-line flow control device at its outlet at Spruce St.; and,
- the provision of an in-line flow control device in the Booth St. sewer near its intersection with Somerset St.

These works are described in more detail below.

3.1 Preston Street Combined Trunk Sewer Upgrade

The PSCTS section between Carling Ave and Spruce Street will be upgraded and lowered to provide an enhanced level of service reducing the health and safety risks associated with basement flooding.

The PSCTS will be replaced with:

- a 1500 mm diameter combined sewer between Carling Ave. and Aberdeen St.;
- a 1650 mm diameter combined sewer between Aberdeen St. and Young St. Note that presence of a large diameter watermain at Young St. forces us to match inverts at Aberdeen St.;
- a deeper 1,800 mm diameter combined sewer between Young St. and Willow St.;
- a deeper 2100 mm diameter sewer between Willow St. and Spruce St. with all flows from Willow St. sewer directed to the PSCTS; and,
- removal of the interconnection (overflow) between the PSCTS and the Booth St. sewer at Laurel St.

The combination of storm inflow restriction into the combined sewers along with an upgraded trunk sewer down to the Booth St. sewer (slightly larger and deeper trunk) provides a significant reduction in hydraulic grade line and risk of basement flooding during infrequent events. Furthermore, the proposed PSCTS upgrade between Willow and Spruce Streets eliminates the reliance on the existing overflow to the Booth St. sewer at Laurel St.

The catchbasins along Preston St., with the exception of the catchbasins in the sag area near Anderson St., will be fitted with 20L/sec inlet control devices to control the flows into the PSCTS (Refer to **Section 4.1.1**).

3.2 Preston Street Sewer Separation - North of Somerset

The area north of Somerset St. will be serviced by separated sewers. The existing combined trunk sewer will be converted to a storm sewer while a new sanitary sewer will be provided between Somerset and Albert Streets. Note that the flows from the newly converted storm sewer and from the new sanitary sewer will be temporarily recombined immediately south of Albert Street and will continue to flow to the Cave Creek Collector until such time that a new storm sewer outlet is provided from Albert St.

Note that the Somerset St. and Spruce St. combined sewers west of Preston Streets are too deep to be serviced by the proposed separated storm and sanitary sewers. The Somerset St. combined sewer west of Preston St. will drain to the upgraded PSCTS whereas the Spruce St. combined sewer west of Preston St. will continue to drain to the Booth St. sewer.

Details of the storm and sanitary sewers are provided below.

3.2.1 Sanitary Sewer

A new sanitary sewer will be provided on Preston St. between Somerset and Albert Streets. The new sewer will range in size from 375mm diameter at Somerset St. to a 525 mm diameter sewer near Albert St. This sewer will collect sanitary sewage from the side streets which have already been separated. Sanitary sub-headers (250 mm diameter) are proposed between Spruce St. and a point 36 m north of Primrose Ave. These are provided to collect the sewage from the properties fronting onto Preston St. and to facilitate future connections of sanitary laterals thereby avoiding excessively deep excavations (up to 7m deep). These high-level sub-headers flow in a north to south direction to the nearest manhole junction with the new sanitary sewer.

3.2.2 Storm Sewer

The existing 1500 mm diameter PSCTS between Spruce and Albert Streets will be converted to a storm sewer which will service the side streets which are for the most part separated.

A new high-level storm relief sewer will be provided between Spruce and Laurel Streets as the existing PSCTS has been found to be in poor condition south of Spruce St. where the overburden thickness decreases and the upgrade of the PSCTS south of Spruce St. requires the removal of the old trunk sewer. This new 1050 mm diameter high-level storm sewer will serve as an extension of the converted storm sewer past Spruce St. The high-level sewer will be located to the west of the upgraded PSCTS alignment and will collect the future storm drainage from Somerset St. east of Preston St. when it is separated. The main purpose of the high-level sewer past Somerset St. is to provide flooding relief from excess surface runoff which tends to accumulate at the Preston St. sag near its intersection with Anderson St. Roadway drainage along Preston Street, between Spruce and Laurel Streets, will be directed to the new high-level sewer.

Details of the proposed high-level sewer and related appurtenances include:

- a 1050 mm diameter high-level storm sewer extending between Spruce and Laurel Streets. The new sewer would have a high point at Oak Street and storm flows would be split between the Preston St. brick storm sewer immediately north of Spruce Street and the Booth Street sewer at Laurel St. Note that the high-level sewer is oversized to provide up to 160 m^3 of in-line storage ;
- the discharge from the high-level sewer to the Preston St. storm sewer north of Spruce St. must be controlled to the existing allowable peak discharge in an effort to prevent increased combined sewer overflows from the Cave Creek collector and to prevent surcharging of the sewer downstream of Spruce St. It is therefore necessary to provide a bulkhead at Spruce Street to allow a maximum discharge of approximately 700 L/sec when the high-level sewer is under surcharge conditions;
- the interconnection of the high-level storm sewer to the existing Booth Street sewer at Laurel St. provides for approximately 800 m^3 of pipe storage. The discharge from the Booth Street sewer must be controlled to prevent surcharging of the Booth St. sewer and ultimately the Preston St. Trunk sewer. A discharge rate of approximately

300 L/sec can be accommodated within the Booth St. sewer downstream of Somerset St. without adversely impacting downstream hydraulic grade lines. Since this interconnection will link the combined system (BSS) with a storm sewer system, it could offer the remote possibility of combined sewage backing up into the storm sewer system. To prevent this, a check valve will be provided along with the orifice in the Booth Street sewer at Somerset Street, upstream of the 900 mm diameter sewer entering from the west on Somerset St.; and,

- the catchbasins located within the large sag area (i.e. Preston St. between Laurel and Somerset Streets, Anderson St. immediately east of Preston Street and Oak St. immediately west of Preston St.) will be connected to the high-level storm relief sewer without inlet control devices.

4 DESIGN BASIS

4.1 Hydrologic and Hydraulic Modeling

4.1.1 Major System Drainage Assessment

A dual drainage hydrologic and hydraulic model was developed (DDSWMM release 2.1) for the sewershed as part of the Preston Street Drainage Area Study (Stantec, 2003). This model was updated as part of the Preston Street Drainage Area Flooding Remediation, Preliminary Design Report (Stantec, August 2004) and further refined as part of the ongoing Preston Street Rehabilitation Project between Carling Avenue and Albert Street. This refinement was undertaken in an effort to reflect recent and proposed road reconstruction activity within the study area and to better characterize street level flow during high intensity storm events. The intent of the proposed stormwater management plan is to limit sewer inflows throughout the sewershed to approximately the 5-year level in order to prevent surcharging of the Preston St. Combined Trunk Sewer and reduce the associated risk of basement and surface flooding. Model input and output files are provided in **Attachment A**.

The criteria used for the DDSWMM model included selected catchbasin capture rates to achieve an average 1:5-year capture rate equivalent to the existing 1:5-year minor system capture rate of 102 L/s/ha for the area north of Carling Ave. and south of Spruce St. The inlet control rates were selected among preset control rates (6, 10, 15 and 20 L/sec) based on City accepted standard designs, rates lower than 15 L/sec are a vortex type ICD. The capture rates selected for catchbasins located along major arterials including Preston St. were set to 20 L/sec to ensure a high level of service. Prescribed inlet restriction rates are illustrated in **Attachment A**.

The resultant future conditions for the 1:5-year and 1:100-year capture rates are estimated at 97 and 134 L/s/ha respectively. The dual drainage model indicates that the implementation of inlet control devices is not expected to result in significant increases in runoff flow depths on the streets for the frequent runoff events up to and including the 1:5-year event.

With the exception of the main profile sag on Preston St. (between Anderson St. and Oak St.) most roadway sag areas are located on side streets where minor inconveniences are expected during major runoff events. A high-level relief storm sewer is proposed between

Laurel and Spruce Streets to help mitigate surface flooding at the Preston St. sag. This high-level sewer will provide an outlet, independent of the PSCTS/Booth St. sewer system, for the Preston St. sag. In-line storage will be provided within the high-level sewer and a section of the Booth St. sewer. Catchbasins located within this sag will drain to the high-level sewer and will not be fitted with ICD.

4.1.2 Hydraulic Analysis

As described in the previous sub-section, a dual drainage model was used to determine the allocation of flows between the sewer system (minor) and roadway system (major). The hydraulic behaviour of the flows within the trunk sewer network was modeled by the City with the use of the XPSWMM model. The sewer system inflows were imported from the dual drainage model (DDSWMM) into the City hydraulic model.

The hydraulic model was set up to assess the hydraulic performance of a few alternative trunk profiles and arrangements. With the lowering of the trunk sewer profile downstream of Young St, the upstream section becomes hydraulically independent due to the significant drop at Young St. The governing factor for the sewer profile upstream of Young St. is the presence of a 1200 mm diameter watermain that cannot be lowered. Hence, the new trunk would have to match the existing invert at this location.

The results of the hydraulic modeling indicate that the use of a 1500 mm diameter sewer at a 0.2% gradient between Carling Ave. and Aberdeen St. and a 1650 mm diameter sewer at a 0.2% gradient between Aberdeen St. and Young St, (while matching inverts at Aberdeen) provides the most efficient use of the infrastructure while reducing the hydraulic grade line during the 1:100-year event. **Figure 2** illustrates the proposed combined trunk sewer profile and estimated hydraulic grade line. The resulting hydraulic grade line is below the surveyed basement elevations and therefore basement flooding risks from sewer surcharge should be eliminated during the 1:100-year event.

For the trunk section downstream of Young St. it was determined that a lowered 1800 mm diameter sewer between Young St. and Willow St. and a 2100 mm diameter sewer between Willow St. and Spruce St. provides the best hydraulic performance. Furthermore, this configuration eliminates the reliance on the overflow to the BSS at Laurel St.

4.2 Sewer Sizing

The new sanitary sewers north of Somerset St. - were sized based on the current City of Ottawa Sewer Design Guidelines (2004). Sewer design spreadsheet and associated drainage plans are attached (**Attachment B**).

The PSCTS being converted to a storm sewer between Spruce and Albert Streets - this segment of 1500 mm diameter sewer currently services 25 ha of area to the north of Somerset St. (which will ultimately be separated) while accepting a maximum combined flow from upstream of Spruce St. of approximately 700 L/sec. Therefore, the conversion of this sewer to a storm sewer while maintaining the flow control at Spruce St. will essentially maintain peak discharges at existing levels. The peak flow capacity of this sewer is approximately 3.3 m^3/sec (1500 @ 0.2% gradient).

The upgraded PSCTS between Carling Ave and Spruce St. - was sized through the use of the XPSWMM hydrodynamic model (refer to **Section 4.1.2**).

The high-level storm relief sewer between Spruce and Laurel Streets - has been oversized in order to provide some in-line storage capacity. The flow past Spruce St. in the existing PSCTS is currently controlled by an orifice (bulkhead) within the PSCTS immediately downstream of its interconnection with the Booth St. sewer. It is estimated that the current bulkhead which restricts flows to the lower 230 mm of the 1500 mm diameter circular section controls the outflow to approximately 700 L/sec when the hydraulic grade line is at the obvert of the sewer. It is proposed to maintain such a flow control device at the outlet of the high-level storm relief sewer into the newly converted storm sewer in order to prevent excessive flows from reaching the Cave Creek Collector resulting in an increase in combined sewer overflow occurrences. The need for this flow control may be re-evaluated by the City in the future when a new storm outlet is provided at Albert Street.

4.3 Design Issues

All sanitary and storm services will be replaced to the property line along Preston St. Catchbasins and catchbasin leads will be also replaced and fitted for the most part with 20 L/sec inlet control devices complete with odour traps (**Attachment A**).

4.3.1 Temporary sewer arrangements

As mentioned previously, the flows from the newly converted storm sewer and from the new sanitary sewer north of Somerset St. will be temporarily recombined immediately south of Albert St. and will continue to flow to the Cave Creek Collector until such time that a new storm sewer outlet is provided at Albert St.

Since Somerset St. east of Preston St. is not yet separated, it will continue to drain to the PSCTS until it is separated. Once separated, the sanitary sewer will discharge to the new sanitary sewer north of Somerset St. This sewer connection will be built as part of this project and a temporary bulkhead will direct to the flow to the PSCTS.

4.3.2 Somerset St. Storm Servicing

Upon the future sewer separation, the storm flows from Somerset St. east of Preston St. will be split between the new high-level storm relief sewer on Preston St. and the PSCTS. By using a flap gate at the outlet of the Somerset St. storm sewer to the high-level sewer, low flows would be allowed to continue through to the storm system on Preston St. For large events when the high-level storm sewer on Preston St. fills up and surcharges due to the 700 L/s restriction, the flap would close and storm flows would be diverted to the PSCTS.

The proposed setup has the advantage of not taking away from combined sewage capacity at the Booth regulator during frequent events and making use of the combined sewage capture capacity at the Lloyd-Preston Regulator on the Cave Creek Collector. Note that the infrastructure necessary to split the future storm flows from Somerset St. will be constructed as part of this project to avoid the future need to dig up Preston St.

5 MITIGATION MEASURES DURING CONSTRUCTION

The contract documents will stipulate that sediment and erosion control will be the responsibility of the Contractor. The Contractor, prior to carrying out the proposed works, shall implement erosion control measures. The Contractor will be required to submit to the Contract Administrator for review a detailed staging and sediment control plan indicating how he intends to control site runoff and secure the site against erosion. The submission will also ensure that the contractor has a complete understanding of the contract requirements. Contract specifications will indicate that exposed grading shall be protected against erosion.

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2007-05-25 11:14AM By: ecalberry

ORIGINAL SHEET - ISO A4

Dec., 2006
1636_00597

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Fax. 613.722.2799
www.stantec.com

Client/Project
CITY OF OTTAWA
PRESTON STREET
RECONSTRUCTION

Figure No.

Title
PRESTON ST. SANITARY
CONTRIBUTING AREAS

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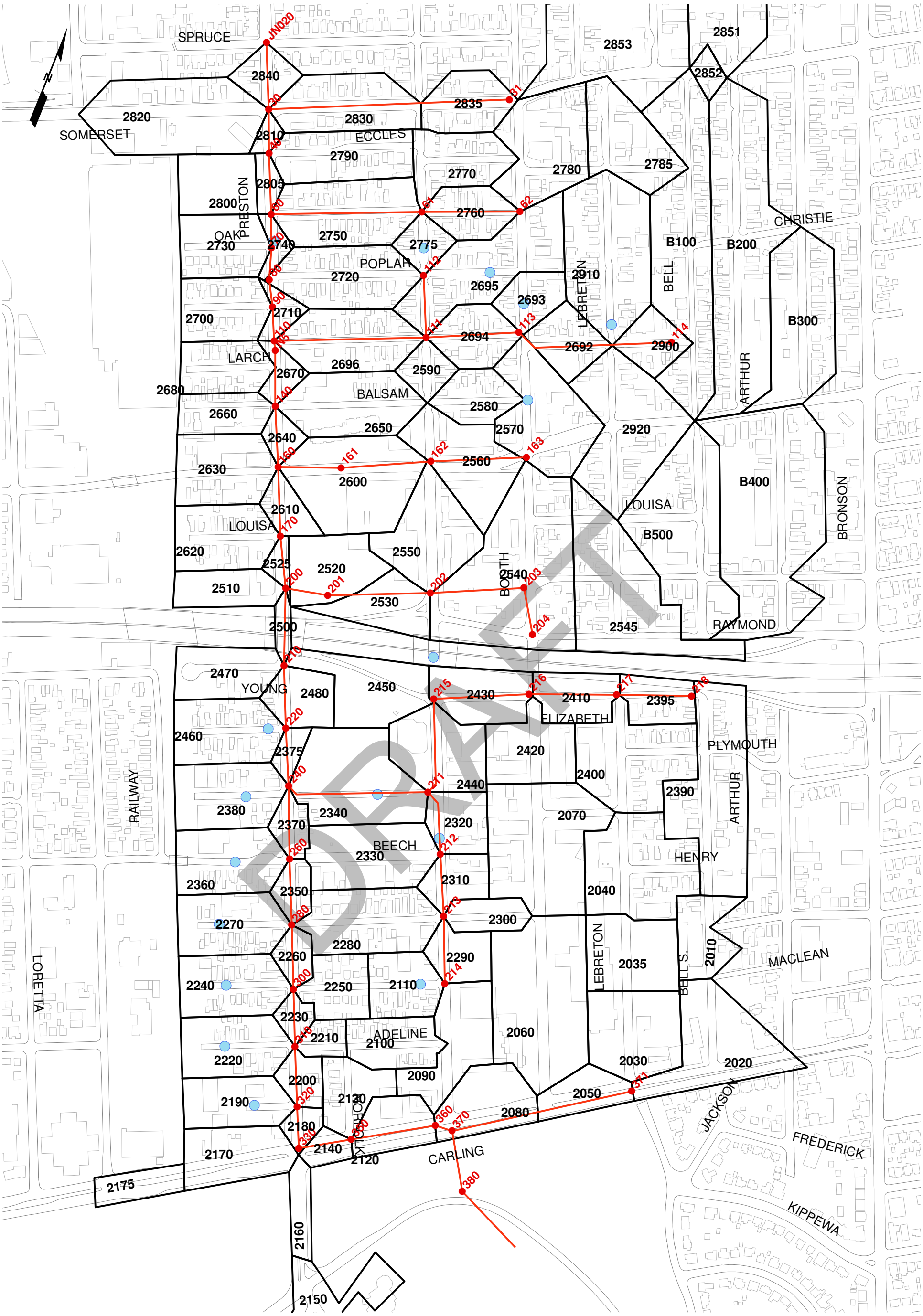
Client/Project
CITY OF OTTAWA
PRESTON STREET
RECONSTRUCTION

Figure No.

Title
PRESTON ST.
FLAT ROOF STORM
CONTRIBUTING AREAS



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Legend

- Maintenance Hole (Modeled)
- Sewer (Modeled)
- DDSWMM Ponding Area
- DDSWMM Subarea

Stantec

Client/Project

CITY OF OTTAWA
PRESTON STREET REHABILITATION
PRELIMINARY DESIGN REPORT

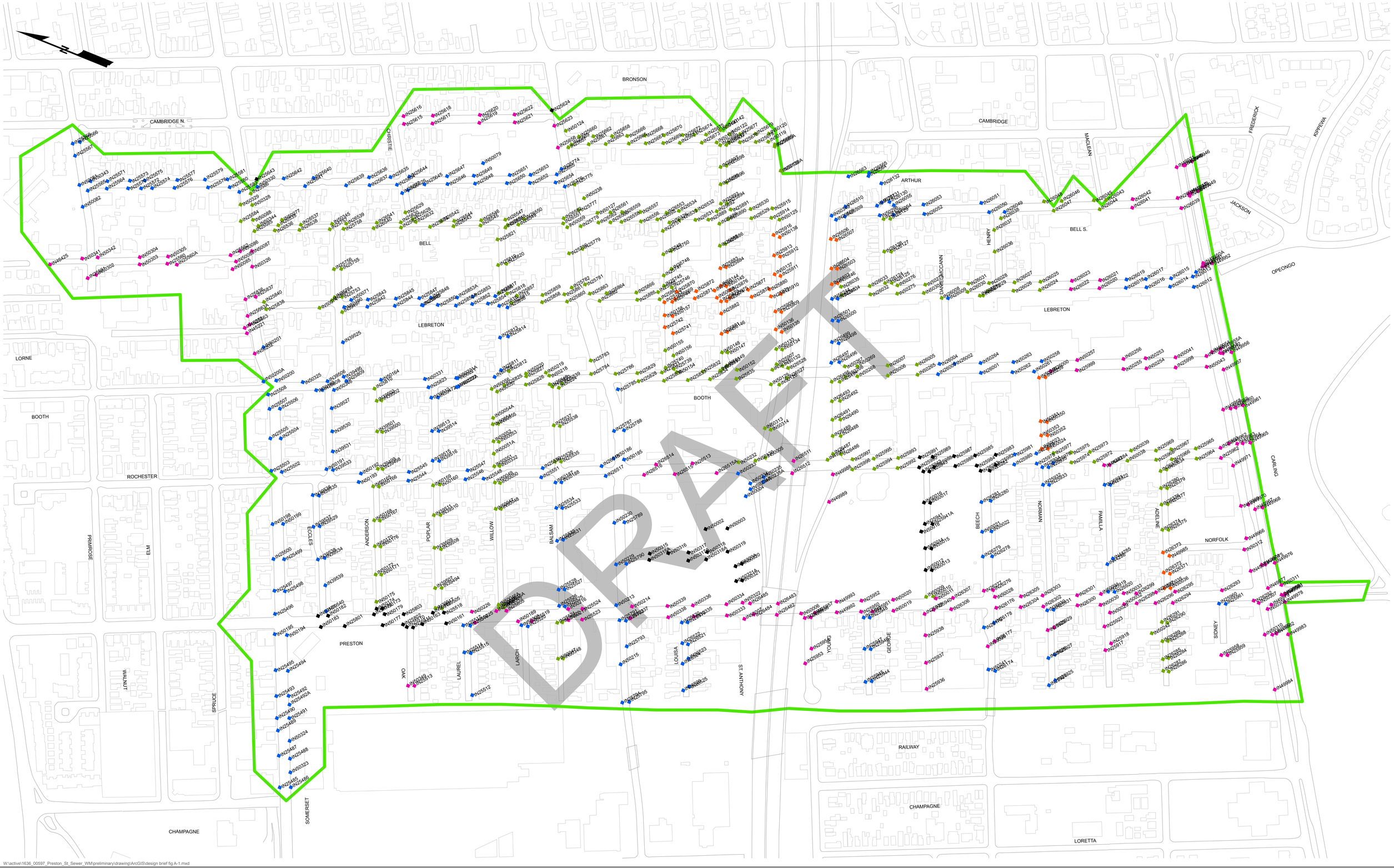
Figure No.

1

Title

Revised DDSWMM System

May 2007
1636-00597



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Legend

Prescribed Control

- 6 L/sec
- 10 L/sec
- 15 L/sec
- 20 L/sec
- No ICD
- ICD implementation Area (this project)

0 112.5 225 337.5 450 Meters

Stantec

Client/Project

CITY OF OTTAWA
PRESTON STREET REHABILITATION
DESIGN BRIEF

Figure No.

A-1

Title

Prescribed Catchbasin Control

November 2007
1636-00597

1 INTRODUCTION

The City of Ottawa has retained Stantec Consulting to prepare a detailed design for the Preston Street Rehabilitation Project which involves the complete road reconstruction including replacement of old watermains and sewers. A stormwater storage facility has been recommended as part of the larger Preston Street Rehabilitation Project to protect private and public property from excessive surface flooding. This design brief has been prepared as supporting documentation for the Ministry of Environment Certificate of Approval for Sewage Works for the stormwater storage facility component of the Preston Street Rehabilitation project. Certificate of Approval applications for the proposed sewer works and installation of catchbasin inlet control devices for the Preston Street Rehabilitation Project have already been submitted under separate cover.

