GRIT ENGINEERING INC

133 REGENT STREET
STRATFORD, ON N5A 3W2
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# FUNCTIONAL SERVICING & STORMWATER MANAGEMENT REPORT

## 251 HAZEL STREET DEVELOPMENT

Project Location:
251 Hazel Street, Waterloo, ON

**Prepared for:**
New Generation Design Wave
c/o Zelijko Prica
156 Columbia Street West
Waterloo, ON N2L 3L3

**Prepared by:**
GRIT Engineering Inc.
133 Regent Street
Stratford, Ontario N5A 2W3

November 7, 2025
GRIT File No: GE25-1209-1-C-RPT-FSR-2025-11-07

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# 1.0 INTRODUCTION

GRIT Engineering Inc. (GRIT) was retained by New Generation Design Wave Inc. (Client) to complete a Functional Servicing and Stormwater Management Report (FSR) for the property located at 251 Hazel Street, Waterloo, Ontario in support of a Site Plan Amendment (SPA). The subject site (Site) is approximately 0.157 hectares in size and is zoned as Residential ((H)RN-12), with no proposed zone change as part of this application. The Site is generally bounded by a portion of the Wilfred Laurier University Campus (UC-40) to the west, existing residential ((H)RN-12) to the north and south, and Hazel Street to the east. The Site is not part of the Grand River Conservation Authority (GRCA) regulatory area.

The existing Site includes three single detached buildings with a total of seven residential units, landscaping, driveways and parking.

This FSR recommends sanitary, water and storm servicing strategies for the Site. This report will discuss the available municipal infrastructure and how the proposed development can be serviced.

# 2.0 SANITARY SERVICING

## 2.1 Sanitary Servicing

The sanitary design flow requirements are based on the City of Waterloo Comprehensive Engineering and Landscape Manual (CELM) (2024), the Region of Waterloo and Area Municipalities *Design Guidelines and Supplemental Specifications for Municipal Services* (DGSSMS) (2025) and the Ministry of Environment, Conservation and Parks (MECP) Design Guidelines for Drinking Water Systems (DGDWS) (2008). Population density of 2.66 persons per unit was used based on the current Development Charges Background Study (CELM). The following criteria have been established:

- Average daily domestic sanitary flow of 275 litres per capita per day (L/cap/d) (CELM),
- Average daily commercial flow of 0.95 litres per second per hectare (L/s/ha) (DGSSMS),
- Harmon Peaking Factor for residential (CELM), and
- Extraneous flow rate of 0.25 L/s/ha (CELM).

Based on the above criteria, the proposed sanitary peak flows from the site are summarized in Table 2.1 below.

*Table 2.1 – Proposed Sanitary Flows*

| Area (ha) | Total Pop. | Per Capita Flows (L/s/c) | Infiltration (L/s/ha) | Res. Peaking Factor | Comm. Peaking Factor | Average Flow (L/s) | Total Peak Flow (L/s) |
|---|---|---|---|---|---|---|---|
| 0.16 | 250 | 0.003 | 0.25 | 4.1 | 2.5 | 0.77 | 3.48 |

A single 150 mm minimum diameter sanitary service at a minimum 1.0% slope is sufficient to service the proposed building. See Appendix B for the sanitary servicing design sheet.

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# 3.0 WATER DISTRIBUTION

## 3.1 Design Approach

The water distribution requirements and performance criteria for the different demand conditions are based on the City of Waterloo CELM and the Region of Waterloo and Area Municipalities DGSSMS, MECP DGDWS, and National Fire Protection Association (NFPA) NFPA13. The design parameters used are:

- A residential average daily domestic demand of 225 litres per capita per day (DGSSMS),
- Minimum water pressures of (DGSSMS):
  - 140 kPa (20 psi) for fire-flow plus maximum day demand,
  - 275 kPa (40 psi) for minimum hour demand,
  - 350 kPa (50 psi) for average day demand
  - 550 kPa (80 psi) for maximum day demand, and
  - 700 kPa (100 psi) maximum residual pressure.
- Peaking factors of 2.75 and 4.13 for maximum day and a maximum hour respectively for residential (DGDWS),
- Population density, 2.66 persons per unit, based on current Development Charges Background Study,
- Water turnover less than 72 hours under average day demand for water quality (DGDWS), and
- Fire-Flow Demand per NFPA13 Fire Fighting Flow requirements.

A single 150 mm diameter water service is being proposed for the Site. See Appendix C for all water demand calculations.

## 3.2 Domestic Water Demand

The domestic water demand was calculated based on the proposed site plan by GRIT Engineering, provided in Appendix A. The population of the Site was multiplied by the average day demand and the corresponding peaking factors and is summarized in the table below.

*Table 3.1 – Domestic Water Demand*

| | Units | Area (ha) | Population | Average Day (L/s) | Maximum Day (L/s) | Maximum Hour (L/s) |
|---|---|---|---|---|---|---|
| Residential | 94 | - | 250 | 0.651 | 1.791 | 2.689 |
| Commercial | - | 0.08 | - | 0.027 | 0.074 | 0.111 |
| **Total** | **94** | **0.08** | **250** | **0.678** | **1.864** | **2.800** |

## 3.3 Fire Flow Demand

The NFPA13 Fire-Fighting Flow requirements were used to calculate the fire-flow demand for the Site, as the proposed building will be equipped with sprinklers and/or a standpipe. As summarized in Table 3.2, the required fire-fighting flow rate is 1,164 L/min, and the maximum day domestic demand is 107.44

L/min, resulting in a combined total demand of 1,271.44 L/min. This demonstrates compliance with the requirements outlined in the DGSSMS.

*Table 3.2 – Fire Flow Demand*

| Fire-fighting Required Flow Rate (L/min) | Domestic Max. Day Demand (L/min) | Fire Flow + Max. Day (L/min) |
|---|---|---|
| 1,644 | 111.86 | 1,275.86 |

A hydrant flow test was conducted by Stumpf Fire Protection Limited on May 29, 2025, in the vicinity of 251 Hazel Street. The test results are summarized in Table 3.3 below. In addition, the flow rate at 20 psi (140 kPa) is calculated to be 16,304 L/min (4,307 USGPM). These results confirm that adequate pressure and flow are available to meet the fire-fighting demand. Fire flow calculations and hydrant test information are provided in Appendix A.

*Table 3.3 – Hydrant Flow Test*

| | Pressure (psi) | Pressure (kPA) | Flow Rate (USGPM) | Flow Rate L/min |
|---|---|---|---|---|
| Static Pressure | 64.00 | 441.26 | 0 | 0 |
| Tested Flow Rate | 60.00 | 413.69 | 1,180 | 4,467 |
| Tested Flow Rate | 58.00 | 399.90 | 1,750 | 6,624 |
| Pressure at Required Flow Rate | 62.86 | 433.38 | 336 | 1,275 |

The OBC states that fire hydrants shall be located within 45m of the building where a standpipe is required. The existing City hydrant in the vicinity of 251 Hazel Street is within 45 m of the Site. Therefore, an additional Site hydrant is not required for this site.

# 4.0 STORMWATER MANAGEMENT AND STORM SERVICING

## 4.1 Stormwater Management Requirements

The City of Waterloo requires quantity and quality Stormwater Management (SWM) controls per the CELM. For SWM quantity control, 2- through 100-year post-development flows should be attenuated to predevelopment 2- through 100-year rates, respectively. To address SWM quality controls, MECP Enhanced Level water quality control is required on-site to the satisfaction of Engineering Services before site plan approval.

## 4.2 Design Approach

### 4.2.1 Calculation Method

As the contributing drainage area to the outlet is 0.157 hectares in size, GRIT utilized MIDUSS (Version 2.25) modeling software. Modeling was completed using local rainfall intensity (IDF) from the Town of Goderich, time of concentration, and runoff coefficient parameters to review the pre-development

(existing) and post-development peak flow rates. Reports for all modelled scenarios are provided in Appendix D.

### 4.2.2 Site Review Methodology

The SWM design for the development achieves the requirements through:

- Reviewing the existing drainage, overland flow route patterns and existing site characteristics.
- Calculating the pre-development (allowable) runoff coefficients and peak flow rates for the 2 through to the 100-year design storm events.
- Calculating the post-development runoff coefficients and peak flow rates for the 2 through to the 100-year design storm events.
- Determining the needed on-site quantity control structures based on the proposed site characteristics and the size requirements.
- Calculating the required on-site stormwater storage volume and surface ponding elevations.
- Reviewing, evaluating, and specifying stormwater quality control techniques and structures.
- Designing and specifying Erosion and Sediment Control (ESC) techniques for the site.

## 4.3 Pre-Development Conditions

Under existing conditions, the Site consists of three properties, each improved with a multi-unit residential building, hardscaped areas for vehicular and pedestrian functioning and landscaping. There are no existing stormwater controls on the Site. See Table 4.1 below outlining the pre-development site characteristics. The pre-development site characteristics are based on the existing survey by others.

*Table 4.1 – Pre-development Site Characteristics*

| Surface Material | Area ($m^2$) | Percent Impervious | Coefficient (C) |
|---|---|---|---|
| Building | 358.21 | 100 | 0.90 |
| Asphalt/Concrete | 702.54 | 100 | 0.90 |
| Gravel | 0 | 100 | 0.90 |
| Grass/Landscape | 576.45 | 10 | 0.20 |
| Total / Average | 1,637.20 | 68.3 | 0.65 |

## 4.4 Post-Development Conditions

In the proposed condition, the subject site will be comprised of a multi-use residential and commercial building containing a total of 94 residential units and three commercial units. The remainder of the site will be comprised of associated hard surfaces for vehicle and pedestrian movement and landscaping. The proposed private storm system will connect to the existing 300 mm diameter storm sewer in the Hazel Street Right-of-Way (ROW).

In the post-development condition, the overall imperviousness of the site increased compared to the pre-development scenario. As a result, quantity control measures are anticipated to be required to maintain pre-development flow conditions and quality control is required for the site based on the CELM and the MECP requirements. The Site is located outside of the Grand River Conservation Authority (GRCA) Regulation Areas. Table 4.2 below defines the proposed site characteristics.

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*Table 4.2 – Post-development Site Characteristics*

| Surface Material | Area ($m^2$) | Percent Impervious (%) | Coefficient (C) |
|---|---|---|---|
| Building | 957.83 | 100 | 0.90 |
| Asphalt/Concrete | 267.89 | 100 | 0.90 |
| Gravel | 0 | 100 | 0.90 |
| Grass/Landscape | 411.48 | 10 | 0.20 |
| Total / Average | 1,637.20 | 77.4 | 0.72 |

## 4.5 Quantity Control

The post-development 2 to 100-year design storm peak flows are controlled to the allowable existing peak flows, per the requirements in Sections 4.1 through 4.2, by an orifice in CBMH 2 and asphalt weir at the Hazel street driveway entrance. Stormwater detention is provided for all design storm events within the storm structures, storm pipes, grass swale and proposed parking areas.

An orifice diameter of 100 mm and 6m asphalt weir were determined using the MIDUSS hydrologic and hydraulic modeling software. The sizing was based on the site-specific runoff characteristics and design storm parameters to ensure adequate flow control in accordance with applicable stormwater management criteria. The orifice is intended to regulate minor storm event discharge from the Site, while the asphalt weir regulates the major 100-year storm event. The quantity controls maintain post-development flow rates at or below pre-development conditions.

## 4.6 Quality Control

To meet the recommended stormwater management quality control criteria, as noted in Section 4.4 of this Report, a treatment train approach is proposed to provide an ‘enhanced’ level of quality control (80% long-term suspended solid removal). The first line of quality control is a grassed swale. All proposed storm structures on Site are to have a 600 mm deep sump for sediment suspension. Further quality control is provided within a 1200 mm diameter Oil-Grit Separator, model Next SDD3 or approved equivalent proposed for the development. The SDD3 (ST-OGS1) to be installed inline and downstream from the proposed orifices and provides 96% removal of total suspended solids (TSS).

*Table 4.3 – Flow Rates*

| Design Storm | Pre-development Flow ($m^3/s$) | Post-development Flow ($m^3/s$) |
|---|---|---|
| 2-year | 0.022 | 0.022 |
| 5-year | 0.031 | 0.024 |
| 25-year | 0.047 | 0.026 |
| 100-year | 0.063 | 0.043 |

Refer to Appendix E for the SDD3 system sizing summary, typical details and Operations and Maintenance information.

## 4.7 Water Balance

The proposed development is located within the footprint of existing residential buildings and an asphalt parking lot. Under current conditions, the Site does not support infiltration for water balance due to its physical characteristics and location within a Source Water Protection Area. Furthermore, the post-development scenario does not result in a significant increase in impervious area compared to the pre-development condition and will maintain the existing drainage patterns. Given these factors and the comparative analysis of pre- and post-development site conditions, additional water balance measures are not considered necessary for this site.

## 4.8 Erosion and Sediment Control

Erosion and Sediment Controls (ESC) will be implemented for the site. The proposed measures will include light-duty sediment control fencing, and silt sacks in the proposed catch basins on-site. All ESC will be installed before construction commences and is to be maintained until the construction is complete with final surfaces and vegetation stabilized with mature growth.

