FUNCTIONAL SERVICING AND PRELIMINARY STORMWATER MANAGEMENT REPORT

359-369 ERB STREET WEST

CITY OF WATERLOO
REGION OF WATERLOO

PREPARED FOR:

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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by 2296342 Ontario Inc. to prepare a Functional Servicing and Preliminary Stormwater Management Report in support of the Zoning By-Law Amendment (ZBA) and Official Plan Amendment (OPA) for the proposed residential development located at 359-369 Erb Street West in the City of Waterloo. The purpose of this report is to demonstrate that the proposed development is feasible from a servicing and stormwater management perspective and conforms with the requirements of the City of Waterloo (City) and the Region of Waterloo (Region).

Contained within this report is: the site description; proposed water and sanitary servicing; proposed drainage conditions; stormwater management; erosion and sediment controls during construction and conclusions and recommendations.

The reports and design standards referenced during the preparation of this report include:

- Region of Waterloo Development Charges Background Study (Watson & Associates, April 2019)
- Ministry of the Environment, Conservation and Parks (MECP) Design Guidelines for Drinking-Water Systems (2008)
- Region of Waterloo and Area Municipalities - Design Guidelines and Supplemental Specifications for Municipal Services (January 2025)
- Ministry of the Environment, Conservation and Parks Stormwater Management Planning and Design Manual (March 2003)
- City of Waterloo Comprehensive Engineering and Landscape Manual (2023)

This report has been prepared to support the second submission of the ZBA and OPA application for the property located at 359-369 Erb Street West.

2.0 Site Description

The site encompasses an area of approximately 0.6 ha and currently consists of four (4) existing low-rise apartment buildings. The site, located in a mixed residential and commercial neighbourhood, is bounded by Erb Street West to the North, Culpepper Drive to the east, and residential dwellings to the south and west.

According to the Site Plan prepared by 2296342 Ontario Inc. dated March 2026, the proposed development consists of the following elements:

- Two residential towers totalling 216 units, interconnected on levels 1-6, with one level of underground parking;
- An internal roadway with associated surface parking on levels 1-3;
- One access point from Erb Street West and one access point from Culpepper Road; and
- Amenity and associated landscaped areas.

The existing apartment buildings, at-grade parking and access to Erb Street West are proposed to be demolished to accommodate the proposed residential development.

3.0 Water Servicing

The City of Waterloo is responsible for the operation and maintenance of the public watermain system. The existing and proposed water servicing strategies are discussed in the following sections.

3.1 Existing Water Servicing

The existing water servicing infrastructure close to the site includes:

- A 300 mm diameter watermain located on the north side of Erb Street West (City of Waterloo As-constructed Drawing 41-500, January 2009)
- A 200 mm diameter watermain located on the east side of Culpepper Drive (City of Waterloo As-constructed Drawing 5-821
- One fire hydrant located on the north side of Erb Street West across from the proposed development (City of Waterloo As-constructed Drawing 41-501, January 2009); and
- One fire hydrant located on the east side of Culpepper Drive adjacent to the Site (City of Waterloo As-constructed Drawing 5-821)

According to the City of Waterloo As-built drawings, the property is currently serviced by four (4) water services to the existing buildings from the 300 mm diameter watermain on Erb Street West. To support the redevelopment, these existing water services will be decommissioned in accordance with all applicable City and Region guidelines.

3.2 Design Water Demand

The water demand for the proposed development was calculated with reference to the City of Waterloo Water Distribution Master Plan (April 2017) and the Ministry of Environment Design Guidelines for Drinking-Water Systems (2008). The Region of Waterloo design guidelines require an average daily water demand of 225 L/capita/day for residential use. Per Schedule 4 of the Watson & Associates - Region of Waterloo Development Charges Background Study (April 2019), a population per unit of 1.30 and 2.10 were used for individual bedroom units and multiple bedroom units, respectively, to determine the approximate population of the development.

Table 1 summarizes the overall water demand for the proposed development. Appendix A contains detailed water demand calculations.

Table 1: Estimated Domestic Water Demand

Standard	Type	Average Daily Water Demand (L/s)	Maximum Daily Water Demand (L/s)	Peak Hourly Water Demand (L/s)
Region of Waterloo	Residential	0.86	2.36	3.55
	Total	0.86	2.36	3.55

Using the City of Waterloo, Region of Waterloo and MECP design criteria for domestic water demand, the estimated average daily demand and peak hourly demand for the proposed development are 0.86 L/s and 3.55 L/s, respectively.

3.3 Fire Flow Demand

The Fire Underwriters Survey (FUS) method was used to estimate the fire flow requirements for the proposed development. This calculation is based on the building type assumption of non-combustible construction and the gross floor area of the largest floor from the Site Plan prepared by 2296342 Ontario Inc. dated March 2026. The estimated fire flow requirements are used to estimate the watermain size required to service the development.

Table 2 summarizes the estimated fire flow demand and duration necessary to meet fire protection for the proposed development. Appendix A contains the Fire Underwriters Survey calculations.

Table 2: Estimated Fire Demand Flows

Method	Demand Flow (L/s)	Duration (h)
Fire Underwriters Survey	167	2.00

Based on the fire flow calculations and the approximate GFA of 2,150 sq.m., (Level 4-6) the required fire flow was calculated to be 167 L/s for a duration of 2.00 hours.

It should be noted that the FUS method is a conservative estimate for comparison purposes only. The Mechanical Engineer for this development will complete the required analysis for fire protection and the Architect will design fire separation methods per the determined fire flow rate to meet municipally available flows and pressures during the Site Plan Approval process and the Building Permit stage. Based on the estimated domestic water demand (3.55 L/s) and fire flow demand (167 L/s) summarized in Table 1 and Table 2, the total design flow for the internal water distribution system is approximately 170.6 L/s.

The Region of Waterloo Water Distribution Model was used to determine the existing available pressures and flows of the watermain junction located at the Erb Street West and Culpepper Drive intersection. Based on the results of the model provided to Crozier from the Region of Waterloo (dated November 15, 2024), it was confirmed that the existing watermain provides an available flow of 434 L/s. The results from the Region can be referenced in Appendix A.

3.4 Proposed Water Servicing

The development is proposed to be serviced by a 200 mm diameter PVC watermain. This service will connect to the existing 200 mm diameter watermain along Culpepper Drive using a tapping sleeve and valve connection.

The proposed 200 mm diameter watermain enters the site, and a 200 mm diameter fire line and a 150 mm domestic water service is provided for the building. The internal water system shall be designed as per the mechanical engineer's details and specifications.

The existing water services that currently service 359, 363, 367, and 359 Erb Street West are to be decommissioned and removed as part of the proposed water servicing strategy. Details have been included on the Site Servicing Plan (Drawing C103).

4.0 Sanitary Servicing

The City of Waterloo is responsible for the operation and maintenance of the public sanitary sewage system. The existing and proposed sanitary servicing are discussed in the following sections.

4.1 Existing Sanitary Servicing

The existing sanitary servicing infrastructure in proximity to the site includes:

- A 300 mm diameter sanitary sewer on the north side of Erb Street West running west to east at a slope of approximately 0.49% (City of Waterloo As-constructed Drawing 41-500, January 2009).
- A 250 mm diameter sanitary sewer on Culpepper Drive running south to north at a slope of approximately 0.59 % (City of Waterloo As-constructed Drawing 41-501, Jan, 2009)

According to the City of Waterloo pre-consultation comments, the property is currently serviced by four (4) existing sanitary service connections from the 300 mm diameter sanitary sewer on Erb Street West. To support the redevelopment, these existing sanitary services will be decommissioned in accordance with all applicable City and Region guidelines.

4.2 Design Sanitary Flow

The Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications (January 2025) was referenced to calculate the sanitary sewage design flows for the proposed development. Per the design guidelines, an average design flow of 275 L/capita/day was used for the proposed residential development. Per Schedule 4 of the Watson & Associates - Region of Waterloo Development Charges Background Study (April 2019), a population per unit of 1.30 and 2.10 were utilized for individual bedroom units and multiple bedroom units, respectively, to determine the approximate population of the development.

Infiltration flow into the sanitary sewer and peaking factors were applied to the average flow to obtain the total estimated design sewage flows. Table 3 summarizes the results and Appendix B contains the detailed sanitary calculations.

Table 3: Estimated Sanitary Design Flows

Standard	Type	Average Daily Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Infiltration Flow (L/s)	Total Peak Flow (L/s)
Region of Waterloo	Residential	1.05	4.06	4.26	0.15	4.41

As shown in Table 3, it is estimated that the total sanitary peak flow for the proposed development is 4.41 L/s which includes the proposed residential and infiltration sanitary flows. The proposed sanitary service (200mm diameter at a slope of 1.0%) has a full flow capacity of approximately 32 L/s and can therefore convey the total peak sanitary sewage flow of 4.41 L/s for the development, in accordance with The Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications (January 2025).

4.3 Proposed Sanitary Servicing

The development is proposed to be serviced by a 200 mm diameter sanitary service that connects to the existing 300 mm diameter sanitary sewer along Erb Street West via the northwest corner of the site. The proposed sanitary service will be designed per the Region of Waterloo's standards. Based on a minimum pipe slope of 1% from the building, the proposed 200 mm diameter sanitary sewer will have the capacity to convey the internal sanitary flows for the proposed site to the existing 300 mm sewer on Erb Street West.

The Site Servicing Plan (Drawing C103) illustrates the location of the sanitary sewer and connections to the buildings. The internal sanitary system of the building will be designed per the mechanical engineer's details and specifications.

The City of Waterloo will confirm available flows and capacities in the local sanitary sewer system based on the demands provided. Based on preliminary correspondence with the City, the sanitary system does have adequate capacity to handle the added flows from the proposed development.

The existing sanitary services to the Site are to be decommissioned and removed as part of the proposed sanitary servicing strategy.

5.0 Drainage Conditions

The drainage conditions for the site in both pre-development and post-development conditions are outlined in the following sections.

5.1 Existing Drainage

According to the topographic survey (Guenther Rueb Surveying Limited, 2024), the site currently consists of four residential buildings, internal at-grade parking lot, paved access to Erb Street West for 369, 367, and 363 Erb Street West, and access to Culpepper Drive from 359 Erb St. The site generally slopes from south to north towards Erb Street West. Most of the stormwater runoff from the site drains towards the internal paved parking areas where it is captured in area drains and directed to the existing municipal storm sewer network on Erb Street West (Catchment 101). The frontage of the property, consisting of the site entrance and landscaped areas, drains uncontrolled to the Erb Street West right-of-way via sheet flow (Catchment UC102). There is a small amount of external drainage from the southern residential lots which appears to drain towards the Site. This drainage pattern will be maintained under proposed conditions. The existing storm sewers on Erb Street West are the ultimate stormwater receiver for the site.

Table 4 summarizes the pre-development catchment areas for the site and the associated runoff coefficients. Figure 1 illustrates the Pre-Development Drainage Plan.

Table 4: Pre-Development Catchment Areas and Runoff Coefficients

Catchment ID	Description	Impervious Area (m^2)	Pervious Area (m^2)	Total Area (m^2)	Weighted Runoff Coefficient[1]	Outlet
101	Existing residential	3,101	1,227	4,328	0.72	Erb Street West Storm Sewers
UC102	Existing residential	774	1,039	1,813	0.53	Overland to Erb Street West
Total				**6,141**		

1. The runoff coefficient values were calculated. See Modified Rational Calculations in Appendix C.

5.2 Proposed Drainage

The proposed site grading divides the site into two main post-development catchment areas consistent with existing conditions, as shown on the Post-Development Drainage Plan (Figure 2):

- Catchment 201 (A = 0.46 ha; RC = 0.87) consists of drainage from the proposed building footprint and internal paved areas. The minor system stormwater is collected via area drains and conveyed to the stormwater storage tank positioned outside the building closer to the Erb Street West frontage. Refer to the Preliminary Site Servicing Plan for the location of the proposed stormwater storage tank. The major system stormwater is conveyed overland to the Culpepper Drive right-of-way; ultimately draining towards the Erb Street West storm sewers.