The project is scheduled for construction in 2008. Because of the stormwater management component and the large scale of the overall project, the planning and design of the whole project proceeded in accordance with the requirements of a Municipal Class Environmental Assessment and more specifically according to the Schedule B Class EA process. A Technical Advisory Committee and Public Advisory Group have been formed to provide guidance during the design and construction process. A notice of filing of an Addendum to the original approved Schedule "B" Class EA was issued on November 9, 2007.

2 BACKGROUND

2.1 Previous Studies

Preston Street Drainage Flooding Remediation, Environmental Assessment Summary Report (Stantec, March 2004)

Stantec undertook this project to complete the 2003 study and advance both the Class EA process and the Canadian Environmental Assessment Act (CEAA) process. The recommended alternatives identified, among other things, the installation of inlet control devices in catch-basins within the entire sewershed to restrict flows into the minor system. The other recommendations focused primarily on surface drainage improvements in the Brown's Inlet area and on hydraulic improvements to the sewer system.

Preston Street Drainage Area Flooding Remediation, Preliminary Design Report (Stantec, August 2004)

This report presents the preliminary design of the recommended alternatives outlined in the Preston Street Drainage Flooding Remediation EA Summary Report (Stantec, March 2004). The majority of those measures deal with surface flooding in the area south of Carling Avenue or improvement of the minor system hydraulics. Specifically detailed in the report is the installation of inlet control devices in catch-basins throughout most of the Preston Street Drainage Area.

While the need for management of excess surface runoff in the portion North of Carling Ave was identified, no specific mitigation measures were presented.

Preston Street Drainage Area Flooding Remediation Environmental Assessment Summary Report Addendum (November 2007)

This recent addendum issued on November 9 , 2007 addresses the mitigation of existing and future surface flooding risks near the Preston Street sag (near Anderson Street). The recommended solution, and the subject of this application, is to lower Plouffe Park (located to the north west of the Preston and Oak Street intersection) to provide storage of excess surface runoff. The proposed works would provide flooding relief for runoff events between the 1:10 and 1:50-yr return period.

2.2 Existing Conditions

The capacity of the existing minor and major drainage system along Preston Street (Carling Ave. to Albert St.) is deficient and there have been numerous reports of basement and surface flooding along Preston Street and a few of the side streets. The catchment area for the major surface drainage on Preston Street is approximately 70 ha and is roughly bounded by the railroad cut to the west, Bell Avenue to the east, Somerset Street to the north and Norman Street to the south (refer to **Figure 2-1**). The low-point north of Norman Street along Preston Street where excess surface runoff accumulates is located between Anderson and Oak Streets adjacent to the City owned Plouffe Park. An estimate of the current flooding extents along Preston Street for a 1:100-yr event is illustrated in **Figure 2-2**. The land use adjacent to the Preston Street profile sag can be described primarily as a mix of residential, commercial and parkland.

2.3 Preston Street Rehabilitation

In order to alleviate basement flooding, the City is upgrading the combined sewer for the segment between Carling Avenue and Spruce Street in combination with the implementation of inlet control devices in the catchbasins to limit sewer inflows to the 1:5-year level. Dual drainage and hydraulic assessments undertaken by the City indicate that such a combination would result in a higher minor system level of service than if these mitigation measures were implemented separately. While the implementation of inlet control devices do not lead to a worsening of the extent of surface flooding, they will not improve the existing situation.

In order to alleviate the extent and duration of surface flooding to some degree, the City intends to provide a high-level storm relief sewer which will drain the Preston Street profile sag, located in the vicinity of Anderson St., to a storm sewer and provide some in-line storage as well. This high-level storm relief sewer will increase the level of service to approximately the 1:10-yr event i.e. major surface drainage will be contained within the roadway right-of-way up to the 1:10-yr event. An estimate of the flooding extents along Preston Street with the implementation of the high-level sewer alone is illustrated in **Figure 2-3**. Current and future surface flooding extents do not meet current City of Ottawa design guidelines.

Note that the proposed infrastructure upgrades within the roadway right-of-ways, including the combined sewer upgrade, the high-level sewer and the inlet control devices, are currently under MOE review for Certificates of Approval for Sewage Works.

3 DESCRIPTION OF PROPOSED WORKS

In an effort to increase the level of service of the surface drainage beyond the 1:10-yr level being offered by the proposed high-level storm relief sewer, the City is proposing to lower the Plouffe Park playing fields in order to temporarily store excess surface runoff in an effort to prevent excessive flood levels within the Preston Street right-of-way and reduce the risk of flooding of private properties (refer to **Figure 3-1**).

The proposed works are presented on **Drawing No. SWM1** and include:

- Lowering of the Plouffe Park;
- Provision of an underdrain system for the fields; and,
- Provision of an outflow control device.

These works are described in more detail below.

As illustrated on the attached design **Drawing No. SWM1**, the surface runoff storage area will be provided by lowering the playing fields by an average depth of 0.7 m with the low points along the east and west edges having an elevation of 56.70m. Further lowering of the fields is not possible without compromising the size of the soccer fields or necessitating an extensive length of retaining walls. The field surfaces will be sloped at 0.5% toward the east and west with a ridge running in a north-south direction in the center of the area. The majority of the field edges will be sloped at 3H:1V slopes with portions of the south, east and west edges being provided with terraced retaining walls to provide seating area and to act as grade control.

An underdrain system in the form of “French drains” will be provided below the playing fields to ensure adequate drainage. 300 mm diameter perforated drains will collect the drainage from the “French drains” and from catchbasins located along the low edges of the fields and convey the flow to the high-level storm relief sewer running north along Preston Street. An orifice plate is proposed to control the outflow from the storage area to the high-level storm relief sewer.

4 DESIGN BASIS

4.1 Hydrologic and Hydraulic Modeling

4.1.1 Major System Drainage Assessment

A dual drainage hydrologic and hydraulic model was developed (DDSWMM release 2.1) for the sewershed as part of the Preston Street Drainage Area Study (Stantec, 2003). This model was updated as part of the Preston Street Drainage Area Flooding Remediation, Preliminary Design Report (Stantec, August 2004) and further refined as part of the ongoing Preston Street Rehabilitation Project between Carling Avenue and Albert Street. This refinement was undertaken in an effort to reflect recent and proposed road reconstruction activity within the study area and to better characterize street level flow during high intensity storm events. The intent of the proposed stormwater management plan is to limit sewer inflows throughout the sewershed to approximately the 5-year level in order to prevent

surcharging of the Preston St. Combined Trunk Sewer and reduce the associated risk of basement and surface flooding. Model input and output files are provided in **Attachment A**.

The criteria used for the DDSWMM model included selected catchbasin capture rates to achieve an average 1:5-year capture rate equivalent to the existing 1:5-year minor system capture rate of 102 L/s/ha for the area north of Carling Ave. and south of Spruce St. The inlet control rates were selected among preset control rates (6, 10, 15 and 20 L/sec) based on City accepted standard designs, rates lower than 15 L/sec are a vortex type ICD. The capture rates selected for catchbasins located along major arterials including Preston St. were set to 20 L/sec to ensure a high level of service. Prescribed inlet restriction rates are illustrated in **Attachment A**.

The dual drainage model indicates that the implementation of inlet control devices is not expected to result in significant increases in runoff flow depths on the streets for the frequent runoff events up to and including the 1:5-year event. It is estimated that approximately 5,400 and 7,400 m^3 of surface runoff (major drainage) reaches the Preston Street profile sag area when the catchment is subject to the 1:50 and the 1:100-yr rainfall events, respectively. These volumes are comparable to previous flooding estimates prepared for the City (Stantec, August 2004) where approximately half of the water in the sag originated from combined sewer breakout. Hence, the implementation of inlet control devices combined with the proposed Preston Street combined sewer upgrade is expected to provide for a net improvement in surface floodwater quality (i.e. no combined sewer breakout) and it is **not** expected to increase the volume of surface flooding at the sag area.

4.1.2 Hydraulic Analysis

In order to estimate the level of surface flooding to be expected, the major system hydrographs from the DDSWMM model and routed through the sag/high-level storm relief sewer and Plouffe Park storage facility using the HydroCAD software. Stage-area relationships for the roadway right-of-way and stage discharge curves for the flow from the roadway to the park were entered into the model along with the flow controls from the high-level sewer and park storage facility. This routing indicated that excess runoff is only expected to spill into the park storage facility for events with a recurrence interval greater than the 1:10-yr and that 1:50-yr events may be accommodated with reasonable amounts of surface flooding on Preston Street. **Attachment B** provides the 1:50-yr HydroCAD output which indicate that a peak discharge of 5.25m^3/sec reaches the street sags resulting in a flood elevation of approximately 57.30 m within the right-of-way. Refer to **Figure 4-1** for the estimated extent of flooding under future conditions. Approximately 1.0m^3/sec is evacuated from the sag by the high-level sewer via the Preston Street storm sewer (0.7m^3/sec) and the Booth St. sewer (0.3m^3/sec). Excess runoff spills to the Plouffe Park storage facility at a peak discharge of approximately 4.1m^3/sec. The maximum level reached in the storage facility is approximately 57.24 m for a peak storage volume of 2,425 m^3. The drawdown time is expected to be in the order of 8 hours for the 50-yr event.

The 1:100-yr event is expected to lead to flooding elevations in the sag area of approximately 57.45 m which may impact private property. Hence, the proposed storage facility will provide a 50-yr level of service against surface flooding. The drawdown time for the storage facility is expected to be in the order of 13 hours for the 1:100-yr event. Refer to **Figure 4-2** for the estimated extent of flooding under these conditions.

4.2 Collection System and Flow Control Orifice Sizing

The collection system proposed for the park field is designed to provide good drainage of the field during the spring snowmelt and for frequent rainfall events. The system is composed of a series of parallel "French drains" (300mm x 300 mm cross section at 8m spacing) and a perforated collection pipe around the west, north and east edge of the field. The collection piping discharges to the high-level storm relief sewer running along Preston Street. Catchbasins are provided along the perforated collection piping at the low edges of the field to evacuate surface runoff during rainfall and storage events. Each branch of the collection piping can convey approximately 60 L/s (300 mm diameter @ 0.35%) for a total flow of 120 L/sec into the manhole containing the outflow control orifice.

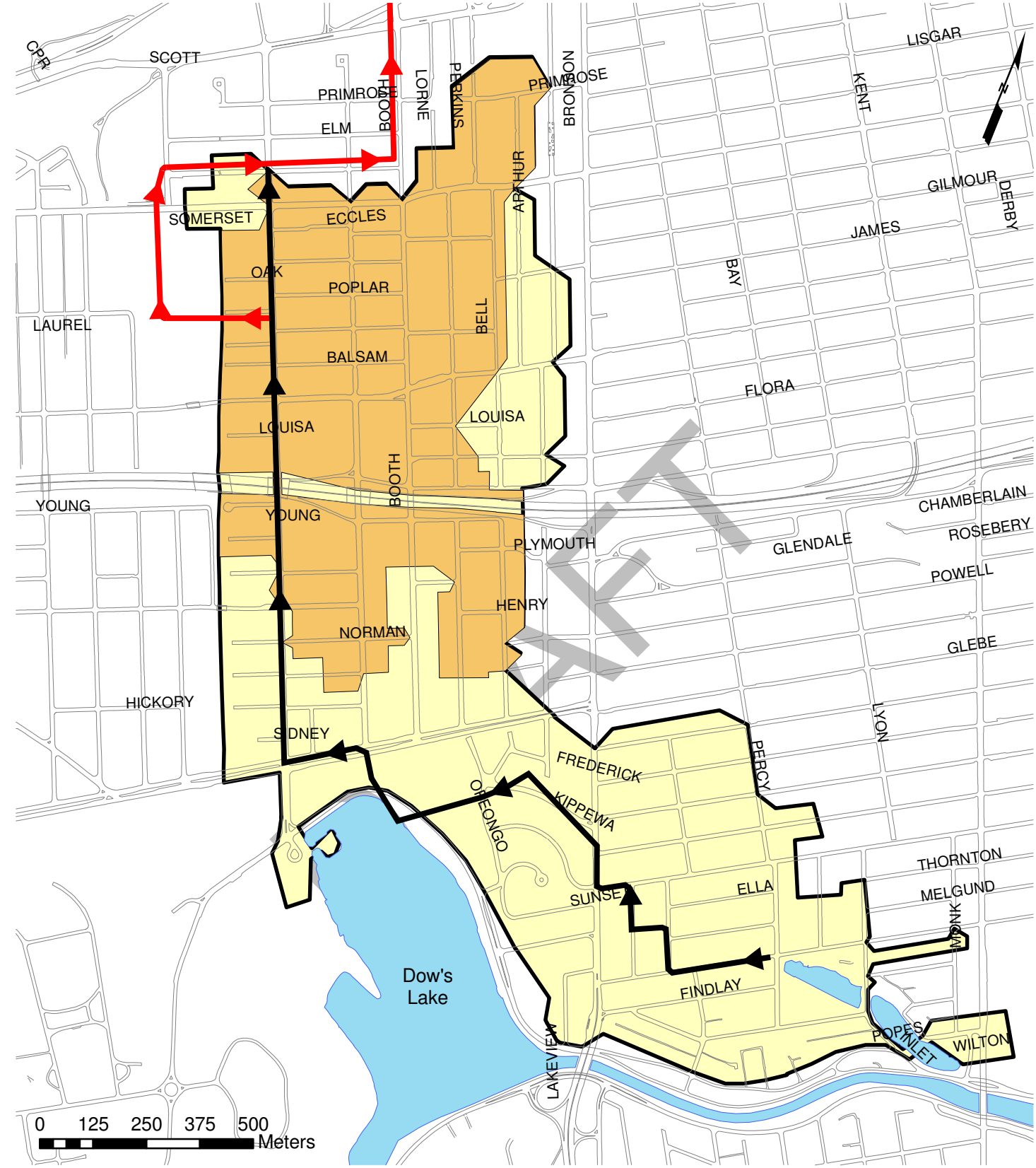
A 155 mm x 155 mm diamond shape orifice plate is proposed to control the outflow from the storage area to the high-level storm relief sewer. This orifice is sized to allow a relatively small outflow rate from the storage facility (approximately 100 L/sec under the design event) while providing reasonable dewatering times. **Attachment C** provides the rating curve for the outlet orifice. As mentioned previously, the estimated dewatering time for the 1:50-yr design event is 8 hours. It is also worth noting that a backflow valve has been specified at the outlet of the collection system at its interconnection with a new high-level storm relief sewer along Preston Street.

4.3 Design Issues

Due to the fact that large maintenance vehicles may access the playing field from time to time, French drains were selected for the underdrain system as opposed to the traditional perforated pipe systems. The French drains were sized to provide an equivalent void end area to that of a 100 mm diameter pipe.

5 MITIGATION MEASURES DURING CONSTRUCTION

The contract documents will stipulate that sediment and erosion control will be the responsibility of the Contractor. The Contractor, prior to carrying out the proposed works, shall implement erosion control measures. The Contractor will be required to submit to the Contract Administrator for review a detailed staging and sediment control plan indicating how he intends to control site runoff and secure the site against erosion. The submission will also ensure that the contractor has a complete understanding of the contract requirements. Contract specifications will indicate that exposed grading shall be protected against erosion.



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Legend

- Preston St Combined Sewer
- Booth St Combined Sewer
- Major Drainage Area to Preston Street Sag
- Preston St Sewer Drainage Area

Stantec

Client/Project
CITY OF OTTAWA
PLOUFFE PARK
STORMWATER STORAGE FACILITY

Figure No.
2-1

Title
Drainage Area Plan

January 2008
1636-00597

Figure 2-2: Current and Future (do nothing) estimated flooding extents along Preston St. for 1:100-yr event

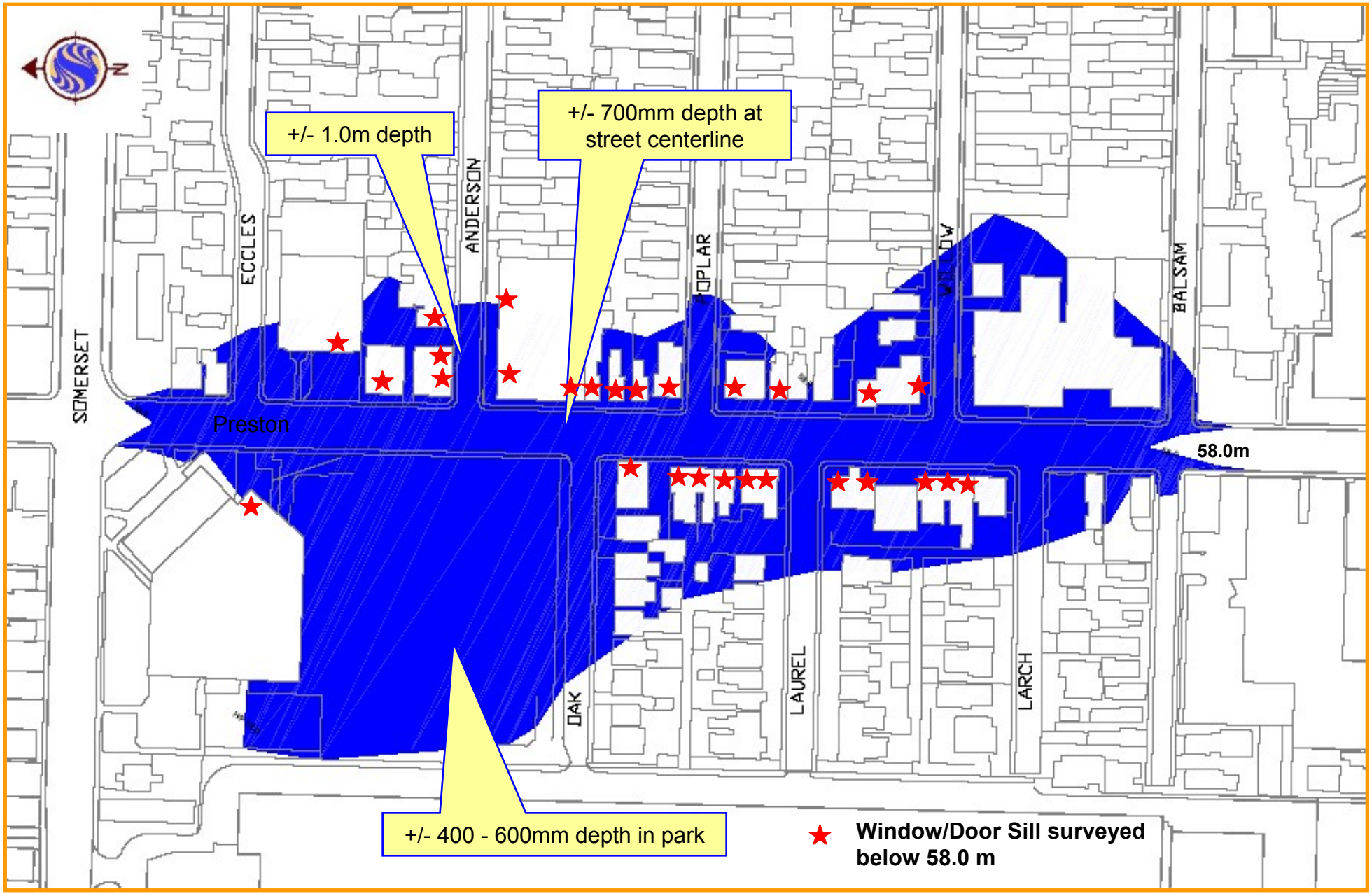


Figure 2-3: Future estimated flooding extents along Preston St. for 1:100-yr event with high-level storm relief sewer to Preston and Booth St. sewers and no surface storage facility