# 5.0 SALT MANAGEMENT

Under the 2025 Grand River Source Protection Plan, a Risk Management Plan for salt application may be required for proposed and/or altered surface parking and vehicle driveway areas greater than eight (8) parking spaces or 200 square metres. The development will implement the following best management practices for the removal of snow and application of salt on this site:

- A winter maintenance contractor will be hired to complete the snow removal/management works.
- Winter maintenance personnel will complete regular site inspections to assess the condition of walking and driving surfaces.
- The contractor will monitor weather forecasts to prepare for snow events.
- The contractor will be trained in winter maintenance practices and be “Smart about Salt” certified.
- Plowing of snow will be completed as required on driveways, parking areas, and sidewalks following snowfall events to ensure safe passage for motorists and pedestrians.
- Plowed snow will be stored in the snow storage areas identified on the approved Site Plan.
- Any snow that needs to be removed from the site will be disposed of at an approved snow dump location.
- Snow drifts will be controlled by frequent plowing as needed.
- Application of a sand/salt mixture (hand application) will occur immediately following plowing, if deemed required, as the application of a sand/salt mixture is not necessary each snow clearing operation.
- A sand/salt mixture will not be applied unless ice conditions develop which create a hazard for motorists and/or pedestrians.
- The contractor will monitor and document the application of a sand/salt mixture (i.e. frequency, concentration, etc.).
- Snow removal equipment will be stored off site.

- Liquid de-icing materials will be kept off site.
- Snow removal equipment washing will occur off site.

This salt management plan is to be used as a guide.

## 6.0 CONCLUSIONS

The proposed residential development can be serviced by the existing and proposed onsite infrastructure. The design and calculations in Sections 2 through 4 and the appendices of this report demonstrate compliance with the Approving Agency's design requirements and establish that the proposed development can be adequately serviced new and existing connections to the existing municipal infrastructure. We trust that this report satisfies the Approving Agency's requirements. If there are any questions regarding this report, please do not hesitate to contact our office.

## 7.0 STATEMENT OF CONDITIONS AND LIMITATIONS

This document was prepared for *New Generation Design Wave (the Client)* and the Approving Agency and has been prepared in a manner consistent with that level of care and skill ordinarily exercised by other members of the engineering profession currently practicing in the same or similar locality, under the same or similar conditions, subject to the time limits and financial, physical, or other constraints applicable to the Services.

The recommendations and conclusions provided in this document are applicable only to the specific site, development, design objectives, and purposes that are described in the text and are based on the information that was available and provided to GRIT Engineering Inc. at the time this document was prepared. This document is not intended to be exhaustive in scope and it shall be recognized that the passage of time may alter the opinions, recommendations, and conclusions that are contained in this document. The design is limited to the documents reference and any other drawings or documents prepared by GRIT Engineering Inc. provided separately. GRIT Engineering Inc. accepts no responsibility or liability for the accuracy of any information provided by others.

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# FIGURES

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Project:

HAZEL ST. DEVELOPMENT

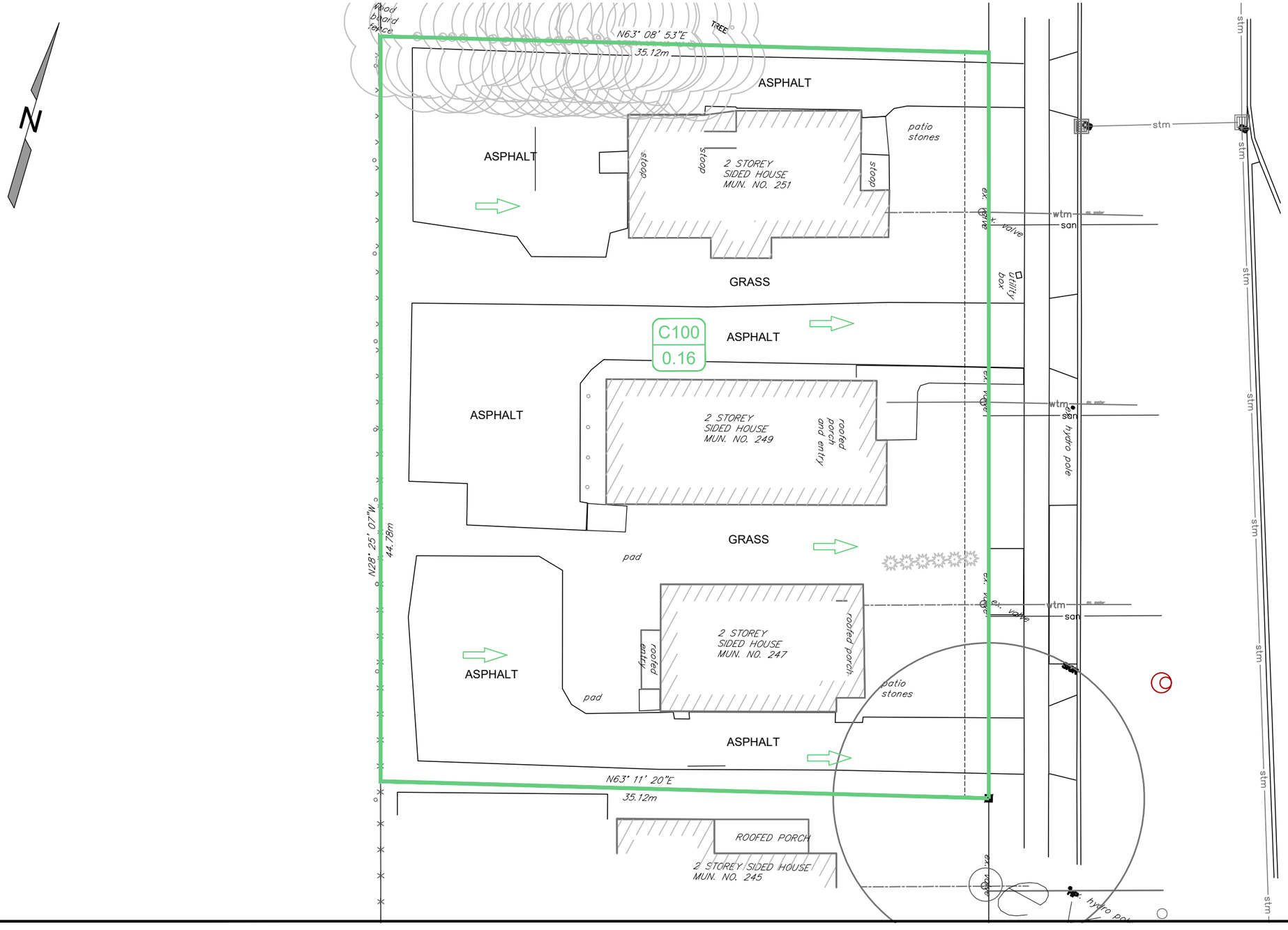
Figure Title:

SITE LOCATION MAP

Figure No:

1

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1 : 250 METRIC

0 5 10 15

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## Legend

CATCHMENT BOUNDARY

CATCHMENT PARAMETER — C100 / 0.123 — CATCHMENT ID / CATCHMENT AREA

E100 / 0.123

OVERLAND FLOW ROUTE ARROW

EX. STORM SEWER — stm

Project:

HAZEL ST. DEVELOPMENT

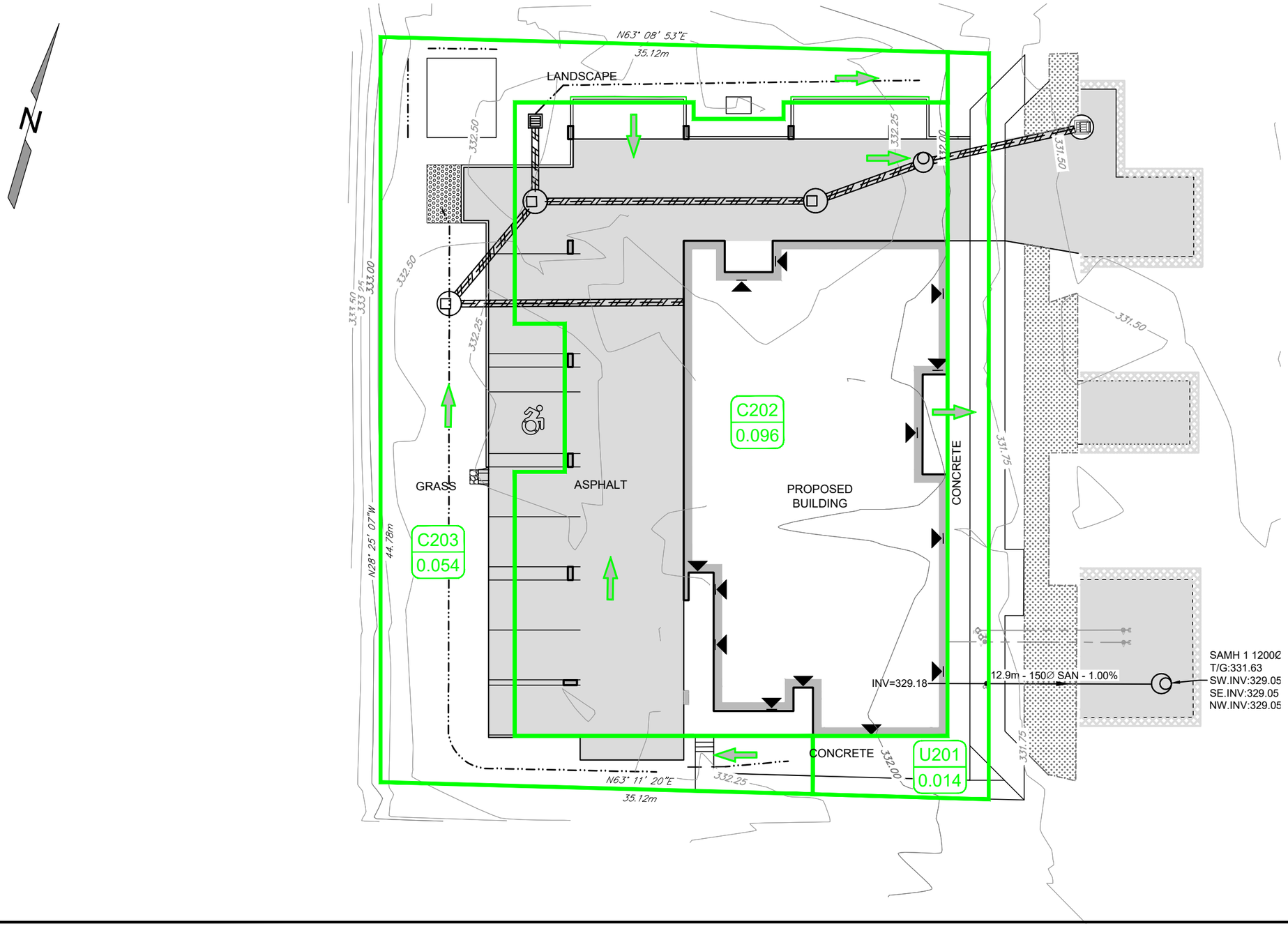
Figure Title:

PRE-DEVELOPMENT CATCHMENT AREA

Figure No:

2

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1 : 250 METRIC

0 5 10 15

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## Legend

CATCHMENT BOUNDARY

CATCHMENT PARAMETER — C200 / 0.123 — U200 / 0.123 — CATCHMENT ID / CATCHMENT AREA

OVERLAND FLOW ROUTE ARROW

PROPOSED STORM SEWER

EX. STORM SEWER (stm)

Project:

HAZEL ST. DEVELOPMENT

Figure Title:

POST-DEVELOPMENT CATCHMENT AREA

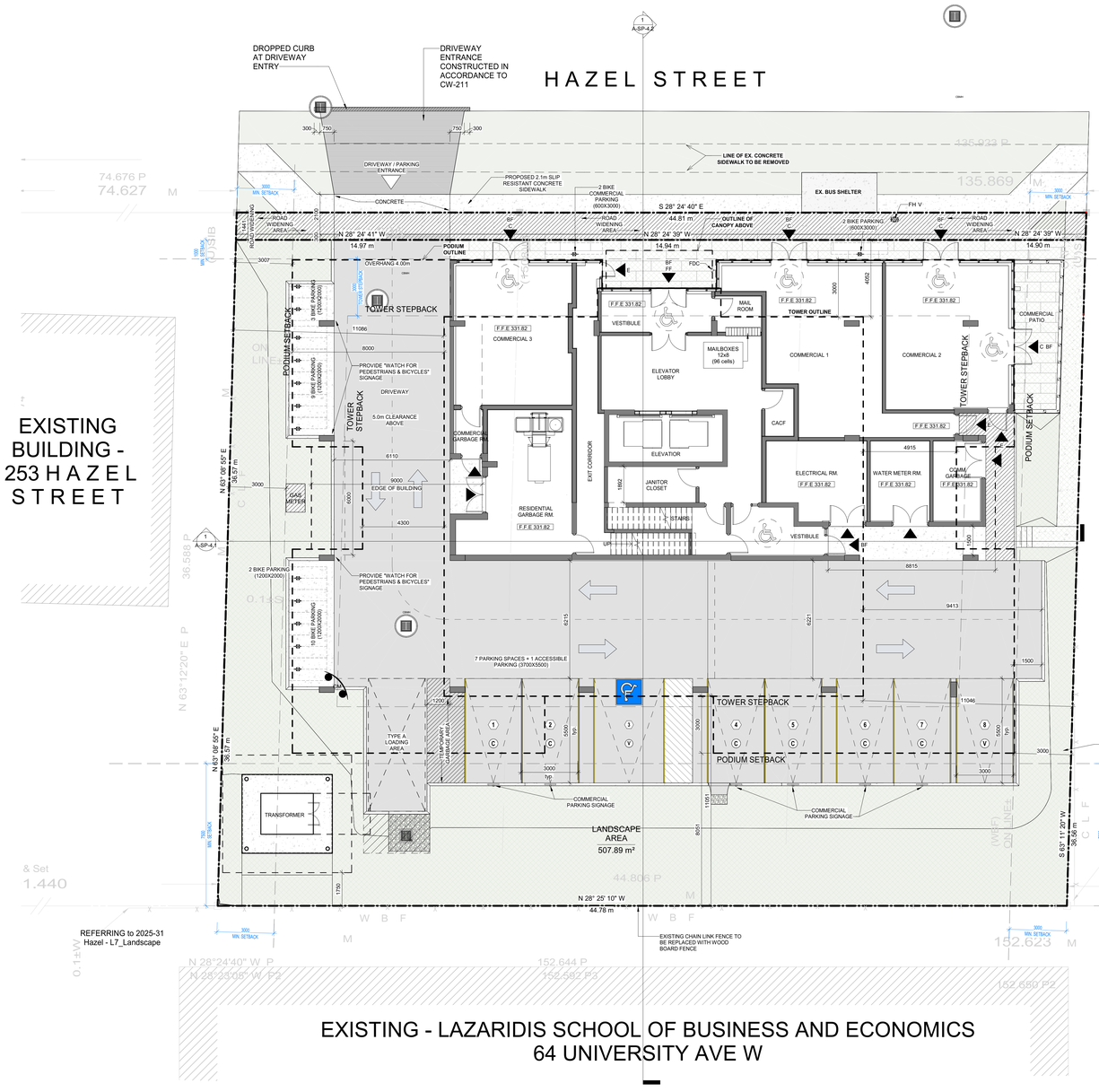
Figure No:

3

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# APPENDIX A – SITE PLAN

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## SITE PLAN
A-SP1 SCALE: 1 : 100

## SUITE AREAS & SUITE TYPE SCHEDULE

| NAME | CONDO # | AREA m² | AREA SF | QTY | # BEDRMS | # BATH | BARRIER FREE | BALCONY |
|---|---|---|---|---|---|---|---|---|
| **LEVEL 02** | | | | | | | | |
| SUITE 201 | UNIT 1 | 59.6 m² | 641 SF | 1 | 1 | 1 | No | No |
| SUITE 202 | UNIT 2 | 53.8 m² | 579 SF | 1 | 1 | 1 | No | No |
| SUITE 203 | UNIT 3 | 76.5 m² | 824 SF | 1 | 1 | 1 | No | No |
| SUITE 205 | UNIT 4 | 72.9 m² | 784 SF | 1 | 1 | 1 | No | Yes |
| SUITE 206 | UNIT 5 | 83.4 m² | 898 SF | 1 | 1 | 1 | No | No |
| SUITE 207 - BF | UNIT 6 | 58.9 m² | 634 SF | 1 | 1 | 1 | Yes | No |
| SUITE 208 | UNIT 7 | 63.9 m² | 688 SF | 1 | 1 | 1 | No | No |
| SUITE 209 | UNIT 8 | 67.7 m² | 729 SF | 1 | 1 | 1 | No | No |
| SUITE 210 | UNIT 9 | 78.2 m² | 842 SF | 1 | 1 | 1 | No | No |
| SUITE 211 | UNIT 10 | 72.3 m² | 778 SF | 1 | 1 | 1 | No | Yes |
| SUITE 212 | UNIT 11 | 73.8 m² | 794 SF | 1 | 1 | 1 | No | No |
| SUITE 215 - BF | UNIT 12 | 60.5 m² | 651 SF | 1 | 1 | 1 | Yes | No |
| | | 821.4 m² | 8,842 SF | 12 | | | | |
| **LEVEL 03** | | | | | | | | |
| SUITE 301 | UNIT 13 | 59.6 m² | 641 SF | 1 | 1 | 1 | No | No |
| SUITE 302 | UNIT 14 | 53.8 m² | 579 SF | 1 | 1 | 1 | No | No |
| SUITE 303 | UNIT 15 | 76.5 m² | 824 SF | 1 | 1 | 1 | No | No |
| SUITE 305 | UNIT 16 | 72.9 m² | 784 SF | 1 | 1 | 1 | No | Yes |
| SUITE 306 | UNIT 17 | 83.4 m² | 898 SF | 1 | 1 | 1 | No | No |
| SUITE 307 - BF | UNIT 18 | 58.9 m² | 634 SF | 1 | 1 | 1 | Yes | No |
| SUITE 308 | UNIT 19 | 63.9 m² | 688 SF | 1 | 1 | 1 | No | No |
| SUITE 309 | UNIT 20 | 67.7 m² | 729 SF | 1 | 1 | 1 | No | No |
| SUITE 310 | UNIT 21 | 78.2 m² | 842 SF | 1 | 1 | 1 | No | No |
| SUITE 311 | UNIT 22 | 72.3 m² | 778 SF | 1 | 1 | 1 | No | Yes |
| SUITE 312 | UNIT 23 | 73.8 m² | 794 SF | 1 | 1 | 1 | No | No |
| SUITE 315 - BF | UNIT 24 | 60.5 m² | 651 SF | 1 | 1 | 1 | Yes | No |
| | | 821.4 m² | 8,842 SF | 12 | | | | |
| **LEVEL 04** | | | | | | | | |
| SUITE 501 | UNIT 25 | 59.6 m² | 641 SF | 1 | 1 | 1 | No | No |
| SUITE 502 | UNIT 26 | 53.8 m² | 579 SF | 1 | 1 | 1 | No | No |
| SUITE 503 | UNIT 27 | 76.5 m² | 824 SF | 1 | 1 | 1 | No | No |
| SUITE 505 | UNIT 28 | 72.9 m² | 784 SF | 1 | 1 | 1 | No | Yes |
| SUITE 506 | UNIT 29 | 83.4 m² | 898 SF | 1 | 1 | 1 | No | No |
| SUITE 507 - BF | UNIT 30 | 58.9 m² | 634 SF | 1 | 1 | 1 | Yes | No |
| SUITE 508 | UNIT 31 | 63.9 m² | 688 SF | 1 | 1 | 1 | No | No |
| SUITE 509 | UNIT 32 | 67.7 m² | 729 SF | 1 | 1 | 1 | No | No |
| SUITE 510 | UNIT 33 | 78.2 m² | 842 SF | 1 | 1 | 1 | No | No |
| SUITE 511 | UNIT 34 | 72.3 m² | 778 SF | 1 | 1 | 1 | No | Yes |
| SUITE 512 | UNIT 35 | 73.8 m² | 794 SF | 1 | 1 | 1 | No | No |
| SUITE 515 -BF | UNIT 36 | 60.5 m² | 651 SF | 1 | 1 | 1 | Yes | No |
| | | 821.4 m² | 8,842 SF | 12 | | | | |
| **LEVEL 05** | | | | | | | | |
| SUITE 601 | UNIT 37 | 59.6 m² | 641 SF | 1 | 1 | 1 | No | No |
| SUITE 602 | UNIT 38 | 53.8 m² | 579 SF | 1 | 1 | 1 | No | No |
| SUITE 603 | UNIT 39 | 76.5 m² | 824 SF | 1 | 1 | 1 | No | No |
| SUITE 605 | UNIT 40 | 72.9 m² | 784 SF | 1 | 1 | 1 | No | Yes |
| SUITE 606 | UNIT 41 | 83.4 m² | 898 SF | 1 | 1 | 1 | No | No |
| SUITE 607 - BF | UNIT 42 | 58.9 m² | 634 SF | 1 | 1 | 1 | Yes | No |
| SUITE 608 | UNIT 43 | 63.9 m² | 688 SF | 1 | 1 | 1 | No | No |
| SUITE 609 | UNIT 44 | 67.7 m² | 729 SF | 1 | 1 | 1 | No | No |
| SUITE 610 | UNIT 45 | 78.2 m² | 842 SF | 1 | 1 | 1 | No | No |
| SUITE 611 | UNIT 46 | 72.3 m² | 778 SF | 1 | 1 | 1 | No | Yes |
| SUITE 612 | UNIT 47 | 73.8 m² | 794 SF | 1 | 1 | 1 | No | No |
| SUITE 613 - BF | UNIT 48 | 60.5 m² | 651 SF | 1 | 1 | 1 | Yes | No |
| | | 821.4 m² | 8,842 SF | 12 | | | | |
| **LEVEL 06** | | | | | | | | |
| SUITE 703 | UNIT 51 | 76.5 m² | 824 SF | 1 | 1 | 1 | No | No |
| SUITE 705 | UNIT 52 | 72.9 m² | 784 SF | 1 | 1 | 1 | No | Yes |
| SUITE 707 - BF | UNIT 54 | 58.9 m² | 634 SF | 1 | 1 | 1 | Yes | No |
| SUITE 710 | UNIT 57 | 78.2 m² | 842 SF | 1 | 1 | 1 | No | No |
| SUITE 708 | UNIT 55 | 63.9 m² | 688 SF | 1 | 1 | 1 | No | No |
| SUITE 711 | UNIT 58 | 72.3 m² | 778 SF | 1 | 1 | 1 | No | Yes |
| SUITE 712 | UNIT 59 | 73.8 m² | 794 SF | 1 | 1 | 1 | No | No |
| SUITE 702 | UNIT 50 | 53.8 m² | 579 SF | 1 | 1 | 1 | No | No |
| SUITE 701 | UNIT 49 | 59.6 m² | 641 SF | 1 | 1 | 1 | No | No |
| SUITE 709 | UNIT 56 | 67.7 m² | 729 SF | 1 | 1 | 1 | No | No |
| SUITE 706 | UNIT 53 | 83.4 m² | 898 SF | 1 | 1 | 1 | No | No |
| SUITE 715 - BF | UNIT 60 | 60.5 m² | 651 SF | 1 | 1 | 1 | Yes | No |
| | | 821.4 m² | 8,842 SF | 12 | | | | |
| **LEVEL 07** | | | | | | | | |
| SUITE 801 | UNIT 61 | 58.2 m² | 627 SF | 1 | 1 | 1 | No | No |
| SUITE 802 | UNIT 62 | 61.4 m² | 661 SF | 1 | 1 | 1 | No | Yes |
| SUITE 803 | UNIT 63 | 53.3 m² | 573 SF | 1 | 1 | 1 | No | Yes |
| SUITE 805 | UNIT 64 | 65.7 m² | 707 SF | 1 | 1 | 1 | No | No |
| SUITE 806 | UNIT 65 | 63.5 m² | 683 SF | 1 | 1 | 1 | No | Yes |
| | | 302.1 m² | 3,251 SF | 5 | | | | |
| **LEVEL 08** | | | | | | | | |
| SUITE 901 | UNIT 66 | 58.2 m² | 626 SF | 1 | 1 | 1 | No | No |
| SUITE 902 | UNIT 67 | 61.4 m² | 661 SF | 1 | 1 | 1 | No | No |
| SUITE 903 | UNIT 68 | 53.3 m² | 573 SF | 1 | 1 | 1 | No | No |
| SUITE 905 | UNIT 69 | 63.0 m² | 679 SF | 1 | 1 | 1 | No | No |
| SUITE 907 | UNIT 71 | 63.1 m² | 679 SF | 1 | 1 | 1 | No | No |
| SUITE 906 - BF | UNIT 70 | 66.2 m² | 713 SF | 1 | 1 | 1 | Yes | No |
| | | 365.2 m² | 3,931 SF | 6 | | | | |
| **LEVEL 09** | | | | | | | | |
| SUITE 1001 | UNIT 66 | 58.2 m² | 626 SF | 1 | 1 | 1 | No | No |
| SUITE 1002 | UNIT 72 | 61.4 m² | 661 SF | 1 | 1 | 1 | No | No |
| SUITE 1003 | UNIT 73 | 53.3 m² | 573 SF | 1 | 1 | 1 | No | No |
| SUITE 1005 | UNIT 74 | 63.0 m² | 679 SF | 1 | 1 | 1 | No | No |
| SUITE 1007 | UNIT 76 | 63.1 m² | 679 SF | 1 | 1 | 1 | No | No |
| SUITE 1006 - BF | UNIT 75 | 66.2 m² | 713 SF | 1 | 1 | 1 | Yes | No |
| | | 365.2 m² | 3,931 SF | 6 | | | | |
| **LEVEL 10** | | | | | | | | |
| SUITE 1101 | UNIT 77 | 58.2 m² | 626 SF | 1 | 1 | 1 | No | No |
| SUITE 1102 | UNIT 78 | 61.4 m² | 661 SF | 1 | 1 | 1 | No | No |
| SUITE 1103 | UNIT 79 | 53.3 m² | 573 SF | 1 | 1 | 1 | No | No |
| SUITE 1105 | UNIT 80 | 63.0 m² | 679 SF | 1 | 1 | 1 | No | No |
| SUITE 1107 | UNIT 82 | 63.1 m² | 679 SF | 1 | 1 | 1 | No | No |
| SUITE 1106 - BF | UNIT 81 | 66.2 m² | 713 SF | 1 | 1 | 1 | Yes | No |
| | | 365.2 m² | 3,931 SF | 6 | | | | |
| **LEVEL 11** | | | | | | | | |
| SUITE 1201 | UNIT 83 | 58.2 m² | 626 SF | 1 | 1 | 1 | No | No |
| SUITE 1202 | UNIT 84 | 61.4 m² | 661 SF | 1 | 1 | 1 | No | No |
| SUITE 1203 | UNIT 85 | 53.3 m² | 573 SF | 1 | 1 | 1 | No | No |
| SUITE 1205 | UNIT 86 | 63.0 m² | 679 SF | 1 | 1 | 1 | No | No |
| SUITE 1207 | UNIT 88 | 63.1 m² | 679 SF | 1 | 1 | 1 | No | No |
| SUITE 1206 - BF | UNIT 87 | 66.2 m² | 713 SF | 1 | 1 | 1 | Yes | No |
| | | 365.2 m² | 3,931 SF | 6 | | | | |
| **LEVEL 12** | | | | | | | | |
| SUITE 1401 | UNIT 89 | 58.9 m² | 634 SF | 1 | 1 | 1 | No | No |
| SUITE 1402 | UNIT 90 | 61.4 m² | 661 SF | 1 | 1 | 1 | No | No |
| SUITE 1403 | UNIT 91 | 53.3 m² | 573 SF | 1 | 1 | 1 | No | No |
| SUITE 1405 | UNIT 92 | 63.3 m² | 681 SF | 1 | 1 | 1 | No | No |
| SUITE 1406 - BF | UNIT 93 | 82.4 m² | 887 SF | 1 | 1 | 1 | Yes | Yes |
| | | 318.3 m² | 3,436 SF | 5 | | | | |
| TOTAL | | 6189.3 m² | 66,622 SF | 94 | | | | |