- Catchment UC202 (A = 0.15 ha; RC = 0.60) consists of uncontrolled drainage from the north west, and east building frontages as well as some landscaped area southwest of the parking lot. All storm events from this catchment are conveyed overland via sheet flow to the Erb Street West right-of-way to mimic the pre-development drainage conditions.

Following development, the minor system will be conveyed from the site to a proposed stormwater storage tank through a storm network consisting of area drains, an internal stormwater conveyance system within the building footprint to be designed by the mechanical engineer, a stormwater storage tank, and an oil-grit separator. The stormwater system will provide quantity control for runoff prior to being treated by the proposed oil-grit separator located downstream of the storage tank. Following quantity and quality treatment, stormwater will be conveyed through a proposed 300 mm diameter storm lateral to the existing 825/900 mm diameter storm sewer within Erb Street West, consistent with the existing site conditions.

The proposed emergency overland flow route for the site mimics the flow direction and patterns of existing conditions, discharging southeast towards the Erb Street West and Culpepper Drive intersection. Table 5 provides details of the catchment areas and runoff coefficients for the post-development conditions.

Table 5: Post-Development Catchment Areas and Runoff Coefficients

Catchment ID	Description	Impervious Area (m^2)	Pervious Area (m^2)	Total Area (m^2)	Weighted Runoff Coefficient[1]	Outlet
201	Proposed buildings and paved areas	4,398	212	4,610	0.87	Erb Street West storm sewer
UC202	North and west building frontages	716	815	1,531	0.59	Erb Street West right-of-way
Total				**6,141**		

1. The runoff coefficient values were calculated. See Modified Rational Calculations in Appendix C.

Refer to the Post-Development Drainage Plan (Figure 2) and the Preliminary Site Grading and Site Servicing Plans (Drawings C102 and C103, respectively) for proposed storm servicing and drainage conditions.

6.0 Stormwater Management

The stormwater management design criteria are based on the City of Waterloo Development Engineering Manual (2013) and pre-consultation comments from the City of Waterloo (January 16, 2024). The stormwater management criteria include:

- Water Quantity Control:
    - According to the Record of Consultation Notes (January 2024), post development flows shall be attenuated to the pre-development levels for the 2, 5 and 100-year storm events.
- Water Quality Control:
    - At least 70% long-term average removal of Total Suspended Solids will be provided with "Normal Protection" as outlined in the Ministry of Environment Stormwater Management Planning and Design Manual.

6.1 Stormwater Quantity Control

As discussed in Section 6.0, stormwater quantity control requirements for the site include an on-site storage system to attenuate up to the 100-year runoff event and discharge to the City's municipal storm sewer system. All storm events greater than the 100-year event are to be released uncontrolled.

Using the City of Waterloo's intensity-duration-frequency (IDF) data, the Modified Rational Method was used to determine the pre-development and post-development peak flow rates for the stormwater runoff from the site. The peak flow targets for the site are based on the pre-development peak flow rates for the 5-year storm event. The pre-development and post-development peak flow rates as well as the required storage are summarized below in Table 6.

Table 6: Peak Flow Summary (Discharge towards Erb Street West Storm Sewer)

Storm Event (yearr)	**Peak Flow** (L/s)			**Required Storage** (m^3)	**Total Provided Storage*** (m^3)
	$Q_{pre-101}$	$Q_{post-201}$ (Uncontrolled)	$Q_{post-201}$ (Orifice Controlled)		
2	70	91	68	15	48
5	94	122		**44**	
25	132	171	128	35	
100	172	222	169	**44**	

*Storage provided for storms up to and including the 100-year storm event.

Based on the modified rational method and orifice sizing calculations, a three-stage orifice control plate with knockout diameters of 135 mm, 185 mm, and 210mm, respectively, installed upstream of the 300 mm storm sewer connection from the site will be sufficient to control the post-development storm events to the pre-development flow rates for all design storm events. A total volume of 44 m^3 will be required to provide quantity control for the 5 and 100-year storm events, based on the orifice configuration. An underground stormwater storage tank has been proposed to provide 48 m^3 of stormwater storage. Further details relating to the orifice control structures and the underground storage tank will be provided at the Site Plan Approval stage. Modified rational and orifice sizing calculations can be referenced in Appendix C

The drainage from Catchment UC202 generally consists of sidewalk and landscape runoff from the northern extents of the development along the Erb Street West right-of-way. The stormwater runoff from Catchment UC202 will drain uncontrolled to the Erb Street West right-of-way via the perimeter of the Site consistent with the pre-development runoff conditions. To ensure the uncontrolled flows to Erb Street West were not increased under post-development conditions, the rational method was used to determine the pre-development and post-development flows. The pre-development and post-development uncontrolled flows are outlined in Table 7:

Table 7: Peak Flow Summary (Discharge towards Erb Street West Right-of-way)

Storm Event	Pre-Development UC102 (L/s)	Post-Development UC202 (L/s)	Difference (L/s)
2-yr	21.7	20.7	-1.0
5-yr	29.1	27.8	-1.3
25-yr	40.8	38.9	-1.9
100-yr	53.0	50.5	-2.4

As per the rational calculations, the uncontrolled flows to Erb Street West from the site are slightly reduced for all storm events up to and including the 100-year storm event. Therefore, quantity controls have not been provided for Catchment UC202.

6.2 Stormwater Quality Control

Stormwater quality controls for the site must incorporate measures to provide a Normal Level of Protection according to the MOE (March 2003) guidelines. Normal water quality protection involves the long-term average removal of at least 70% of the Total Suspended Solids (TSS) from 90% of the annual runoff volume.

Water quality control for Catchment 201 will be provided using an oil-grit separator (Stormceptor EF4 or approved equivalent). The oil-grit-separator, located downstream of the underground stormwater storage unit, will provide quality control for runoff before discharging towards the Erb Street West storm sewer network. Details of the proposed oil-grit separator will be confirmed during future design stages of this project.

Catchment UC202 will discharge uncontrolled towards the Erb Street West right-of-way, consistent with the existing overland flow conditions. The uncontrolled flow from this catchment is minor and primarily consists of clean runoff; therefore, quality controls have not been provided for this catchment.

7.0 Erosion and Sediment Controls During Construction

The design of the erosion and sediment controls can be referenced on the Erosion and Sediment Control Plan (Drawing C101). The erosion and sediment controls are required to be installed prior to the beginning of any construction activities. They will be maintained until the site is stabilized or as directed by the Site Engineer and/or City of Waterloo. Controls will be inspected after each significant rainfall event and maintained in proper working condition by the Contractor. Further details will be provided through detailed design.

Light Duty Silt Fencing

Light duty silt fencing will be installed around the perimeter of the site to intercept sheet flow and delineate the site limits. Additional silt fencing may be added based on field decisions by the Site Engineer and Owner, prior to, during, and following construction.

Rock Mud Mat

A rock mud mat will be installed at the entrance to the construction zone to prevent mud tracking from the site onto surrounding lands and the perimeter roadway network. All construction traffic will be restricted to this access only. The Contractor is to maintain the mud mat as required.

Silt sacks in Catchbasins

A silt sack will be installed in each new catchbasin as they are installed. The silt sack will provide sediment control to prevent silt and sediment from entering the storm water system. Silt sacks will also be installed on the existing catchbasins during construction to prevent sediment from entering the existing storm sewer pipe.

8.0 Conclusions and Recommendations

This report was prepared in support of the Zoning By-law Amendment and Official Plan Amendment Applications for the property located at 359-369 Erb Street West in the City of Waterloo. The proposed development can be serviced for water, sanitary and stormwater management in accordance with City and Region requirements and standards. Our conclusions and recommendations include:

Proposed Water Service

1. The domestic peak hourly water demand for the proposed development is 3.55 L/s. The design fire flow is 170.6 L/s for 2.00 hours.

2. Water demand for the proposed development will be met by connecting a 200 mm diameter PVC water service to the existing 200 mm diameter watermain on Culpepper Drive. The proposed watermain will split into fire and domestic lines at the east property line as shown in the Preliminary Site Servicing Plan (C103).

Proposed Sanitary Service

1. Total peak sanitary flow for the proposed development is 4.41 L/s.

2. Sanitary conveyance for the proposed development will be provided using a 200 mm diameter PVC sanitary sewer which will connect to the existing sanitary sewer on Erb Street West. One 200 mm diameter sanitary service lateral is provided for both residential towers.

Stormwater Management

1. The site's stormwater runoff will be collected in area drains and conveyed into an underground storage tank for events up to and including the 100-year storm event. The proposed stormwater management system will control the flows down to the pre-development peak flows before discharging into the existing sewer on Erb Street West. Stormwater runoff from the northern extent and perimeter of the site will flow uncontrolled towards the Erb Street West right-of-way.

2. Stormwater quantity controls are required to provide on-site storage and conveyance for all rainfall events up to and including the 100-year storm event. An underground storage tank has been sized to provide post- to pre-development quantity control for the 100-year storm event. Storm events larger than the 100-year event will flow uncontrolled towards the Erb Street West right-of-way per City requirements.

3. Stormwater quality controls for the site will be provided by an in-line-oil-grit separator (Stormceptor EF4 or approved equivalent) unit installed downstream of the underground stormwater storage tank.

Based on the above conclusions, we recommend the approval of the Zoning By-Law Amendment and Official Plan Amendment Applications from the perspective of servicing and stormwater management.

Respectfully submitted,

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APPENDIX A

Water Demand Calculations

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Project: 359-369 Erb St | **Created By:** FI | **Date:** 2026-02-13
Project No.: 2704-7158 | **Checked By:** MB | **Updated:** 2026-03-25

Proposed Domestic Water Demand

Site Area:	0.60	ha
Number of units:	216	units
Population:	330	capita

Units	P.P.U	# of Units	Population
1 Bedroom	1.30	154	200
2+ Bedrooms	2.10	62	130
Total	-	216	330

Design Parameters

Average Demand (L/capita/d)
225

Water Demand Residential:

Average Daily Demand =	74229	L/day
=	**0.86**	**L/s**

Peaking Factors (Residential)

Max Day PF =	2.75
Peak Hour PF =	4.13

Average Day =	0.86	L/s
Max Day =	**2.36**	**L/s**
Peak Hour =	**3.55**	**L/s**

Municipality	Average Daily Water Demand (L/s)	Max Day Demand (L/s)	Peak Hourly Demand (L/s)
Region of Waterloo	0.86	2.36	3.55

Notes & References

Site stats per Site Plan prepared by 2296342 Ont Inc. dated March, 2026.

Population per unit from Appendix A Schedule 4 of Watson & Associates Region of Waterloo Development Charges Background Study (April 2019)

Average Demand from Section B2.2.2 from the Region of Waterloo and Area Municipalities - Design Guidelines and Supplemental Specifications for Municipal Services (January 2025)

Peaking Factors from Table 3.1 of MOE - Design Guidelines for Drinking-Water Systems (2008)

Max Day = Average Day Demand * Max Day PF
Peak Hour = Average Day Demand * Peak Hour PF

Total demand calculations includes only residential flows, no commercial.

Project: 359-369 Erb Street
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Date: 2026-03-20
Designed By: FI
Checked By: MB

Water Supply for Public Fire Protection (2020)
Fire Underwriters Survey

Assumptions:

1) Construction type for the proposed high-rise buildings is assumed to be non-combustible.
2) Building gross-floor area is based on Site Plan prepared by 2296342 Ontario Inc. dated March, 2026.
3) The building will be equipped with complete automatic sprinkler protection based on similar types of construction.

