

Functional Servicing Report

Proposed Residential Development

2916 McKay Avenue

Windsor, Ontario

Our Project No. 25-a155

December 12, 2025



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Civil Engineer

SUBMITTED TO:

The City of Windsor

The principal objective of this report is to provide the site servicing for a proposed residential development at 2916 McKay Avenue. This shall include the stormwater storage requirement, in accordance with the storm water management guidelines set out in Windsor/Essex Region Stormwater Manual.

Available Infrastructure

Based on record drawings and the topographic survey, the current property is serviced by the following:

- 250 mm diameter asbestos cement sanitary sewer
- Sanitary private drain connection
- 675 mm diameter concrete storm sewer
- Storm private drain connection
- 150 mm diameter watermain

STORM

Current Conditions

Existing site topography

The existing site includes a residential building with a total area of about 0.14 ha (1,466 m²). The north and south ends of the property are landscaped with dense grass and trees. As per the Essex Regional Conservation Authority mapping system, it was found that the current site is defined by Brookston Clay Loam soil, placing it in a Hydrologic Group D condition. In the existing condition, the surface condition breakdown will be as follows:

Building/Hardscape Area	450 square metres
Landscaped Area	1,016 square metres

The allowable storm runoff rate from the site was assumed to be based on a runoff coefficient of 0.35. These parameters were assumed based on the former design standards of the existing storm sewers.

The discharges for the site are as follows:

5-year Event	0.018 cubic metres per second
100-year Event	0.030 cubic metres per second

The location and invert of a existing private drain connection to the site was supplied by the City of Windsor. The site is currently serviced with a 150 mm diameter outlet pipe, which is connected to the 675 mm diameter storm sewer on McKay Avenue. It is proposed to re-use the existing service.

Proposed Development

The report has been prepared to support a Zoning By-law Amendment application that would see the site re-zoned from a Residential Districts 1 (RD 1.4) Zone to a Residential Districts 3 (RD3.1(_)) Special Provision Zone. The proposed RD3.1(_) zone would allow for a variety of residential building forms. The conceptual plan for the property includes a 3.5-storey residential building with a total of 16 dwelling units. With respect to the proposed Zoning, the 3.5 storey building concept represents the upper-bound scenario with respect to site servicing, meaning any lesser configuration is generally expected to remain well within acceptable parameters.

The proposed project includes the construction of a 3.5-storey residential building with a curbed parking lot and reworked access driveway from McKay Avenue. In the developed condition, the surface condition breakdown will be as follows:

Building Area	340 square metres
Paved/Hardscape Area	600 square metres
Landscaped Area	526 square metres
Runoff Coefficient	0.68

Based on the allowable release rate of 18 l/s, the excess stormwater generated shall be stored on site.

The proposed system includes the following components:

- New storm sewer system under the proposed pavement;
- Storage in depressed areas and surface storage on pavement;
- Outlet control

Minor System

The minor system consists of the proposed storm sewer network to be constructed on the site. Due to the proposed flow restrictions, stormwater quantity control is necessary in the minor system design. Therefore, the necessary storm water storage associated with the minor storm event shall be accommodated by means of underground structures (pipes, manholes, catch basins, and storage units). The minor system storage elevation shall be below ground (i.e., **no surface storage**), as per the standards manual.

The site shall be serviced with 150 mm diameter storm pipes which will be connected to the existing 150 mm diameter private drain connection at the front property line. The outlet control device shall be installed in a manhole located at the storm outlet. Refer to Appendix A for the stormwater management calculations.

Major System

The major system conveys flows during the major storm event. The design was developed using the minimum standard for major system design, the 100-year return period. The necessary storm

water storage associated with the 100-year storm event shall be accommodated by means of underground structures (pipes, manholes, catch basins), and by surface ponding within the new parking area, to a **maximum** elevation 300 mm below the lowest building opening.

Runoff Control

Based on the establishing of the 5-year and 100-year event flood storage levels and an anticipated elevation of the outlet, it was found that an equivalent of a 100 mm diameter opening is required. Alternatively, a Tempest® Inlet Control Devices may be introduced to control the outflow to a maximum release rate of 18 l/s.

Storage Requirements

Based on the requirements already noted in this report, it was found that the site would require a minimum storage capacity of 9.5 cubic meters for the 1:5-year storm and 30.8 cubic metres for the 1:100-year storm. High water levels shall be 183.00 and 183.30 metres for the 1:5 and 1:100-year rainfall events, respectively. The ponding elevation will be a minimum of 0.30 m below finished floor.