## DETAILS OF DEVELOPMENT :

| | | | |
|---|---|---|---|
| GENERAL INFORMATION | LEGAL ADDRESS: | 247 - 251 HAZEL ST | |
| | ZONING: | RESIDENTIAL NORTH/DALE TWELVE ZONE (RN-12) | |
| | STREET FRONTAGE: | ACTIVE | |
| | SITE REGULATIONS | RESIDENTIAL NORTH/DALE TWELVE ZONE (RN-12) | |
| | | REQUIRED | PROVIDED |
| | MIN. LOT FRONTAGE | 20.0 m | 44.8 m |
| | GROSS LOT AREA: | 1,637.198 m² | |
| | ROAD WIDENING AREA: | 64.574 m² | |
| | NET LOT AREA: | 1,572.624 m² | |
| | BUILDING AREA: | 918.13m² | |
| | BUILDING COVERAGE | N/A | 918.3 m² |
| DENSITY | TOTAL NUMBER OF BEDS: | min. 250bed/Ha = 39 | |
| | | max. 600bed/Ha = 94 | 94 Bedrooms (598 beds/Ha) |
| | TOTAL NUMBER OF UNITS: | N/A | 94 Units |
| SETBACKS | FRONT YARD SETBACK (E) | min. 1.0 m | 1 m |
| | SIDE YARD SETBACK (N) | 3.0 m | 3.0 m |
| | SIDE YARD SETBACK (S) | 3.0 m | 3.0 m |
| | REAR YARD SETBACK (W) | 7.5 m | 7.5 m |

| | | REQUIRED | PROVIDED |
|---|---|---|---|
| HEIGHT | PODIUM REQUIREMENT | Podium Height: Min.=10.5 m Max.= 20 m | 20.70 m |
| | MIN. GROUND FLOOR HEIGHT | 4.0 m | 5.85 m |
| | STOREYS | N/A | 12 |
| | BUILDING HEIGHT | Max. 41.5m | 38.5 m |
| TOWER INFORMATION | MIN. FRONT & FLANKAGE TOWER STEPBACK | 3 m | 3 m |
| | MAX. TOWER FOOTPRINT ABOVE THE EIGHT (8th) STOREY | 800 m² | 451.9 m² |
| | MIN. TOWER SEPARATION | 22.0m | N/A |
| | MIN. TOWER SEPARATION FROM AN INTERIOR LOT | 11m | 11 m |
| | MAX. HORIZONTAL TOWER DIMENSION | 35 m | 22.1 m |
| | | REQUIRED | PROVIDED |
| PARKING | PARKING REQUIREMENT: Residential: 0 Visitor: 0 | 0 0 | 2 - RESIDENTIAL/ VISITOR 6 - COMMERCIAL |
| | PARKING NON-RES. 3.0 PER 100 SQUARE METERS OF NON-RESIDENTIAL BUILDING FLOOR AREA | 175.7m² x 3.0/100m² =5.271 THEREFORE = 6 | 6 |
| | Total Parking | Total Parking = 6 | Total Parking = 8 |
| | DESIGNED ELECTRIC VEHICLE SPACES (80% OF STRUCT. PARKING) | 100% | 100% |
| | B.F. PARKING 1-25 SPACES | TYPE 'A' = 1 TYPE 'B' = 0 | TYPE 'A' = 1 TYPE 'B' = 0 |
| | MIN. BIKE PARKING RESIDENTIAL: 0.25 per BEDROOM | 0.25x94 = 24 | 24 |
| | 1 PER 100 SQUARE METERS OF COMMERCIAL FLOOR AREA | 178.04 / 100 = 2 TOTAL: 26 | 2 TOTAL: 26 |
| LOADING | REQUIRED LOADING SPACES RESIDENTIAL/COMMERCIAL TYPE 'A' = 3m(W)x7m(L)x3m(H) TYPE 'B' = 3m(W)x12m(L)x4.5m(H) | 0< 249m² = 0 76 < 900 = 1 TYP. A | TYPE 'A' = 1 |
| AMENITY AREA | LANDSCAPED OPEN SPACE | 30% = 491.15m² | 31.02% = 507.89m² |
| | REQUIRED AMENITY AREA (min) 3 m² for the first BEDROOM and 2 m² for each additional BEDROOM in the DWELLING UNIT | 94x3 = 282m² | 417.50m² |
| | BUILDING FLOOR AREA FIRST STOREY | 30% = 128.55m² | 30.95% = 132.82m² |
| | GARBAGE ENCLOSURE | INSIDE | |

### GENERAL NOTES

1. LEGAL DESCRIPTION: PART OF LOT 67, 68 & 69, REGISTERED PLAN 710, CITY OF WATERLOO, TAKEN FROM SURVEY PREPARED BY GUENTHER RUEB SURVEYING LIMITED, JANUARY 6, 2025.
2. TREE PROTECTION WILL REMAIN ON SITE FOR THE DURATION OF CONSTRUCTION.
3. PARKING AND SITE LIGHTING FIXTURES WILL BE FULL CUT-OF DIRECTED AWAY FROM ABUTTING PROPERTIES WITH NO GLARE.
4. SNOW STORAGE TO BE LOCATED ON SITE. EXCESS SNOW WILL BE TRUCKED AWAY FROM THE SITE AT OWNER'S EXPENSE.
5. ALL UNDERGROUND AND ABOVE GROUND (I.E. SIDEWALKS, CURBS, SOD, ROADS) WORKS IN MUNICIPAL R.O.W. TO BE UPGRADED AT 100% OWNER'S COST TO THE SATISFACTION OF THE CITY.
6. HANDICAP ACCESSIBLE ENTRANCE TO BE LOCATED AT THE FRONT ENTRANCE AND UNDERGROUND PARKING GARAGE ACCESS DOOR.
7. BICYCLE STORAGE AREA WILL BE PROVIDED INSIDE THE BUILDING AND OUTDOOR.
8. PARKING CEILING AND INTERIOR PARKING WALL WILL BE PAINTED LIGHT COLOR.
9. ALL LEVELS ARE BARRIER FREE ACCESSIBLE.
10. SITE PLAN, SITE GRADING AND LANDSCAPE PLANS HAVE BEEN COORDINATED.
11. ALL MECHANICAL EQUIPMENT TO BE FULLY SCREENED FROM PUBLIC VIEW. ROOF TOP UNITS SHALL NOT BE VISIBLE FROM PUBLIC REALM OR RESIDENTIAL PROPERTIES AND ALL VENTING EQUIPMENT SHALL BE ARCHITECTURALLY INTEGRATED INTO BUILDING FACADE WITH NO EXTERNAL UNITS LOCATED ON BUILDING WALLS.
12. GARBAGE BINS WILL BE PERMANENTLY STORED IN THE GARBAGE ROOM, AND WILL NOT REMAIN IN THE TEMPORARY GARBAGE PICKUP AREA. GARBAGE BINS WILL BE BROUGHT TO THE GARBAGE PICKUP AREA ONLY SHORT TIME PRIOR TO GARBAGE PICKUP. GARBAGE WILL BE COLLECTED BY PRIVATE SERVICE AT THE SOLE EXPENSE OF THE OWNER.
13. PEDESTRIAN WIND ASSESSMENT PREPARED BY ROWAN WILLIAMS DAVIES & IRWIN INC. DATED NOV 30, 2020 WAS REVIEWED. WIND CONDITIONS AROUND THE PROPOSED DEVELOPMENT AND ROOFTOP AMENITY SPACES ARE EXPECTED TO BE SUITABLE FOR THE INTENDED USAGE AND MEET THE APPLICABLE WIND COMFORT CRITERIA.
14. 676.6m² TOTAL COMMERCIAL SPACE WILL BE PROVIDED.
15. MIN. 25% HABITABLE SPACE PROVIDED AT THE FRONT OF THE BUILDING
16. EXTERIOR WALKS THAT FORM PART OF A BARRIER- FREE PATH OF TRAVEL SHALL HAVE A PERMANENT, FIRM AND SLIP-RESISTANT SURFACE AND A TACTILE ATTENTION INDICATOR THAT IS LOCATED TO IDENTIFY AN ENTRY INTO A VEHICULAR ROUTE OR AREA WHERE NO CURBS OR ANY OTHER ELEMENT SEPARATE THE VEHICULAR ROUTE OR AREA FROM A PEDESTRIAN ROUTE.
17. EXISTING MUNICIPAL SIDEWALKS FRONTING THE DEVELOPMENT ARE TO REMAIN TO PROVIDE SAFE ACCESS DURING CONSTRUCTION, AND ONLY REMOVED ONCE CONTRACTOR IS READY TO CONSTRUCT A NEW SIDEWALK. SAFE PEDESTRIAN WALKWAY SHALL BE PROVIDED AT ALL TIMES.
18. THE MAXIMUM NUMBER OF BEDROOMS PERMITTED WITHIN EACH RESIDENTIAL UNIT SHALL BE CONSISTENT WITH ISSUED BUILDING PERMIT AND ASSOCIATED SITE PLAN AND DRAWINGS.
19. EACH UNIT SHALL CONTAIN NO MORE THAN 1 BEDROOM. THE ROOMS WITHIN EACH UNIT LABELLED 'DINING ROOM' SHALL NOT BE USED AS BEDROOMS.
20. ALL STRUCTURED PARKING TO BE ELECTRIC VEHICLE READY AS PER SECTION 8.3.1 OF THE ZONING BY-LAW.
21. THE DAYLIGHT TRIANGLES WILL REMAIN UNOBSTRUCTED AT ALL TIMES.
22. BUILDING RAFT FOUNDATIONS TO BE WATERPROOFED AND DESIGNED FOR HYDROSTATIC PRESSURES TO THE SATISFACTION OF THE CITY'S CHIEF BUILDING OFFICIAL.