Part II - Guide for Determination of Required Fire Flow

1. An estimate of fire flow required for a given area may be determined by the formula:

$$F = 220 * C * \sqrt{A}$$

Where:

F = the required fire flow in litres per minute

C = coefficient related to the type of construction:

=	1.5	for wood frame construction (structure essentially all combustible)
=	0.8	for type IV-A mass timber construction
=	0.9	for type IV-B mass timber construction
=	1.0	for type IV-C mass timber construction
=	1.5	for type IV-D mass timber construction
=	1.0	for ordinary construction (brick or other masonry walls, combustible floor and interior)
=	0.8	for non-combustible construction (unprotected metal structural components)
=	0.6	for fire-resistive construction (fully protected frame, floors, roof)

A = The largest floor area in square meters (plus the following percentages of the total areas of the other floors).

For Construction Coefficient from 1.0 to 1.5:
= 100% of ALL Floor Areas
For Construction Coefficient below 1.0:
- Floors With Any Unprotected Vertical Openings in the Building
= two largest adjoining floors + 50% all floors immediately above (max 8 floors)
- Floors With Any Protected Vertical Openings and Protected Exterior Vertical Communications
= 25% each of two immediately adjoining floors

Proposed Buildings (GFA are as per Site Plan)

Area:

A= 2,150 sq.m — GFA of L5 as measured on the Site Plan (2296342 Ontario Inc., March 2026)
A= 1,030 sq.m — GFA of 25% of each of the two immediately adjoining floors. (L4 and L6)

C= 0.8

Therefore RFF = 10,000 L/min

Fire flow determined above shall not exceed:
30,000 L/min for wood frame construction
30,000 L/min for ordinary construction
25,000 L/min for non-combustible construction
25,000 L/min for fire-resistive construction

2. Values obtained in No. 1 may be reduced by as much as 25% for occupancies having low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

*Non-Combustible	-25%	Free Burning	15%
Limited Combustible	-15%	Rapid Burning	25%
Combustible	0%		

Occupancy Type: Residential (C) Reduction %: -15%

1,500 L/min reduction
Subtotal = 8,500 L/min

Note: Flow determined shall not be less than 2,000 L/min

3. Sprinklers - The value obtained in No. 2 above may be reduced by up to 50% for complete automatic sprinkler protection.

Automatic Sprinkler Design System	Credit to part of building with coverage
Automatic sprinkler protection designed and installed in accordance with NFPA 13.	30%
Water supply is standard for both the system and Fire Department hose lines.	10%
Fully supervised system.	10%

Reduction %: 20%

1,700 L/min reduction
Subtotal = 6,800 L/min

Part II - Guide for Determination of Required Fire Flow

4. Exposure - To the value obtained in No. 2, a percentage should be added for structures exposed within 30 meters by the fire area under consideration. The percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s) and the effect of hillside locations on the possible spread of fire.

Separation	Charge	Separation	Charge
0 to 3 m	25%	20.1 to 30 m	10%
3.1 to 10 m	20%	>30 m	0%
10.1 to 20 m	15%		

Exposed buildings

Direction	Distance (m)	Charge	Surcharge (L/min)
Existing Residential (North)	44	0%	0
Existing Commercial (East)	31	0%	0
Existing Detached Homes (South/West)	22	10%	850
Existing Detached Homes (West)	9	20%	1,700
Total Surcharge			**2550**

Determine Required Fire Flow

No.1	10,000
No. 2	1,500 reduction
No. 3	1,700 reduction
No. 4	2,550 surcharge

Required Flow: 9,350 L/min
Rounded to nearest 1000 L/min: 10,000 L/min or **167 L/s**
2,640 USGPM

Note: USGPM = 0.264*(L/min)

Required Duration of Fire Flow	
Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3,000	1.25
4,000	1.50
5,000	1.75
6,000	2.00
8,000	2.00
10,000	**2.00**
12,000	2.50
14,000	3.00
16,000	3.50
18,000	4.00
20,000	4.50
22,000	5.00
24,000	5.50
26,000	6.00
28,000	6.50
30,000	7.00
32,000	7.50
34,000	8.00
36,000	8.50
38,000	9.00
40,000 and over	9.50

Region of Waterloo

ENGINEERING AND ENVIRONMENTAL SERVICES
Water and Wastewater Services

150 Frederick Street 7th Floor
Kitchener Ontario N2G 4J3 Canada
Telephone: 519-575-4400; TTY: 519-575-4608
Email: waterservices@regionofwaterloo.ca
www.regionofwaterloo.ca/water

Trevor Fraser
C.F. Crozier & Associates Inc
Milton, Ontario, Canada L9T 6P4
548.708.0023

Date: November 15, 2024

Dear: Trevor

Re: 359-369 Erb St

Please find the results of the modeling simulations for boundary conditions requested on October 1, 2024. The results include a figure showing the location of the node from the Region's model. Attached are a series of spreadsheets containing results for Average Day, Maximum Day demands and available fire flows for node JCT_23146 located at Erb St W and Culpepper Dr. The diurnal 24-hour demand distribution accounts for the minimum hour and peak hour peaking factors. The maximum pressure on the average day represents the minimum hour, and the minimum pressure on the maximum day represents the peak hour.

Table 1 – Modeling Results

Node	**Elevation** (mASL)	**Demand**		**Fire Flow Results**	
		Ave Day (L/s)	Max Day (L/s)	Design Flow (L/s)	Design Pressure (m)
JCT_23146	343.0	0.6	0.6	434.0	25.2

A fire flow analysis shows the maximum flow available at a node with an associated design pressure during the maximum day scenario while maintaining the minimum design pressure of 14 m (140 kPa) at all nodes within the pressure zone.

If you have any questions, please contact me

Kevin Dolishny P.Eng.
Senior Engineer, Water Services
c. 226.751.4551
e. kdolishny@regionofwaterloo.ca

WAT 5 359-369 Erb St W

JCT_23146 **Average Day 24 Hour Simulation**

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	0.47	403.82	60.82
01:00 hrs	0.51	403.67	60.67
02:00 hrs	0.53	403.67	60.67
03:00 hrs	0.48	403.73	60.73
04:00 hrs	0.41	403.80	60.80
05:00 hrs	0.61	403.66	60.66
06:00 hrs	1.20	403.06	60.06
07:00 hrs	1.47	402.70	59.70
08:00 hrs	1.28	402.89	59.89
09:00 hrs	1.26	402.88	59.88
10:00 hrs	1.22	403.07	60.07
11:00 hrs	1.17	403.12	60.12
12:00 hrs	1.11	403.16	60.16
13:00 hrs	1.04	403.23	60.23
14:00 hrs	0.98	403.30	60.30
15:00 hrs	1.02	403.26	60.26
16:00 hrs	1.06	403.22	60.22
17:00 hrs	1.19	403.09	60.09
18:00 hrs	1.27	403.00	60.00
19:00 hrs	1.26	403.00	60.00
20:00 hrs	1.18	403.07	60.07
21:00 hrs	1.05	403.19	60.19
22:00 hrs	0.86	403.38	60.38
23:00 hrs	0.60	403.61	60.61
Average Day HGL:		403.27	
Minimum Hour:		403.82	

JCT_23146 **Maximum Day 24 Hour Simulation**

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	0.38	403.76	60.76
01:00 hrs	0.42	403.73	60.73
02:00 hrs	0.49	403.69	60.69
03:00 hrs	0.48	403.71	60.71
04:00 hrs	0.42	403.77	60.77
05:00 hrs	0.75	403.46	60.46
06:00 hrs	1.40	402.67	59.67
07:00 hrs	1.61	402.66	59.66
08:00 hrs	1.26	403.04	60.04
09:00 hrs	1.04	403.26	60.26
10:00 hrs	0.98	403.29	60.29
11:00 hrs	0.90	403.37	60.37
12:00 hrs	1.03	403.22	60.22
13:00 hrs	1.21	403.00	60.00
14:00 hrs	1.07	403.15	60.15
15:00 hrs	1.33	402.84	59.84
16:00 hrs	1.38	402.76	59.76
17:00 hrs	1.59	402.46	59.46
18:00 hrs	1.71	402.49	59.49
19:00 hrs	1.71	402.47	59.47
20:00 hrs	1.55	402.63	59.63
21:00 hrs	1.11	403.09	60.09
22:00 hrs	0.83	403.38	60.38
23:00 hrs	0.55	403.62	60.62
Maximum Day HGL:		403.15	
Peak Hour:		402.46	

WAT 5 359-369 Erb St W

Available Flow (L/s)	Residual Pressure (m)
0.0	60.6
20.0	60.2
40.0	59.7
60.0	59.1
80.0	58.3
100.0	57.4
120.0	56.4
140.0	55.3
160.0	54.0
180.0	52.7
200.0	51.3
220.0	49.7
240.0	48.1
260.0	46.3
280.0	44.5
300.0	42.5
320.0	40.5
340.0	38.3
360.0	36.1
380.0	33.7
400.0	31.3
420.0	28.7
434.0	25.2

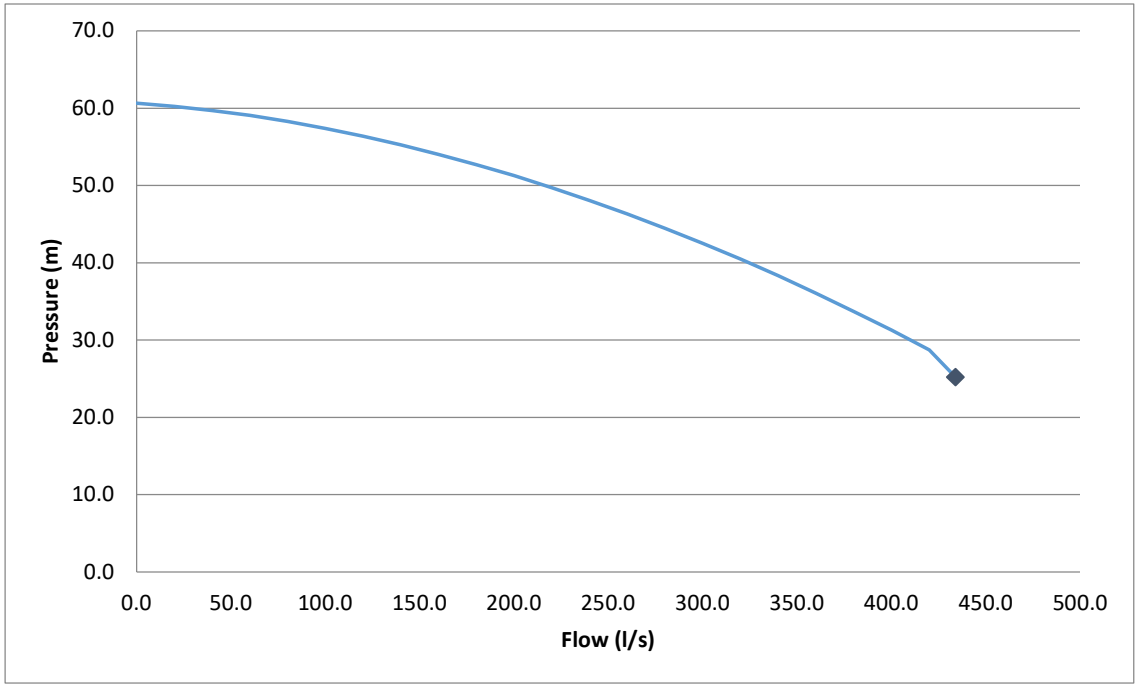
Fire Flow Analysis

Fire Flow Node:	JCT_23146
Design Flow (L/s):	434.0
Design Pressure (m):	25.2

Design Flow: *The final adjusted flow at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.*

Design Pressure: *The lowest allowable pressure at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.*

Critical Node ID: *The constraining node within the pressure zone that drops to the minimum design pressure of (14m (140 kPa)) during the design flow.*