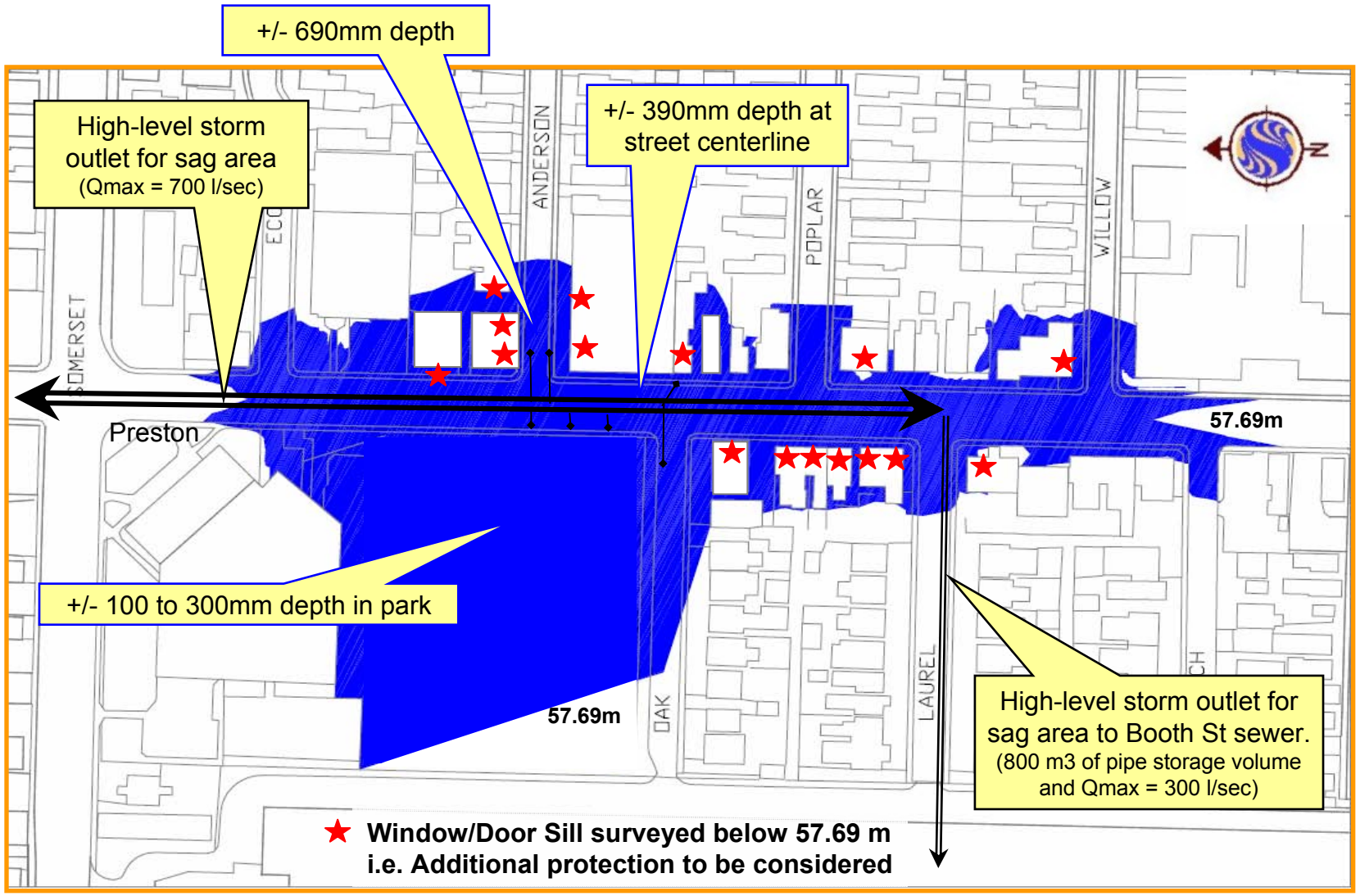


Figure 3-1: Proposed Stormwater Storage Facility

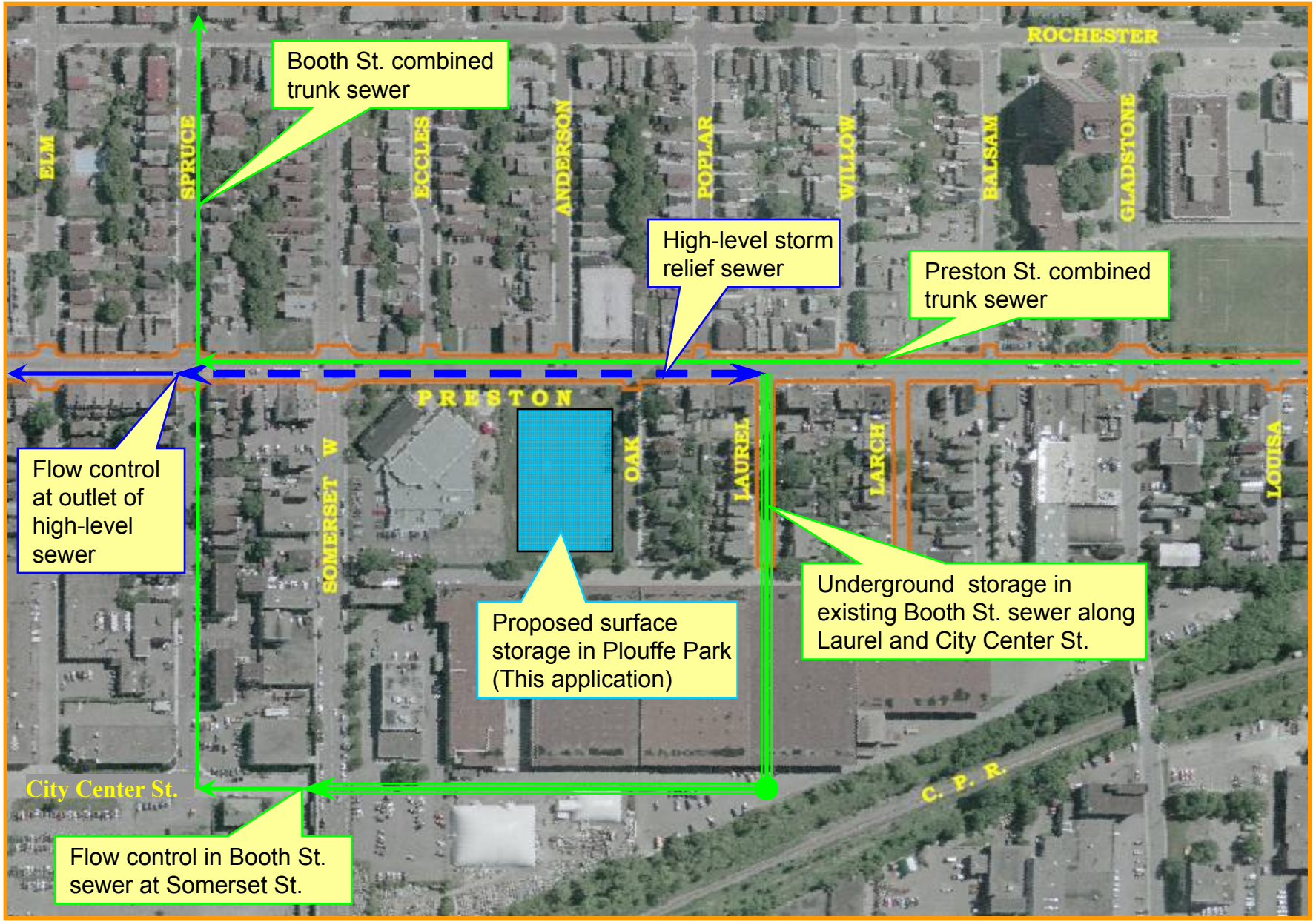


Figure 4-1: Future estimated flooding extents along Preston St. for 1:50-yr event with high-level sewer to Preston and Booth St. sewers and surface storage in park

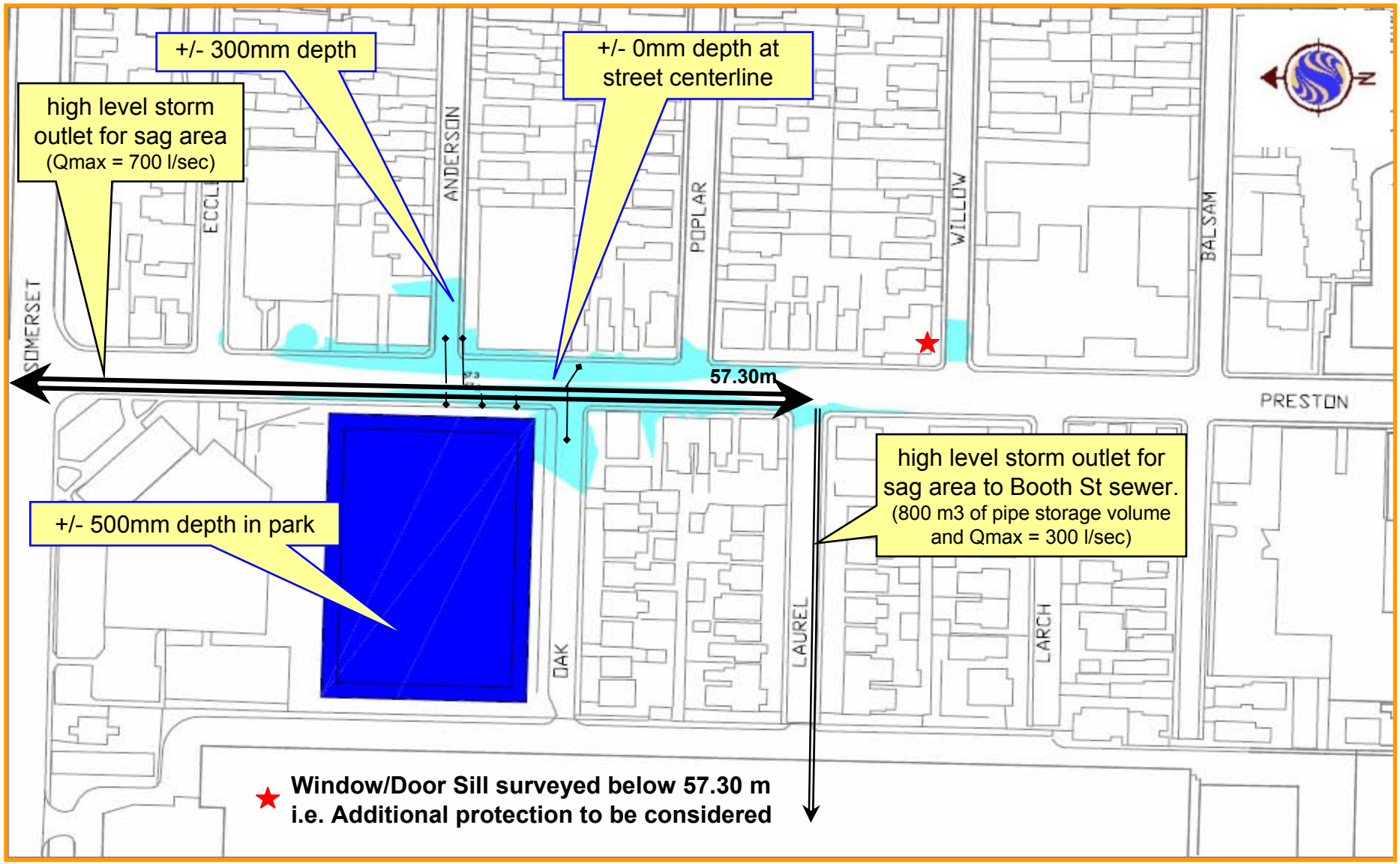
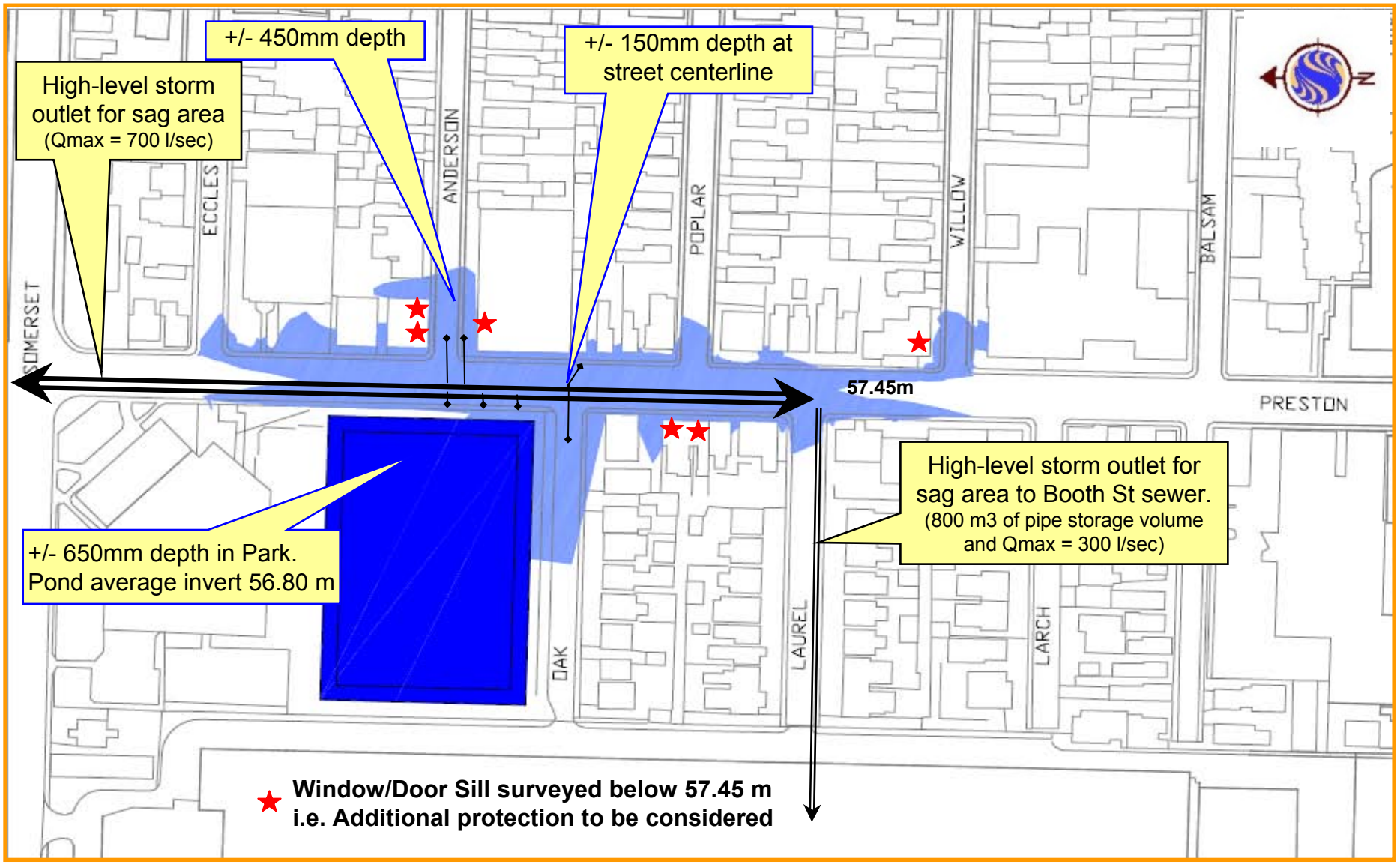
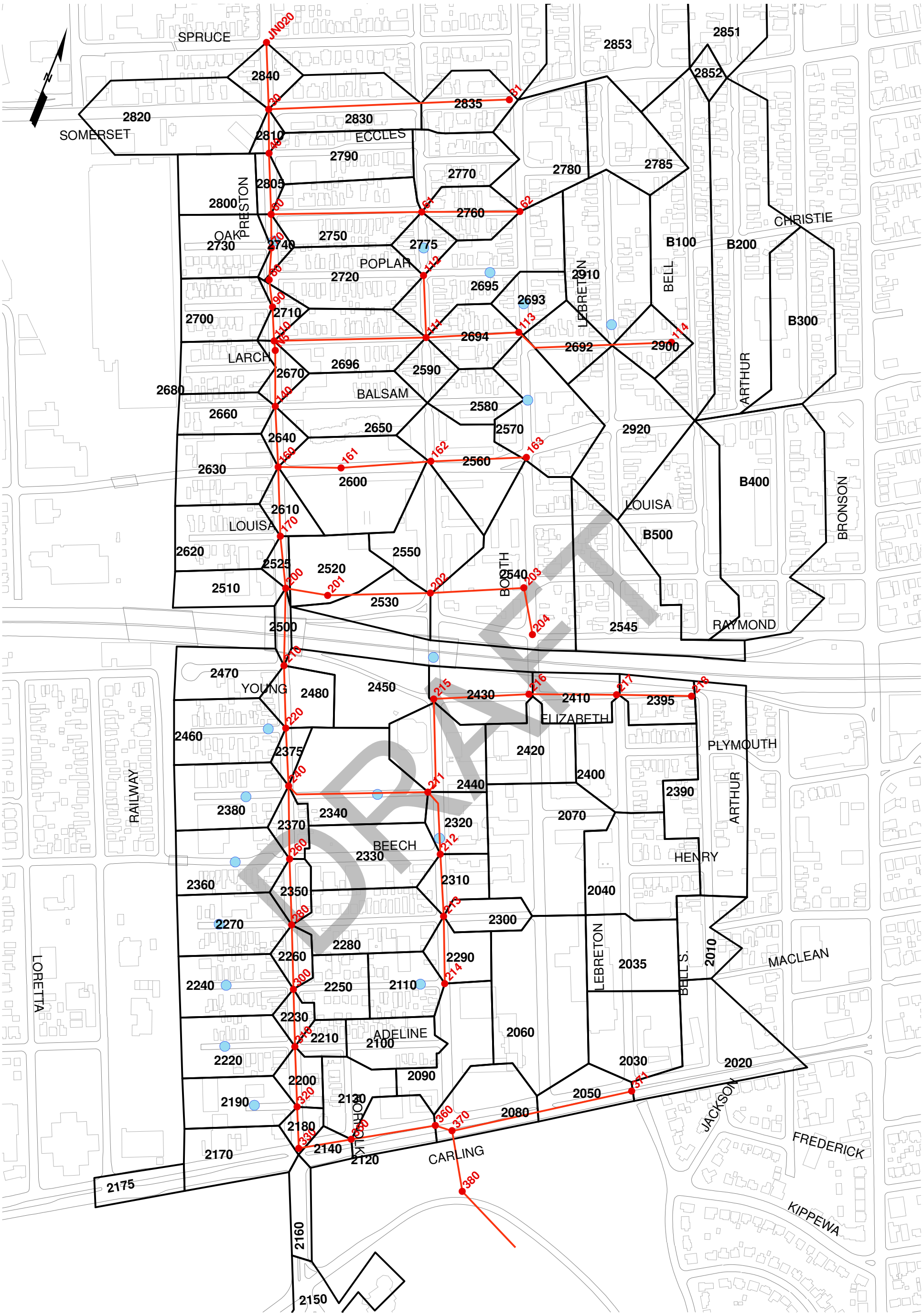


Figure 4-2: Future estimated flooding extents along Preston St. for 1:100-yr event with high-level sewer to Preston and Booth St. sewers and surface storage in park





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Legend

- Maintenance Hole (Modeled)
- Sewer (Modeled)
- DDSWMM Ponding Area
- DDSWMM Subarea

Stantec

Client/Project

CITY OF OTTAWA
PRESTON STREET REHABILITATION
PRELIMINARY DESIGN REPORT

Figure No.

1

Title

Revised DDSWMM System

May 2007
1636-00597

Appendix D STORMWATER MANAGEMENT

D.1 FUNCTIONAL STORM SEWER DESIGN SHEET

Stantec

Gladstone Village - 933 Gladstone Avenue

DATE: 2021-04-13
REVISION: 2
DESIGNED BY: WAJ
CHECKED BY: AMP

STORM SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401614
Functional Storm Sewer Design for Draft Plan

DESIGN PARAMETERS

$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013 BEDDING CLASS = B
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min

LOCATION			DRAINAGE AREA																					PIPE SELECTION											
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETE (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
	107	106	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	2000.0	2000.0	2000.0	31.4	1350	1350	CIRCULAR	CONCRETE	100-D	0.30	3049.8	**65.58%**	2.06	1.92	0.27
L106B, L106A	106	105	0.41	0.00	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.321	0.321	0.000	0.000	0.000	0.000	0.000	0.000	10.27	75.77	102.77	120.47	176.10	0.0	2000.0	2067.6	120.3	1350	1350	CIRCULAR	CONCRETE	100-D	0.30	3049.8	**67.80%**	2.06	1.93	1.04
L105B, L105A	105	104	0.58	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00	0.478	0.799	0.000	0.000	0.000	0.000	0.000	0.000	11.31	72.11	97.74	114.55	167.40	0.0	2000.0	2160.2	55.7	1350	1350	CIRCULAR	CONCRETE	100-D	0.30	3049.8	**70.83%**	2.06	1.96	0.47
L104C, L104A, L104B	104	103	0.45	0.00	0.00	0.00	0.00	0.81	0.00	0.00	0.00	0.360	1.160	0.000	0.000	0.000	0.000	0.000	0.000	11.78	70.57	95.63	112.05	163.74	0.0	2000.0	2227.4	78.4	1350	1350	CIRCULAR	CONCRETE	100-D	0.30	3049.8	**73.03%**	2.06	1.99	0.66
													12.44																									
L109B, L109A, L109C, L109D	109	103	0.46	0.00	0.00	0.00	0.00	0.77	0.00	0.00	0.00	0.354	0.354	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	75.6	43.1	375	375	CIRCULAR	PVC	SDR 35	0.50	116.6	**64.84%**	1.11	1.02	0.70
													10.70																									
L103A, L103C, L103B	103	102	0.84	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00	0.691	2.205	0.000	0.000	0.000	0.000	0.000	0.000	12.44	68.55	92.85	108.78	158.94	0.0	2000.0	2419.9	82.6	1650	1650	CIRCULAR	CONCRETE	100-D	0.30	5208.0	**46.46%**	2.36	1.98	0.70
													13.14																									
L108B, L108A, L108C, L108D	108	102	0.49	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.364	0.364	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	77.8	43.6	375	375	CIRCULAR	PVC	SDR 35	0.50	116.6	**66.71%**	1.11	1.03	0.70
													10.70																									
	102	101	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	2.570	0.000	0.000	0.000	0.000	0.000	0.000	13.14	66.54	90.10	105.55	154.19	0.0	2000.0	2475.0	12.1	1650	1650	CIRCULAR	CONCRETE	100-D	0.30	5208.0	**47.52%**	2.36	1.98	0.10
	101	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	2.570	0.000	0.000	0.000	0.000	0.000	0.000	13.24	66.26	89.71	105.09	153.52	0.0	2000.0	2473.0	82.8	1650	1650	CIRCULAR	CONCRETE	100-D	0.30	5208.0	**47.48%**	2.36	1.98	0.70
													13.94																1650	1650								

Note:
1. Based on correspondence with City of Ottawa staff, a constant upstream peak flow of 2 cms from the Nepean storm sewer has been included to assess the conveyance capacity of the proposed trunk storm sewer.

D.2 MODIFIED RATIONAL METHOD CALCULATIONS

Stormwater Management Calculations

File No: **160401614**
Project: **933 Gladstone Avenue - Gladstone Village OCH**
Date: **15-Apr-21**

SWM Approach:
Restrict 100-year peak flows from entire site to 411.2 L/s/ (128.1 L/s/ha)

Post-Development Site Conditions:

Overall Runoff Coefficient for Site and Sub-Catchment Areas

Runoff Coefficient Table

Catchment Type	Sub-catchment Area ID / Description		Area (ha) "A"		Runoff Coefficient "C"	"A x C"		Overall Runoff Coefficient
Tributary to Cistern Block 1	L106B - UNC	Hard	0.005		0.9	0.00		
Block 1		Soft	0.015		0.2	0.00		
	Subtotal			0.02			0.01	0.38
Controlled Roof	L106B -Roof	Hard	0.190		0.9	0.17		
Block 1		Soft	0.000		0.2	0.00		
	Subtotal			0.19			0.17	0.90
Tributary to Cistern Block 2	L105B - UNC	Hard	0.260		0.9	0.23		
Block 2		Soft	0.034		0.2	0.01		
	Subtotal			0.29			0.24	0.82
Controlled Roof	L105B - Roof	Hard	0.176		0.9	0.16		
Block 2		Soft	0.000		0.2	0.00		
	Subtotal			0.18			0.16	0.90
Tributary to Preston Street	L104C - UNC	Hard	0.019		0.9	0.02		
Block 3		Soft	0.001		0.2	0.00		
	Subtotal			0.02			0.017	0.85
Tributary to Cistern Block 4	L104B - UNC	Hard	0.128		0.9	0.12		
Block 4		Soft	0.021		0.2	0.00		
	Subtotal			0.15			0.12	0.80
Controlled Roof	L104B - Roof	Hard	0.151		0.9	0.14		
Block 4		Soft	0.000		0.2	0.00		
	Subtotal			0.15			0.14	0.90
Tributary to Preston Street	L103C - UNC	Hard	0.065		0.9	0.06		
Block 5		Soft	0.005		0.2	0.00		
	Subtotal			0.07			0.06	0.85
Tributary to Cistern Block 6	L103B - UNC	Hard	0.360		0.9	0.32		
Block 6		Soft	0.044		0.2	0.01		
	Subtotal			0.40			0.33	0.82
Controlled Roof	L103B - Roof	Hard	0.216		0.9	0.19		
Block 6		Soft	0.000		0.2	0.00		
	Subtotal			0.22			0.19	0.90
Tributary to Cistern Block 7	L108D - UNC	Hard	0.120		0.9	0.11		
Block 7		Soft	0.020		0.2	0.00		
	Subtotal			0.14			0.11	0.80
Tributary to Underground Storage	L108B - UNC	Hard	0.090		0.9	0.08		
Block 8 (To Block 12)		Soft	0.050		0.2	0.01		
	Subtotal			0.14			0.091	0.65
Tributary to Prestion Street	L109A - UNC	Hard	0.065		0.9	0.06		
Block 9		Soft	0.005		0.2	0.00		
	Subtotal			0.07			0.06	0.85
Tributary to Underground Storage	L109B - UNC	Hard	0.096		0.9	0.09		
Block 10 (To Block 13)		Soft	0.054		0.2	0.01		
	Subtotal			0.15			0.10	0.65
Tributary to Cistern Block 11	L109D - UNC	Hard	0.120		0.9	0.11		
Block 11		Soft	0.020		0.2	0.00		
	Subtotal			0.14			0.11	0.80
Tributary to Underground Storage	L108C - UNC	Hard	0.084		0.9	0.08		
Block 12		Soft	0.006		0.2	0.00		
	Subtotal			0.09			0.08	0.85
Tributary to Underground Stroage	L109C - UNC	Hard	0.084		0.9	0.08		
Block 13		Soft	0.006		0.2	0.00		
	Subtotal			0.09			0.08	0.85
Tributary to Preston Street	L106A - UNC	Hard	0.143		0.9	0.13		
Street 4		Soft	0.057		0.2	0.01		
	Subtotal			0.20			0.14	0.70
Tributary to Preston Street	L105A - UNC	Hard	0.079		0.9	0.07		
Street 3		Soft	0.031		0.2	0.01		
	Subtotal			0.11			0.08	0.70
Tributary to Preston Street	L104A - UNC	Hard	0.093		0.9	0.08		
Street 2		Soft	0.037		0.2	0.01		
	Subtotal			0.13			0.09	0.70
Tributary to Preston Street	L103A - UNC	Hard	0.107		0.9	0.10		
Street 2		Soft	0.043		0.2	0.01		
	Subtotal			0.15			0.11	0.70
Tributary to Preston Street	L108A - UNC	Hard	0.079		0.9	0.07		
Street 1		Soft	0.031		0.2	0.01		
	Subtotal			0.11			0.08	0.70
Total				**3.210**			**2.552**	
Overall Runoff Coefficient= C:								**0.79**