## COMMERCIAL AREA BREAKDOWN

| COMMERCIAL AREA BREAKDOWN | | |
|---|---|---|
| Name | AREA(m²) | AREA (SF) |
| COMMERCIAL 1 | | |
| LEVEL 01 | 66.6 m² | 717 SF |
| COMMERCIAL 2 | | |
| LEVEL 01 | 55.3 m² | 595 SF |
| COMMERCIAL 3 | | |
| LEVEL 01 | 52.5 m² | 565 SF |
| TOTAL: 3 | 174.3 m² | 1,877 SF |

## GROSS FLOOR AREAS AND SUITES

| GFA & SUITE DATA CHART | | | GROSS FLOOR AREA | | COMMON SPACE DEDUCTIONS | | FLOOR AREA | |
|---|---|---|---|---|---|---|---|---|
| LEVEL | # SUITES | # BEDROOMS | AREA(m²) | AREA (SF) | AREA(m²) | AREA (SF) | AREA(m²) | AREA (SF) |
| LEVEL 01 | 0 | 0 | 428.5 m² | 4,612 SF | 254.2 m² | 2,736 SF | 389.7 m² | 4,194 SF |
| LEVEL 02 | 12 | 12 | 918.3 m² | 9,884 SF | 96.8 m² | 1,042 SF | 874.1 m² | 9,409 SF |
| LEVEL 03 | 12 | 12 | 918.3 m² | 9,884 SF | 96.8 m² | 1,042 SF | 874.1 m² | 9,409 SF |
| LEVEL 04 | 12 | 12 | 918.3 m² | 9,884 SF | 96.8 m² | 1,042 SF | 874.1 m² | 9,409 SF |
| LEVEL 05 | 12 | 12 | 918.3 m² | 9,884 SF | 96.8 m² | 1,042 SF | 874.1 m² | 9,409 SF |
| LEVEL 06 | 12 | 12 | 918.3 m² | 9,884 SF | 96.8 m² | 1,042 SF | 874.1 m² | 9,409 SF |
| LEVEL 07 | 5 | 5 | 614.6 m² | 6,616 SF | 312.6 m² | 3,364 SF | 572.6 m² | 6,163 SF |
| LEVEL 08 | 6 | 6 | 451.9 m² | 4,864 SF | 86.7 m² | 933 SF | 407.9 m² | 4,390 SF |
| LEVEL 09 | 6 | 6 | 451.9 m² | 4,864 SF | 86.7 m² | 933 SF | 407.9 m² | 4,390 SF |
| LEVEL 10 | 6 | 6 | 451.9 m² | 4,864 SF | 86.7 m² | 933 SF | 407.9 m² | 4,390 SF |
| LEVEL 11 | 6 | 6 | 451.9 m² | 4,864 SF | 86.7 m² | 933 SF | 407.9 m² | 4,390 SF |
| LEVEL 12 | 5 | 5 | 407.8 m² | 4,389 SF | 88.5 m² | 953 SF | 363.4 m² | 3,912 SF |
| LEVEL 13 - MECH PH (WIP) | 0 | 0 | 170.0 m² | 1,830 SF | 170.0 m² | 1,830 SF | 157.8 m² | 1,698 SF |
| TOTAL | 94 | 94 | 8,019.6 m² | 86,322 SF | 1,655.9 m² | 17,824 SF | 7,485.5 m² | 80,574 SF |

**NOTES:**

*GROSS FLOOR AREA* MEANS TOTAL AREA OF ALL FLOORS ABOVE GRADE MEASURED BETWEEN THE OUTSIDE SURFACES OF EXTERIOR WALLS OR BETWEEN THE OUTSIDE SURFACES OF EXTERIOR WALLS AND CENTRE LINE OF DEMISING WALLS.

*TOTAL DEDUCTIONS* INCLUDE MAJOR VERTICAL PENETRATIONS SUCH AS ELEVATOR SHAFTS THAT AREA MEASURED TO THE INSIDE FACE OF PERIMETER WALLS WITHIN THE GROSS FLOOR AREA. TOTAL DEDUCTIONS ALSO INCLUDE COMMON AREAS & SERVICE SPACES MEASURED TO THE INSIDE FACE OF PERIMETER WALLS. IF COMMON AREAS & SERVICE SPACES ARE ADJACENT, THE MEASUREMENT IS TO THE CENTRE LINE OF THE WALL.

*FLOOR AREA* IS THE GROSS FLOOR AREA MINUS VERTICAL DEDUCTIONS.

*TOTAL LEASABLE AREA* MEANS TOTAL AREA OF RESIDENTIAL SUITES MEASURED AS PER TARION BUILDER BULLETIN 22 WHICH IS MEASURED BETWEEN THE OUTSIDE SURFACE OF EXTERIOR WALLS TO THE CORRIDOR SIDE OF CORRIDOR WALLS, AND TO THE CENTER LINE OF DEMISING WALLS INCLUDING ENTIRE WALLS SEPARATING SERVICE SPACES.

*CONSTRUCTION LEVEL* REFERS TO A BUILDING STOREY AS DEFINED IN THE ONTARIO BUILDING CODE

*MUNICIPAL LEVEL* REFERS TO THE NAME GIVEN TO THE LEVEL FOR MUNICIPAL ADDRESS PURPOSES AND WILL EXCLUDE ALL ITERATIONS OF THE NUMBERS 4 AND 13.

| MECHANICAL AND ELEVATOR PENTHOUSE AREAS | | |
|---|---|---|
| Level | AREA(m²) | AREA (SF) |
| LEVEL 13 - MECH PH (WIP) | 12.2 m² | 131 SF |
| LEVEL 13 - MECH PH (WIP) | 123.3 m² | 1,327 SF |
| LEVEL 13 - MECH PH (WIP) | 14.6 m² | 157 SF |
| LEVEL 13 - MECH PH (WIP) | 19.9 m² | 214 SF |
| TOTAL | 170.0 m² | 1,830 SF |

| BARRIER FREE RESIDENTIAL UNITS | |
|---|---|
| LEVEL | COUNT |
| LEVEL 02 | 2 |
| LEVEL 03 | 2 |
| LEVEL 04 | 2 |
| LEVEL 05 | 2 |
| LEVEL 06 | 2 |
| LEVEL 08 | 1 |
| LEVEL 09 | 1 |
| LEVEL 10 | 1 |
| LEVEL 11 | 1 |
| LEVEL 12 | 1 |
| | 15 |

## TOTAL LEASABLE AREAS

| GROSS LEASABLE AREA | |
|---|---|
| AREA(m²) | AREA (SF) |
| 174.3 m² | 1,877 SF |
| 821.4 m² | 8,842 SF |
| 821.4 m² | 8,842 SF |
| 821.4 m² | 8,842 SF |
| 821.4 m² | 8,842 SF |
| 302.1 m² | 3,251 SF |
| 365.2 m² | 3,931 SF |
| 365.2 m² | 3,931 SF |
| 365.2 m² | 3,931 SF |
| 319.3 m² | 3,436 SF |
| 6,363.7 m² | 68,498 SF |

| TOTAL COMMERCIAL AREA1 | | |
|---|---|---|
| Level | AREA(m²) | AREA (SF) |
| LEVEL 01 | 174.3 m² | 1,877 SF |

| RESIDENTIAL UNITS AREA | | |
|---|---|---|
| Level | AREA(m²) | AREA (SF) |
| LEVEL 02 | 821.4 m² | 8,842 SF |
| LEVEL 03 | 821.4 m² | 8,842 SF |
| LEVEL 04 | 821.4 m² | 8,842 SF |
| LEVEL 05 | 821.4 m² | 8,842 SF |
| LEVEL 06 | 821.4 m² | 8,842 SF |
| LEVEL 07 | 302.1 m² | 3,251 SF |
| LEVEL 08 | 365.2 m² | 3,931 SF |
| LEVEL 09 | 365.2 m² | 3,931 SF |
| LEVEL 10 | 365.2 m² | 3,931 SF |
| LEVEL 11 | 365.2 m² | 3,931 SF |
| LEVEL 12 | 319.3 m² | 3,436 SF |
| | 6,189.3 m² | 66,622 SF |

## AMENITY AREAS

| RESIDENTIAL COMMON AMENITY AREAS - RECAP | | |
|---|---|---|
| | AREA (m²) | AREA(SF) |
| AMENITY | 64.7 m² | 697 SF |
| BALCONY- AMENITY | 162.8 m² | 1,752 SF |
| TOTAL | 227.5 m² | 2,449 SF |

| AMENITY BALCONY AREAS - RECAP | | |
|---|---|---|
| | AREA (m²) | AREA(SF) |
| BALCONY | 318.0 m² | 3,423 SF |
| TOTAL | 318.0 m² | 3,423 SF |

| TOTAL AMENITY AREA PER FLOOR - RECAP | | | |
|---|---|---|---|
| LEVEL | Space Type | AREA(m²) | AREA (SF) |
| LEVEL 02 | BALCONY | 25.6 m² | 276 SF |
| LEVEL 03 | BALCONY | 25.6 m² | 276 SF |
| LEVEL 04 | BALCONY | 25.6 m² | 276 SF |
| LEVEL 05 | BALCONY | 25.6 m² | 276 SF |
| LEVEL 06 | BALCONY | 25.6 m² | 276 SF |
| LEVEL 07 | AMENITY | 227.5 m² | 2,449 SF |
| LEVEL 07 | BALCONY | 145.8 m² | 1,570 SF |
| LEVEL 12 | BALCONY | 44.1 m² | 475 SF |
| TOTAL | | 545.5 m² | 5,872 SF |

## PARKINGS AND PARKING AREA

### Car Parking

| CAR PARKING SCHEDULE1 | |
|---|---|
| LEVEL / TYPE | COUNT |
| LEVEL 01 | |
| Waterloo ADA - Type A (3700x5500) | 1 |
| | 1 |
| COMMERCIAL PARKING | |
| Waterloo Regular 90° 1 Side Abut (3000x5500) | 3 |
| | 3 |
| RESIDENTIAL PARKING | |
| Waterloo Regular 90° 1 Side Abut (3000x5500) | 4 |
| | 4 |
| TOTAL PARKING SPACES | 8 |

### Bicycle Parking

| BICYCLE PARKING SCHEDULE | | |
|---|---|---|
| RACK | # BIKE RACKS | # BICYCLE PARKINGS |
| LEVEL 01 | | |
| double front - single side - non stacked | 2 | 4 |
| single front - both sides - non stacked | 10 | 20 |
| single front - one side - non stacked | 2 | 2 |
| | | 26 |

NEW GENERATION DESIGN WAVE

ALL DIMENSIONS, NOTES AND DETAILS MUST BE CHECKED AND VERIFIED ON THE JOBSITE BY THE CONTRACTOR PRIOR TO START OF CONSTRUCTION. ANY DISCREPANCIES ARE TO BE IMMEDIATELY REPORTED TO THE ARCHITECT ANY EXISTING AND/OR CHANGES RESULTING FROM FAILURE TO DO SO WILL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

ALL DRAWINGS, DETAILS AND SPECIFICATIONS ARE THE PROPERTY OF THE ARCHITECT AND ARE NOT TO BE USED OF THE DRAWINGS, DETAILS AND SPECIFICATIONS IS PROHIBITED.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS AND DETAILS ISSUED FOR CONSTRUCTION OF THIS PROJECT.

THE CONTRACTOR SHALL READ ALL NOTES AND SPECIFICATIONS BEFORE BEGINNING WORK.

THE CONTRACTOR SHALL CAREFULLY STUDY AND COMPARE THE ARCHITECTURAL DRAWINGS WITH THE STRUCTURAL, OTHER DISCIPLINES DRAWINGS, AND HE/SHE SHALL IMMEDIATELY NOTIFY THE ARCHITECT OF ANY INCONSISTENCIES OR OMISSIONS THAT HE MAY DISCOVER.

THE CONTRACTOR SHALL NOT SCALE DRAWINGS. IF DIMENSIONS ARE IN QUESTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING CLARIFICATION FROM THE ARCHITECT BEFORE CONTINUING WITH WORK.

THE CONTRACTOR SHALL NOTIFY THE ARCHITECT OF ITEMS REQUIRING DETAILS THAT ARE NOT CLARIFIED IN THE CONTRACT DOCUMENTS.

THE CONTRACTOR SHALL NOTIFY THE ARCHITECT IF ANY WORK INDICATED IN THE CONTRACT DOCUMENTS CAN NOT BE PERFORMED DUE TO EXISTING FIELD CONDITIONS.

CONTRACTOR TO VERIFY DELIVERY SCHEDULE OF ALL MECHANICAL EQUIPMENT, ELECTRICAL EQUIPMENT, LIGHTING AND ANY OTHER ITEMS SPECIFIED AND THE ARCHITECT IS TO BE NOTIFIED IMMEDIATELY IF ANY MATERIALS AND OR FIXTURES CANNOT BE OBTAINED WITHIN THE REQUIRED CONSTRUCTION SCHEDULE.

| | | | |
|---|---|---|---|
| 6 | 2025.10.03 | SPA/MV SUBMISSION | MT BS |
| 5 | 2025.06.09 | SPA 3RD SUBMISSION | MT BS |
| NO. | DATE | ISSUED FOR: | CH BY |

ISSUES

PLOT DATE:
2025-11-05 3:39:15 PM

NORTH: STAMP:

LEGEND:

**WALL CATEGORY KEY:**

| | |
|---|---|
| BH | CEILING BULKHEAD WALL |
| DM | DEMISING WALL |
| EX | EXTERIOR WALL |
| FR | FURRING WALL |
| LM

# APPENDIX B – SANITARY CALCULATIONS

133 REGENT STREET
STRATFORD, ON N5A 3W2
519.305.5727
gritengineering.ca

# 251 Hazel Street, Waterloo ON

## SANITARY SEWER DESIGN SHEET

**Waterloo, Ontario**

| | | | |
|---|---|---|---|
| AVERAGE RESIDENTIAL RATE = | **0.003** l/s/cap (275 l/d/cap) | DESIGN PARAMETERS | |
| COMMERCIAL RATE = | **0.950** l/s/ha | RESIDENTIAL HARON PEAKING FACTOR | |
| COMMERCIAL PEAKING FACTOR = | **2.5** | n = | 0.013 |
| AVERAGE INFILTRATION RATE = | **0.25** l/s/ha | Vmax = | **3.0** m/sec (peak flow) |
| AVERAGE PEOPLE PER UNIT= | **2.66** people/unit | Vmin = | **0.8** m/sec (peak flow) |

| | |
|---|---|
| SHEET NO. | 1 OF 1 |
| JOB No.: | GE25-1209-1 |
| CALCULATED BY: | Ann Gibson, MES, P.Eng. |
| DATE: | November 6, 2025 |
| FILE: | GE25-1209-1-C-CALC-SAN-2025-11-06 |