Author: chase Document Path: I:\InfoWater\Modeling Requests\2024\Crozier\359-369 Erb St\359-369 Erb St.aprx
Time: 3:36 PM Date: 2024-10-03

Region of Waterloo

ENGINEERING AND
ENVIRONMENTAL SERVICES

Water and Wastewater Services

150 Frederick Street
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www.regionofwaterloo.ca

Junction
- Junction
- Pipe
- Subject Site
- Assessment Parcels (MPAC)

359-369 Erb St W
Waterloo

APPENDIX B

Sanitary Flow Calculations

CROZIER CONSULTING ENGINEERS

Project: 359-369 Erb St
Project No.: 2704-7158

Created By: FI
Checked By: MB

Date: 2026-02-13
Updated: 2026-03-25

Proposed Sanitary Design Flow

Site Area:	0.60	ha
Number of units:	216	units
Population:	330	capita

Residential Sanitary Flow

Units	P.P.U	# of Units	Population
1 Bedroom	1.30	154	200
2+ Bedrooms	2.10	62	130
Total	-	216	330

Population per unit from Appendix A Schedule 4 of Watson & Associates Region of Waterloo Development Charges Background Study (April 2019)

Design Parameters:

Average Flow (L/capita/d)
275

Average Flow from Section B.3.1.2.1 from the Region of Waterloo and Area Municipalities - Design Guidelines for Municipal Services (January, 2025)

Sanitary Design Flow:

Average Daily Flow =	90,724	L/d
=	**1.05**	**L/s**

Average Daily Flow = Average Daily Flow (L/cap./day) * population / 86400

Harmon Peak Factor: M = **4.06**

$$M = 1 + \frac{14}{4 + p^{0.5}}$$

Residential Peak Flow = **4.26** **L/s**

Peak Flow = Average Daily Flow * M

Infiltration Flow:

Infiltration =	0.25	L/s/ha
Total Infiltration =	**0.15**	**L/s**

Infiltration Allowance from Section B.3.1.2.6 of Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications (January, 2025)

Municipality	Residential Peak Flow (L/s)	Infiltration Flow (L/s)	Overall Peak Development Flow (L/s)
Region of Waterloo	4.26	0.15	4.41

Total Design Flow = Residential Peak Flow + Total Infiltration

Notes & References

Site stats per Site Plan prepared by 2296342 Ont Inc. dated March, 2026.

APPENDIX C

Stormwater Management Calculations

CROZIER CONSULTING ENGINEERS

Project: 359-369 Erb Street
Project No.: 2704-7158
Created By: MB
Checked By: TF
Date: 2024-07-18
Updated: 2026-03-25

Modified Rational Calculations - Input Parameters

Storm Data: Waterloo

Time of Concentration: T_c = 10 min (per City of Waterloo standards)

Return Period	A	B	C	I (mm/hr)
2 yr	1101	9.258	0.882	81.05
5 yr	1755	12.347	0.895	108.82
25 yr	3261	16.193	0.938	152.44
100 yr	4692	17.437	0.956	197.84

Note: Rainfall Intensity stastics provided per City of Waterloo IDF Curve.

Pre - Development Conditions (101)				
Land Use	**Area** (ha)	**Area** (m^2)	**RC**	**Weighted RC**
Pervious	0.12	1,227	**0.25**	**0.07**
Impervious	0.31	3,101	**0.90**	**0.64**
Total Site	**0.43**	**4328**	**-**	**0.72**

Pre - Development Conditions (UC102)				
Land Use	**Area** (ha)	**Area** (m^2)	**RC**	**Weighted RC**
Pervious	0.10	1,039	**0.25**	**0.14**
Impervious	0.08	774	**0.90**	**0.38**
Total Site	**0.18**	**1813**	**-**	**0.53**

Post - Development Conditions (201)				
Land Use	**Area** (ha)	**Area** (m^2)	**C**	**Weighted Average RC**
Pervious	0.02	212	0.25	**0.01**
Impervious	0.44	4398	0.90	**0.86**
Total Site	**0.46**	**4610**	**-**	**0.87**

Note: Landscaped areas above the limit of underground parking are considered to be impervious (C = 0.90).

Post - Development Conditions (UC202)				
Catchment	**Area** (ha)	**Area** (m^2)	**RC**	**Weighted RC**
Pervious	0.07	716	**0.25**	**0.12**
Impervious	0.08	815	**0.90**	**0.48**
Total Site	**0.15**	**1531**	**-**	**0.60**

Equations:

Peak Flow
$Q_{post} = 0.00278 \cdot C \cdot i(T_d) \cdot A$

Intensity
$i(T_d) = AT\text{^}B$

CROZIER
CONSULTING ENGINEERS

Project: 359-369 Erb Street
Project No.: 2704-7158
Created By: MB
Checked By: TF
Date: 2024-07-18
Updated: 2026-03-25

Modified Rational Calculations - Peak Flows Summary

Pre-Development 101	
Storm Event	**Peak Flow** (L/s)
2 yr	70.30
5 yr	94.38
25 yr	132.21
100 yr	171.58

Post Development 201		Required Storage (m^3)
Storm Event	**Peak Flow Rate** (L/s)	
2 yr	91.03	15.22
5 yr	122.23	43.51
25 yr	171.21	36.21
100 yr	222.20	43.68

Uncontrolled to Erb Street West

	Pre- Development UC101	Post Development UC201	
Storm Event	**Peak Flow Rate** (L/s)	**Peak Flow Rate** (L/s)	**Increase** (L/s)
2 yr	21.70	20.71	-1.00
5 yr	29.14	27.80	-1.34
25 yr	40.82	38.94	-1.88
100 yr	52.98	50.54	-2.44

CROZIER CONSULTING ENGINEERS

Project: 359-369 Erb Street
Project No.: 2704-7158
Created By: MB
Checked By: TF
Date: 2024-07-18
Updated: 2026-03-25

Modified Rational Calculations - 100-Year Storm Event

Control Criteria

100 yr: Control Post-Development Peak Flows to Pre-Development Peak Flows

100 yr: Uncontrolled Post-Development Flow

Q_{post} = 222.20 L/s

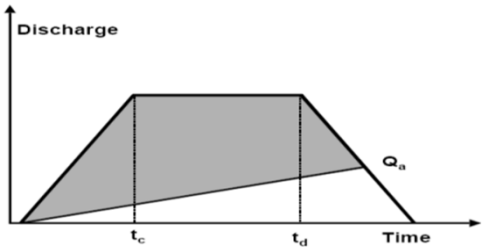
100 yr: Uncontrolled Pre-development Flows (101)

Q_{pre} = 171.58 L/s

100 yr: Orifice controlled Post-development Flows (201)

$Q_{post(controlled)}$ = 164.75 L/s

Storage Volume Determination				
T_d (min)	i (mm/hr)	T_d (sec)	Q_{Uncont} (m^3/s)	S_d (m^3)
5	239.79	300	0.269	3.58
10	197.84	600	0.222	30.37
15	168.58	900	0.189	41.72
20	146.99	1200	0.165	43.68
25	130.39	1500	0.146	39.50
30	117.22	1800	0.132	31.07
35	106.51	2100	0.120	19.58
Required Storage Volume:				**43.68**



Peak Flow
$Q_{post} = 0.0028 \cdot C_{post} \cdot i(T_d) \cdot A$

Storage
$S_d = Q_{post} \cdot T_d - Q_{target} (T_d + T_c) / 2$

Project: 359-369 Erb Street
Project No.: 2704-7158
Created By: MB
Checked By: TF
Date: 2024-07-18
Updated: 2026-03-25

Modified Rational Calculations - 25-Year Storm Event

Control Criteria

25 yr: Control Post-Development Peak Flows to Pre-Development Peak Flows

25 yr: Uncontrolled Post-Development Flow

$Q_{post(uncontrolled)}$ = 171.21 L/s

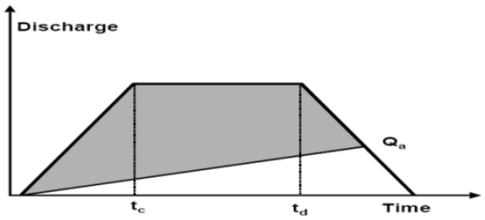
25 yr: Uncontrolled Pre-development Flows

Q_{pre} = 132.21 L/s

25 yr: Orifice controlled Post-development Flows (201)

$Q_{post(controlled)}$ = 128.32 L/s

Storage Volume Determination				
T_d (min)	i (mm/hr)	T_d (sec)	Q_{Uncont} (m^3/s)	S_d (m^3)
5	185.94	300	0.209	4.91
10	152.44	600	0.171	25.73
15	129.40	900	0.145	34.56
20	112.55	1200	0.126	36.21
25	99.69	1500	0.112	33.21
30	89.53	1800	0.101	27.02
Required Storage Volume:				**36.21**



Peak Flow
$Q_{post} = 0.0028 \cdot C_{post} \cdot i(T_d) \cdot A$

Storage
$S_d = Q_{post} \cdot T_d - Q_{target} (T_d + T_c) / 2$

Project: 359-369 Erb Street
Project No.: 2704-7158
Created By: MB
Checked By: TF
Date: 2024-07-18
Updated: 2026-03-25

Modified Rational Calculations - 5-Year Storm Event

Control Criteria

5 yr: Control Post-Development Peak Flows to Pre-Development Peak Flows

5 yr: Uncontrolled Post-Development Flow

$Q_{post(uncontrolled)}$ = 122.23 L/s

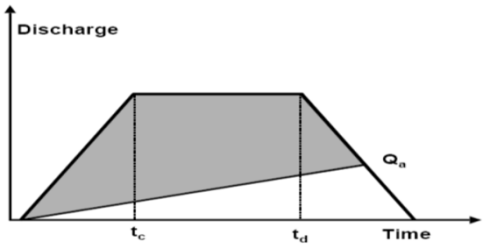
5 yr: Uncontrolled Pre-development Flows

Q_{pre} = 94.38 L/s

5 yr: Orifice controlled Post-development Flows (201)

$Q_{post(controlled)}$ = 68.83 L/s

Storage Volume Determination				
T_d (min)	i (mm/hr)	T_d (sec)	Q_{Uncont} (m^3/s)	S_d (m^3)
5	136.51	300	0.153	15.03
10	108.82	600	0.122	32.04
15	90.83	900	0.102	40.20
20	78.16	1200	0.088	43.40
25	68.72	1500	0.077	43.51
30	61.41	1800	0.069	41.57
Required Storage Volume:				**43.51**



Peak Flow
$Q_{post} = 0.0028 \cdot C_{post} \cdot i(T_d) \cdot A$

Storage
$S_d = Q_{post} \cdot T_d - Q_{target} (T_d + T_c) / 2$

Project: 359-369 Erb Street
Project No.: 2704-7158
Created By: MB
Checked By: TF
Date: 2024-07-18
Updated: 2026-03-25

Modified Rational Calculations - 2-Year Storm Event

Control Criteria

2 yr: Control Post-Development Peak Flows to Pre-Development Peak Flows

2 yr: Uncontrolled Post-Development Flow

$Q_{post(uncontrolled)}$ = 91.03 L/s

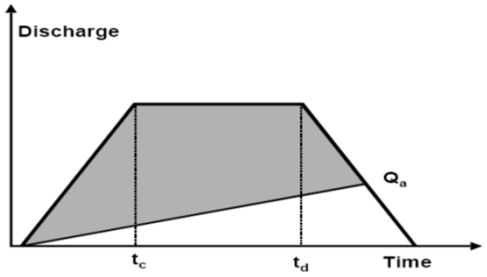
2 yr: Uncontrolled Pre-Development Flows

Q_{pre} = 70.30 L/s

2 yr: Orifice controlled Post-development Flows (201)