Stormwater Quality Control

The study area falls under the “Normal” water protection level under the MECP’s 2003 SWM manual. Using the new standards manual’s recommendation this requires a long-term average removal of 70% of suspended solids via settling, filtration or hydrodynamic separation. Water quality treatment will be provided by an OGS device (hydro International First Defense or similar).

SANITARY

The proposed development is to comply with the Ontario Building Code 2024 requirements for plumbing, occupancy density and peak demand. The peak domestic sewage flow is calculated based on the design criteria established in the Windsor Development Manual. The sanitary calculations are based on the 3.5 storey multiple dwelling concept. The population assumed for this site includes:

4 people per each unit x 16 units = 64

This would correspond to a peak domestic flow of 1.6 L/s.

The existing 150 mm diameter private sanitary service connection at the main will re-used. It must be inspected to verify the condition for use. Refer to Appendix B for sanitary calculations.

WATER

The proposed development includes 16 residential units, each containing one bathroom group, a kitchen sink, clothes washing machine and a dishwasher. Each floor would feature a laundry sink. Domestic water flow calculations (Appendix D) were based on OBC 2024 Table 7.6.3.2-A. The required domestic water service flow to the residential building is 170.4 fixture units, equating to

a peak demand of 5.36 L/s (85 GPM) based on Hunter's curve. A new 65 mm water service shall be required to supply the development's domestic water system.

Closing

We trust that this submission meets with your approval. If you have any questions or comments regarding this report, please feel free to contact our office.

Appendix A
SWM Calculations



This project has been analyzed in accordance with the requirements set out in the latest edition of the Windsor-Essex Region Stormwater Management Report for catchments 2Ha or smaller

Project Description:	2916 Mckay Avenue		
Project No.:	25-a155		
Date of Analysis	Nov-25	Revision	0
Design for Minor Event	5	Design for Major Event	100

Property Information (SM units)

Description	Existing	New	Table 3.2.2.7 C
Total Catchment Size	1466	1466	
Building Area	0	340	0.95
Paved Area	0.0	600	0.95
PreDevelopment	1466		0.35
Landscape - Clay	0.0	526	0.20
Landscape - Sand	0.0	0.0	0.15
Residential Single Family			0.60
Resid. Single - Lots <500SM			0.70
Residential - semi det.			0.70
Residential - Town/Row			0.80
Industrial Commerical			0.90

Description	AC	
	Existing	New
Building Area	-	323.00
Paved Area	-	570.00
Gravel Area	513.10	-
Landscape - Clay	-	105.20
Landscape - Sand	-	-
Residential Single Family	-	-
Resid. Single - Lots <500SM	-	-
Residential - semi det.	-	-
Residential - Town/Row	-	-
Industrial Commerical	-	-
Sumation	513.10	998.20

Soil Designation (A-D)	D
% Impervious Override	0 %

Storm Event - Section 3.2 (Pre-Developed)

Storm Event	a	b	c
2	854	7	0.818
5	1259	8.8	0.838
10	1511	9.5	0.845
25	1851	10.2	0.852
50	2114	10.6	0.858
100	2375	11	0.861

I = $\frac{a}{(T+b)^c}$	
Minor Storm	
a	1259
b	8.8
c	0.838
Major Storm	
a	2375
b	11
c	0.861

Time of Concentration - 3.7.3

Time of Concentration = t (sheet) + t (shallow) + t (concentrated)

$$t_{\text{sheet}} (t_1) = \frac{6.92L^{0.6}n^{0.6}}{1^{0.4}S^{0.3}}$$

Length of Shallow flow	29.1	m
Mannings	Grass - shore prairie	
Average Slope	3.3	%

Shallow Concentrated Flow (User Input) t2	0	min
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Concentrated time (pipe flow) (User Input) t3	0	min
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***USER NOTE - macro will not run to solve t1 if t1 below reads 0.0 - input higher value*

Mannings n - Values Per Table 3.7.4.1

Value	Description
0.013	Smooth asphalt/concrete
0.06	Cultivated soil - resid. Cover <20%
0.17	Cultivated soil - resid. Cover >20%
0.13	Range (natural)
0.15	Grass - shore prairie
0.24	grass - dense
0.4	woods - light underbrush
0.8	woods - dense underbrush
0	User Input

Minor Storm Event	
Calculated n value	0.15
t2+t3	0
t1 (sheet)	6.73
t total	6.73
Intensity	126.45

Major Storm Event	
Calculated n value	0.15
t2+t3	0
t1 (sheet)	5.46
t total	5.46
Intensity	212.97