GRIT ENGINEERING INC

| LOCATION | | | | RESIDENTIAL AREAS | | | | | | COMMERCIAL | | | | | INFILTRATION | | | DESIGN | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | AREA NO. | MANHOLE LOCATION | | POPULATION DENSITY | | POPUL. | ACCUM. POPUL. | PEAK FACTOR "PF" | PEAK RES. FLOW | HECTARES AND FLOW OF EACH ZONING 0.95 *L/s/ha* | | | | TOTAL COMM. FLOW | AREA | ACCUM AREA | INFIL FLOW | TOTAL VOLUME FLOW | DIST | SLOPE | PIPE SIZE | CAPACITY | FULL FLOW VELOCITY | ACTUAL VELOCITY | FALL IN SEWER | DROP IN MH | INVERT U.S. | INVERT D.S. |
| | | FROM MH | TO MH | *Area* | *# Units* | | | | | AREA | ACCUM AREA | PF | PEAK FLOW | | | | | | | | | | | | | | | |
| | | | | *ha* | | | | | *L/s* | *ha* | *ha* | | *L/s* | *L/s* | *ha* | *ha* | *L/s* | *L/s* | *m* | *%* | *mm* | *L/s* | *m/s* | *m/s* | *m* | *m* | *m* | *m* |
| Hazel St. | 1 | U7-24A | SAMH1 | 0.06 | 1 | 3 | 3 | 4.5 | 0.04 | | | | | | 0.06 | 0.06 | 0.01 | 0.04 | 14.3 | 1.03 | 200 | 33.27 | 1.06 | 0.18 | 0.535 | - | 329.054 | 328.519 |
| 251 Hazel St. | 2 | - | SAMH1 | 0.16 | 94 | 250 | 250 | 4.1 | 3.27 | 0.08 | 0.08 | 2.5 | 0.20 | 0.20 | 0.16 | 0.16 | 0.02 | 3.48 | 12.9 | 1.00 | 150 | 15.22 | 0.86 | 0.70 | 0.12 | - | 329.05 | 328.93 |
| Hazel St. | 3 | SAMH1 | U7-24 | 0.22 | 44 | 117 | 367 | 4.0 | 4.72 | | 0.08 | 2.5 | 0.20 | 0.20 | 0.22 | 0.38 | 0.04 | 4.95 | 39.8 | 0.73 | 200 | 28.01 | 0.89 | 0.67 | 0.39 | 0.06 | 328.464 | 328.069 |
| | 4 | U7-23 | U7-16 | 0.14 | 3 | 8 | 375 | 4.0 | 4.82 | | 0.08 | 2.5 | 0.20 | 0.20 | 0.14 | 0.53 | 0.05 | 5.07 | 62.7 | 1.93 | 200 | 45.54 | 1.45 | 0.96 | 1.20 | 0.09 | 327.979 | 326.774 |

# APPENDIX C – WATER DEMAND CALCULATIONS

133 REGENT STREET
STRATFORD, ON N5A 3W2
519.305.5727
gritengineering.ca

# Domestic Water Requirement, Velocity, and Turnover

| | |
|---|---|
| **Project** | 251 Hazel Street Development |
| **Project Number** | GE25-1209-1 |
| **Client** | New Generation Design Wave |
| **Address** | 251 Hazel Street, Waterloo ON |
| **Date** | November 6, 2025 |

**Domestic Water Demand**

| | | |
|---|---|---|
| Average Day Demand =[1] | 225 | L/day/cap |
| Average Day Demand =[1] | 0.003 | L/s/cap |
| Maximum Day Peaking Factor =[2] | 2.75 | |
| Maximum Hour Peaking Factor =[2] | 4.13 | |
| High Density Residential =[1] | 2.66 | p/unit |
| Commercial Area Allowance Average Flow= 28m$^3$/ha/d =[1] | 28000.0 | L/day/ha |

| | Units | Area (ha) | Population | Average Day (L/s) | Maximum Day (L/s) | Maximum Hour (L/s) |
|---|---|---|---|---|---|---|
| **High Density Residential**[3] | 94 | N/A | 250 | 0.651 | 1.791 | 2.689 |
| **Commercial Area**[3] | N/A | 0.08 | N/A | 0.027 | 0.074 | 0.111 |
| **Totals** | **94** | **0.08** | **250** | **0.678** | **1.864** | **2.800** |

**Velocity Check in Service Pipe**

| Pipe Diameter (mm) | Demand (L/s) | Velocity (m/s) |
|---|---|---|
| 150 | 2.800 | 0.16 |

Therefore, the maximum velocity of 0.16 m/s is less than the maximum allowable velocity of 5 m/s in the Maximum Hour Senerio.[1]

**Water Volume & Turnover Calculation**

| Pipe Size (mm) | Length (m) | Volume (L) |
|---|---|---|
| 150 | 11.0 | 193.86 |
| | 0.0 | 0.00 |
| | 0.0 | 0.00 |
| | 0.0 | 0.00 |
| **Total Volume** | | **193.86** |

| Volume (L) | Average Day Demand (L/s) | Hours | Days |
|---|---|---|---|
| 193.86 | 0.678 | 0.08 | 0.00 |

Therefore, the water turnover of 0.08 hours is less than the maximum allowable time of 72 hours.[2]

**References**


1. Region of Waterloo *Design Guidelines and Supplemental Specifications for Municipal Services* 2025
2. MECP *Design Guidelines for Drinking Water Systems 2008*
3. See Site Plan prepared by New Generation Design Wave

# NFPA13 Fire-Fighting Flow Requirements

| | |
|---|---|
| **Project** | 251 Hazel Street Development |
| **Project Number** | GE25-1209-1 |
| **Client** | New Generation Design Wave |
| **Address** | 251 Hazel Street, Waterloo ON |
| **Date** | November 6, 2025 |

**Maximum NFPA13 Fire-Firghting Flow Required**[1]

| Hazard Level | Sprinkler Flow (L/min) Figure 19.2.3.1.1 | Inside Hose Allowance (L/min) Section 19.1.6.3 | Outside Hose / Hydrant Allowance (L/min) Table 19.2.3.1.2 | Total Flow Required (L/min) |
|---|---|---|---|---|
| **Light** | 784 | 190 | 190 | 1,164 |
| **Ordinary 1** | 1,517 | 380 | 570 | 2,467 |
| **Ordinary 2** | 2,257 | 380 | 570 | 3,207 |
| **Extra 1** | 3,767 | 380 | 1,520 | 5,667 |
| **Extra 2** | 5,673 | 380 | 1,520 | 7,573 |

Note: The maximum area for each Hazard Level and density for that area has been used to calculate the Sprinkler Flow, actual required flow may be less and will be determined by the Fire Protection Engineer at the time of Detailed Design.

| | | |
|---|---|---|
| **Fire-Fighting Required Flow Rate=** | **1,164** | **L/min** |
| Domestic Maximum Day Demand=[2] | 1.86 | L/s |
| = | **111.86** | **L/min** |
| **Total Required - Fire-Flow + Max. Day=** | **1,275.86** | **L/min** |

**Fire-Fighting Available Flow @ Pressure**

| | | | | |
|---|---|---|---|---|
| Static Pressure=[3] | 64.00 | psi (441.26 kPa) @ | 0 | USGPM (0.00 L/min) |
| Tested Supply Flow Rate=[3] | 60.00 | psi (413.69 kPa) @ | 1,180 | USGPM (4467 L/min) |
| Tested Supply Flow Rate=[3] | 58.00 | psi (399.9 kPa) @ | 1,750 | USGPM (6624 L/min) |
| **Pressure @ Required Flow Rate=** | **62.86** | **psi (433.38 kPa) @** | **337** | **USGPM (1275.86 L/min)** |
| Pressure Drop in System= | 1.14 | psi (7.89 kPa) | | |

The water supply pressure at the required flow rate of 1275.86 L/min is 433.38 kPa or 62.86 psi which is greater than minimum required pressure of 140 kPa (20 psi) that is required under the Fire-Flow + Maximum Day senerio.[4]

**Velocity Check in Service Pipe**

| Pipe Diameter (mm) | Demand (L/min) | Velocity (m/s) |
|---|---|---|
| 150 | 1,275.86 | 1.20 |

The velocity of 1.2 m/s is less than the maximum allowable velocity of 3 m/s in the Fire-Fighting + Maximum Day Senerio.[4]

**References**


1. National Fire Protection Association (NFPA) NFPA13. Relevant sections attached or referenced.
2. See *Domestic Water Demand Calculations* by GRIT Engineering Inc.
3. See Hydrant Flow Test by Stumpf Fire Protection, completed on May 29, 2025
4. MECP *Design Guidelines for Drinking Water Systems 2008*

the occupancy hazards of potential tenants and their likely storage needs.

The short period response parameter, $S_s$, is defined in 3.3.198. Additional information about $S_s$ is provided in 18.5.9.

The intent of Section 4.2 is to provide the owner's certificate for all new systems and where there is a change of occupancy and/or building use. *[See Figure A.28.1(b).]*

**A.4.2(4)** Recycled or reclaimed water used in a sprinkler system should not have contaminants in the water that are combustible or that will have a detrimental effect on the sprinkler system performance or the life of the sprinkler system.

**A.4.3** Occupancy examples in the listings as shown in the various hazard classifications are intended to represent the norm for those occupancy types. Unusual or abnormal fuel loadings or combustible characteristics and susceptibility for changes in these characteristics, for a particular occupancy, are considerations that should be weighed in the selection and classification.

The light hazard classification is intended to encompass residential occupancies; however, this is not intended to preclude the use of listed residential sprinklers in residential occupancies or residential portions of other occupancies.

**A.4.3.1.4** Miscellaneous storage is intended to be storage that is ancillary to the primary function of the building. One example is a manufacturing facility where storage on the manufacturing floor is limited.

**A.4.3.2** Light hazard occupancies include occupancies having uses and conditions similar to the following:

(1) Animal shelters
(2) Churches
(3) Clubs
(4) Eaves and overhangs, if of combustible construction with no combustibles beneath
(5) Educational
(6) Hospitals, including animal hospitals and veterinary facilities
(7) Institutional
(8) Kennels
(9) Libraries, except large stack rooms
(10) Museums
(11) Nursing or convalescent homes
(12) Offices, including data processing
(13) Residential
(14) Restaurant seating areas
(15) Theaters and auditoriums, excluding stages and prosceniums
(16) Unused attics

Note that it is not the committee's intent to automatically equate library bookshelves with ordinary hazard occupancies or with library stacks. Typical library bookshelves of approximately 8 ft (2.4 m) in height, containing books stored vertically on end, held in place in close association with each other, with aisles wider than 30 in. (750 mm) can be considered to be light hazard occupancies. Similarly, library stack areas, which are more akin to shelf storage or record storage, as defined in NFPA 232, should be considered to be ordinary hazard occupancies.

**A.4.3.3** Class I, Class II, Class III, and Class IV commodities are considered to have moderate rates of heat release, while Group A plastics are considered to have high rates of heat release. Stockpiles are considered to include display merchandise (e.g., mercantile stockpiles) and arrangements of combustibles ancillary to operations within the occupancy as opposed to dedicated storage areas where the fire loading is generally more severe.

**A.4.3.3.1** Ordinary hazard (Group 1) occupancies include occupancies having uses and conditions similar to the following:

(1) Automobile showrooms
(2) Bakeries
(3) Beverage manufacturing
(4) Canneries
(5) Dairy products manufacturing and processing
(6) Electronic plants
(7) Glass and glass products manufacturing
(8) Laundries
(9) Restaurant service areas
(10) Porte cocheres
(11) Mechanical rooms

**A.4.3.3.2** Ordinary hazard (Group 2) occupancies include occupancies having uses and conditions similar to the following:

(1) Agricultural facilities
(2) Automobile parking garages
(3) Barns and stables
(4) Cereal mills
(5) Chemical plants — ordinary
(6) Confectionery products
(7) Distilleries
(8) Dry cleaners
(9) Exterior loading docks (Note that exterior loading docks only used for loading and unloading of ordinary combustibles should be classified as OH2. For the handling of flammable and combustible liquidsor hazardous materials, or where utilized for storage, exterior and interior loading docks should be protected based upon the actual occupancy and the materials handled on the dock, as if the materials were actually stored in that configuration.)
(10) Feed mills
(11) Horse stables
(12) Leather goods manufacturing
(13) Libraries — large stack room areas
(14) Machine shops
(15) Metal working
(16) Mercantile
(17) Paper and pulp mills
(18) Paper process plants
(19) Piers and wharves
(20) Plastics fabrication, including blow molding, extruding, and machining; excluding operations using combustible hydraulic fluids
(21) Post offices
(22) Printing and publishing
(23) Racetrack stable/kennel areas, including those stable/kennel areas, barns, and associated buildings at state, county, and local fairgrounds
(24) Repair garages
(25) Resin application area
(26) Stages
(27) Textile manufacturing
(28) Tire manufacturing
(29) Tobacco products manufacturing

(30) Wood machining
(31) Wood product assembly

**A.4.3.4** Extra hazard (Group 1) occupancies include occupancies having uses and conditions similar to the following:

(1) Aircraft hangars (except as governed by NFPA 409)
(2) Combustible hydraulic fluid use areas
(3) Die casting
(4) Metal extruding
(5) Plywood and particleboard manufacturing
(6) Printing [using inks having flash points below 100°F (38°C)]
(7) Rubber reclaiming, compounding, drying, milling, vulcanizing
(8) Saw mills
(9) Textile picking, opening, blending, garnetting, or carding, combining of cotton, synthetics, wool shoddy, or burlap
(10) Upholstering with plastic foams

**A.4.3.5** Extra hazard (Group 2) occupancies include occupancies having uses and conditions similar to the following:

(1) Asphalt saturating
(2) Flammable liquids spraying
(3) Flow coating
(4) Manufactured home or modular building assemblies (where finished enclosure is present and has combustible interiors)
(5) Open oil quenching
(6) Plastics manufacturing
(7) Solvent cleaning
(8) Varnish and paint dipping
(9) Car stackers and car lift systems with 2 cars stacked vertically

**A.4.3.7** Other NFPA standards contain design criteria for fire control or fire suppression *(see 4.3.7 and Chapter 2)*. While these can form the basis of design criteria, this standard describes the design, installation, fabrication, calculation, and evaluation methods of water supplies that should be used for the specific design of the system.