$Q_{post(controlled)}$ = 68.83 L/s

Storage Volume Determination				
T_d (min)	i (mm/hr)	T_d (sec)	Q_{Uncont} (m^3/s)	S_d (m^3)
5	105.66	300	0.119	4.63
10	81.05	600	0.091	13.32
15	66.12	900	0.074	15.22
20	56.05	1200	0.063	13.60
25	48.77	1500	0.055	9.89
30	43.25	1800	0.049	4.84
Required Storage Volume:				**15.22**



Peak Flow

$$Q_{post} = 0.0028 \cdot C_{post} \cdot i(T_d) \cdot A$$

Storage

$$S_d = Q_{post} \cdot T_d - Q_{target} (T_d + T_c) / 2$$

PROJECT: 359-369 Erb Street
PROJECT No.: 2704-7158
FILE: Orifice Design
DATE: 2026-03-16
UPDATE: 2026-03-25
DESIGN: MB
CHECK: TF

Orifice Design Summary - Catchment 201

Orifice Type =	Tube	
Invert Elevation =	342.84	m
Diameter of Orifice =	135	mm
Area of Orifice (A) =	0.0143	sq.m
Orifice Coefficient (Cd) =	0.820	

2-5 year orifice control

Calculation of Head

Centroid Elevation =	342.91	m
Water Elevation =	344.66	m
Upstream Head*, (h) =	1.75	m

Qa =	**(Cd)(A)(2gh)^0.5**	
Actual Controlled Discharge, Qa =	0.06883	cms
Qa =	**68.83**	**L/s**

*Head is based upon orifice area @ orifice face not Vena Contracta

J:\2700\2704 - 2296342 Ontario Inc\7158 - 359-369 Erb Street West\Design\Civil_Water\[2026.03.27_Modified Rational Method.xlsx]Peak

CROZIER
CONSULTING ENGINEERS

PROJECT: 359-369 Erb Street
PROJECT No.: 2704-7158
FILE: Orifice Design
DATE: 2026-03-16
UPDATE: 2026-03-25
DESIGN: MB
CHECK: TF

Orifice Design Summary - Catchment 201

Orifice Type =	Tube	
Invert Elevation =	342.84	m
Diameter of Orifice =	185	mm
Area of Orifice (A) =	0.0269	sq.m
Orifice Coefficient (Cd) =	0.820	

25 year orifice control

Calculation of Head

Centroid Elevation =	342.93	m
Water Elevation =	344.66	m
Upstream Head*, (h) =	1.73	m

Qa =	**(Cd)(A)(2gh)^0.5**	
Actual Controlled Discharge, Qa =	0.12832	cms
Qa =	**128.32**	**L/s**

*Head is based upon orifice area @ orifice face not Vena Contracta

CROZIER
CONSULTING ENGINEERS

PROJECT: 359-369 Erb Street
PROJECT No.: 2704-7158
FILE: Orifice Design
DATE: 2026-03-16
UPDATE: 2026-03-25
DESIGN: MB
CHECK: TF

Orifice Design Summary - Catchment 201

Orifice Type =	Tube		
Invert Elevation =	342.84	m	
Diameter of Orifice =	210	mm	100 year orifice control
Area of Orifice (A) =	0.0346	sq.m	
Orifice Coefficient (Cd) =	0.820		

Calculation of Head

Centroid Elevation =	342.95	m
Water Elevation =	344.66	m
Upstream Head*, (h) =	1.72	m

Qa =	**(Cd)(A)(2gh)^0.5**	
Actual Controlled Discharge, Qa =	0.16475	cms
Qa =	**164.75**	**L/s**

*Head is based upon orifice area @ orifice face not Vena Contracta

DRAWINGS AND FIGURES

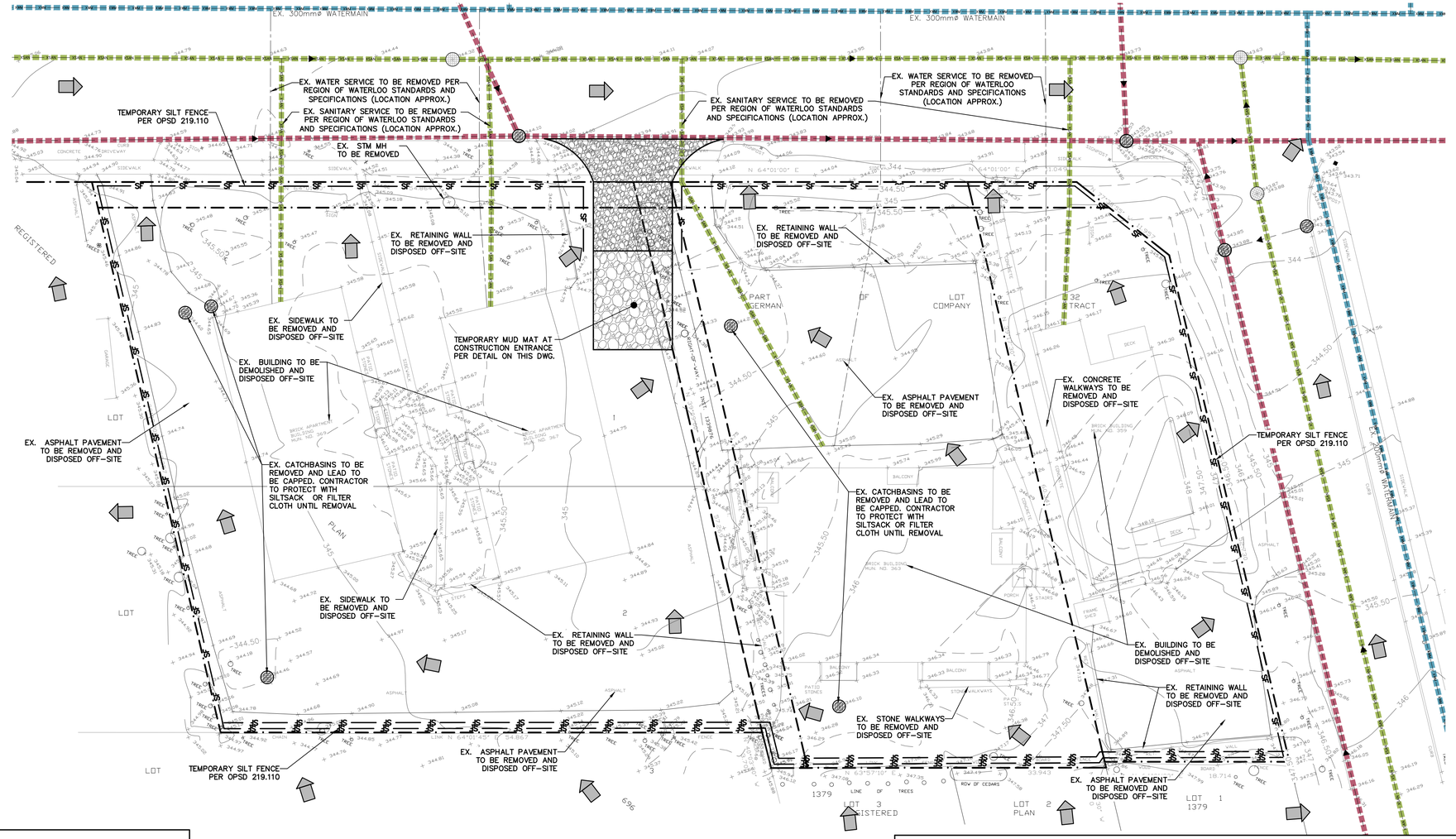
Drawing C101: Removals, Erosion & Sediment Control Plan

Drawing C102: Preliminary Site Grading Plan

Drawing C103: Preliminary Site Servicing Plan

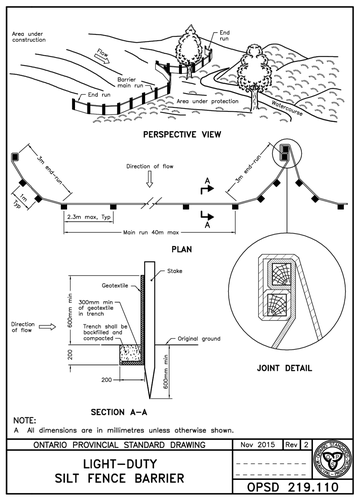
Figure 1: Pre-Development Drainage Plan

Figure 2: Post-Development Drainage Plan



LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- x 215.00 — EXISTING GRADE
- EXISTING WATERMAIN & GATE VALVE
- EXISTING STORM SEWER & MANHOLE
- EXISTING SINGLE CATCHBASIN
- EXISTING SANITARY SEWER & MANHOLE
- PROPOSED TEMPORARY MUD-MAT; SEE DETAIL
- SF — PROPOSED TEMPORARY SILT FENCE
- EXISTING FENCE
- EXISTING OVERLAND FLOW DIRECTION
- TEMPORARY CATCHBASIN SILTATION CONTROL DEVICE (SILTSACK) SEE DETAIL ON THIS PLAN



NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
LIGHT-DUTY SILT FENCE BARRIER		OPSD 219.110

SCALE: 1:250

EROSION & SEDIMENT CONTROL NOTES:

1. EROSION & SEDIMENT CONTROL MEASURES MUST BE INSTALLED PRIOR TO THE COMMENCEMENT OF SITE WORKS.
2. EROSION & SEDIMENT CONTROLS MUST BE INSPECTED ON A WEEKLY BASIS AND AFTER EVERY RAIN FALL EVENT, AND MUST BE MAINTAINED AND REPAIRED IN A TIMELY MANNER TO PREVENT SEDIMENT FROM LEAVING THE SITE.
3. EXISTING AND PROPOSED CATCHBASINS ARE TO BE PROTECTED WITH FILTER CLOTH AND 150mm DEPTH OF 50mm DIA. STONE COVER DURING CONSTRUCTION.
4. IT IS REQUIRED TO STABILIZE ALL AREAS PER OPSS 804 THAT WILL REMAIN DISTURBED FOR MORE THAN 30 DAYS.
5. MUD MAT, SILT FENCE, AND CATCHBASIN PROTECTION ARE NOT TO BE REMOVED UNTIL COMPLETION OF CONSTRUCTION.
6. ALL SILT FENCES SHOWN ARE OFFSET FROM PROPERTY LINE FOR CLARITY ONLY. INSTALL SILT FENCE IN SUITABLE LOCATION FOR THE DURATION OF THE PROJECT.
7. SEDIMENT AND EROSION CONTROL MEASURES WILL BE IMPLEMENTED PRIOR TO, AND MAINTAINED DURING THE CONSTRUCTION PHASES, TO PREVENT ENTRY OF SEDIMENT INTO THE STORM RUNOFF.
8. THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO PREVENT SEDIMENT RELEASES TO THE NATURAL ENVIRONMENT. THE GRCA ENFORCEMENT OFFICER SHOULD BE IMMEDIATELY CONTACTED SHOULD THE EROSION AND SEDIMENT CONTROL PLANS CHANGE FROM THE APPROVED PLANS.
9. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
10. ALL DISTURBED AREAS WILL BE STABILIZED AND RESTORED WITH NATIVE/NON-INVASIVE SPECIES UPON COMPLETION OF THE WORK.
11. A REHABILITATION PLAN IS TO BE IMPLEMENTED TO RESTORE THE CONSTRUCTION SITE BACK TO ITS PRE-CONSTRUCTION STATE, OR BETTER.
12. THE CONTRACTOR SHALL MONITOR THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS WILL BE CONDUCTED DURING FAVOURABLE WEATHER CONDITIONS.
13. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE REMOVED ONLY AFTER CONSTRUCTION COMPLETION

REGION OF WATERLOO WORK PERMIT NOTE:

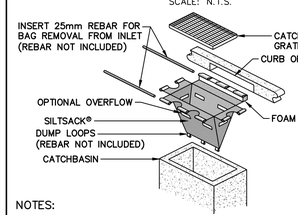
1. A REGION OF WATERLOO WORK PERMIT IS REQUIRED FOR ANY WORKS WITHIN THE ERB STREET WEST AND CULPEPPER DRIVE RIGHT-OF-WAY.