Total Block 1 (Roof Storage & Cistern)	0.21	**ha**
Total Block 2 (Roof Storage & Cistern)	0.47	**ha**
Total Block 3 (Underground Storage)	0.02	**ha**
Total Block 4 (Roof Storage & Cistern)	0.30	**ha**
Total Block 5 (Underground Storage)	0.07	**ha**
Total Block 6 (Roof Storage & Cistern)	0.62	**ha**
Total Block 7 (Cistern)	0.14	**ha**
Total Block 8 (Cistern)	0.14	**ha**
Total Block 9 (Underground Storage)	0.07	**ha**
Total Block 10 (Cistern)	0.15	**ha**
Total Block 11 (Cistern)	0.14	**ha**
Total Block 12 (Cistern)	0.09	**ha**
Total Block 13 (Cistern)	0.09	**ha**
Street 1	0.11	**ha**
Street 2 (L103A)	0.15	**ha**
Street 2 (L104A)	0.13	**ha**
Street 3	0.11	**ha**
Street 4	0.20	**ha**
Total Site	**3.210**	**ha**

Stormwater Management Calculations

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Modified Rational Method Calculatons for Storage

2 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	732.951
b =	6.199
c =	0.81

t (min)	I (mm/hr)
10	76.81
20	52.03
30	40.04
40	32.86
50	28.04
60	24.56
70	21.91
80	19.83
90	18.14
100	16.75
110	15.57
120	14.56

2 YEAR Predevelopment Target Release from Portion of Site

Restrict Sanitary Peak Flows and 100-year peak flows from entire site to 2-year pre-development with C of 0.60

Area (ha): 3.2100
C: 0.60

tc (min)	I (2 yr) (mm/hr)	Q2-yr (L/s)	Qall (L/s)
10	76.81	411.2	**411.2**

128.1 L/s/ha

2 YEAR Modified Rational Method for Entire Site

Subdrainage Area: L106B - UNC Block 1
Area (ha): 0.02 Tributary to Cistern Block 1
C: 0.38

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	1.64	1.64		
20	52.03	1.11	1.11		
30	40.04	0.85	0.85		
40	32.86	0.70	0.70		
50	28.04	0.60	0.60		
60	24.56	0.52	0.52		
70	21.91	0.47	0.47		
80	19.83	0.42	0.42		
90	18.14	0.39	0.39		
100	16.75	0.36	0.36		
110	15.57	0.33	0.33		
120	14.56	0.31	0.31		

Subdrainage Area: L106B -Roof Controlled Roof
Area (ha): 0.19 Maximum Storage Depth: 150 mm
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	76.81	36.5	7.1	29.4	17.6	90.6	0.00
20	52.03	24.7	7.5	17.2	20.7	96.5	0.00
30	40.04	19.0	7.5	11.5	20.7	**96.6**	0.00
40	32.86	15.6	7.4	8.2	19.7	94.7	0.00
50	28.04	13.3	7.2	6.1	18.3	92.0	0.00
60	24.56	11.7	7.0	4.7	16.8	89.0	0.00
70	21.91	10.4	6.8	3.6	15.2	85.9	0.00
80	19.83	9.4	6.6	2.8	13.6	82.8	0.00
90	18.14	8.6	6.4	2.2	12.0	79.8	0.00
100	16.75	8.0	6.2	1.8	10.5	77.0	0.00
110	15.57	7.4	6.0	1.4	9.2	73.9	0.00
120	14.56	6.9	5.8	1.1	8.3	70.4	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
2-year Water Level	96.6	0.10	7.5	20.7	75.9	0.0

Subdrainage Area: Block 1 Tributary to Internal Cistern (L106B)
Area (ha): 0.210 **Allowable Release Rate: 26.90 L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	
10	76.81	8.75	**8.75**	0.00	0.00	0 m^3/ha
20	52.03	8.61	8.61	0.00	0.00	
30	40.04	8.36	8.36	0.00	0.00	
40	32.86	8.08	8.08	0.00	0.00	
50	28.04	7.80	7.80	0.00	0.00	
60	24.56	7.53	7.53	0.00	0.00	
70	21.91	7.26	7.26	0.00	0.00	
80	19.83	7.01	7.01	0.00	0.00	
90	18.14	6.78	6.78	0.00	0.00	
100	16.75	6.56	6.56	0.00	0.00	
110	15.57	6.33	6.33	0.00	0.00	
120	14.56	6.08	6.08	0.00	0.00	

Subdrainage Area: L105B - UNC Block 2
Area (ha): 0.29 Tributary to Cistern Block 2
C: 0.82

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	51.5	51.5		
20	52.03	34.9	34.9		
30	40.04	26.8	26.8		
40	32.86	22.0	22.0		
50	28.04	18.8	18.8		
60	24.56	16.5	16.5		
70	21.91	14.7	14.7		
80	19.83	13.3	13.3		
90	18.14	12.2	12.2		
100	16.75	11.2	11.2		
110	15.57	10.4	10.4		
120	14.56	9.8	9.8		

Subdrainage Area: L105B - Roof Controlled Roof
Area (ha): 0.18 Maximum Storage Depth: 150 mm
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	76.81	33.84	7.07	26.77	16.06	90.0	0.00
20	52.03	22.93	7.42	15.51	18.61	**95.3**	0.00
30	40.04	17.64	7.40	10.25	18.45	95.0	0.00
40	32.86	14.48	7.25	7.23	17.36	92.7	0.00
50	28.04	12.35	7.05	5.31	15.92	89.7	0.00
60	24.56	10.82	6.83	3.99	14.35	86.5	0.00
70	21.91	9.65	6.62	3.04	12.76	83.2	0.00
80	19.83	8.74	6.40	2.33	11.21	80.0	0.00
90	18.14	7.99	6.20	1.80	9.71	76.9	0.00
100	16.75	7.38	5.97	1.41	8.43	73.5	0.00
110	15.57	6.86	5.72	1.14	7.50	69.7	0.00
120	14.56	6.42	5.49	0.92	6.64	66.3	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
2-year Water Level	95.3	0.10	7.4	18.6	70.4	0.0

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Modified Rational Method Calculatons for Storage

100 yr Intensity
City of Ottawa

$I = a/(t + b)^c$

a =	1735.688
b =	6.014
c =	0.820

t (min)	I (mm/hr)
10	178.56
20	119.95
30	91.87
40	75.15
50	63.95
60	55.89
70	49.79
80	44.99
90	41.11
100	37.90
110	35.20
120	32.89

100 YEAR Modified Rational Method for Entire Site

Subdrainage Area: L106B - UNC Block 1
Area (ha): 0.02 Tributary to Cistern Block 1
C: 0.48

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	4.77	4.77		
20	119.95	3.20	3.20		
30	91.87	2.45	2.45		
40	75.15	2.01	2.01		
50	63.95	1.71	1.71		
60	55.89	1.49	1.49		
70	49.79	1.33	1.33		
80	44.99	1.20	1.20		
90	41.11	1.10	1.10		
100	37.90	1.01	1.01		
110	35.20	0.94	0.94		
120	32.89	0.88	0.88		

Subdrainage Area: L106B -Roof Controlled Roof
Area (ha): 0.19 Maximum Storage Depth: 150 mm
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	178.56	94.2	9.7	84.5	50.7	130.3	0.00
20	119.95	63.3	10.4	52.9	63.5	140.3	0.00
30	91.87	48.5	10.6	37.8	68.1	143.9	0.00
40	75.15	39.6	10.7	28.9	69.5	**145.0**	0.00
50	63.95	33.7	10.7	23.1	69.2	144.7	0.00
60	55.89	29.5	10.6	18.9	67.9	143.7	0.00
70	49.79	26.3	10.5	15.7	66.1	142.3	0.00
80	44.99	23.7	10.4	13.3	63.9	140.6	0.00
90	41.11	21.7	10.3	11.4	61.5	138.8	0.00
100	37.90	20.0	10.2	9.8	59.0	136.8	0.00
110	35.20	18.6	10.0	8.5	56.4	134.7	0.00
120	32.89	17.4	9.9	7.5	53.7	132.7	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	145.0	0.14	10.7	69.5	75.9	0.0

Subdrainage Area: Block 1 Tributary to Internal Cistern (L106B)
Area (ha): 0.210

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	
10	178.56	14.50	**14.50**	0.00	0.00	0 m^3/ha
20	119.95	13.60	13.60	0.00	0.00	
30	91.87	13.09	13.09	0.00	0.00	
40	75.15	12.71	12.71	0.00	0.00	
50	63.95	12.40	12.40	0.00	0.00	
60	55.89	12.12	12.12	0.00	0.00	
70	49.79	11.86	11.86	0.00	0.00	
80	44.99	11.62	11.62	0.00	0.00	
90	41.11	11.39	11.39	0.00	0.00	
100	37.90	11.18	11.18	0.00	0.00	
110	35.20	10.97	10.97	0.00	0.00	
120	32.89	10.77	10.77	0.00	0.00	

Subdrainage Area: L105B - UNC Block 2
Area (ha): 0.29 Tributary to Cistern Block 2
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	145.9	145.9		
20	119.95	98.0	98.0		
30	91.87	75.1	75.1		
40	75.15	61.4	61.4		
50	63.95	52.3	52.3		
60	55.89	45.7	45.7		
70	49.79	40.7	40.7		
80	44.99	36.8	36.8		
90	41.11	33.6	33.6		
100	37.90	31.0	31.0		
110	35.20	28.8	28.8		
120	32.89	26.9	26.9		

Subdrainage Area: L105B - Roof Controlled Roof
Area (ha): 0.18 Maximum Storage Depth: 150 mm
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	178.56	87.4	9.7	77.7	46.6	129.9	0.00
20	119.95	58.7	10.3	48.4	58.0	139.6	0.00
30	91.87	45.0	10.6	34.4	61.9	142.8	0.00
40	75.15	36.8	10.6	26.2	62.8	**143.6**	0.00
50	63.95	31.3	10.6	20.7	62.2	143.0	0.00
60	55.89	27.4	10.5	16.9	60.7	141.8	0.00
70	49.79	24.4	10.4	14.0	58.7	140.1	0.00
80	44.99	22.0	10.3	11.8	56.5	138.2	0.00
90	41.11	20.1	10.1	10.0	54.0	136.2	0.00
100	37.90	18.6	10.0	8.6	51.4	134.0	0.00
110	35.20	17.2	9.8	7.4	48.8	131.8	0.00
120	32.89	16.1	9.7	6.4	46.2	129.6	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	143.6	0.14	10.6	62.8	70.4	0.0

Stormwater Management Calculations

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Modified Rational Method Calculatons for Storage

Subdrainage Area: Block 2 Tributary to Internal Cistern (L105B)
Area (ha): 0.470 **Allowable Release Rate: 60.21 L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	58.53	**58.53**	0.00	**0.00**
20	52.03	42.28	42.28	0.00	0.00
30	40.04	34.23	34.23	0.00	0.00
40	32.86	29.27	29.27	0.00	0.00
50	28.04	25.84	25.84	0.00	0.00
60	24.56	23.29	23.29	0.00	0.00
70	21.91	21.30	21.30	0.00	0.00
80	19.83	19.69	19.69	0.00	0.00
90	18.14	18.35	18.35	0.00	0.00
100	16.75	17.19	17.19	0.00	0.00
110	15.57	16.15	16.15	0.00	0.00
120	14.56	15.25	15.25	0.00	0.00

0 m^3/ha

Subdrainage Area: L104C - UNC Block 3
Area (ha): 0.02 Tributary to Preston Street
C: 0.85 **Allowable Release Rate: 2.56 L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	76.81	3.63	**2.56**
20	52.03	2.46	2.46
30	40.04	1.89	1.89
40	32.86	1.55	1.55
50	28.04	1.33	1.33
60	24.56	1.16	1.16
70	21.91	1.04	1.04
80	19.83	0.94	0.94
90	18.14	0.86	0.86
100	16.75	0.79	0.79
110	15.57	0.74	0.74
120	14.56	0.69	0.69

Subdrainage Area: L104B - UNC Block 4
Area (ha): 0.15 Tributary to Cistern Block 4
C: 0.80

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	25.5	25.5		
20	52.03	17.3	17.3		
30	40.04	13.3	13.3		
40	32.86	10.9	10.9		
50	28.04	9.3	9.3		
60	24.56	8.2	8.2		
70	21.91	7.3	7.3		
80	19.83	6.6	6.6		
90	18.14	6.0	6.0		
100	16.75	5.6	5.6		
110	15.57	5.2	5.2		
120	14.56	4.8	4.8		

Subdrainage Area: L104B - Roof Controlled Roof
Area (ha): 0.15 Maximum Storage Depth: 150 mm
C: 0.90

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	76.81	28.9	5.3	23.6	14.1	91.1	0.00
20	52.03	19.6	5.6	14.0	16.8	97.5	0.00
30	40.04	15.1	5.6	9.5	17.1	**98.1**	0.00
40	32.86	12.4	5.5	6.8	16.4	96.5	0.00
50	28.04	10.6	5.4	5.1	15.3	93.9	0.00
60	24.56	9.2	5.3	3.9	14.1	90.9	0.00
70	21.91	8.3	5.2	3.0	12.8	87.7	0.00
80	19.83	7.5	5.1	2.4	11.4	84.4	0.00
90	18.14	6.8	5.0	1.9	10.1	81.2	0.00
100	16.75	6.3	4.8	1.5	8.8	78.0	0.00
110	15.57	5.9	4.7	1.1	7.5	74.9	0.00
120	14.56	5.5	4.6	0.9	6.6	70.6	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
2-year Water Level	98.1	0.10	5.6	17.1	60.2	0.0

Subdrainage Area: Block 4 Tributary to Internal Cistern (L104B)
Area (ha): 0.300 **Allowable Release Rate: 38.43 L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	30.87	**30.87**	0.00	**0.00**
20	52.03	22.88	22.88	0.00	0.00
30	40.04	18.91	18.91	0.00	0.00
40	32.86	16.47	16.47	0.00	0.00
50	28.04	14.77	14.77	0.00	0.00
60	24.56	13.50	13.50	0.00	0.00
70	21.91	12.50	12.50	0.00	0.00
80	19.83	11.68	11.68	0.00	0.00
90	18.14	11.00	11.00	0.00	0.00
100	16.75	10.41	10.41	0.00	0.00
110	15.57	9.90	9.90	0.00	0.00
120	14.56	9.41	9.41	0.00	0.00

0 m^3/ha

Subdrainage Area: L103C - UNC Block 5
Area (ha): 0.07 Tributary to Preston Street
C: 0.85 **Allowable Release Rate: 8.97 L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	76.81	12.70	**8.97**
20	52.03	8.61	8.61
30	40.04	6.62	6.62
40	32.86	5.44	5.44
50	28.04	4.64	4.64
60	24.56	4.06	4.06
70	21.91	3.62	3.62
80	19.83	3.28	3.28
90	18.14	3.00	3.00
100	16.75	2.77	2.77
110	15.57	2.58	2.58
120	14.56	2.41	2.41

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Modified Rational Method Calculatons for Storage

Subdrainage Area: Block 2 Tributary to Internal Cistern (L105B)
Area (ha): 0.470

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	155.60	60.21	95.39	57.23
20	119.95	108.35	**60.21**	48.14	**57.77**
30	91.87	85.63	60.21	25.41	45.75
40	75.15	72.01	60.21	11.80	28.32
50	63.95	62.83	60.21	2.62	7.86
60	55.89	56.17	56.17	0.00	0.00
70	49.79	51.07	51.07	0.00	0.00
80	44.99	47.02	47.02	0.00	0.00
90	41.11	43.71	43.71	0.00	0.00
100	37.90	40.95	40.95	0.00	0.00
110	35.20	38.60	38.60	0.00	0.00
120	32.89	36.56	36.56	0.00	0.00

123 m^3/ha

Subdrainage Area: L104C - UNC Block 3
Area (ha): 0.02 Tributary to Preston Street
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	178.56	9.93	**2.56**
20	119.95	6.67	2.56
30	91.87	5.11	2.56
40	75.15	4.18	2.56
50	63.95	3.56	2.56
60	55.89	3.11	2.56
70	49.79	2.77	2.56
80	44.99	2.50	2.50
90	41.11	2.29	2.29
100	37.90	2.11	2.11
110	35.20	1.96	1.96
120	32.89	1.83	1.83

Subdrainage Area: L104B - UNC Block 4
Area (ha): 0.15 Tributary to Cistern Block 4
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	74.2	74.2		
20	119.95	49.8	49.8		
30	91.87	38.2	38.2		
40	75.15	31.2	31.2		
50	63.95	26.6	26.6		
60	55.89	23.2	23.2		
70	49.79	20.7	20.7		
80	44.99	18.7	18.7		
90	41.11	17.1	17.1		
100	37.90	15.7	15.7		
110	35.20	14.6	14.6		
120	32.89	13.7	13.7		

Subdrainage Area: L104B - Roof Controlled Roof
Area (ha): 0.15 Maximum Storage Depth: 150 mm
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	178.56	74.7	6.8	67.9	40.7	130.8	0.00
20	119.95	50.2	7.2	42.9	51.5	141.5	0.00
30	91.87	38.4	7.4	31.0	55.9	145.7	0.00
40	75.15	31.4	7.5	24.0	57.5	147.4	0.00
50	63.95	26.8	7.5	19.3	57.8	**147.7**	0.00
60	55.89	23.4	7.5	15.9	57.3	147.2	0.00
70	49.79	20.8	7.4	13.4	56.3	146.2	0.00
80	44.99	18.8	7.4	11.4	55.0	144.8	0.00
90	41.11	17.2	7.3	9.9	53.4	143.3	0.00
100	37.90	15.9	7.3	8.6	51.6	141.6	0.00
110	35.20	14.7	7.2	7.5	49.8	139.7	0.00
120	32.89	13.8	7.1	6.7	47.9	137.9	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	147.7	0.15	7.5	57.8	60.2	0.0

Subdrainage Area: Block 4 Tributary to Internal Cistern (L104B)
Area (ha): 0.300

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	81.02	38.43	42.59	25.55
20	119.95	57.08	**38.43**	18.65	**22.37**
30	91.87	45.57	38.43	7.14	12.85
40	75.15	38.69	38.43	0.26	0.61
50	63.95	34.05	34.05	0.00	0.00
60	55.89	30.68	30.68	0.00	0.00
70	49.79	28.11	28.11	0.00	0.00
80	44.99	26.07	26.07	0.00	0.00
90	41.11	24.40	24.40	0.00	0.00
100	37.90	23.00	23.00	0.00	0.00
110	35.20	21.81	21.81	0.00	0.00
120	32.89	20.78	20.78	0.00	0.00

75 m^3/ha

Subdrainage Area: L103C - UNC Block 5
Area (ha): 0.07 Tributary to Preston Street
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	178.56	34.75	8.97
20	119.95	23.34	**8.97**
30	91.87	17.88	8.97
40	75.15	14.62	8.97
50	63.95	12.45	8.97
60	55.89	10.88	8.97
70	49.79	9.69	8.97
80	44.99	8.76	8.76
90	41.11	8.00	8.00
100	37.90	7.38	7.38
110	35.20	6.85	6.85
120	32.89	6.40	6.40

Stormwater Management Calculations

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Modified Rational Method Calculatons for Storage

Subdrainage Area: **L103B - UNC** — Block 6
Area (ha): **0.40** — Tributary to Cistern Block 6
C: **0.82**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	71.0	71.0		
20	52.03	48.1	48.1		
30	40.04	37.0	37.0		
40	32.86	30.4	30.4		
50	28.04	25.9	25.9		
60	24.56	22.7	22.7		
70	21.91	20.3	20.3		
80	19.83	18.3	18.3		
90	18.14	16.8	16.8		
100	16.75	15.5	15.5		
110	15.57	14.4	14.4		
120	14.56	13.5	13.5		

Subdrainage Area: **L103B - Roof** — Controlled Roof
Area (ha): **0.22** — Maximum Storage Depth: 150 mm
C: **0.90**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	76.81	41.5	8.1	33.4	20.0	90.6	0.00
20	52.03	28.1	8.6	19.6	23.5	96.4	0.00
30	40.04	21.7	8.6	13.1	**23.5**	96.5	0.00
40	32.86	17.8	8.4	9.3	22.4	94.6	0.00
50	28.04	15.2	8.2	6.9	20.8	91.9	0.00
60	24.56	13.3	8.0	5.3	19.0	88.9	0.00
70	21.91	11.8	7.8	4.1	17.2	85.8	0.00
80	19.83	10.7	7.5	3.2	15.4	82.7	0.00
90	18.14	9.8	7.3	2.5	13.6	79.7	0.00
100	16.75	9.1	7.1	2.0	11.9	76.8	0.00
110	15.57	8.4	6.8	1.6	10.4	73.7	0.00
120	14.56	7.9	6.6	1.3	9.3	70.2	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
2-year Water Level	96.5	0.10	8.6	23.5	86.4	0.0

Subdrainage Area: **Block 6 Tributary to Internal Cistern (L103B)**
Area (ha): **0.620** — **Allowable Release Rate:** **79.43** **L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	
10	76.81	79.12	**79.43**	0.00	**0.00**	0 m³/ha
20	52.03	56.66	56.66	0.00	0.00	
30	40.04	45.58	45.58	0.00	0.00	
40	32.86	38.80	38.80	0.00	0.00	
50	28.04	34.14	34.14	0.00	0.00	
60	24.56	30.69	30.69	0.00	0.00	
70	21.91	28.01	28.01	0.00	0.00	
80	19.83	25.85	25.85	0.00	0.00	
90	18.14	24.07	24.07	0.00	0.00	
100	16.75	22.56	22.56	0.00	0.00	
110	15.57	21.23	21.23	0.00	0.00	
120	14.56	20.04	20.04	0.00	0.00	