Other NFPA standards contain sprinkler system design criteria for fire control or suppression of specific hazards. These other standards are referenced in Chapter 27.

**A.4.4.1(3)** Pipe schedule — 25,000 ft$^2$ (2320 m$^2$).

**A.4.4.6** Buildings adjacent to a primary structure can be protected by extending the fire sprinkler system from the primary structure. This eliminates the need to provide a separate fire sprinkler system for small auxiliary buildings. Items that should be considered before finalizing fire sprinkler design should include the following:

(1) Actual physical distance between adjacent structures
(2) Potential for the property to be split into separate parcels and sold separately
(3) Square footage of both the primary and auxiliary structures
(4) Difficulties in providing a separate water supply to the auxiliary structure
(5) Occupancy/hazard of the auxiliary structure
(6) Ability of emergency response personnel to easily identify the structure from which waterflow is originating

**A.4.5.1.1** Alternative means of determining available water supplies should be considered where drought or other concerns are present.

**A.4.6** Bacterial inhibitors and other chemicals that are listed and used for the prevention and mitigation of MIC and that do not adversely affect the fire-fighting properties of the water or the performance of the fire sprinkler system components are not prohibited.

**A.4.8** Non-system components can adversely affect the operation and longevity of the fire sprinkler system. Objects connected to the sprinkler system can displace sprinkler system piping, causing obstruction to the spray pattern of sprinklers, delay the activation of a sprinkler, or cause chemical compatibility problems that can cause the failure of sprinkler system components.

**A.4.9.1** The provisions of 4.9.1 do not require inherently noncombustible materials to be tested in order to be classified as noncombustible materials. [**5000:**A.7.1.4.1]

**A.4.9.1.1(1)** Examples of such materials include steel, concrete, masonry and glass. [**5000:**A.7.1.4.1.1(1)]

**A.4.9.2** Material subject to increase in combustibility or flame spread index beyond the limits herein established through the effects of age, moisture, or other atmospheric condition is considered combustible. *(See NFPA 259 and NFPA 220.)* [**5000:**A.7.1.4.2]

**A.5.1.3** For typical combined domestic/fire sprinkler demands, systems with 4 in. (100 mm) pipe or larger typically do not need to include the domestic demand in the calculations because it is such a small fraction of the total flow that it does not make a significant difference in the results. But for situations where 4 in. (100 mm) pipe is used for the combined domestic/fire sprinkler systems and the domestic demand is considerable, then the domestic demand should be included in the calculations. Generally, pipe that is 6 in. (150 mm) or larger can carry combined domestic/fire protection demand without any consideration for domestic demand being necessary.

**A.5.1.4** Evaluation of the water supply and environmental conditions does not necessarily require a water sample analysis by a laboratory. Instead, general knowledge of the long-term condition of sprinkler systems with similar piping materials in similar environments on the same water supply can be a sufficient evaluation.

There are several options to address the effects of MIC on sprinkler systems. Some types of sprinkler pipe such as CPVC have not shown to be affected by MIC. Other types of pipe are being manufactured with a biofilm that resists the effects of MIC.

Where water supplies are treated with bacterial inhibitors, evaluation of the effects of the bacterial inhibitor on sprinkler system components (pipe, fittings, sprinklers, gaskets, valves, and seals) is just as important as evaluating the effect the bacterial inhibitor has on the organisms. Where water treatment is selected as the method to deal with MIC, all water entering the system during testing or flushing needs to be treated so that the organisms do not get a chance to establish themselves.

Since all of the conditions that can affect the growth of MIC are unknown, a plan to sample randomly selected interior positions in the system can be effective. The frequency and location

# APPENDIX D – STORMWATER MANAGEMENT CALCULATIONS

133 REGENT STREET
STRATFORD, ON N5A 3W2
519.305.5727
gritengineering.ca

```
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"                Company                                     Grit Engineering Inc."
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"            1   Chicago storm"
"     1101.000   Coefficient A"
"        9.258   Constant B"
"        0.882   Exponent C"
"        0.400   Fraction R"
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"        1.000   Time step multiplier"
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"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101"
"       68.300   % Impervious"
"        0.164   Total Area"
"       45.000   Flow length"
"        2.000   Overland Slope"
"        0.052   Pervious Area"
"       45.000   Pervious length"
"        2.000   Pervious slope"
"        0.112   Impervious Area"
"       45.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.831   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.022     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.052      0.112      0.164      hectare"
"             Time of concentration  35.723     2.866      5.603      minutes"
"             Time to Centroid       141.926    90.631     94.905     minutes"
"             Rainfall depth         32.400     32.400     32.400     mm"
"             Rainfall volume        16.84      36.29      53.14      c.m"
"             Rainfall losses        27.128     5.479      12.342     mm"
"             Runoff depth           5.273      26.921     20.059     mm"
"             Runoff volume          2.74       30.16      32.90      c.m"
"             Runoff coefficient     0.163      0.831      0.619      "
"             Maximum flow           0.001      0.022      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.022     0.022     0.000     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.164    hectare"
"             Total Impervious area                     0.112    hectare"
"             Total % impervious                       68.300"
" 19          EXIT"
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"     1500.000   Max. Hydrograph"
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"            1   Chicago storm"
"     1705.000   Coefficient A"
"       12.347   Constant B"
"        0.895   Exponent C"
"        0.400   Fraction R"
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"            1   SCS method"
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"       68.300   % Impervious"
"        0.164   Total Area"
"       45.000   Flow length"
"        2.000   Overland Slope"
"        0.052   Pervious Area"
"       45.000   Pervious length"
"        2.000   Pervious slope"
"        0.112   Impervious Area"
"       45.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.252   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.870   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.031     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.052      0.112      0.164      hectare"
"             Time of concentration  25.231     2.578      5.257      minutes"
"             Time to Centroid       128.755    89.619     94.247     minutes"
"             Rainfall depth         46.194     46.194     46.194     mm"
"             Rainfall volume        24.02      51.74      75.76      c.m"
"             Rainfall losses        34.576     5.992      15.053     mm"
"             Runoff depth           11.619     40.202     31.141     mm"
"             Runoff volume          6.04       45.03      51.07      c.m"
"             Runoff coefficient     0.252      0.870      0.674      "
"             Maximum flow           0.002      0.031      0.031      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.031     0.031     0.000     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.164    hectare"
"             Total Impervious area                     0.112    hectare"
"             Total % impervious                       68.300"
" 19          EXIT"
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"                Licensee name:                                      James Hough"
"                Company                                   Grit Engineering Inc."
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"        5.000   Time Step"
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"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3261.000   Coefficient A"
"       16.193   Constant B"
"        0.938   Exponent C"
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"        1.000   Time step multiplier"
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"          101   101"
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"        0.164   Total Area"
"       45.000   Flow length"
"        2.000   Overland Slope"
"        0.052   Pervious Area"
"       45.000   Pervious length"
"        2.000   Pervious slope"
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"       45.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.366   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.909   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.047     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.052      0.112      0.164      hectare"
"             Time of concentration  18.143     2.230      4.738      minutes"
"             Time to Centroid       117.353    87.803     92.461     minutes"
"             Rainfall depth         69.173     69.173     69.173     mm"
"             Rainfall volume        35.96      77.48      113.44     c.m"
"             Rainfall losses        43.838     6.323      18.215     mm"
"             Runoff depth           25.335     62.849     50.957     mm"
"             Runoff volume          13.17      70.40      83.57      c.m"
"             Runoff coefficient     0.366      0.909      0.737      "
"             Maximum flow           0.005      0.047      0.047      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.047     0.047     0.000     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.164    hectare"
"             Total Impervious area                     0.112    hectare"
"             Total % impervious                       68.300"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:                                C:\Users\JamesHough\"
"                OneDrive - gritengineering.ca\Project Work 2025\1209-1\CIV\2-Design
Calculations\SWM\MIDUSS\PRE"
"                Output filename:                  GE25-1209-C-100YR-PRE-R1.out"
"                Licensee name:                                      James Hough"
"                Company                                   Grit Engineering Inc."
"                Date & Time last used:                 7/21/2025 at 9:55:18 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4692.000   Coefficient A"
"       17.437   Constant B"
"        0.956   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           239.793    mm/hr"
"             Total depth                  89.960    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   101"
"       68.300   % Impervious"
"        0.164   Total Area"
"       45.000   Flow length"
"        2.000   Overland Slope"
"        0.052   Pervious Area"
"       45.000   Pervious length"
"        2.000   Pervious slope"
"        0.112   Impervious Area"
"       45.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.444   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.926   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.063     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.052      0.112      0.164      hectare"
"             Time of concentration  14.899     2.007      4.351      minutes"
"             Time to Centroid       111.812    86.797     91.346     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        46.77      100.77     147.53     c.m"
"             Rainfall losses        50.059     6.653      20.413     mm"
"             Runoff depth           39.901     83.307     69.547     mm"
"             Runoff volume          20.74      93.31      114.06     c.m"
"             Runoff coefficient     0.444      0.926      0.773      "
"             Maximum flow           0.009      0.062      0.063      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.063     0.063     0.000     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.164    hectare"
"             Total Impervious area                     0.112    hectare"
"             Total % impervious                       68.300"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                              C:\Users\DaveBolger\"
"                OneDrive - gritengineering.ca\Project Work 2025 -
Documents\1209-1\CIV\2-Design Calculations\SWM\MIDUSS\POST"
"                Output filename:                            2 YEAR post rev3.out"
"                Licensee name:                                            GRIT"
"                Company                                                      "
"                Date & Time last used:                  11/5/2025 at 3:41:15 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1101.000   Coefficient A"
"        9.258   Constant B"
"        0.882   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           105.659    mm/hr"
"             Total depth                  32.400    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Uncontrolled"
"       92.500   % Impervious"
"        0.014   Total Area"
"        2.500   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        2.500   Pervious length"
"        2.000   Pervious slope"
"        0.013   Impervious Area"
"        2.500   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.161   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.761   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.003     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.001      0.013      0.014      hectare"
"             Time of concentration  6.307      0.506      0.604      minutes"
"             Time to Centroid       107.626    87.710     88.045     minutes"
"             Rainfall depth         32.400     32.400     32.400     mm"
"             Rainfall volume        0.34       4.20       4.54       c.m"
"             Rainfall losses        27.181     7.736      9.194      mm"
"             Runoff depth           5.219      24.664     23.206     mm"
"             Runoff volume          0.05       3.19       3.25       c.m"
"             Runoff coefficient     0.161      0.761      0.716      "
"             Maximum flow           0.000      0.003      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.003     0.003     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.003     0.003     0.003     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                total flow"
"             Maximum flow                  0.003    c.m/sec"
"             Hydrograph volume             3.249    c.m"
"                     0.003     0.003     0.003     0.003"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.003     0.000     0.003     0.003"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Controlled"
"      100.000   % Impervious"
"        0.096   Total Area"
"       30.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       30.000   Pervious length"
"        1.000   Pervious slope"
"        0.096   Impervious Area"
"       30.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.830   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.019     0.000     0.003     0.003 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.096      0.096      hectare"
"             Time of concentration  34.483     2.766      2.766      minutes"
"             Time to Centroid       140.478    90.470     90.470     minutes"
"             Rainfall depth         32.400     32.400     32.400     mm"
"             Rainfall volume        0.00       31.10      31.10      c.m"
"             Rainfall losses        27.129     5.506      5.506      mm"
"             Runoff depth           5.271      26.895     26.895     mm"
"             Runoff volume          0.00       25.82      25.82      c.m"
"             Runoff coefficient     0.000      0.830      0.830      "
"             Maximum flow           0.000      0.019      0.019      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.019     0.019     0.003     0.003"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.019     0.019     0.019     0.003"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.019     0.019     0.019     0.003"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Controlled"
"       33.200   % Impervious"
"        0.054   Total Area"
"       45.000   Flow length"
"        0.500   Overland Slope"
"        0.036   Pervious Area"
"       45.000   Pervious length"
"        0.500   Pervious slope"
"        0.018   Impervious Area"
"       45.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.837   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.004     0.019     0.019     0.003 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.018      0.054      hectare"
"             Time of concentration  54.147     4.343      18.347     minutes"
"             Time to Centroid       163.502    92.839     112.708    minutes"
"             Rainfall depth         32.400     32.400     32.400     mm"
"             Rainfall volume        11.69      5.81       17.50      c.m"
"             Rainfall losses        27.127     5.276      19.873     mm"
"             Runoff depth           5.273      27.124     12.528     mm"
"             Runoff volume          1.90       4.86       6.76       c.m"
"             Runoff coefficient     0.163      0.837      0.387      "
"             Maximum flow           0.000      0.004      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"              4   Add Runoff "
"                    0.004     0.022     0.019     0.003"
" 54          POND DESIGN"
"         0.022   Current peak flow    c.m/sec"
"         0.021   Target outflow    c.m/sec"
"          32.6   Hydrograph volume    c.m"
"            8.   Number of stages"
"       331.440   Minimum water level    metre"
"       331.800   Maximum water level    metre"
"       331.440   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 331.440     0.000     0.000"
"                 331.491   0.01878   0.05000"
"                 331.543   0.01944    0.4800"
"                 331.594   0.02006     1.790"
"                 331.646   0.02067     4.600"
"                 331.700   0.02129     9.930"
"                 331.750   0.02184    19.610"
"                 331.800    0.1253    38.620"
"            1.   WEIRS"
"                   Crest      Weir     Crest      Left     Right"
"               elevation coefficie   breadth sideslope sideslope"
"                 331.750     0.900     6.000     0.000     0.000"
"            1.   ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 330.690     0.630    0.1000     1.000"
"            1.   LAYERS"
"                  Bottom    Aspect    Bottom       Top   Average"
"                    area     ratio elevation elevation sideslope"
"                 110.000     1.000   331.210   331.850    15.000"
"              Peak outflow                  0.020    c.m/sec"
"              Maximum level               331.565    metre"
"              Maximum storage               1.046    c.m"
"              Centroidal lag                1.576   hours"
"                   0.004     0.022     0.020     0.003 c.m/sec"
```

```
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                total flow"
"             Maximum flow                  0.022    c.m/sec"
"             Hydrograph volume            38.441    c.m"
"                     0.004     0.022     0.020     0.022"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                total flow"
"             Maximum flow                  0.022    c.m/sec"
"             Hydrograph volume            38.441    c.m"
"                     0.004     0.022     0.020     0.000"
```