NOTE:

THROUGHOUT EARTHWORKS, GRADING, AND SERVICING WORK, APPROPRIATE TRAFFIC SIGNS (TRUCK TURNING ETC.) MUST BE SET UP ALONG ERB STREET WEST AND CULPEPPER DRIVE IN ACCORDANCE WITH ONTARIO TRAFFIC MANUAL BOOK 7.
ANY CONSTRUCTION SIGNAGE PROPOSED WITHIN THE ERB STREET WEST AND CULPEPPER DRIVE RIGHT-OF-WAY MUST BE APPROVED BY THE REGION OF WATERLOO.

'SILTSACK' DETAIL

SCALE: N.T.S.

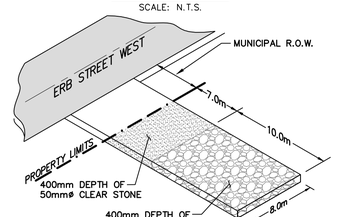


NOTES:

1. INSTALL TERRAFIX 'SILTSACK' IN ALL CATCHBASINS & CATCHBASIN MANHOLES AFFECTED BY CONSTRUCTION.
2. INSTALL TERRAFIX 'SILTSACK' IN ALL NEW CATCHBASINS & CATCHBASIN MANHOLES.

MUD MAT DETAIL

SCALE: N.T.S.



NOTE:
GEOTEXTILE (TERRAFIX 270R OR APPROVED EQUAL) TO BE PLACED AS SEPARATION BARRIER BETWEEN EXISTING GROUND AND CLEAR STONE.

SERVICE DISCONNECTION NOTES:

1. EXISTING SANITARY SERVICES MUST BE DISCONNECTED AT THE MAIN. IF THE EXISTING SERVICE IS NOT PVC, A SECTION OF PVC PIPE IS TO BE CONNECTED TO THE EXISTING PIPE WITH A FLEXIBLE COUPLING. THE DOWNSTREAM END OF THE ABANDONED SERVICE SHALL BE CAPPED WITH A GASKETED PVC CAP. THE UPSTREAM SIDE OF THE ABANDONED SERVICE SHALL BE PLUGGED WITH GROUT OR LEAN-MIX CONCRETE.
2. EXISTING WATER SERVICE 50mm OR LESS IN DIA. SHALL BE ABANDONED AT THE MAIN. IF THE MAIN STOP IS FOUND TO BE LEAKING AT THE TIME OF ABANDONMENT IT MUST BE REMOVED IN ITS ENTIRETY.
3. EXISTING WATER SERVICE 100mm OR LARGER IN DIA. SHALL BE DISCONNECTED AT THE MECHANICAL JOINT CONNECTION AT THE WATERMAIN. THE MECHANICAL JOINT CONNECTION SHALL BE COMPLETELY REMOVED FROM THE MAIN AND ANY SERVICE PIPE LEFT IN THE GROUND SHALL BE FILLED WITH GROUT TO PREVENT SINKHOLES.
4. TAPPING SLEEVE AND VALVES SHALL BE CUT OUT OF THE WATERMAIN AND THE WATERMAIN SHALL BE REINSTATED WITH A STRAIGHT PIPE AND APPROVED FITTINGS. IF THE SERVICE TERMINATES AT THE WATERMAIN WITH A MECHANICAL JOINT (MJ) THE SERVICE CAN BE DISCONNECTED FROM THE TEE AND A MJ PLUG PLACED ON THE TEE. ALL CUT OR DISCONNECTED PIPES MUST BE CAPPED OR BULKHEADED
5. FOR RESIDENTIAL SERVICE ABANDONMENTS, THE BUILDING DEPARTMENT SHALL BE INFORMED OF ALL DISCONNECTIONS AND SHALL BE ON SITE TO COMPLETE AN INSPECTION DURING THE DISCONNECTIONS. RESIDENTIAL SANITARY AND WATER SERVICES ARE TO BE CAPPED AT PROPERTY LINE UNTIL THE DEVELOPMENT TAKES PLACE. AT THAT TIME THE WATER SERVICES ARE TO BE ABANDONED PROPERLY AT THE WATERMAIN AND CITY UTILITIES SHALL BE INFORMED OF THE ABANDONMENT AND SHALL BE ON SITE TO COMPLETE AN INSPECTION DURING THE DISCONNECTIONS. FOR ICI SERVICE ABANDONMENTS, ENGINEERING SERVICES AND CITY UTILITIES STAFF SHALL BE INFORMED OF ALL DISCONNECTIONS AND SHALL BE ON SITE TO COMPLETE AN INSPECTION DURING THE DISCONNECTIONS
6. ALL SERVICE DISCONNECTIONS MUST BE RECORDED AND PHOTOGRAPHICALLY DOCUMENTED BY THE CONTRACTOR OR DEVELOPER'S REPRESENTATIVE. A COPY MUST BE PROVIDED TO ENGINEERING SERVICES TO CONFIRM THE WORK HAS BEEN COMPLETED AS PER CITY STANDARDS.
7. ONLY CITY OF WATERLOO MECP CERTIFIED WATER OPERATIONS STAFF ARE TO OPERATE MUNICIPAL VALVES
8. ALTERATION TO ANY MUNICIPAL SYSTEM WILL REQUIRE APPROVAL FROM CITY UTILITIES OR THE MECP, WHERE THE MECP DESIGN CRITERIA IS NOT MET.
9. WHEN SERVICES ARE BEING DISCONNECTED WITHIN THE RMOW 'S ROW THEY SHALL BE DISCONNECTED PER RMOW CORRIDOR MANAGEMENT.

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1	ISSUED FOR 2nd SUBMISSION OPA/ZBA	2026/MAR/25
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SURVEY NOTES:

SURVEY COMPLETED BY GUENTHER RUEB SURVEYING LIMITED, JULY 02, 2024.
REFERENCE No. 75-4 (18) & 75-4 (19)
DISTANCES SHOWN ON THIS PLAN ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999568

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON CONCEPTUAL SITE PLAN BY 2296342 ONT INC.
DATED: MARCH 2026
JOB No. 7530-10, SHEET NUMBER: 01

DRAWING NOTES:

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Project

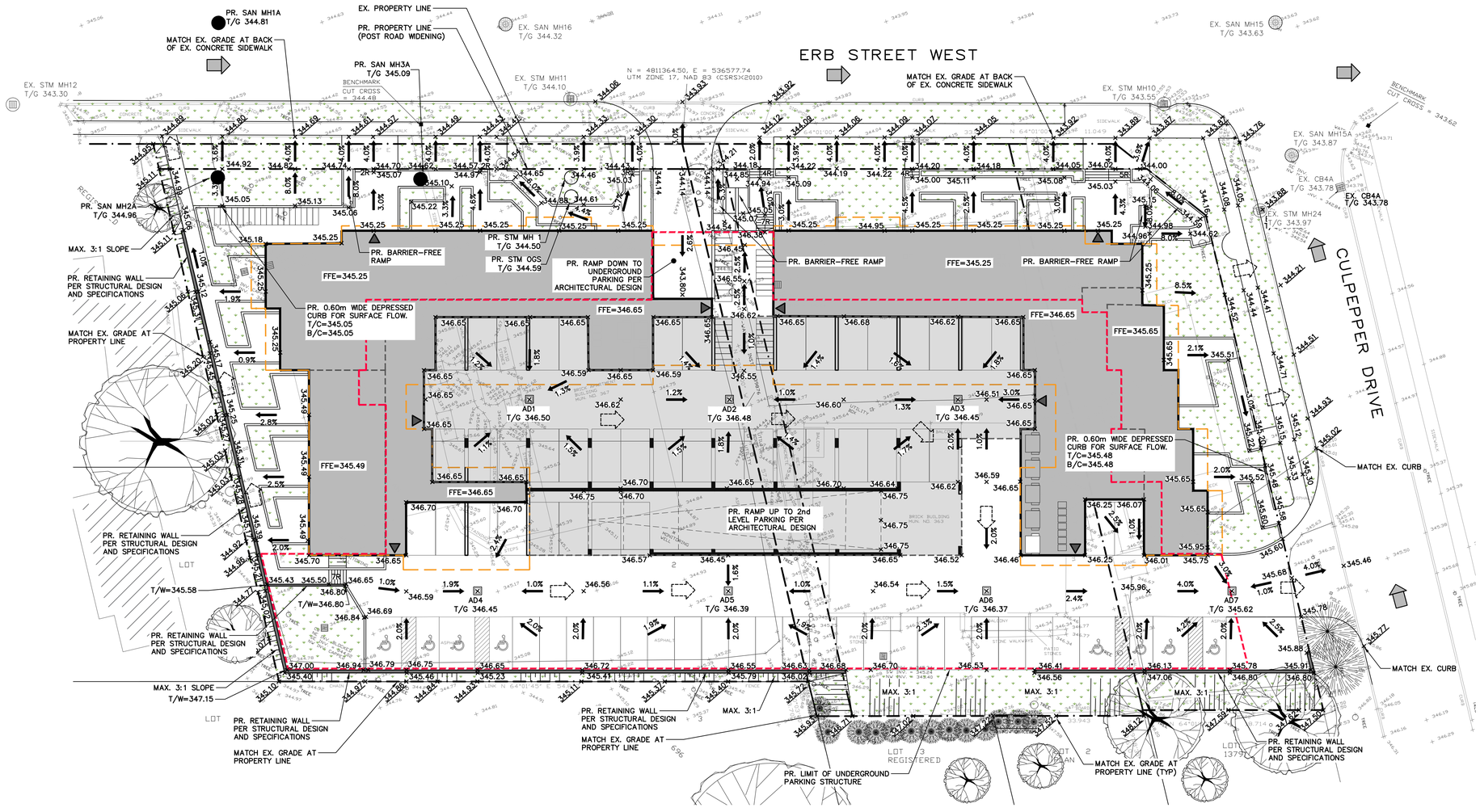
359-369 ERB STREET WEST
CITY OF WATERLOO

Drawing

REMOVALS, EROSION & SEDIMENT CONTROL PLAN

CROZIER CONSULTING ENGINEERS

Drawn	M.I.M	Design	M.B.	Project No.	2704-7158
Check	M.B.	Check	T.F.	Scale	1:250
				Dwg.	C101





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING FENCE
- x215.00 EXISTING GRADE
- x215.00 PROPOSED GRADE
- x215.00 PROPOSED GRADE (TO MATCH EXISTING)
- 2.0% PROPOSED MINOR FLOW DIRECTION
- 2.0% PROPOSED GRASSED SWALE
- x 215.00 TW PROPOSED TOP OF WALL GRADE
- x 215.00 BW PROPOSED BOTTOM OF WALL GRADE
- PROPOSED RETAINING WALL
- PROPOSED SLOPE (3:1 MAX.)
- BUILDING ENTRANCE
- PARKING GARAGE ENTRANCE (OVERHEAD DOOR)
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED OVERLAND FLOW DIRECTION
- PROPOSED FIRE HYDRANT & GATE VALVE
- PROPOSED SANITARY MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED LIMIT OF BUILDING ROOF ABOVE
- PROPOSED LIMIT OF OVERHEAD PARKING (LEVEL 2-3)
- PROPOSED UNDERGROUND PARKING LIMITS

NOTES:
1. THROUGHOUT EARTHWORKS, GRADING, AND SERVICING WORK, APPROPRIATE TRAFFIC SIGNS (TRUCK TURNING ETC.) MUST BE SET UP ALONG ERB STREET WEST AND CULPEPPER DRIVE IN ACCORDANCE WITH ONTARIO TRAFFIC MANUAL BOOK 7.
2. ANY EXISTING ABOVEGROUND AND UNDERGROUND SERVICES AND UTILITIES TO BE ADJUSTED TO FINAL GRADES.
3. SEE ARCHITECTURAL SITE PLAN LAYOUT OF PROPOSED BUILDINGS, SIDEWALKS AND CURBS.
4. THE PROPOSED TOP OF FOUNDATION WALL MUST BE A MINIMUM OF 0.15m HIGHER THAN THE EXISTING EXTERIOR GRADES AROUND THE BUILDING.
5. ALL PROPOSED INTERNAL CONCRETE CURBING TO BE BARRIER CURB PER OPSD 600.110 WITH DEPRESSED CURB (DC) AT NOTED LOCATIONS.