Soil Classification

D

Description	AC	
	Existing	New
Property Total Area CM	1,466.00	1,466.00
Building Area	-	323.00
Paved Area	-	570.00
PreDevelopment	513.10	-
Landscape - Clay	-	105.20
Landscape - Sand	-	-
Residential Single Family	-	-
Resid. Single - Lots <500SM	-	-
Residential - semi det.	-	-
Residential - Town/Row	-	-
Industrial Commerical	-	-
Sumation AC	513.10	998.20

* User Note: % Impervious taken as 100% for noted items - if different use override on Pg.1

% Impervious	64.1	%	C equiv by AC	0.681
Storage depth 3.3.2	93.2	mm	C 100 year	0.863

Runoff Pre-Development

Intensity (minor)	126.45	mm/hr
Intensity (major)	212.97	mm/hr

Rational Method - PreDevelopment

Q _{minor}	0.018	CMS	Q Reduction	0	CMS **
Q _{major}	0.030	CMS	** per approval authority		

Surface Elevation :	Minor Event	183.00	m
	Major Event	183.30	m

Outlet Info:	Invert at outlet	182.15	m	Max. Dia.	113.5	mm
	Orifice Diameter	100.00	mm			
	Orifice coefficient	0.62				
	Tailwater elev.	0	m			

Head Condition Differential	Minor	0.420	m
	Major	0.673	m

Discharge Rate Through Orifice	Minor	0.014	CMS	OK
	Major	0.018	CMS	OK

Page 4 Storage Requirements

Zero Release condition

Storage Depth 93.16 mm Zero Release Storage 136.6 CM

$C_{100\text{year}}$ 0.863 C_{minor} 0.681

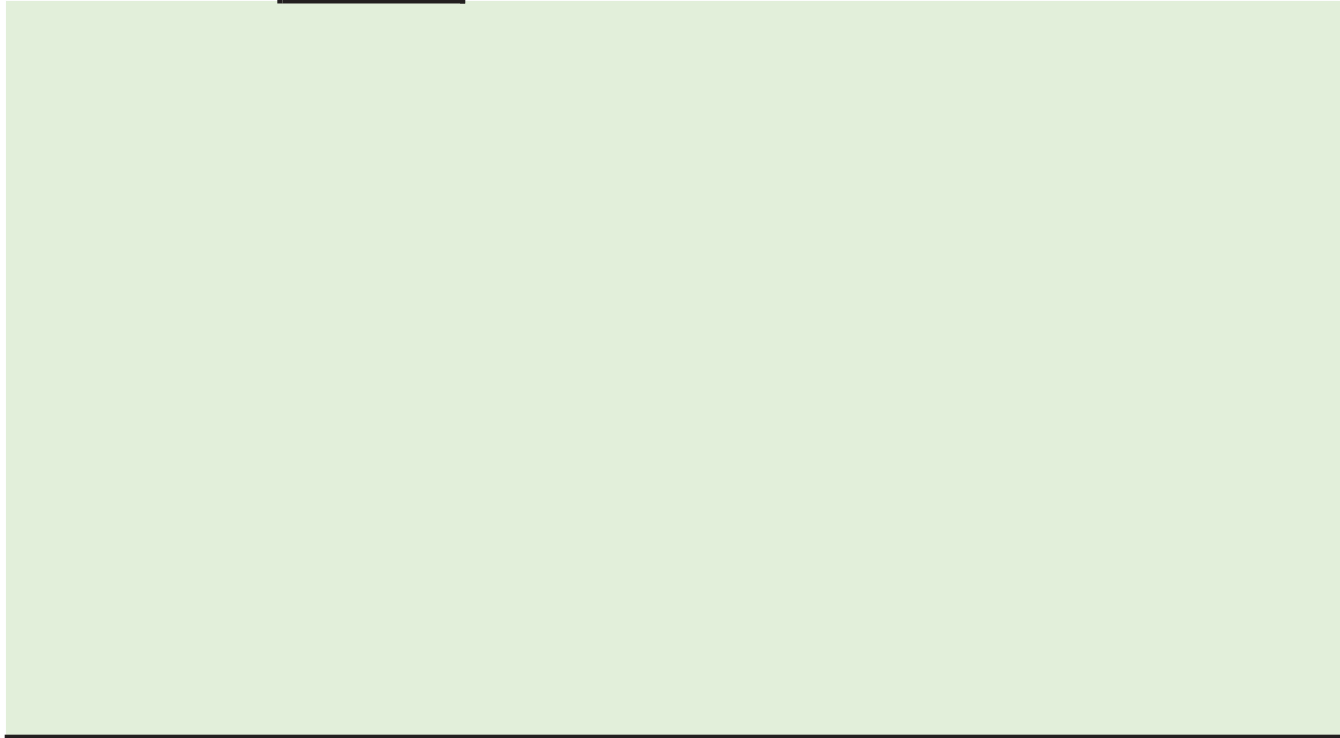
Release Rates CMS Minor 0.014 Major 0.018
 CMS CMS