Subdrainage Area: **L108D - UNC** — Block 7
Area (ha): **0.14** — Tributary to Cistern Block 7
C: **0.80** — **Allowable Release Rate:** **17.94** **L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	
10	76.81	23.9	**17.94**	5.98	**3.59**	26 m³/ha
20	52.03	16.2	16.20	0.00	0.00	
30	40.04	12.5	12.47	0.00	0.00	
40	32.86	10.2	10.23	0.00	0.00	
50	28.04	8.7	8.73	0.00	0.00	
60	24.56	7.6	7.65	0.00	0.00	
70	21.91	6.8	6.82	0.00	0.00	
80	19.83	6.2	6.17	0.00	0.00	
90	18.14	5.6	5.65	0.00	0.00	
100	16.75	5.2	5.21	0.00	0.00	
110	15.57	4.8	4.85	0.00	0.00	
120	14.56	4.5	4.53	0.00	0.00	

Subdrainage Area: **L108B - UNC** — Block 8 (To Block 12)
Area (ha): **0.14** — Tributary to Underground Storage
C: **0.65** — **Allowable Release Rate:** **17.94** **L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	19.4	19.4		
20	52.03	13.2	13.2		
30	40.04	10.1	10.1		
40	32.86	8.3	8.3		
50	28.04	7.1	7.1		
60	24.56	6.2	6.2		
70	21.91	5.5	5.5		
80	19.83	5.0	5.0		
90	18.14	4.6	4.6		
100	16.75	4.2	4.2		
110	15.57	3.9	3.9		
120	14.56	3.7	3.7		

Subdrainage Area: **L108C - UNC** — Block 12
Area (ha): **0.09** — Tributary to Underground Storage
C: **0.85** — **Allowable Release Rate:** **11.53** **L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	16.3	16.3		
20	52.03	11.1	11.1		
30	40.04	8.5	8.5		
40	32.86	7.0	7.0		
50	28.04	6.0	6.0		
60	24.56	5.2	5.2		
70	21.91	4.7	4.7		
80	19.83	4.2	4.2		
90	18.14	3.9	3.9		
100	16.75	3.6	3.6		
110	15.57	3.3	3.3		
120	14.56	3.1	3.1		

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Modified Rational Method Calculatons for Storage

Subdrainage Area: **L103B - UNC** — Block 6
Area (ha): **0.40** — Tributary to Cistern Block 6
C: **1.00**

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	200.5	200.5		
20	119.95	134.7	134.7		
30	91.87	103.2	103.2		
40	75.15	84.4	84.4		
50	63.95	71.8	71.8		
60	55.89	62.8	62.8		
70	49.79	55.9	55.9		
80	44.99	50.5	50.5		
90	41.11	46.2	46.2		
100	37.90	42.6	42.6		
110	35.20	39.5	39.5		
120	32.89	36.9	36.9		

Subdrainage Area: **L103B - Roof** — Controlled Roof
Area (ha): **0.22** — Maximum Storage Depth: 150 mm
C: **1.00**

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	Depth (mm)	
10	178.56	107.3	11.1	96.1	57.7	130.3	0.00
20	119.95	72.1	11.9	60.2	72.2	140.2	0.00
30	91.87	55.2	12.2	43.0	77.5	143.8	0.00
40	75.15	45.1	12.2	32.9	79.0	**144.9**	0.00
50	63.95	38.4	12.2	26.2	78.6	144.6	0.00
60	55.89	33.6	12.1	21.4	77.2	143.7	0.00
70	49.79	29.9	12.0	17.9	75.1	142.2	0.00
80	44.99	27.0	11.9	15.1	72.6	140.5	0.00
90	41.11	24.7	11.8	12.9	69.9	138.6	0.00
100	37.90	22.8	11.6	11.2	67.0	136.6	0.00
110	35.20	21.1	11.5	9.7	64.0	134.6	0.00
120	32.89	19.8	11.3	8.5	61.0	132.5	0.00

Storage: Roof Storage

	Depth (mm)	Head (m)	Discharge (L/s)	Vreq (cu. m)	Vavail (cu. m)	Discharge Check
100-year Water Level	144.9	0.14	12.2	79.0	86.4	0.0

Subdrainage Area: **Block 6 Tributary to Internal Cistern (L103B)**
Area (ha): **0.620**

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	
10	178.56	211.62	79.43	132.19	79.31	
20	119.95	146.56	**79.43**	67.14	**80.56**	130 m³/ha
30	91.87	115.31	79.43	35.88	64.58	
40	75.15	96.61	79.43	17.18	41.23	
50	63.95	84.02	79.43	4.59	13.78	
60	55.89	74.90	74.90	0.00	0.00	
70	49.79	67.93	67.93	0.00	0.00	
80	44.99	62.42	62.42	0.00	0.00	
90	41.11	57.92	57.92	0.00	0.00	
100	37.90	54.17	54.17	0.00	0.00	
110	35.20	50.98	50.98	0.00	0.00	
120	32.89	48.23	48.23	0.00	0.00	

Subdrainage Area: **L108D - UNC** — Block 7
Area (ha): **0.14** — Tributary to Cistern Block 7
C: **1.00**

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)	
10	178.56	69.5	17.94	51.56	30.94	
20	119.95	46.7	**17.94**	28.75	**34.50**	246 m³/ha
30	91.87	35.8	17.94	17.82	32.08	
40	75.15	29.2	17.94	11.31	27.15	
50	63.95	24.9	17.94	6.96	20.87	
60	55.89	21.8	17.94	3.82	13.75	
70	49.79	19.4	17.94	1.44	6.06	
80	44.99	17.5	17.51	0.00	0.00	
90	41.11	16.0	16.00	0.00	0.00	
100	37.90	14.8	14.75	0.00	0.00	
110	35.20	13.7	13.70	0.00	0.00	
120	32.89	12.8	12.80	0.00	0.00	

Subdrainage Area: **L108B - UNC** — Block 8 (To Block 12)
Area (ha): **0.14** — Tributary to Underground Storage
C: **0.81**

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	56.5	56.5		
20	119.95	37.9	37.9		
30	91.87	29.1	29.1		
40	75.15	23.8	23.8		
50	63.95	20.2	20.2		
60	55.89	17.7	17.7		
70	49.79	15.7	15.7		
80	44.99	14.2	14.2		
90	41.11	13.0	13.0		
100	37.90	12.0	12.0		
110	35.20	11.1	11.1		
120	32.89	10.4	10.4		

Subdrainage Area: **L108C - UNC** — Block 12
Area (ha): **0.090** — Tributary to Underground Storage
C: **1.00**

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	44.7	44.7		
20	119.95	30.0	30.0		
30	91.87	23.0	23.0		
40	75.15	18.8	18.8		
50	63.95	16.0	16.0		
60	55.89	14.0	14.0		
70	49.79	12.5	12.5		
80	44.99	11.3	11.3		
90	41.11	10.3	10.3		
100	37.90	9.5	9.5		
110	35.20	8.8	8.8		
120	32.89	8.2	8.2		

Stormwater Management Calculations

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Modified Rational Method Calculatons for Storage

Subdrainage Area: Block 8 & 12 Tributary to Underground Storage (L108B & L108C)
Area (ha): 0.23 **Allowable Release Rate:** 29.47 L/s

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	35.76	**29.47**	6.30	**3.78**
20	52.03	24.23	24.23	0.00	0.00
30	40.04	18.65	18.65	0.00	0.00
40	32.86	15.30	15.30	0.00	0.00
50	28.04	13.06	13.06	0.00	0.00
60	24.56	11.44	11.44	0.00	0.00
70	21.91	10.20	10.20	0.00	0.00
80	19.83	9.23	9.23	0.00	0.00
90	18.14	8.45	8.45	0.00	0.00
100	16.75	7.80	7.80	0.00	0.00
110	15.57	7.25	7.25	0.00	0.00
120	14.56	6.78	6.78	0.00	0.00

16 m^3/ha

Subdrainage Area: L109D - UNC Block 11
Area (ha): 0.14 Tributary to Cistern Block 11
C: 0.80 **Allowable Release Rate:** 17.94 L/s

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	23.9	**17.9**	6.0	**3.6**
20	52.03	16.2	16.2	0.0	0.0
30	40.04	12.5	12.5	0.0	0.0
40	32.86	10.2	10.2	0.0	0.0
50	28.04	8.7	8.7	0.0	0.0
60	24.56	7.6	7.6	0.0	0.0
70	21.91	6.8	6.8	0.0	0.0
80	19.83	6.2	6.2	0.0	0.0
90	18.14	5.6	5.6	0.0	0.0
100	16.75	5.2	5.2	0.0	0.0
110	15.57	4.8	4.8	0.0	0.0
120	14.56	4.5	4.5	0.0	0.0

Subdrainage Area: L109B - UNC Block 10 (To Block 13)
Area (ha): 0.15 Tributary to Underground Storage
C: 0.65 **Allowable Release Rate:** 19.22 L/s

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	20.8	20.8		
20	52.03	14.1	14.1		
30	40.04	10.9	10.9		
40	32.86	8.9	8.9		
50	28.04	7.6	7.6		
60	24.56	6.7	6.7		
70	21.91	5.9	5.9		
80	19.83	5.4	5.4		
90	18.14	4.9	4.9		
100	16.75	4.5	4.5		
110	15.57	4.2	4.2		
120	14.56	3.9	3.9		

Subdrainage Area: L109C - UNC Block 13
Area (ha): 0.090 Tributary to Underground Stroage
C: 0.85 **Allowable Release Rate:** 11.53 L/s

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	16.3	16.3		
20	52.03	11.1	11.1		
30	40.04	8.5	8.5		
40	32.86	7.0	7.0		
50	28.04	6.0	6.0		
60	24.56	5.2	5.2		
70	21.91	4.7	4.7		
80	19.83	4.2	4.2		
90	18.14	3.9	3.9		
100	16.75	3.6	3.6		
110	15.57	3.3	3.3		
120	14.56	3.1	3.1		

Subdrainage Area: Block 10 & 13 Tributary to Underground Storage (L109B & L109C)
Area (ha): 0.24 **Allowable Release Rate:** 30.75 L/s

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	76.81	37.15	**30.75**	6.41	**3.84**
20	52.03	25.17	25.17	0.00	0.00
30	40.04	19.37	19.37	0.00	0.00
40	32.86	15.90	15.90	0.00	0.00
50	28.04	13.56	13.56	0.00	0.00
60	24.56	11.88	11.88	0.00	0.00
70	21.91	10.60	10.60	0.00	0.00
80	19.83	9.59	9.59	0.00	0.00
90	18.14	8.78	8.78	0.00	0.00
100	16.75	8.10	8.10	0.00	0.00
110	15.57	7.53	7.53	0.00	0.00
120	14.56	7.04	7.04	0.00	0.00

16 m^3/ha

Subdrainage Area: L109A - UNC Block 9
Area (ha): 0.07 Tributary to Prestion Street
C: 0.85 **Allowable Release Rate:** 8.97 L/s

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	76.81	12.70	**8.97**
20	52.03	8.61	8.61
30	40.04	6.62	6.62
40	32.86	5.44	5.44
50	28.04	4.64	4.64
60	24.56	4.06	4.06
70	21.91	3.62	3.62
80	19.83	3.28	3.28
90	18.14	3.00	3.00
100	16.75	2.77	2.77
110	15.57	2.58	2.58
120	14.56	2.41	2.41

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Modified Rational Method Calculatons for Storage

Subdrainage Area: Block 8 & 12 Tributary to Underground Storage (L108B & L108C)
Area (ha): 0.23

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	101.14	29.47	71.67	43.00
20	119.95	67.94	**29.47**	38.48	**46.17**
30	91.87	52.04	29.47	22.57	40.63
40	75.15	42.56	29.47	13.10	31.44
50	63.95	36.23	29.47	6.76	20.28
60	55.89	31.66	29.47	2.19	7.90
70	49.79	28.20	28.20	0.00	0.00
80	44.99	25.48	25.48	0.00	0.00
90	41.11	23.29	23.29	0.00	0.00
100	37.90	21.47	21.47	0.00	0.00
110	35.20	19.94	19.94	0.00	0.00
120	32.89	18.63	18.63	0.00	0.00

201 m^3/ha

Subdrainage Area: L109D - UNC Block 11
Area (ha): 0.14 Tributary to Cistern Block 11
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	69.5	17.9	51.6	30.9
20	119.95	46.7	**17.9**	28.7	**34.5**
30	91.87	35.8	17.9	17.8	32.1
40	75.15	29.2	17.9	11.3	27.1
50	63.95	24.9	17.9	7.0	20.9
60	55.89	21.8	17.9	3.8	13.7
70	49.79	19.4	17.9	1.4	6.1
80	44.99	17.5	17.5	0.0	0.0
90	41.11	16.0	16.0	0.0	0.0
100	37.90	14.8	14.8	0.0	0.0
110	35.20	13.7	13.7	0.0	0.0
120	32.89	12.8	12.8	0.0	0.0

Subdrainage Area: L109B - UNC Block 10 (To Block 13)
Area (ha): 0.15 Tributary to Underground Storage
C: 0.81

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	60.5	60.5		
20	119.95	40.6	40.6		
30	91.87	31.1	31.1		
40	75.15	25.5	25.5		
50	63.95	21.7	21.7		
60	55.89	18.9	18.9		
70	49.79	16.9	16.9		
80	44.99	15.2	15.2		
90	41.11	13.9	13.9		
100	37.90	12.8	12.8		
110	35.20	11.9	11.9		
120	32.89	11.1	11.1		

Subdrainage Area: L109C - UNC Block 13
Area (ha): 0.090 Tributary to Underground Stroage
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	44.7	44.7		
20	119.95	30.0	30.0		
30	91.87	23.0	23.0		
40	75.15	18.8	18.8		
50	63.95	16.0	16.0		
60	55.89	14.0	14.0		
70	49.79	12.5	12.5		
80	44.99	11.3	11.3		
90	41.11	10.3	10.3		
100	37.90	9.5	9.5		
110	35.20	8.8	8.8		
120	32.89	8.2	8.2		

Subdrainage Area: Block 10 & 13 Tributary to Underground Storage (L109B & L109C)
Area (ha): 0.24

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)	Qstored (L/s)	Vstored (m^3)
10	178.56	105.17	30.75	74.43	44.66
20	119.95	70.65	**30.75**	39.91	**47.89**
30	91.87	54.11	30.75	23.36	42.06
40	75.15	44.26	30.75	13.51	32.44
50	63.95	37.67	30.75	6.92	20.77
60	55.89	32.92	30.75	2.18	7.83
70	49.79	29.33	29.33	0.00	0.00
80	44.99	26.50	26.50	0.00	0.00
90	41.11	24.21	24.21	0.00	0.00
100	37.90	22.33	22.33	0.00	0.00
110	35.20	20.73	20.73	0.00	0.00
120	32.89	19.38	19.38	0.00	0.00

200 m^3/ha

Subdrainage Area: L109A - UNC Block 9
Area (ha): 0.07 Tributary to Prestion Street
C: 1.00

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	178.56	34.75	**8.97**
20	119.95	23.34	8.97
30	91.87	17.88	8.97
40	75.15	14.62	8.97
50	63.95	12.45	8.97
60	55.89	10.88	8.97
70	49.79	9.69	8.97
80	44.99	8.76	8.76
90	41.11	8.00	8.00
100	37.90	7.38	7.38
110	35.20	6.85	6.85
120	32.89	6.40	6.40

Stormwater Management Calculations

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Modified Rational Method Calculatons for Storage

Subdrainage Area: L108A - UNC
Area (ha): 0.11
C: 0.70
Street 1
Tributary to Preston Street
Allowable Release Rate: **14.09** **L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	76.81	16.4	**14.1**
20	52.03	11.1	11.1
30	40.04	8.6	8.6
40	32.86	7.0	7.0
50	28.04	6.0	6.0
60	24.56	5.3	5.3
70	21.91	4.7	4.7
80	19.83	4.2	4.2
90	18.14	3.9	3.9
100	16.75	3.6	3.6
110	15.57	3.3	3.3
120	14.56	3.1	3.1

Subdrainage Area: L103A - UNC
Area (ha): 0.15
C: 0.70
Street 2
Tributary to Preston Street
Allowable Release Rate: **19.22** **L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	76.81	22.4	**19.2**
20	52.03	15.2	15.2
30	40.04	11.7	11.7
40	32.86	9.6	9.6
50	28.04	8.2	8.2
60	24.56	7.2	7.2
70	21.91	6.4	6.4
80	19.83	5.8	5.8
90	18.14	5.3	5.3
100	16.75	4.9	4.9
110	15.57	4.5	4.5
120	14.56	4.3	4.3

Subdrainage Area: L104A - UNC
Area (ha): 0.13
C: 0.70
Street 2
Tributary to Preston Street
Allowable Release Rate: **16.65** **L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	76.81	19.4	**16.7**
20	52.03	13.2	13.2
30	40.04	10.1	10.1
40	32.86	8.3	8.3
50	28.04	7.1	7.1
60	24.56	6.2	6.2
70	21.91	5.5	5.5
80	19.83	5.0	5.0
90	18.14	4.6	4.6
100	16.75	4.2	4.2
110	15.57	3.9	3.9
120	14.56	3.7	3.7

Subdrainage Area: L105A - UNC
Area (ha): 0.11
C: 0.70
Street 3
Tributary to Preston Street
Allowable Release Rate: **14.09** **L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	76.81	16.4	**14.1**
20	52.03	11.1	11.1
30	40.04	8.6	8.6
40	32.86	7.0	7.0
50	28.04	6.0	6.0
60	24.56	5.3	5.3
70	21.91	4.7	4.7
80	19.83	4.2	4.2
90	18.14	3.9	3.9
100	16.75	3.6	3.6
110	15.57	3.3	3.3
120	14.56	3.1	3.1

Subdrainage Area: L106A - UNC
Area (ha): 0.200
C: 0.70
Street 4
Tributary to Preston Street
Allowable Release Rate: **25.62** **L/s**

tc (min)	I (2 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	76.81	29.9	**25.6**
20	52.03	20.3	20.3
30	40.04	15.6	15.6
40	32.86	12.8	12.8
50	28.04	10.9	10.9
60	24.56	9.6	9.6
70	21.91	8.5	8.5
80	19.83	7.7	7.7
90	18.14	7.1	7.1
100	16.75	6.5	6.5
110	15.57	6.1	6.1
120	14.56	5.7	5.7

SUMMARY TO OUTLET

Block ID	Area ID	Roof Storage (m3)	Cistern Storage (m3)	Underground Storage (m3)	Controlled Release Rate (L/s)
Block 1	L106B	20.7	0.0	-	8.75
Block 2	L105B	18.6	0.0	-	58.53
Block 3	L104C	-	-	-	2.56
Block 4	L104B	17.1	0.0	-	30.87
Block 5	L103C	-	-	-	8.97
Block 6	L103B	23.5	0.0	-	79.43
Block 7	L108D	-	3.6	-	17.94
Block 8	L108B	-	-	-	-
Block 9	L109A	-	-	-	8.97
Block 10	L109B	-	-	-	-
Block 11	L109D	-	3.6	-	17.94
Block 12	L108C	-	-	3.8	29.47
Block 13	L109C	-	-	3.8	30.75
Street 1	L108A	-	-	-	14.09
Street 2	L103A	-	-	-	19.22
Street 2	L104A	-	-	-	16.65
Street 3	L105A	-	-	-	14.09
Street 4	L106A	-	-	-	25.62

Total Minor System Release Rate: **383.8** **L/s**
Site Target Release Rate: 411.2 L/s
-27.4 L/s

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Modified Rational Method Calculatons for Storage

Subdrainage Area: L108A - UNC
Area (ha): 0.11
C: 0.88
Street 1
Tributary to Preston Street

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	178.56	47.8	**14.1**
20	119.95	32.1	14.1
30	91.87	24.6	14.1
40	75.15	20.1	14.1
50	63.95	17.1	14.1
60	55.89	15.0	14.1
70	49.79	13.3	13.3
80	44.99	12.0	12.0
90	41.11	11.0	11.0
100	37.90	10.1	10.1
110	35.20	9.4	9.4
120	32.89	8.8	8.8

Subdrainage Area: L103A - UNC
Area (ha): 0.15
C: 0.88
Street 2
Tributary to Preston Street

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	178.56	65.2	**19.2**
20	119.95	43.8	19.2
30	91.87	33.5	19.2
40	75.15	27.4	19.2
50	63.95	23.3	19.2
60	55.89	20.4	19.2
70	49.79	18.2	18.2
80	44.99	16.4	16.4
90	41.11	15.0	15.0
100	37.90	13.8	13.8
110	35.20	12.8	12.8
120	32.89	12.0	12.0

Subdrainage Area: L104A - UNC
Area (ha): 0.13
C: 0.88
Street 2
Tributary to Preston Street

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	178.56	56.5	**16.7**
20	119.95	37.9	16.7
30	91.87	29.1	16.7
40	75.15	23.8	16.7
50	63.95	20.2	16.7
60	55.89	17.7	16.7
70	49.79	15.7	15.7
80	44.99	14.2	14.2
90	41.11	13.0	13.0
100	37.90	12.0	12.0
110	35.20	11.1	11.1
120	32.89	10.4	10.4

Subdrainage Area: L105A - UNC
Area (ha): 0.11
C: 0.88
Street 3
Tributary to Preston Street

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	178.56	47.8	**14.1**
20	119.95	32.1	14.1
30	91.87	24.6	14.1
40	75.15	20.1	14.1
50	63.95	17.1	14.1
60	55.89	15.0	14.1
70	49.79	13.3	13.3
80	44.99	12.0	12.0
90	41.11	11.0	11.0
100	37.90	10.1	10.1
110	35.20	9.4	9.4
120	32.89	8.8	8.8

Subdrainage Area: L106A - UNC
Area (ha): 0.200
C: 0.88
Street 4
Tributary to Preston Street

tc (min)	I (100 yr) (mm/hr)	Qactual (L/s)	Qrelease (L/s)
10	178.56	86.9	**25.6**
20	119.95	58.4	25.6
30	91.87	44.7	25.6
40	75.15	36.6	25.6
50	63.95	31.1	25.6
60	55.89	27.2	25.6
70	49.79	24.2	24.2
80	44.99	21.9	21.9
90	41.11	20.0	20.0
100	37.90	18.4	18.4
110	35.20	17.1	17.1
120	32.89	16.0	16.0

SUMMARY TO OUTLET

Block ID	Area ID	Roof Storage (m3)	Cistern Storage (m3)	Underground Storage (m3)	Controlled Release Rate (L/s)	Area (ha)	Underground/Cistern (m3/ha)
Block 1	L106B	69.5	0.0	-	14.50	0.21	0.0
Block 2	L105B	62.8	57.8	-	60.21	0.47	122.9
Block 3	L104C	-	-	-	2.56	0.02	-
Block 4	L104B	57.8	22.4	-	38.43	0.30	74.6
Block 5	L103C	-	-	-	8.97	0.07	-
Block 6	L103B	79.0	80.6	-	79.43	0.62	129.9
Block 7	L108D	-	34.5	-	17.94	0.14	246.4
Block 8	L108B	-	-	-	-	0.14	-
Block 9	L109A	-	-	-	8.97	0.07	-
Block 10	L109B	-	-	-	-	0.15	-
Block 11	L109D	-	34.5	-	17.94	0.14	246.4
Block 12	L108C	-	-	46.2	29.47	0.09	200.8
Block 13	L109C	-	-	47.9	30.75	0.09	199.5
Street 1	L108A	-	-	-	14.09	0.11	-
Street 2	L103A	-	-	-	19.22	0.15	-
Street 2	L104A	-	-	-	16.65	0.13	-
Street 3	L105A	-	-	-	14.09	0.11	-
Street 4	L106A	-	-	-	25.62	0.20	-