NOTE:
ALL PAVEMENT TO BE HEAVY DUTY STRUCTURE (BY OTHERS) UNLESS NOTED OTHERWISE PER THIS PLAN.

NOTE:
AN ARBORIST SHOULD BE PRESENT DURING GRADING TO ENSURE PROPER TREE PROTECTION IS PROVIDED

ANY CONSTRUCTION SIGNAGE PROPOSED WITHIN THE ERB STREET WEST AND CULPEPPER DRIVE RIGHT-OF-WAY MUST BE APPROVED BY THE REGION OF WATERLOO.

FOR ALL LANDSCAPE WALLS AND FEATURES REFER TO THE LANDSCAPE PLANS AND DETAILS.

FOR ANY WORKS WITHIN THE ERB STREET WEST AND THE CULPEPPER DRIVE RIGHT-OF-WAY A REGION OF WATERLOO WORK PERMIT IS REQUIRED.

5 0m 5 10 15 20
SCALE: 1:250

LIGHT DUTY PAVEMENT STRUCTURE
SCALE: N.T.S.

40mm	HL3 SURFACE COURSE ASPHALT
40mm	HL8 BASE COURSE ASPHALT
150mm	GRANULAR 'A' BASE COURSE
300mm	GRANULAR 'B' SUB-BASE COURSE
530mm	TOTAL
	COMPACTED SUB-BASE (ALL TOPSOIL REMOVED)

NOTE:
REFER TO CONSTRUCTION NOTES FOR DETAILS ON COMPACTION. PAVEMENT STRUCTURE IS BASED ON GEOTECHNICAL CONSULTANT'S RECOMMENDATIONS BY CHUNG & VANDER DOELEN ENGINEERING LTD., PROJECT # 1723, DATED SEPT 3, 2024.

HEAVY DUTY PAVEMENT STRUCTURE
SCALE: N.T.S.

40mm	HL3 SURFACE COURSE ASPHALT
50mm	HL8 BASE COURSE ASPHALT
150mm	GRANULAR 'A' BASE COURSE
400mm	GRANULAR 'B' SUB-BASE COURSE
640mm	TOTAL
	COMPACTED SUB-BASE (ALL TOPSOIL REMOVED)

NOTE:
REFER TO CONSTRUCTION NOTES FOR DETAILS ON COMPACTION. PAVEMENT STRUCTURE IS BASED ON GEOTECHNICAL CONSULTANT'S RECOMMENDATIONS BY CHUNG & VANDER DOELEN ENGINEERING LTD., PROJECT # 1723, DATED SEPT 3, 2024.

TYPICAL GRASSED SWALE DETAIL
SCALE: N.T.S.



NOTE:
ALL DIMENSIONS ARE IN MILLIMETERS.

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SURVEY NOTES:
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REFERENCE No. 75-4 (18) & 75-4 (19)
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Stamp

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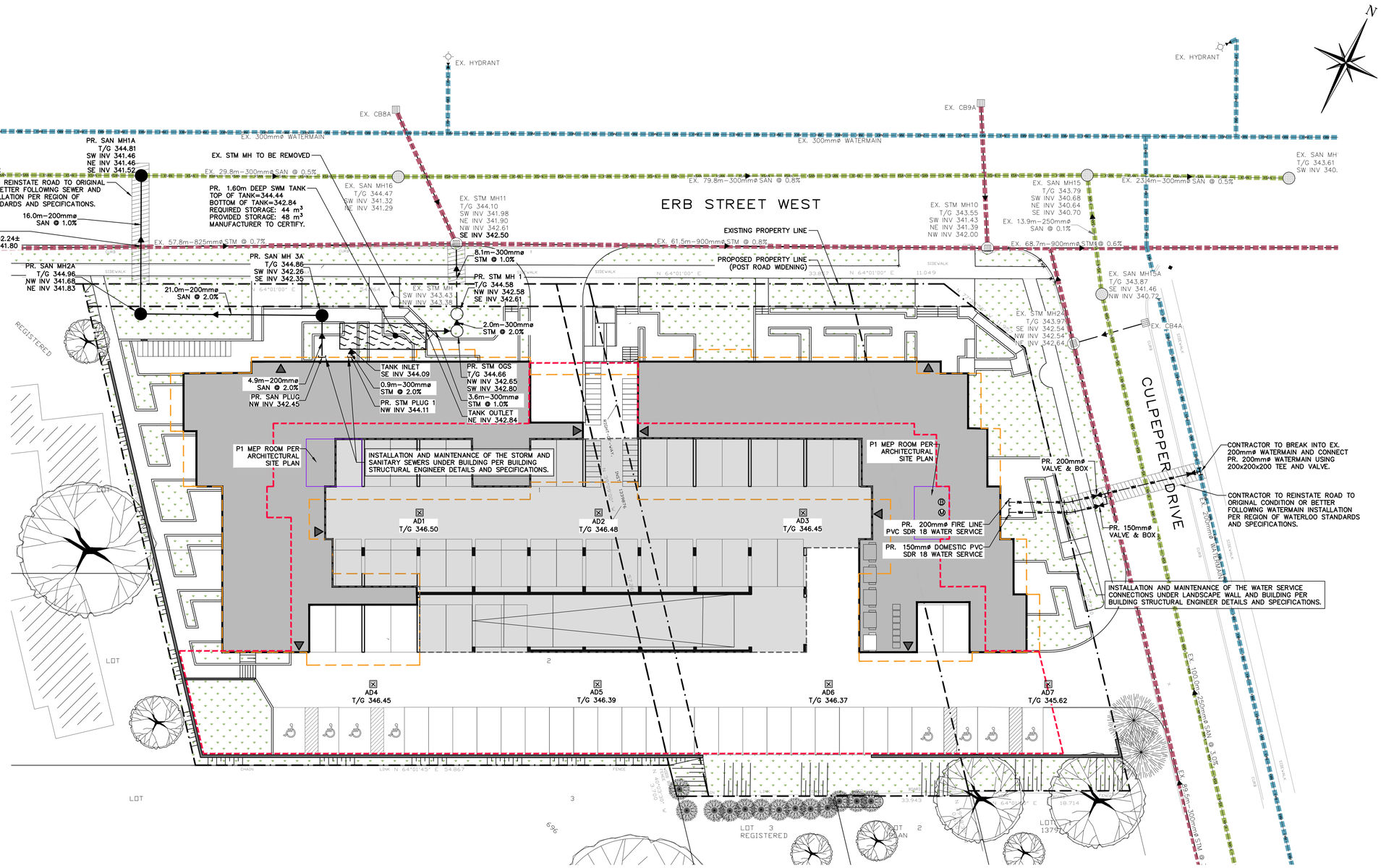
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Project
359-369 ERB STREET WEST
CITY OF WATERLOO

Drawing
PRELIMINARY SITE GRADING PLAN

CROZIER
CONSULTING ENGINEERS

Drawn	Design	Project No.	
M.I.M	M.B.		2704-7158
Check	Check	Scale	Dwg.
M.B.	T.F.	1:250	C102





LEGEND

- PROPERTY LINE
- EXISTING WATERMAIN & GATE VALVE
- EXISTING STORM SEWER & MANHOLE
- EXISTING SINGLE CATCHBASIN
- EXISTING SANITARY SEWER & MANHOLE
- PROPOSED WATERMAIN & GATE VALVE
- EXISTING FIRE HYDRANT & GATE VALVE
- PROPOSED FIRE HYDRANT & GATE VALVE
- PROPOSED SIAMESE CONNECTION
- PROPOSED WATER METER PER MECHANICAL DESIGN AND SPECIFICAITONS
- PROPOSED BACKFLOW PREVENTOR PER MECHANICAL DESIGN AND SPECIFICAITONS
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED AREA DRAIN
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED SANITARY SEWER & MANHOLE
- BUILDING ENTRANCE (PERSONNEL DOOR)
- PARKING GARAGE ENTRANCE (OVERHEAD DOOR)
- PROPOSED RETAINING WALL
- PROPOSED LIMIT OF BUILDING ROOF ABOVE
- PROPOSED LIMIT OF OVERHEAD PARKING (LEVEL 2–3)
- PROPOSED UNDERGROUND PARKING LIMITS
- PROPOSED UNDERGROUND STORMWATER STORAGE TANK

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Project

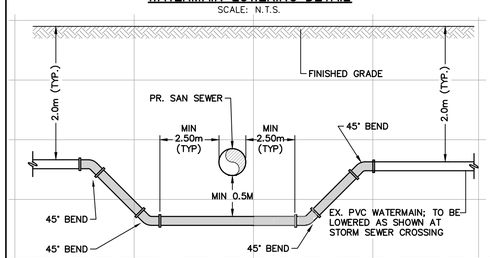
359–369 ERB STREET WEST CITY OF WATERLOO

Drawing

PRELIMINARY SITE SERVICING PLAN

WATERMAIN LOWERING DETAIL

SCALE: N.T.S.



A BURIED WATER SERVICE PIPE MAY PASS UNDER A BUILDING DRAIN OR BUILDING SEWER IF THE LENGTH OF THE WATER SERVICE PIPE IS LOCATED SO THAT THERE ARE NO JOINTS WITHIN 2440mm MEASURE HORIZONTALLY FROM THE INTERSECTION WITH THE BUILDING DRAIN OR THE BUILDING SEWER.

5 0m 5 10 15 20
SCALE: 1:250

NOTES:

1. MANHOLES IN EXCESS OF 5.0m DEPTH ARE TO BE EQUIPPED WITH SAFETY PLATFORMS PER OPSD 404.020.
2. CONTRACTOR TO ENSURE A MINIMUM 0.50m VERTICAL SEPARATION BETWEEN THE WATERMAIN AND ALL SEWER CROSSINGS DURING CONSTRUCTION. IN CASE OF CONFLICT WITH PROPOSED SEWER, CONTRACTOR TO LOWER THE PROPOSED WATERMAIN TO ENSURE MINIMUM REQUIRED CLEARANCE.
3. ALL PVC WATERMAINS TO BE CL150 DR–18.
4. ALL PVC STORM AND SANITARY SEWERS TO BE SDR–35.
5. ALL PVC STORM CATCHBASIN LEADS TO BE SDR–35.
6. ALL SANITARY SERVICE CONNECTIONS TO BE PVC SDR–28.
7. EXISTING 150mmø WATER SERVICE TO BE DISCONNECTED AT THE MECHANICAL JOINT ON MAIN. MECHANICAL JOINT CONNECTION TO BE COMPLETELY REMOVED FROM MAIN AND ANY SERVICE PIPE LEFT IN THE GROUND SHALL BE CAPPED.
8. CONTRACTOR TO CO–ORDINATE THE EXACT HORIZONTAL AND VERTICAL LOCATION OF THE EXTERNAL SERVICE CONNECTIONS OF THE BUILDINGS WITH THE SERVICES INSTALLED INSIDE OF BUILDINGS.

THROUGHOUT EARTHWORKS, GRADING, AND SERVICING WORK, APPROPRIATE TRAFFIC SIGNS (TRUCK TURNING ETC.) MUST BE SET UP ALONG ERB STREET WEST AND CULPEPPER DRIVE IN ACCORDANCE WITH ONTARIO TRAFFIC MANUAL BOOK 7. ANY CONSTRUCTION SIGNAGE PROPOSED WITHIN THE ERB STREET WEST RIGHT–OF–WAY MUST BE APPROVED BY THE REGION OF WATERLOO.