Time	Minor Event				Major			
	Intensity (mm/hr)	Total Input CM	Total Release CM	Storage CM	Intensity (mm/hr)	Total Input CM	Total Release CM	Storage CM
5	139.6	11.61	4.19	7.4	218.2	23.00	5.31	17.69
10	107.7	17.92	8.39	9.5	172.7	36.39	10.62	25.78
15	88.4	22.06	12.58	9.5	143.7	45.42	15.93	29.50
20	75.3	25.07	16.77	8.3	123.5	52.05	21.23	30.82
25	65.9	27.40	20.97	6.4	108.6	57.20	26.54	30.66
30	58.7	29.29	25.16	4.1	97.1	61.37	31.85	29.52
35	53.0	30.87	29.35	1.5	87.9	64.85	37.16	27.69
40	48.4	32.23	33.55	- 1.3	80.4	67.81	42.47	25.34
45	44.6	33.41	37.74	- 4.3	74.2	70.38	47.78	22.61
50	41.4	34.46	41.94	- 7.5	68.9	72.65	53.08	19.57
55	38.7	35.40	46.13	- 10.7	64.4	74.68	58.39	16.28
60	36.3	36.25	50.32	- 14.1	60.5	76.50	63.70	12.80
65	34.2	37.03	54.52	- 17.5	57.1	78.16	69.01	9.15
70	32.4	37.75	58.71	- 21.0	54.0	79.68	74.32	5.36
75	30.8	38.41	62.90	- 24.5	51.3	81.08	79.63	1.45
80	29.3	39.03	67.10	- 28.1	48.9	82.38	84.93	-2.56
85	28.0	39.61	71.29	- 31.7	46.7	83.59	90.24	-6.66
90	26.8	40.15	75.48	- 35.3	44.7	84.72	95.55	-10.83
95	25.7	40.67	79.68	- 39.0	42.8	85.78	100.86	-15.08
100	24.7	41.15	83.87	- 42.7	41.2	86.78	106.17	-19.39
105	23.8	41.61	88.06	- 46.5	39.6	87.73	111.48	-23.75
110	23.0	42.05	92.26	- 50.2	38.2	88.63	116.78	-28.16
115	22.2	42.47	96.45	- 54.0	36.9	89.48	122.09	-32.61
120	21.5	42.87	100.64	- 57.8	35.7	90.29	127.40	-37.11
125	20.8	43.25	104.84	- 61.6	34.6	91.07	132.71	-41.64
130	20.2	43.62	109.03	- 65.4	33.5	91.82	138.02	-46.20
135	19.6	43.98	113.22	- 69.2	32.5	92.53	143.33	-50.80
140	19.0	44.32	117.42	- 73.1	31.6	93.21	148.63	-55.42
145	18.5	44.65	121.61	- 77.0	30.7	93.87	153.94	-60.07
150	18.0	44.96	125.81	- 80.8	29.9	94.51	159.25	-64.74
155	17.6	45.27	130.00	- 84.7	29.1	95.12	164.56	-69.44
160	17.1	45.57	134.19	- 88.6	28.4	95.71	169.87	-74.16
165	16.7	45.86	138.39	- 92.5	27.7	96.28	175.18	-78.89
				9.5				30.8

Minor Event	9.5	CM - REQUIRED
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Major Event	30.8	CM - REQUIRED
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Appendix B
Sanitary Design Calculations

SANITARY SEWER DESIGN

**2916 MCKAY AVENUE
WINDSOR, ONTARIO**

25-a155

Q (Ultimate) = Residential Sewage Flow x Ultimate Population Served x
Ultimate Flow Factor + Infiltration

Residential sewage flow = 0.0042 litre/second/capita
Ultimate Flow Factor = 6.00

Infiltration = 0.1560 Litre/second/hectare

STREET OR EASEMENT	FROM MANHOLE	TO MANHOLE	POPULATION SERVED	CUMULATIVE POPULATION SERVED	LAND USE	ULTIMATE FLOW FACTOR	AREA SERVED	CUMULATIVE AREA SERVED	GENERATED FLOW	INFILTRATION FLOW	MAXIMUM FLOW EXPECTED	MAXIMUM FLOW EXPECTED	DIAMETER OF PIPE	SLOPE OF PIPE	LENGTH OF LINE BETWEEN MANHOLES	COEFFICIENT OF ROUGHNESS	VELOCITY FLOWING FULL	QUANTITY FLOWING FULL	PERCENTAGE OF DISCHARGE FOR FULL SECTION
			P (persons)	SUM OF P (persons)			A (hectares)	SUM OF A (hectares)	Qp (l/s)	Qi (l/s)	Q (l/s)	Q (m ³ /s)	D (mm)	S (%)	L (m)	n	Vfull (m/s)	Qfull (m ³ /s)	Q/Qfull (%)
McKay	Build.	Sampling	64	64	Res	6.00	0.147	0.147	1.610	0.023	1.633	0.0016	150	2	3	0.013	1.22	0.022	8