Total Minor System Release Rate: **398.8** **L/s**
Site Target Release Rate: 411.2 L/s
-12.4 L/s

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Roof Drain Design Sheet, Estimated Roof Area in Block 1 (L103D-Roof)
Standard Watts Model R1100 Accuflow Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0022	0	0.025	42	0	0	0.025
0.050	0.0006	0.0044	3	0.050	169	2	3	0.050
0.075	0.0009	0.0061	9	0.075	380	7	9	0.075
0.100	0.0011	0.0077	22	0.100	675	13	22	0.100
0.125	0.0013	0.0094	44	0.125	1054	21	44	0.125
0.150	0.0016	0.0110	76	0.150	1518	32	76	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
2.5	557.1	2.5	0.154753
9.1	1099.7	6.7	0.460238
22.1	1682.7	13.0	0.927655
43.6	2284.6	21.4	1.56227
75.6	2897.0	32.0	2.366984

Rooftop Storage Summary

Total Building Area (sq.m)		1898
Assume Available Roof Area (sq.m)	80%	1518.4
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		7
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		76
Estimated 100 Year Drawdown Time (h)		2.2

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Watts Drain Catalogue

Head (m)	L/s Open	75%	50%	25%	Closed
0.025	0.3155	0.31545	0.31545	0.31545	0.31545
0.050	0.6309	0.6309	0.6309	0.6309	0.6309
0.075	0.9464	0.86749	0.78863	0.70976	0.6309
0.100	1.2618	1.10408	0.94635	0.78863	0.6309
0.125	1.5773	1.34067	1.10408	0.86749	0.6309
0.150	1.8927	1.57726	1.2618	0.94635	0.6309

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.008	0.011	-
Depth (m)	0.097	0.145	0.150
Volume (cu.m)	20.7	69.5	75.9
Draintime (hrs)	0.9	2.21	

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Roof Drain Design Sheet, Estimated Roof Area in Block 2 (L103C-Roof)
Standard Watts Model R1100 Accuflow Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0022	0	0.025	39	0	0	0.025
0.050	0.0006	0.0044	3	0.050	157	2	3	0.050
0.075	0.0009	0.0061	9	0.075	352	6	9	0.075
0.100	0.0011	0.0077	21	0.100	626	12	21	0.100
0.125	0.0013	0.0094	41	0.125	978	20	41	0.125
0.150	0.0016	0.0110	70	0.150	1409	30	70	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
2.3	516.9	2.3	0.1435824
8.5	1020.4	6.2	0.4270178
20.5	1561.2	12.1	0.8606954
40.4	2119.7	19.9	1.4495038
70.1	2687.9	29.7	2.1961322

Rooftop Storage Summary

Total Building Area (sq.m)		1761
Assume Available Roof Area (sq.n	80%	1408.8
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		7
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		70
Estimated 100 Year Drawdown Time (h)		2.0

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Watts Drain Catalogue

Head (m)	L/s Open	75%	50%	25%	Closed
0.025	0.3155	**0.31545**	0.31545	0.31545	0.315451
0.050	0.6309	**0.6309**	0.6309	0.6309	0.630902
0.075	0.9464	**0.86749**	0.78863	0.70976	0.630902
0.100	1.2618	**1.10408**	0.94635	0.78863	0.630902
0.125	1.5773	**1.34067**	1.10408	0.86749	0.630902
0.150	1.8927	**1.57726**	1.2618	0.94635	0.630902

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.007	0.011	-
Depth (m)	0.095	0.144	0.150
Volume (cu.m)	18.6	62.8	70.4
Draintime (hrs)	0.8	2.0	

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Roof Drain Design Sheet, Estimated Roof Area in Block 4 (L104B-Roof)
Standard Watts Model R1100 Accuflow Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0019	0	0.025	33	0	0	0.025
0.050	0.0006	0.0038	2	0.050	134	2	2	0.050
0.075	0.0008	0.0047	8	0.075	301	5	8	0.075
0.100	0.0009	0.0057	18	0.100	535	10	18	0.100
0.125	0.0011	0.0066	35	0.125	836	17	35	0.125
0.150	0.0013	0.0076	60	0.150	1204	25	60	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
2.0	515.4	2.0	0.143161
7.2	1119.1	5.3	0.454025
17.6	1816.1	10.3	0.958498
34.6	2566.4	17.0	1.671382
59.9	3350.0	25.4	2.60193

Rooftop Storage Summary

Total Building Area (sq.m)		1505
Assume Available Roof Area (sq.m)	80%	1204
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		6
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		60
Estimated 100 Year Drawdown Time (h)		2.5

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Watts Drain Catalogue

Head (m)	L/s Open	75%	50%	25%	Closed
0.025	0.3155	0.31545	**0.31545**	0.31545	0.31545
0.050	0.6309	0.6309	**0.6309**	0.6309	0.6309
0.075	0.9464	0.86749	**0.78863**	0.70976	0.6309
0.100	1.2618	1.10408	**0.94635**	0.78863	0.6309
0.125	1.5773	1.34067	**1.10408**	0.86749	0.6309
0.150	1.8927	1.57726	**1.2618**	0.94635	0.6309

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.006	0.007	-
Depth (m)	0.098	0.148	0.150
Volume (cu.m)	17.1	57.8	60.2
Draintime (hrs)	0.9	2.5	

Project #160401614, 933 Gladstone Avenue - Gladstone Village OCH
Roof Drain Design Sheet, Estimated Roof Area in Block 6 (L103B-Roof)
Standard Watts Model R1100 Accuflow Roof Drain

Rating Curve				Volume Estimation				
Elevation (m)	Discharge Rate (cu.m/s)	Outlet Discharge (cu.m/s)	Storage (cu. m)	Elevation (m)	Area (sq. m)	Volume (cu. m) Increment	Volume (cu. m) Accumulated	Water Depth (m)
0.000	0.0000	0.0000	0	0.000	0	0	0	0.000
0.025	0.0003	0.0025	0	0.025	48	0	0	0.025
0.050	0.0006	0.0050	3	0.050	192	3	3	0.050
0.075	0.0009	0.0069	11	0.075	432	8	11	0.075
0.100	0.0011	0.0088	26	0.100	768	15	26	0.100
0.125	0.0013	0.0107	50	0.125	1201	24	50	0.125
0.150	0.0016	0.0126	86	0.150	1729	36	86	0.150

Drawdown Estimate			
Total Volume (cu.m)	Total Time (sec)	Vol (cu.m)	Detention Time (hr)
0.0	0.0	0.0	0
2.8	555.0	2.8	0.1541717
10.4	1095.6	7.6	0.4585107
25.2	1676.4	14.8	0.9241723
49.6	2276.0	24.4	1.5564057
86.0	2886.1	36.4	2.3580985

Rooftop Storage Summary

Total Building Area (sq.m)		2161
Assume Available Roof Area (sq.	80%	1728.8
Roof Imperviousness		0.99
Roof Drain Requirement (sq.m/Notch)		232
Number of Roof Notches*		8
Max. Allowable Depth of Roof Ponding (m)		0.15
Max. Allowable Storage (cu.m)		86
Estimated 100 Year Drawdown Time (h)		2.2

* As per Ontario Building Code section OBC 7.4.10.4.(2)(c).

From Watts Drain Catalogue

Head (m)	L/s Open	75%	50%	25%	Closed
0.025	0.3155	0.31545	0.31545	0.31545	0.315451
0.050	0.6309	0.6309	0.6309	0.6309	0.630902
0.075	0.9464	0.86749	0.78863	0.70976	0.630902
0.100	1.2618	1.10408	0.94635	0.78863	0.630902
0.125	1.5773	1.34067	1.10408	0.86749	0.630902
0.150	1.8927	1.57726	1.2618	0.94635	0.630902

* Note: Number of drains can be reduced if multiple-notch drain used.

Calculation Results	5yr	100yr	Available
Qresult (cu.m/s)	0.009	0.012	-
Depth (m)	0.097	0.145	0.150
Volume (cu.m)	23.5	79.0	86.4
Draintime (hrs)	0.9	2.2	

D.3 CORRESPONDENCE WITH THE CITY OF OTTAWA (SWM CRITERIA)

Gladstone Village Meeting Minutes

Date: February 16th, 2021
Time: 11:00am –12:00 pm

Attendees:

City: Shawn Wessel (IPM), Eric Tousignant (Water Resources Dept., Eng.), Abdul Mottalib (Sr. Eng.), Edith Tam (Planner -City Realty), Doug James (Central Branch Manager). Andrew McCreight (File Lead), Amy Whelan (EIT)

Applicant Team: Robert MacNeil (OCHC), Christa Allevato, Peter Moroz (Stantec), Karin Smadella (Stantec)

Location: Online @ MTeams

Agenda Items:

SWM Criteria
Relocation of Combined Sewer and Domestic Water Mains
Capacity Issues
Park Land

Karin Smadella-
For Gladstone village - this is intended to be a public street running through the subdivision and connecting in with oak street along Plouffe (18m cross-section).

Across these lands there is quite a lot of significant infrastructure. The collector storm sewer has to be relocated either along the multi-use pathway (NCC ownership) or through the subdivision itself.

Design criteria- We understand that a 2-year predevelopment with a max C= 0.4 to discharge to the combined sewer is to be used, although there was no mention of the collector storm sewer. Our first question is can there be a connection to this storm sewer and if so, what is the allowable release rate?

Eric Tousignant-
This storm sewer collects from the highway as well and we must check if the MTO has ownership. MTO will typically have ownership even outside of their property and drainage rights. If there is a proposal to add more flow to the sewer, we need to ensure that there are no issues with capacity and this scenario is a better option then trying to connect to the combined sewer, if possible. We will also be able to assess impacts to the storm sewer. A storm model has been created for the whole system in this area.

Robert MacNeil-
This storm sewer is conflicting with the placement of our buildings and extends on the city lands to the north is also conflicting with the envisioned development there. Therefore, it will need to be shifted to the west to be below the MUP which is owned partially by the NCC (90%) and the City. Robin working with Steven Willis to acquire the NCC owned portion of the MUP this Calander year.

Another factor to consider is that the city is considering extending district energy down to this site. My understanding is that if that is to ever occur the best place to extend district energy to connect would be along below the MUP giving added reasoning to acquire the NCC lands so that they are not a party to these discussions.

Alternatively, the storm sewer can be within the public street in the subdivision.

Abdul Mottalib-
Additionally, because the storm sewer is taking flows from the highway (partial ownership by MTO) if we move it below and along the MUP that would take care of the issue of MTO drainage rights.

Karin Smadella-
Why don't we look at the property as a whole and come up with a 5-year predevelopment flow rate and determine the flows and see if the storm sewer has the capacity.

Eric Tousignant-
This storm sewer was likely designed with 2-year criteria due to its age, as well we must consider the extra flow from the highway. Also keep in mind that the MTO is likely discharging as much flow as possible to the storm sewer and for a highway is likely designed with a 10-year capture.

Karin Smadella-
Stantec to provide 2-year predevelopment flow for City to verify if it can be accommodated in the storm collector sewer.
The city has acquired the lands next to the rec-center and the park and is planning to redevelop. We would like to know what their plan is for storm water management and what their plan is with respect to the storm sewer that cuts across in order to coordinate efficiently. As well if it is possible to share a storm water management and storage.

Edith Tam-
So far there is no storm water management in place for the above noted lands right now. We are in the process of acquiring 1010 Somerset and approximately 1 hector of those lands are tentatively being allocated to the development of a soccer field. Currently Plouffe park is depressed and from what I understand is currently a storm water pond for 100-year flood. With this in mind, it is likely the proposed soccer field will also be depressed. As far as I know we are coordinating with Ottawa community housing because they have 933 Gladstone. We are planning on building a community center, there might be a French elementary school, and would like to coordinate effectively for this development.

Robert MacNeil-
The main trunk sewer will need to be shifted so that it doesn't fall below building footprints. The water and the combined sewers that run alongside one another run will have an opportunity to continue with some of the servicing still positioned there.
Edith's group has been focussing on acquiring the lands right now and therefore will be behind us by several years in terms of development. There scoping and design work will not catch up to us so the challenge for us is to continue working with their group and the City in making decisions that are going to be fortuitous for everyone.
Other than phase one, Plouffe park is going to be extended westerly and run all the way through the site likely with no buildings along its length. It would be a massive city park. There could be underground parking below as well as dry underground storage.

Eric Tousingnant-

The Pluoffe park SWM Pond is a 50-year design, so during a 100-year event the lower part of Preston just in front of Pluoffe will continue to flood. What we have is an improvement from what was there before. If you are keeping the park lands to the west of Plouffe there is a good opportunity to create more storage for Pluoffe park and upgrade to a 100-year design, removing the ponding that will happen on Preston street during a 100-year event. This potential expansion of storage could also be allocated to the city lands to the north as well as Gladstone's lands to south.

Karin Smadella-
Our other major question is if the existing major infrastructure that crosses through the site must stay in service? As part of the subdivision design, will connections have to be maintained to the existing public and private mains located within the City lands to the north?
Similarly, the combined collector sewer that runs through the development will need to be relocated. Are there known constraints that should be considered in the design and construction phasing?

Abdul Mottalib
Advised that City will consult with Asset Management to ask if connections will have to be maintained to the City watermains to the north.

Eric Tousingant-
In terms of moving the combined collector sewer, it can be moved as long as it has no hydraulic impact to the system and can continue to be a relief system for the Preston Trunk. If there is a realignment it must maintain the existing crossing location under Somerset Street.

Robert MacNeil-
Can you foresee any issues with moving the Nepean Storm under the MUP and potentially coupled with district energy running side by side? The MUP easement is about 50ft in width.

Shawn Wessel-

Moving the Nepean storm will require a certain offset from infrastructure (clearances) in order to be able to access the sewer for future maintenance/replacement. This will be something that will need to be looked into with more detail (plan & profile, cross sections, etc.) to determine if there is room, depending on what is required for development.

Karin Smadella-
For the sanitary sewage and potentially combined sewage for these lands should it be directed to the local or combined collector system.

Eric Tousingant-
It would be preferable to the local system if it has capacity. Typically, we do not connect to the collector systems. If the storm can be directed elsewhere and it is just the sanitary discharge to the local system there shouldn't be any issues with capacity.

Shawn Wessel-
Detailed Design -
It is important to note that for your submission we would require grading, site servicing, stormwater management plans and roof plans. The roof and grading plans should include all ponding for 5- and 100-year events. Roof Plans are to include drain and scupper locations as well as what table speaking to the prescribed drain types (manufacture and model #), weir openings and flows for all buildings with flat roofs on this all sites.

Karin Smadella
Noted that Gladstone Village application will be for a plan of subdivision. Rochester Heights may be a site plan application. For site plans with buildings of this nature (mid-high rise), detailed design of the buildings (including building mechanical) is normally not available when the site plan control application is being approved. Discussion about this request can be undertaken separately.
Actionable items:

- Determine if the collector storm sewer (that drains the highway) is owned by the MTO or the City.
- Check with parks to determine if it is possible to create more storage to upgrade the park from a 50-year design to a 100-year design and ultimately reduce the potential of flooding on Preston.
- Provide a plan & profile and section drawings for the proposed relocation of the Nepean Storm under the MUP coupled with district energy to determine if there is enough clearance for City approval. (KS – I believe that only a section was discussed for high level feasibility – Plan and profile drawings would accompany the detailed design submission based on the preferred sewer alignment)
- Determine if the 406mm water main that crosses through the development site can be abandoned once the new development is up and running or if it must remain. Please see image below. Note: There is a FH at rear of 332 Preston that is connected to the private water line of 933 Gladstone property. Need to check if abandoning this FH is an option or if there is a way to connect to WM on Balsam St. and if so, who pays for this?

- I’ve spoken with Robin Souchen about the watermains on the 1010 Somerset property and to both of us it makes the most sense to keep this 406mm watermain that runs adjacent to the Booth Street Trunk and continues on under City Centre Avenue.
- As Rob MacNeil has noted, the City is behind OCH by a few years in regards to master planning subject lands. All we know is the we have a number of items we may have to accommodate on the lands:
- Approx. 1 hectare park – to be depressed
- Underground parking 800+ parking spots similar to Lansdowne
- Twin pad arena – to be confirmed by Linda Tremblay
- An elementary school for 389 students
- Expansion of Plant Bath community centre space
- Gym
- 150-300 residential units
- Approximately 6 floors of office space
- Retail space

This may give you an idea of what capacity is required for the area.

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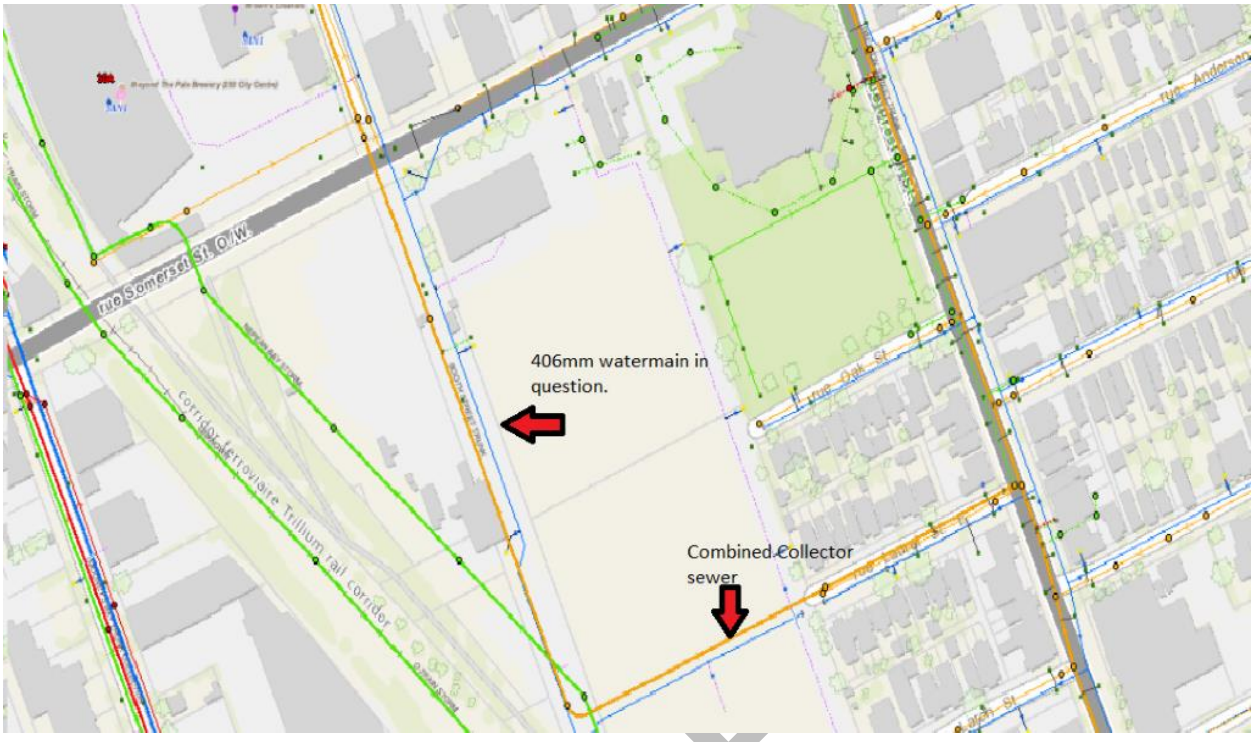
406mm watermain in question.
Combined Collector sewer
Corridor ferroviaire Trillium rail corridor

From: Smadella, Karin
To: Paerez, Ana
Subject: FW: Gladstone Village - Storm Collector Contributions
Date: Wednesday, March 17, 2021 5:20:49 PM
Attachments: image002.png

FYI

Karin Smadella, P.Eng
Project Manager

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Karin.Smadella@stantec.com

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From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Wednesday, March 17, 2021 3:54 PM
To: Smadella, Karin <Karin.Smadella@stantec.com>
Subject: RE: Gladstone Village - Storm Collector Contributions

The Nepean Bay SWM model assumed an imperviousness of 0.55, which is roughly a C of 0.6. Since this is only a 2 year system and there is a risk of this storm system backing up into the LRT corridor, let's try to match existing conditions, especially since the LRT team is currently using hydrographs from this system to come up with a flood proofing solution.

Eric

Eric Tousignant, P.Eng.
Senior Water Resources Engineer
Infrastructure Services
613-580-2424 ext 25129

From: Smadella, Karin <Karin.Smadella@stantec.com>
Sent: March 17, 2021 3:49 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Subject: RE: Gladstone Village - Storm Collector Contributions

Yes the storm trunk along the LRT – in your correspondence below you noted that the storm sewer has capacity but that discharge to the system should be controlled to the 2 year storm. My mtg will be done in the next 15 min and I can give you a call.

The Nepean Bay storm model assumes 4.7 ha of these lands draining to the storm sewer uncontrolled (No ICDs) (see blue areas in figure below). There is a total of 20 ha drainage to this trunk sewer system (starting at highway 417) with a peak flow of about 2 cms. In short, there is available capacity in the storm system for your flows.

Given the extremely tight nature of these systems and the potential for backup onto the future LRT system, I would recommend that we set the target release rates at 2 year. Also, since we did not account for any of these areas in the Preston combined system model, any area draining to the combined would also need to be controlled to 2 year.

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Project Manager

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From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Wednesday, March 17, 2021 3:42 PM
To: Smadella, Karin <Karin.Smadella@stantec.com>
Subject: RE: Gladstone Village - Storm Collector Contributions

Unfortunately I am in meetings all day tomorrow. Is this the storm trunk next to the LRT corridor?

From: Smadella, Karin <Karin.Smadella@stantec.com>
Sent: March 17, 2021 3:41 PM

To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Paerez, Ana <Ana.Paerez@stantec.com>
Subject: RE: Gladstone Village - Storm Collector Contributions

Hi Eric – Sorry I'm in a meeting but otherwise would give you a call to avoid these emails back and forth. The C-value we are looking for is for the contribution to the existing storm trunk and not the combined sewer.

I can call you tomorrow to discuss if that is easier.

Karin

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Project Manager

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From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Wednesday, March 17, 2021 3:37 PM
To: Smadella, Karin <Karin.Smadella@stantec.com>
Cc: Paerez, Ana <Ana.Paerez@stantec.com>
Subject: RE: Gladstone Village - Storm Collector Contributions

Hi Karin

Unfortunately, the entire Preston combined sewer Model assumed an existing imperviousness of roughly 0.45, which is equivalent to a C of roughly 0.5. You would have to stick with the 0.5.

As for the major system. As you noted, You will have to control development sites up to the 100 year event on-site, but internal roadways (if they are city streets) can drain to existing roadway. I would only ask that you check the impact of the runoff on the local street to make sure that it is not excessive.