FOR ALL LANDSCAPE WALLS AND FEATURES REFER TO THE LANDSCAPE PLANS AND DETAILS.

FOR ANY WORKS WITHIN THE ERB STREET WEST AND CULPEPPER DRIVE RIGHT–OF–WAY A REGION OF WATERLOO WORK PERMIT IS REQUIRED.

WATERMAIN NOTES:

1. IF MIN 0.50m VERTICAL CLEARANCE IS NOT ACHIEVED UPON VERIFYING SERVICES IN THE FIELD, A WATERMAIN ALTERATION (FORM 1) APPLICATION AND APPROVAL IS REQUIRED FROM CITY UTILITIES.
2. THE REMOVAL OF EXISTING WATER SERVICE REQUIRES THE EXISTING TEE BE CUT OUT OF THE EXISTING MUNICIPAL WATERMAIN AND REPLACED WITH A SECTION OF PIPE AND SLEEVE. THE REMOVAL OF THE EXISTING WATER SERVICE WILL FORM PART OF THE WATERMAIN ALTERATION (FORM 1) APPLICATION AND APPROVAL FROM CITY UTILITIES.

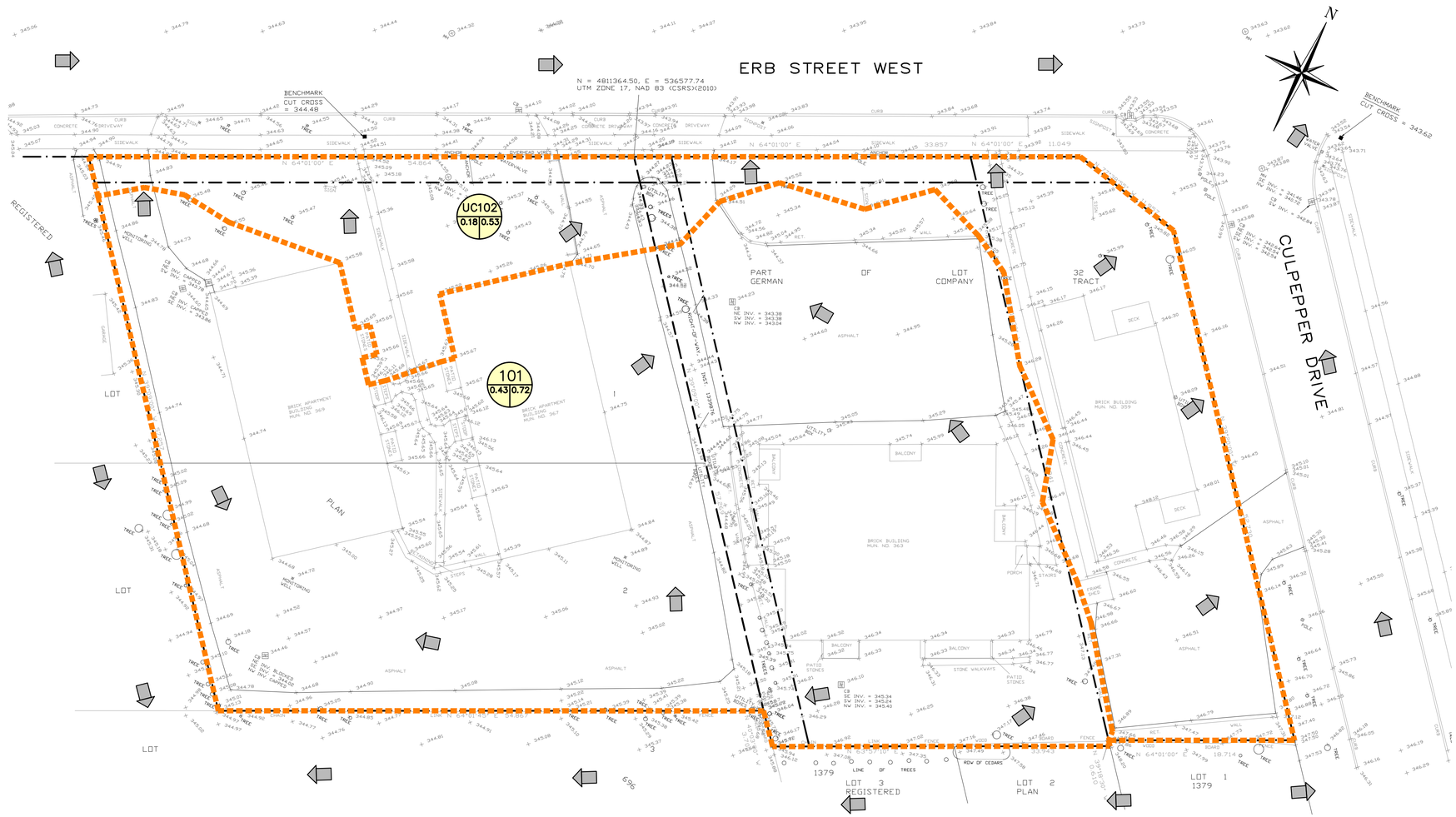
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CROZIER CONSULTING ENGINEERS

Drawn	M.I.M	Design	M.B.	Project No.	2704–7158
Check	M.B.	Check	T.F.	Scale	1: 250
				Dwg.	C103





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- × 215.00 EXISTING GRADE
- EXISTING OVERLAND FLOW DIRECTION
- STORM DRAINAGE CATCHMENT
- ID / A | RC — CATCHMENT I.D. / AREA (ha) | RUNOFF COEFFICIENT

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ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

359–369 ERB STREET WEST
CITY OF WATERLOO

Drawing

PRE–DEVELOPMENT DRAINAGE PLAN

Stamp

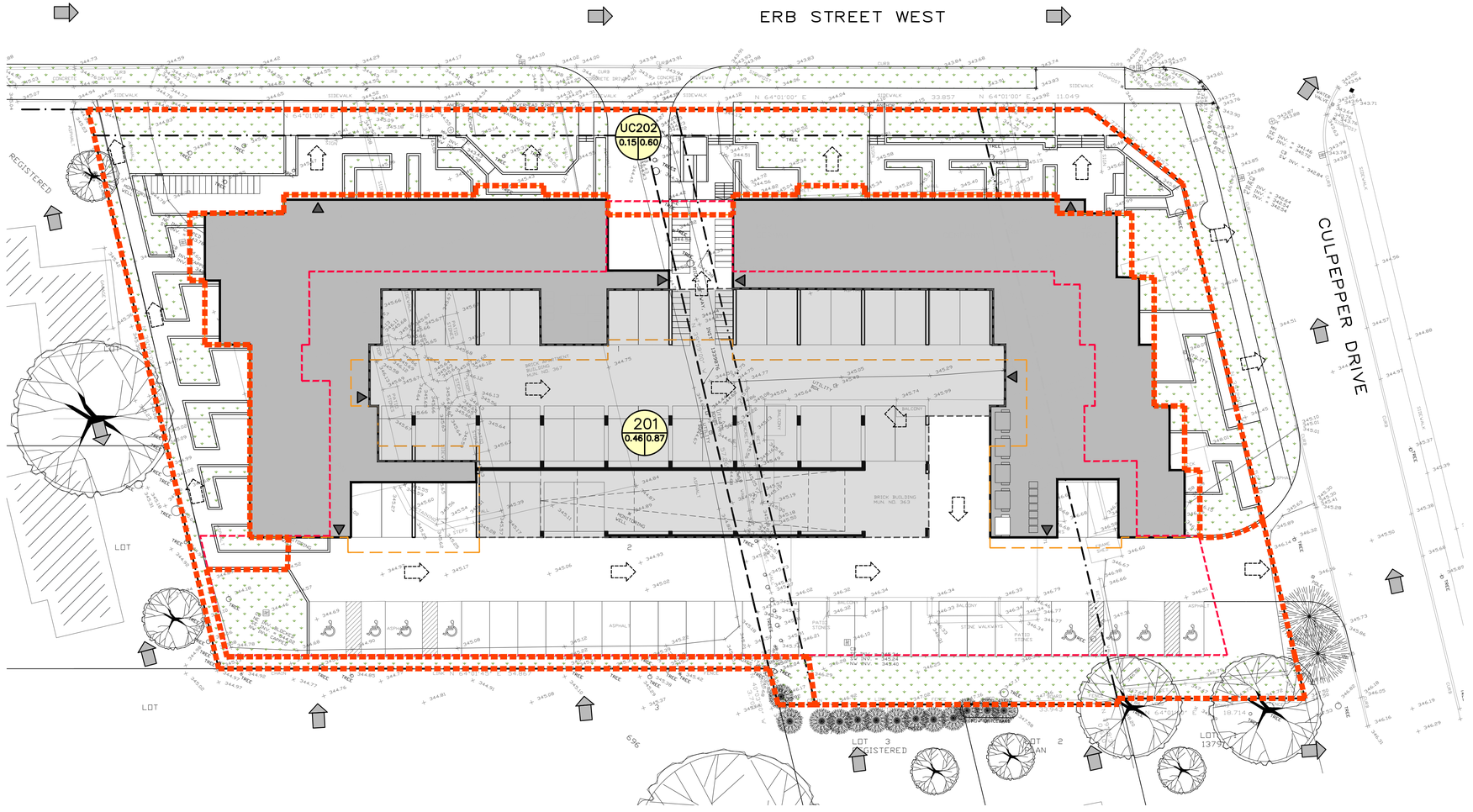
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Drawn	Design	Project No.	
M.I.M	M.B.		2704–7158
Check	Check	Scale	Dwg.
M.B.	T.F.	1: 250	FIG1

5 0m 5 10 15 20
SCALE: 1: 250





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING SINGLE / DOUBLE CATCHBASIN
- x215.00 EXISTING GRADE
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED OVERLAND FLOW DIRECTION
- PROPOSED UNDERGROUND PARKING LIMITS
- LIMIT OF BUILDING ROOF ABOVE
- PROPOSED LIMIT OF OVERHEAD PARKING (LEVEL 2-3)
- STORM DRAINAGE CATCHMENT
- EXISTING SINGLE / DOUBLE CATCHBASIN
- PROPOSED STORM MANHOLE
- PROPOSED AREA DRAIN
- ID / A | RC — CATCHMENT I.D. / AREA (ha) | RUNOFF COEFFICIENT

No.	ISSUE / REVISION	YYYY/MMM/DD
1	ISSUED FOR 2nd SUBMISSION OPA/ZBA	2026/MAR/25
0	ISSUED FOR 1ST SUBMISSION OPA/ZBA	2024/DEC/20

BEARING NOTE:

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B, BY REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD 83 (CSRS) (2010.0).

SURVEY NOTES:

SURVEY COMPLETED BY GUENTHER RUEB SURVEYING LIMITED, JULY 02, 2024.
REFERENCE No. 75-4 (18) & 75-4 (19)
DISTANCES SHOWN ON THIS PLAN ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999568

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON CONCEPTUAL SITE PLAN BY 2296342 ONT INC.
DATED: MARCH 2026
JOB No. 7530-10, SHEET NUMBER: 01

DRAWING NOTES:

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

359-369 ERB STREET WEST
CITY OF WATERLOO

Drawing

POST-DEVELOPMENT DRAINAGE PLAN

Stamp

FOR REVIEW
NOT TO BE USED FOR CONSTRUCTION

Stamp

CROZIER
CONSULTING ENGINEERS

Drawn	Design	Project No.
M.I.M	M.B.	2704-7158
Check	**Check**	**Scale** / **Dwg.**
M.B.	T.F.	1:250 / FIG2

5 0m 5 10 15 20
SCALE: 1:250