Appendix C

Water Service Calculations

Domestic Water Service - 2916 McKay Avenue

Number of units - 16
 Capita- 64
 Number of floors w/units- 3

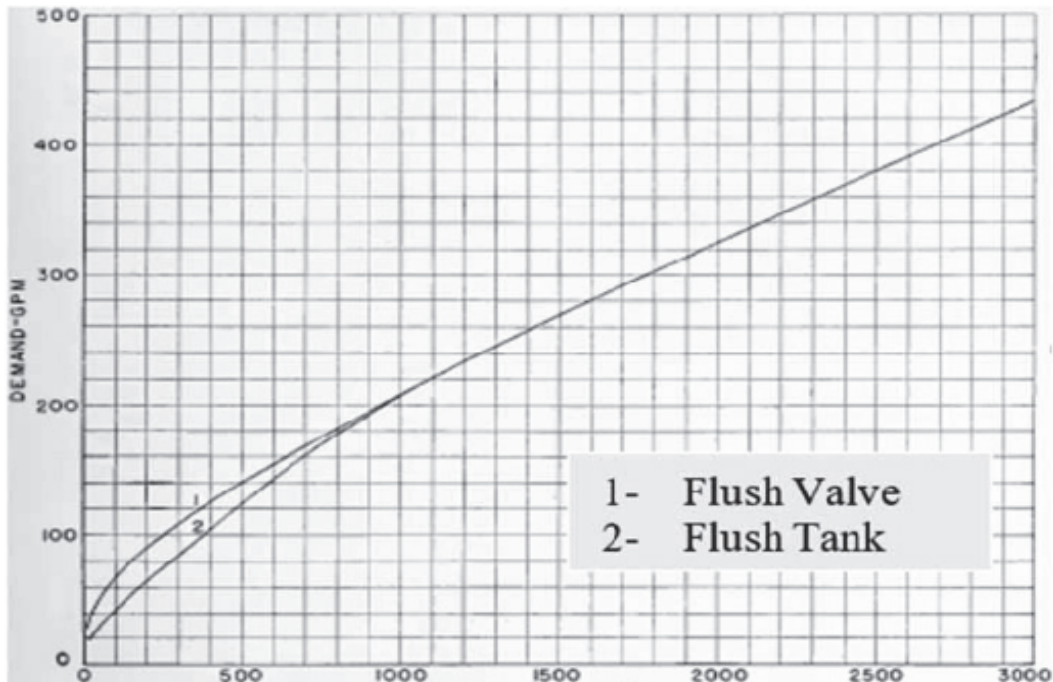
Hydraulic Load based on Table 7.6.3.2-A OBC 2024

Fixture Type	Fixture Units	Basis for Count	Count (Fixture Units)
Bathroom Group greater than 6 LPF flush tank	6	1 per unit	96
Sink, kitchen, domestic, 8.3 LPM or less	1.4	1 per unit	22.4
Dishwasher, domestic	1.4	1 per unit	22.4
Clothes washer, 3.5 kg	1.4	1 per unit	22.4
Sink, laundry, public	1.4	1 per floor w/units	4.2
Sink, service or mop basin, public	3	1 per building	3
Total			170.4
		Per Hunter's Curve	85 GPM 5.36 L/s

Select the pipe size: Maintaining a flow velocity of 6ft/s, and a peak flow demand of 85 GPM

Pipe size		Capacity at 6ft/s	Velocity for 85 GPM
20 mm	3/4 in	8.96 GPM	56.9 ft/s
25 mm	1 in	14 GPM	36.4 ft/s
30 mm	1 1/4 in	20.17 GPM	25.3 ft/s
40 mm	1 1/2 in	35.85 GPM	14.2 ft/s
50 mm	2 in	56.02 GPM	9.1 ft/s
65 mm	2 1/2 in	94.67 GPM	5.4 ft/s
75 mm	3 in	132.19 GPM	3.9 ft/s

Hunter's Curve



FIXTURE UNITS