Eric

Eric Tousignant, P.Eng.
Senior Water Resources Engineer
Infrastructure Services
613-580-2424 ext 25129

From: Smadella, Karin <Karin.Smadella@stantec.com>
Sent: March 12, 2021 2:18 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Paerez, Ana <Ana.Paerez@stantec.com>
Subject: RE: Gladstone Village - Storm Collector Contributions

Thanks Eric

I have summarized the sewer and swm criteria below. Can you please confirm the criteria and provide a response to the two questions highlighted?

Minor Storm System Design Criteria
To be controlled to 2 year flow, C = ?
Please confirm the runoff coefficient to be assumed for the allowable 2 year flow into the minor system. Given the predevelopment condition where the site was all hard surface with no inlet control, can we use 2 year flow at C=0.9?

Major System Design Criteria
Major system flow from Public Streets to be directed to Preston Street. Is there any known restriction from directing some of the major system flows down the local streets abutting the site (Oak, Laurel, Larch, Balsam)?
Private Blocks to provide on-site storage for stormwater in excess of the allowable minor system contributions up to the 100-year event.

Combined System Design Criteria
To be controlled to the 2 year flow, maximum C=0.4.

Thanks for your quick responses. Have a great weekend.

Karin

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From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Tuesday, March 09, 2021 2:47 PM
To: Smadella, Karin <Karin.Smadella@stantec.com>
Cc: Paerez, Ana <Ana.Paerez@stantec.com>
Subject: RE: Gladstone Village - Storm Collector Contributions

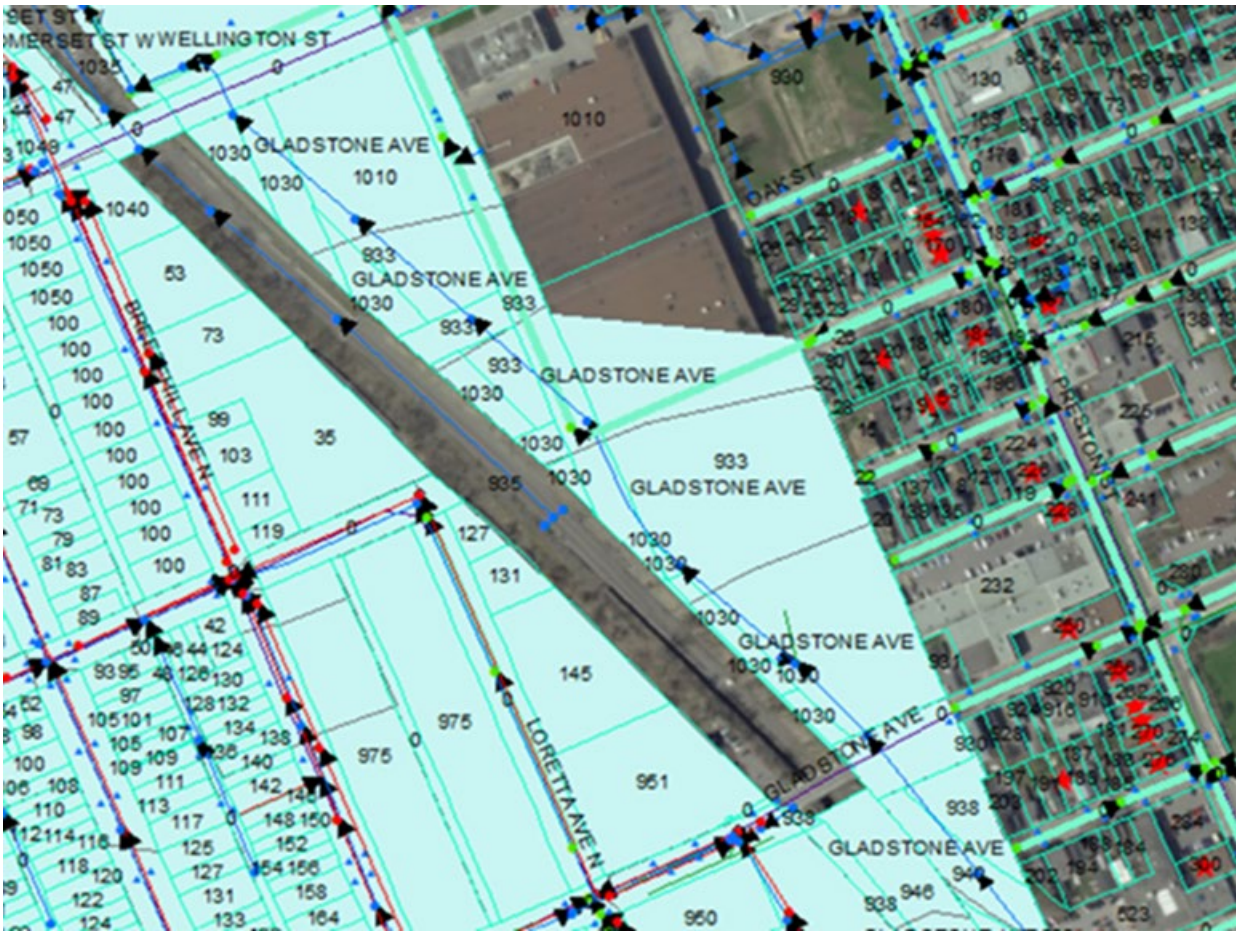
Hi Karin

Attached is the DDSWMM sketch for the Preston combined sewer model. As you can see, the lands in question do not drain to the combined system in our model and have been assumed draining to the storm sewer next to the rail corridor.

The Nepean Bay storm model assumes 4.7 ha of these lands draining to the storm sewer uncontrolled (No ICDs) (see blue areas in figure below). There is a total of 20 ha drainage to this trunk sewer system (starting at highway 417) with a peak flow of about 2 cms. In short, there is available capacity in the storm system for your flows.

Given the extremely tight nature of these systems and the potential for backup onto the future LRT system, I would recommend that we set the target release rates at 2 year. Also, since we did not account for any of these areas in the Preston combined system model, any area draining to the combined would also need to be controlled to 2 year.

Eric



From: Smadella, Karin <Karin.Smadella@stantec.com>
Sent: March 09, 2021 11:57 AM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Paerez, Ana <Ana.Paerez@stantec.com>
Subject: RE: Gladstone Village - Storm Collector Contributions

Hi Eric – Yes, the questions below are related to the Gladstone Village site at 933 Gladstone Avenue. Both sites have Gladstone addresses so it is confusing.

We require clarity on what will be permitted for the storm/combined outlets prior to layout out the sewers for this subdivision development. Thanks for clarifying that the major system from the public roadway can be directed to Preston Street.

Karin

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From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Sent: Tuesday, March 09, 2021 11:12 AM
To: Smadella, Karin <Karin.Smadella@stantec.com>
Subject: RE: Gladstone Village - Storm Collector Contributions

Hi again Karin

Just to be on the same page, your email from March 3rd is not for the Gladstone/Rochester site. I think there is some confusion. I have asked my modeler to model the new combined sewer location through the site at Rochester/Gladstone, but I think you are looking for answers about the old Fed buildings site.

We just completed updating the Nepean Bay storm sewer model so we can add flow to the storm pipe, but that system is very tight, and it can impact the future light rail.

Unfortunately, we are very backlogged right now due to light rail and I will try to get on this site ASAP.

As for your question about the SWM facility. I don't anticipate any changes to it. Plouffe park is there to protect a low point on Preston and **not to accommodate future development**. You will need to provide on-site detention for any site plan in the development area. If there are city streets within the future development area, then they will just flow onto Preston and will form part of the overall major system flow strategy for Preston Street. Their impact on the Plouffe park SWM facility will be negligible given that the park captures all the excess major flow for the Preston drainage area north of Carling.

Eric

Eric Tousignant, P.Eng.
Senior Water Resources Engineer
Infrastructure Services
613-580-2424 ext 25129

From: Smadella, Karin <Karin.Smadella@stantec.com>
Sent: March 09, 2021 10:42 AM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Paerez, Ana <Ana.Paerez@stantec.com>
Subject: RE: Gladstone Village - Storm Collector Contributions

Hi Eric,

Please see the attached figure which the infrastructure picked up in the survey. It appears that the inlets at the south end of the site would contribute to the storm system and those on the eastern limit the combined.

Below I have included the aerials from 1958 and 2014. During that period the site was covered in a large building and asphalt. I do not expect that there were stormwater controls installed at the time of construction.

Let us know if you require anything further.

Karin

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From: Tousignant, Eric <Eric.Tousignant@ottawa.ca>

Sent: Tuesday, March 09, 2021 8:43 AM
To: Smadella, Karin <Karin.Smadella@stantec.com>
Subject: RE: Gladstone Village - Storm Collector Contributions

HI again Karin

A question that has come back to me from the modelers is if the existing site has CBs on it. This will help us determine the next increase in runoff. No problem if you don't have the answer. What we will do then, is figure out how much water runs off onto the street in the existing system and gets into street CBs. We will then subtract this flow from the future flow go get the net increase.

Eric

From: Smadella, Karin <Karin.Smadella@stantec.com>
Sent: March 08, 2021 5:18 PM
To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Paerez, Ana <Ana.Paerez@stantec.com>; Robert MacNeil <Robert_MacNeil@och.ca>
Subject: RE: Gladstone Village - Storm Collector Contributions

Hi Eric – I realize that this request was only sent to you mid-last week but can you please confirm receipt and advise when you expect to be able to provide direction? As I am certain you are aware, this is a very important project for OCH and they want to move forward with the functional design as soon as possible.

Thanks,

Karin

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From: Smadella, Karin
Sent: Wednesday, March 03, 2021 11:01 AM

To: Tousignant, Eric <Eric.Tousignant@ottawa.ca>
Cc: Wessel, Shawn <shawn.wessel@ottawa.ca>; Ana Paerez (Ana.Paerez@stantec.com) <Ana.Paerez@stantec.com>; Robert MacNeil <Robert_MacNeil@och.ca>; Moroz, Peter <peter.moroz@stantec.com>; Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: Gladstone Village - Storm Collector Contributions

Hi Eric,

Further to our meeting on February 16th, I am providing storm flows based on a contributing area of 3.24ha from the Gladstone Village site. We understand that it is the City's preference that storm flow be separated from the combined system if possible. **Please advise whether or not the stormwater flows below can be accommodated in the storm collector sewer that currently runs along the western limit of the site.** Should discharge be permitted to the storm system, all sanitary flows will be directed to the local sewers on the adjacent roadways.

Flows are based on the following:

Scenario 1

- Full capture of the 2 year event from the proposed municipal ROW to avoid ponding in the street in the 2 year event. Major flows would be directed to a shared SWM facility on neighbouring City lands.
- Allowable release rate from the private blocks based on the 5 year event with a maximum C=0.4 (equivalent to the allowable discharge to the combined system). Storage for the affordable housing units to be provided in the new/expanded City SWM facility – alternatively storage to be provided on the individual development blocks.
- **Based on these assumptions, the 100 year target flow rate for minor system discharge to the storm trunk would be 406.4 L/s.**

Scenario 2

- Full capture of the 2 year event from the proposed municipal ROW to avoid any ponding in the street in the 2 year event. Major flows would be directed to a shared SWM facility on neighbouring City lands.
- Allowable release rate from the private blocks based on the 2 year event with a maximum C=0.4. Storage for the affordable housing units to be provided in the new/expanded City SWM facility – alternatively storage to be provided on the individual development blocks.
- **Based on these assumptions, the 100 year target flow rate for minor system discharge to the storm trunk would be 329.0 L/s.**

If capacity in the storm collector sewer is not available, the flow from Scenario 1 would be directed to the combined system. **Under this condition, please advise if the local combined sewers have capacity to receive a combined sewage flow of 406.4 L/s or if the flow should be directed to the combined collector sewer.**

Timing:
Do you have an idea if the timing if the development of the City lands and the expansion of the SWM facility? Should the development of the Gladstone Village subdivision proceed in advance of the SWM works on the City lands, will the major system flow from the municipal ROW (and potentially flow from the private development blocks) be permitted to outlet to Plouffe Park or would an interim facility on the City development lands be required?

Thanks and please let me know if you have any questions.

Karin

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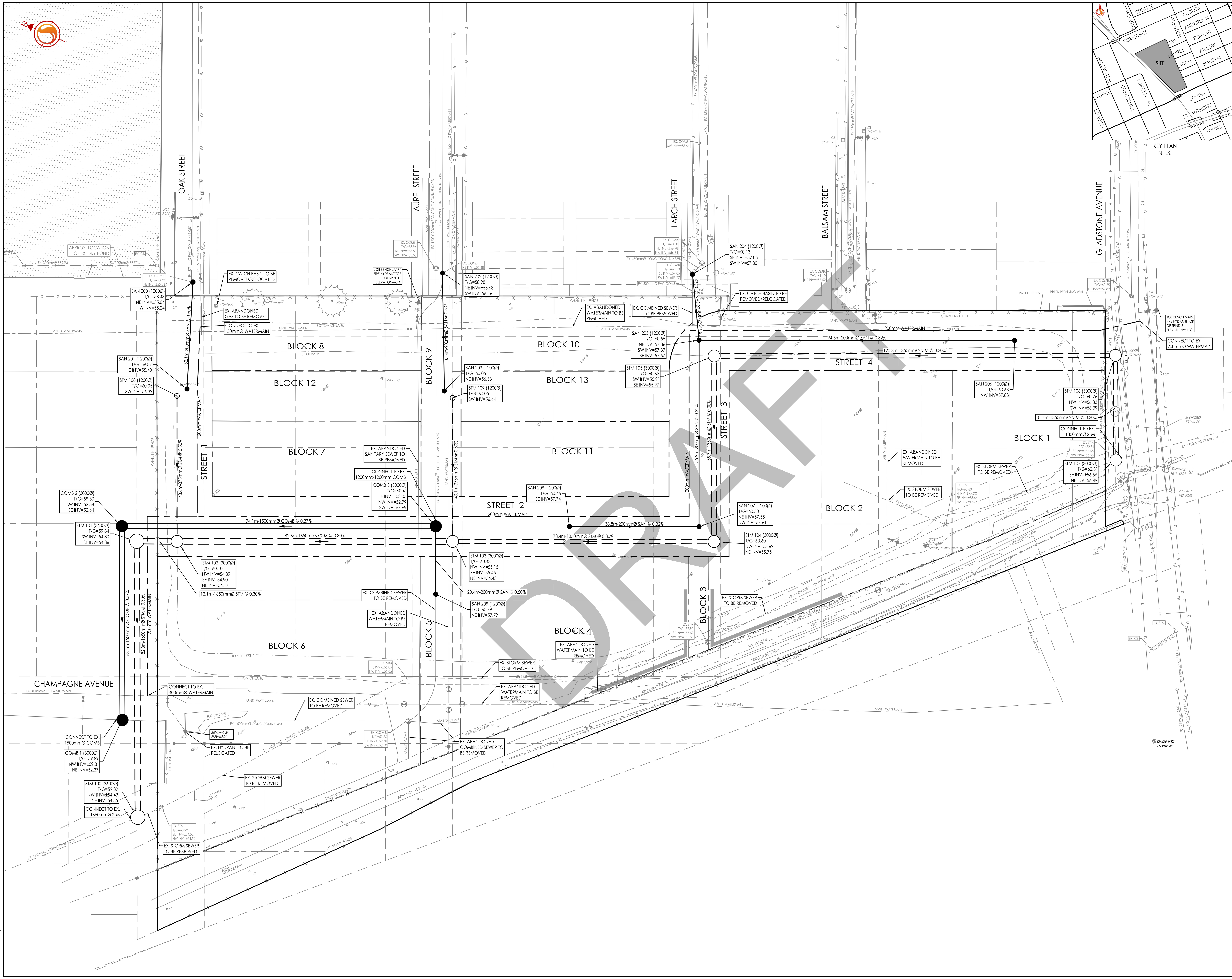
Appendix E BACKGROUND REPORTS

Appendix F CONCEPTUAL SERVICING DRAWINGS



Stantec

Stantec Consulting Ltd.
400 - 1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

Legend

- PROPOSED WATERMAIN
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- EXISTING WATERMAIN
- EXISTING VALVE AND VALVE BOX
- EXISTING VALVE CHAMBER
- EXISTING FIRE HYDRANT
- EXISTING SANITARY/COMBINED SEWER
- EXISTING STORM SEWER
- EXISTING CATCHBASIN
- EXISTING BELL CONDUIT
- EXISTING HYDRO CONDUIT
- EXISTING STREETLIGHT CONDUIT
- EXISTING TRAFFIC CONDUIT
- EXISTING CABLE CONDUIT
- EXISTING GAS MAIN
- EXISTING OVERHEAD WIRES
- PROPOSED RETAINING WALL

Notes

1. DRAFT PLAN PREPARED BY STANTEC GEOMATICS LTD. DATED JANUARY 29, 2021.
2. TOPOGRAPHIC SURVEY PREPARED BY STANTEC GEOMATICS LTD. DATED JANUARY 29, 2021.
3. THE LOCATION OF UTILITIES IS APPROXIMATE ONLY AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL RESPONSIBLE FOR THEIR PROTECTION AND THE IMPLEMENTATION OF ANY NECESSARY PROCEDURES CALLED FOR IN THE APPROPRIATE STANDARDS AND REGULATIONS
4. CONTRACTOR TO LOCATE ALL EXISTING SERVICES AND ANY CONFLICTS WITH EXISTING SERVICING MUST BE REPORTED TO THE ENGINEER PRIOR TO CONTINUING WITH CONSTRUCTION.
5. SERVICING AND GRADING SHOWN ON THE DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. EXACT SIZE, LOCATION AND ELEVATIONS OF WATERMAINS, SEWERS, AND ROADS TO BE DETERMINED DURING DETAILED DESIGN.

Revision		By	Appd.	YY.MM.DD
1	ISSUED FOR REVIEW	WAJ	AMP	21.04.15

File Name: 160401614-DB	WAJ	AMP	WAJ	21.03.02
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

OTTAWA COMMUNITY HOUSING CORPORATION

GLADSTONE VILLAGE
933 GLADSTONE AVENUE
OTTAWA, ON

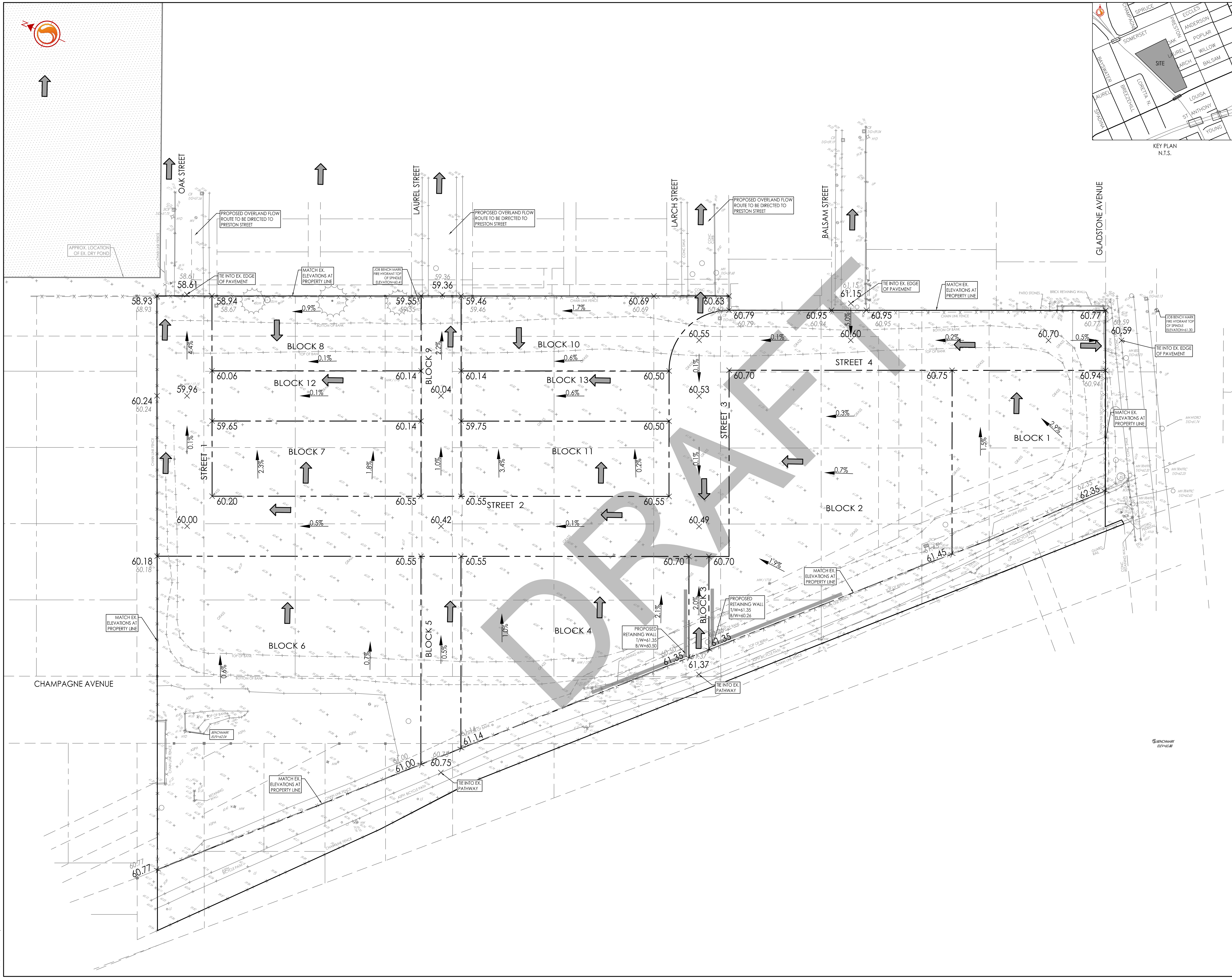
Title

CONCEPTUAL OVERALL SERVICING PLAN

Project No.	Scale
160401614	1:500

Drawing No.	Sheet	Revision
OSSP-1	1 of 6	1

ORIGINAL SHEET - ARCH D



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Ottawa ON
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Legend

99.99	ORIGINAL GROUND ELEVATION
99.99	PROPOSED ELEVATION
2.0%	FLOW DIRECTION AND GRADE
3:1	TERRACING 3:1 SLOPE MAXIMUM (UNLESS OTHERWISE SHOWN)
	PROPOSED SWALE
	DIRECTION OF EMERGENCY OVERLAND FLOW
OHW	EXISTING OVERHEAD WIRES
	PROPOSED RETAINING WALL

Notes

1. DRAFT PLAN PREPARED BY STANTEC GEOMATICS LTD. DATED JANUARY 29, 2021.
2. TOPOGRAPHIC SURVEY PREPARED BY STANTEC GEOMATICS LTD. DATED JANUARY 29, 2021.
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		By	Appd.	YY.MM.DD
1	ISSUED FOR REVIEW	WAJ	AMP	21.04.15

Revision

File Name: 160401614-DB	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	WAJ	AMP	WAJ	21.03.02

Permit-Seal

Client/Project

OTTAWA COMMUNITY HOUSING CORPORATION

GLADSTONE VILLAGE
933 GLADSTONE AVENUE

OTTAWA, ON

Title

CONCEPTUAL OVERALL GRADING PLAN

Project No. 160401614

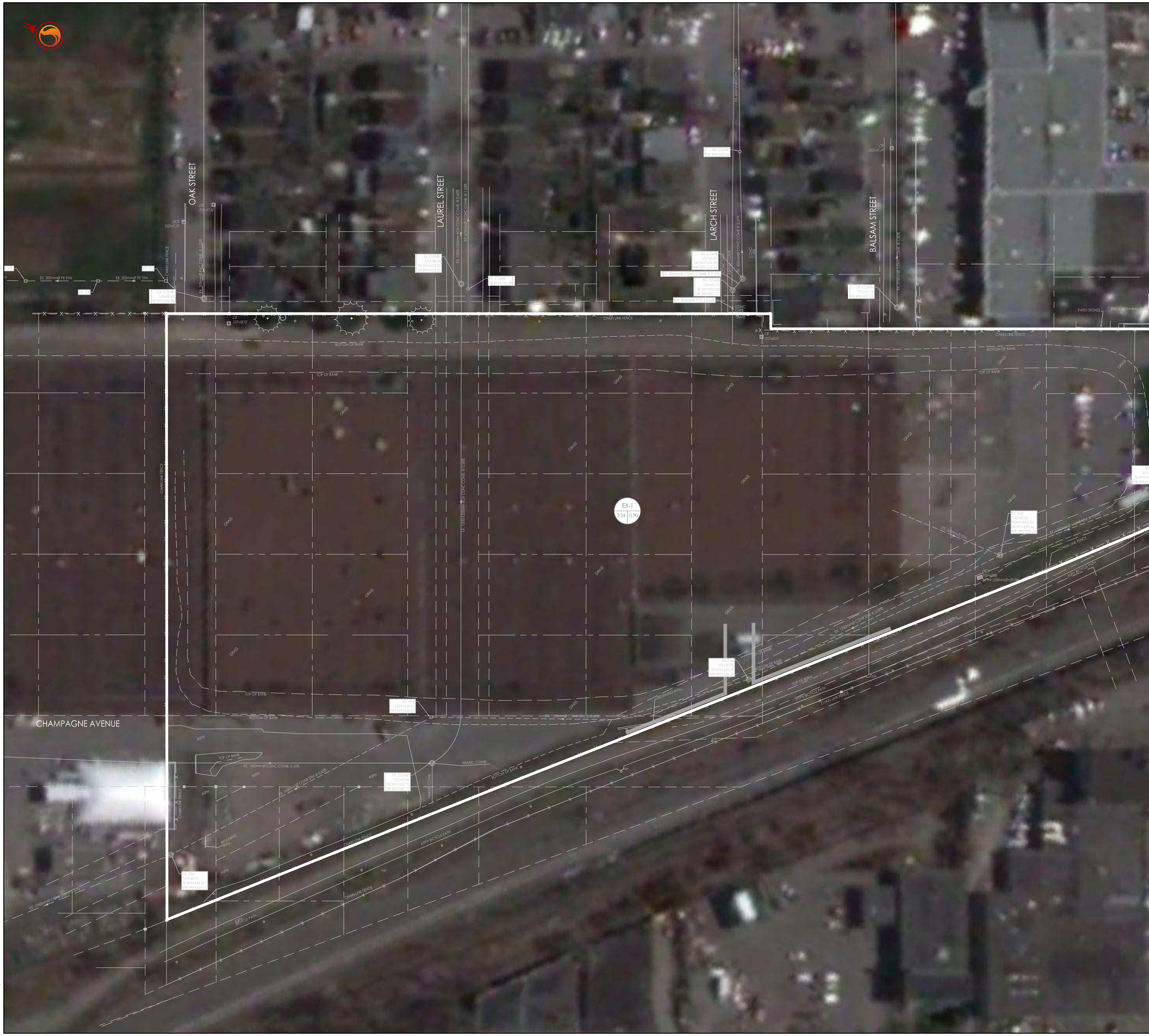
Scale 1:500 (0, 5, 15, 25m)

Drawing No. OGP-1

Sheet 2 of 6

Revision 1

ORIGINAL SHEET - ARCH D



KEY PLAN
N.T.S.

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Legend

1-1 / 1.13 / 0.60 — AREA ID; RUNOFF COEFFICIENT; STORM DRAINAGE AREA ha.

EXISTING STORM DRAINAGE BOUNDARY
EXISTING STORM SEWER
EXISTING SANITARY/COMBINED SEWER

Notes

1. EXISTING CONDITIONS SHOWN BASED ON PHOTOS FROM 2014.

Revision	By	Appd.	YY.MM.DD
1 ISSUED FOR REVIEW	WAJ	AMP	21.04.15

File Name: 160401614-DB	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	WAJ	AMP	WAJ	21.03.02

Permit-Seal

Client/Project

OTTAWA COMMUNITY
HOUSING CORPORATION

GLADSTONE VILLAGE
933 GLADSTONE AVENUE
OTTAWA, ON

Title

CONCEPTUAL
OVERALL EXISTING STORM DRAINAGE PLAN

Project No. 160401614

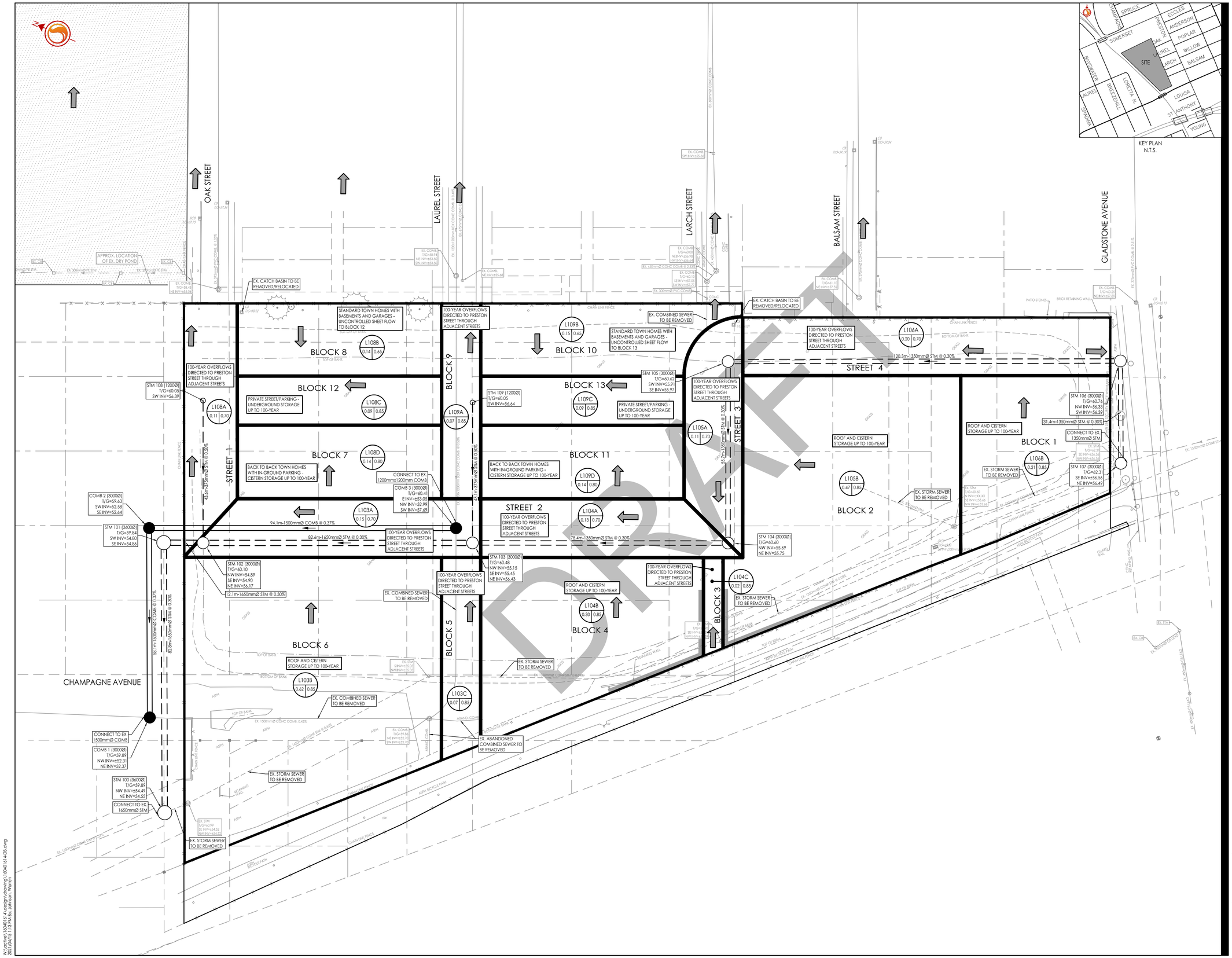
Scale 1:500 (0 5 15 25m)

Drawing No. EXSD-1

Sheet 3 of 6

Revision 1

ORIGINAL SHEET - ARCH D



KEY PLAN
N.T.S.

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Legend

- 1-1 / 0.11 / 0.70 — AREA ID, RUNOFF COEFFICIENT, STORM DRAINAGE AREA ha.
- STORM DRAINAGE BOUNDARY
- EXISTING/FUTURE STORM DRAINAGE BOUNDARY
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- EXISTING COMBINED SEWER

Notes

1	ISSUED FOR REVIEW	WAJ	AMP	21.04.15
	Revision	By	Appd.	YY.MM.DD

File Name: 160401614-D8	WAJ	AMP	WAJ	21.03.02
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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Client/Project
OTTAWA COMMUNITY HOUSING CORPORATION

GLADSTONE VILLAGE
933 GLADSTONE AVENUE
OTTAWA, ON

Title
CONCEPTUAL
OVERALL STORM DRAINAGE PLAN

Project No.	Scale	
160401614	1:500	0 5 15 25m

Drawing No.	Sheet	Revision
OSD-1	4 of 6	1

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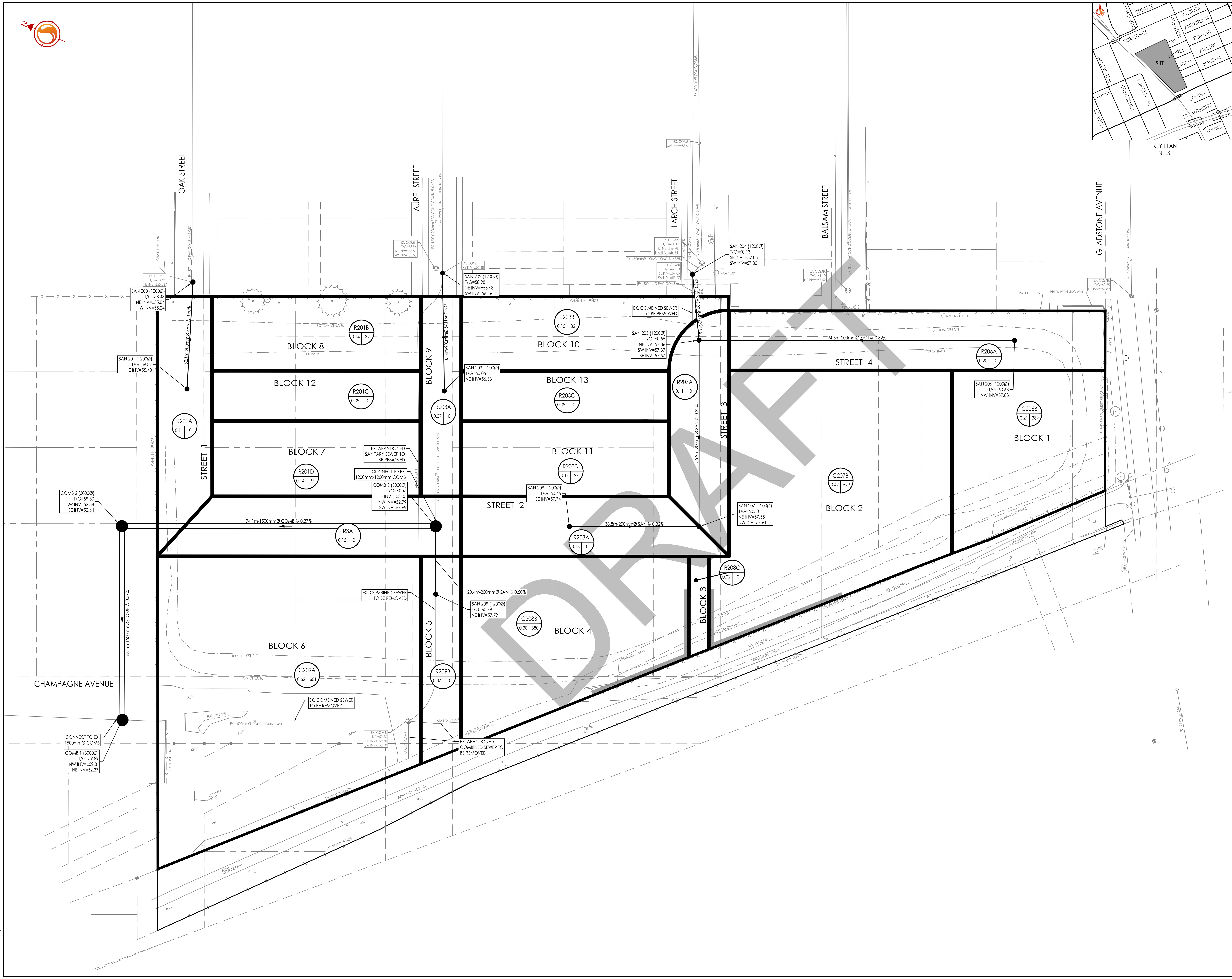

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Legend

SA24A — SANITARY DRAINAGE AREA ID#
34 — POPULATION
0.38 — SANITARY DRAINAGE AREA ha.
SANITARY DRAINAGE AREA
PROPOSED COMBINED SEWER
EXISTING SANITARY/COMBINED SEWER

Notes

1	ISSUED FOR REVIEW	WAJ	AMP	21.04.15
Revision		By	Appd.	YY.MM.DD

File Name: 160401614-DB	WAJ	AMP	WAJ	21.03.02
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

OTTAWA COMMUNITY HOUSING CORPORATION

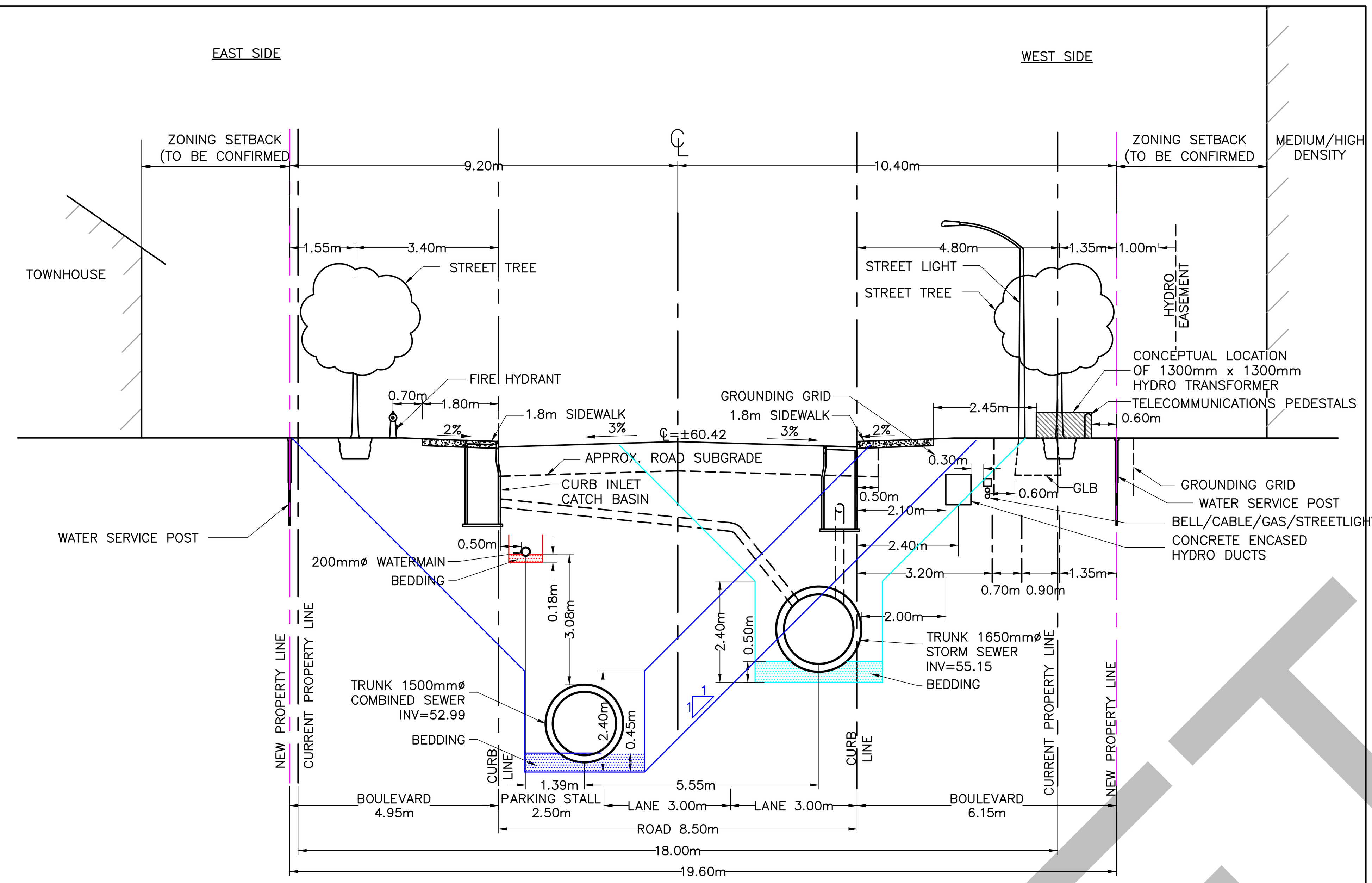
GLADSTONE VILLAGE
933 GLADSTONE AVENUE

OTTAWA, ON

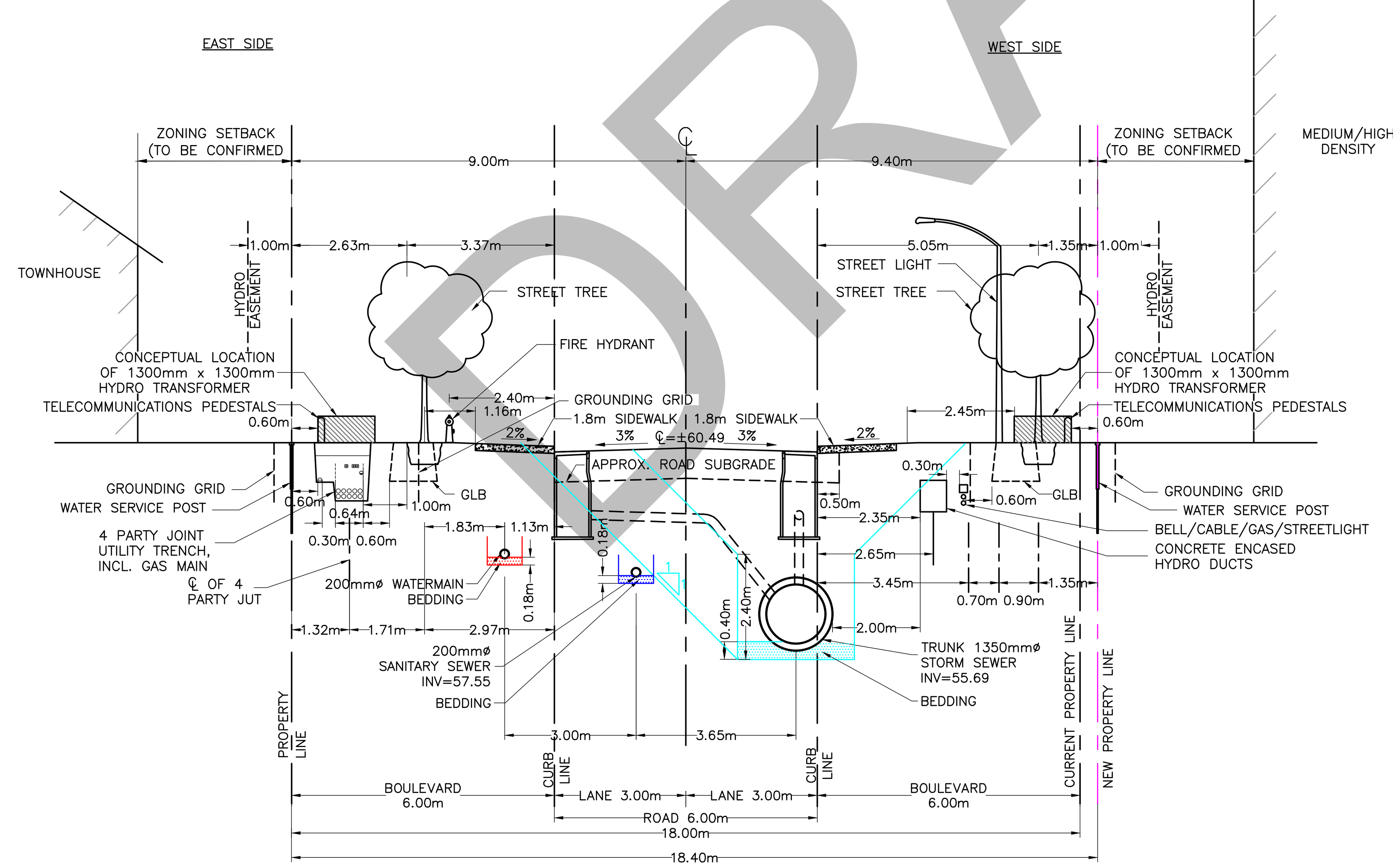
Title

CONCEPTUAL
OVERALL SANITARY DRAINAGE PLAN

Project No.	Scale	
160401614	1:500	
Drawing No.	Sheet	Revision
OSA-1	5 of 6	1



RESIDENTIAL ROAD 18.0m RIGHT OF WAY
STREET 2 (8.5m ASPHALT)
CONCEPTUAL SECTION WITH COMBINED AND STORM TRUNK SEWERS
SCALE 1:100



RESIDENTIAL ROAD 18.0m RIGHT OF WAY
STREET 2 (6.0m ASPHALT)
CONCEPTUAL SECTION WITH STORM TRUNK SEWERS
SCALE 1:100

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Legend

1	ISSUED FOR REVIEW	WAJ	AMP	21.04.15
Revision		By	Appd.	YY.MM.DD

File Name: 160401614-D8	WAJ	AMP	WAJ	21.03.02
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
OTTAWA COMMUNITY HOUSING CORPORATION

GLADSTONE VILLAGE
933 GLADSTONE AVENUE
OTTAWA, ON

Title
CONCEPTUAL DETAIL SHEET

Project No.	Scale	
160401614	AS SHOWN	
Drawing No.	Sheet	Revision
DS-1	6 of 6	1

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2021/04/15 11:12 AM By: Johnson, Warren

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