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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                              C:\Users\DaveBolger\"
"                OneDrive - gritengineering.ca\Project Work 2025 -
Documents\1209-1\CIV\2-Design Calculations\SWM\MIDUSS\POST"
"                Output filename:                            5 YEAR post rev3.out"
"                Licensee name:                                            GRIT"
"                Company                                                      "
"                Date & Time last used:                  11/5/2025 at 3:43:46 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1705.000   Coefficient A"
"       12.347   Constant B"
"        0.895   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           132.623    mm/hr"
"             Total depth                  46.194    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Uncontrolled"
"       92.500   % Impervious"
"        0.014   Total Area"
"        2.500   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        2.500   Pervious length"
"        2.000   Pervious slope"
"        0.013   Impervious Area"
"        2.500   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.250   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.790   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.004     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.001      0.013      0.014      hectare"
"             Time of concentration  4.454      0.455      0.555      minutes"
"             Time to Centroid       103.554    87.026     87.438     minutes"
"             Rainfall depth         46.194     46.194     46.194     mm"
"             Rainfall volume        0.49       5.98       6.47       c.m"
"             Rainfall losses        34.662     9.682      11.555     mm"
"             Runoff depth           11.533     36.513     34.639     mm"
"             Runoff volume          0.12       4.73       4.85       c.m"
"             Runoff coefficient     0.250      0.790      0.750      "
"             Maximum flow           0.000      0.004      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.004     0.004     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.004     0.004     0.004     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                total flow"
"             Maximum flow                  0.004    c.m/sec"
"             Hydrograph volume             4.849    c.m"
"                     0.004     0.004     0.004     0.004"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.004     0.000     0.004     0.004"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Controlled"
"      100.000   % Impervious"
"        0.096   Total Area"
"       30.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       30.000   Pervious length"
"        1.000   Pervious slope"
"        0.096   Impervious Area"
"       30.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.872   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.027     0.000     0.004     0.004 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.096      0.096      hectare"
"             Time of concentration  24.355     2.488      2.488      minutes"
"             Time to Centroid       127.685    89.472     89.472     minutes"
"             Rainfall depth         46.194     46.194     46.194     mm"
"             Rainfall volume        0.00       44.35      44.35      c.m"
"             Rainfall losses        34.573     5.922      5.922      mm"
"             Runoff depth           11.622     40.272     40.272     mm"
"             Runoff volume          0.00       38.66      38.66      c.m"
"             Runoff coefficient     0.000      0.872      0.872      "
"             Maximum flow           0.000      0.027      0.027      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.027     0.027     0.004     0.004"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.027     0.027     0.027     0.004"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.027     0.027     0.027     0.004"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Controlled"
"       33.200   % Impervious"
"        0.054   Total Area"
"       45.000   Flow length"
"        0.500   Overland Slope"
"        0.036   Pervious Area"
"       45.000   Pervious length"
"        0.500   Pervious slope"
"        0.018   Impervious Area"
"       45.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.252   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.875   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.005     0.027     0.027     0.004 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.018      0.054      hectare"
"             Time of concentration  38.244     3.907      16.490     minutes"
"             Time to Centroid       144.571    91.572     110.994    minutes"
"             Rainfall depth         46.194     46.194     46.194     mm"
"             Rainfall volume        16.66      8.28       24.94      c.m"
"             Rainfall losses        34.573     5.771      25.011     mm"
"             Runoff depth           11.621     40.424     21.184     mm"
"             Runoff volume          4.19       7.25       11.44      c.m"
"             Runoff coefficient     0.252      0.875      0.459      "
"             Maximum flow           0.001      0.005      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"              4   Add Runoff "
"                    0.005     0.031     0.027     0.004"
" 54          POND DESIGN"
"         0.031   Current peak flow    c.m/sec"
"         0.021   Target outflow    c.m/sec"
"          50.1   Hydrograph volume    c.m"
"            8.   Number of stages"
"       331.440   Minimum water level    metre"
"       331.800   Maximum water level    metre"
"       331.440   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 331.440     0.000     0.000"
"                 331.491   0.01878   0.05000"
"                 331.543   0.01944    0.4800"
"                 331.594   0.02006     1.790"
"                 331.646   0.02067     4.600"
"                 331.700   0.02129     9.930"
"                 331.750   0.02184    19.610"
"                 331.800    0.1253    38.620"
"            1.   WEIRS"
"                   Crest      Weir     Crest      Left     Right"
"               elevation coefficie   breadth sideslope sideslope"
"                 331.750     0.900     6.000     0.000     0.000"
"            1.   ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 330.690     0.630    0.1000     1.000"
"            1.   LAYERS"
"                  Bottom    Aspect    Bottom       Top   Average"
"                    area     ratio elevation elevation sideslope"
"                 110.000     1.000   331.210   331.850    15.000"
"             Peak outflow                  0.021    c.m/sec"
"             Maximum level               331.649    metre"
"             Maximum storage               4.927    c.m"
"             Centroidal lag                1.581   hours"
"                  0.005     0.031     0.021     0.004 c.m/sec"
```

```
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                total flow"
"             Maximum flow                  0.024    c.m/sec"
"             Hydrograph volume            52.141    c.m"
"                     0.005     0.031     0.021     0.024"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                total flow"
"             Maximum flow                  0.024    c.m/sec"
"             Hydrograph volume            52.141    c.m"
"                     0.005     0.024     0.021     0.000"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                              C:\Users\DaveBolger\"
"                OneDrive - gritengineering.ca\Project Work 2025 -
Documents\1209-1\CIV\2-Design Calculations\SWM\MIDUSS\POST"
"                Output filename:                          25 YEAR post rev3.out"
"                Licensee name:                                          GRIT"
"                Company                                                    "
"                Date & Time last used:                  11/6/2025 at 8:32:22 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3261.000   Coefficient A"
"       16.193   Constant B"
"        0.938   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           185.944    mm/hr"
"             Total depth                  69.173    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Uncontrolled"
"       92.500   % Impervious"
"        0.014   Total Area"
"        2.500   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        2.500   Pervious length"
"        2.000   Pervious slope"
"        0.013   Impervious Area"
"        2.500   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.358   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.807   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.006     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.001      0.013      0.014      hectare"
"             Time of concentration  3.203      0.394      0.491      minutes"
"             Time to Centroid       99.021     85.573     86.040     minutes"
"             Rainfall depth         69.173     69.173     69.173     mm"
"             Rainfall volume        0.73       8.96       9.68       c.m"
"             Rainfall losses        44.420     13.326     15.658     mm"
"             Runoff depth           24.753     55.847     53.515     mm"
"             Runoff volume          0.26       7.23       7.49       c.m"
"             Runoff coefficient     0.358      0.807      0.774      "
"             Maximum flow           0.000      0.005      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.006     0.006     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.006     0.006     0.006     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                total flow"
"             Maximum flow                  0.006    c.m/sec"
"             Hydrograph volume             7.492    c.m"
"                     0.006     0.006     0.006     0.006"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.006     0.000     0.006     0.006"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Controlled"
"      100.000   % Impervious"
"        0.096   Total Area"
"       30.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       30.000   Pervious length"
"        1.000   Pervious slope"
"        0.096   Impervious Area"
"       30.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.909   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.040     0.000     0.006     0.006 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.096      0.096      hectare"
"             Time of concentration  17.513     2.152      2.152      minutes"
"             Time to Centroid       116.564    87.689     87.689     minutes"
"             Rainfall depth         69.173     69.173     69.173     mm"
"             Rainfall volume        0.00       66.41      66.41      c.m"
"             Rainfall losses        43.869     6.298      6.298      mm"
"             Runoff depth           25.304     62.875     62.875     mm"
"             Runoff volume          0.00       60.36      60.36      c.m"
"             Runoff coefficient     0.000      0.909      0.909      "
"             Maximum flow           0.000      0.040      0.040      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.040     0.040     0.006     0.006"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.040     0.040     0.040     0.006"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.040     0.040     0.040     0.006"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Controlled"
"       33.200   % Impervious"
"        0.054   Total Area"
"       45.000   Flow length"
"        0.500   Overland Slope"
"        0.036   Pervious Area"
"       45.000   Pervious length"
"        0.500   Pervious slope"
"        0.018   Impervious Area"
"       45.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.366   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.905   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.008     0.040     0.040     0.006 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.018      0.054      hectare"
"             Time of concentration  27.499     3.380      14.206     minutes"
"             Time to Centroid       128.914    89.522     107.204    minutes"
"             Rainfall depth         69.173     69.173     69.173     mm"
"             Rainfall volume        24.95      12.40      37.35      c.m"
"             Rainfall losses        43.832     6.571      31.461     mm"
"             Runoff depth           25.341     62.602     37.712     mm"
"             Runoff volume          9.14       11.22      20.36      c.m"
"             Runoff coefficient     0.366      0.905      0.545      "
"             Maximum flow           0.003      0.007      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"              4   Add Runoff "
"                    0.008     0.047     0.040     0.006"
" 54          POND DESIGN"
"         0.047   Current peak flow    c.m/sec"
"         0.021   Target outflow    c.m/sec"
"          80.7   Hydrograph volume    c.m"
"            8.   Number of stages"
"       331.440   Minimum water level    metre"
"       331.800   Maximum water level    metre"
"       331.440   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 331.440     0.000     0.000"
"                 331.491   0.01878   0.05000"
"                 331.543   0.01944    0.4800"
"                 331.594   0.02006     1.790"
"                 331.646   0.02067     4.600"
"                 331.700   0.02129     9.930"
"                 331.750   0.02184    19.610"
"                 331.800    0.1253    38.620"
"            1.   WEIRS"
"                   Crest      Weir     Crest      Left     Right"
"               elevation coefficie   breadth sideslope sideslope"
"                 331.750     0.900     6.000     0.000     0.000"
"            1.   ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 330.690     0.630    0.1000     1.000"
"            1.   LAYERS"
"                  Bottom    Aspect    Bottom       Top   Average"
"                    area     ratio elevation elevation sideslope"
"                 110.000     1.000   331.210   331.850    15.000"
"              Peak outflow                  0.022    c.m/sec"
"              Maximum level                331.730    metre"
"              Maximum storage               15.766    c.m"
"              Centroidal lag                 1.628   hours"
"                   0.008     0.047     0.022     0.006 c.m/sec"
```

```
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                total flow"
"             Maximum flow                 0.026    c.m/sec"
"             Hydrograph volume           88.277    c.m"
"                     0.008     0.047     0.022     0.026"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                total flow"
"             Maximum flow                 0.026    c.m/sec"
"             Hydrograph volume           88.277    c.m"
"                     0.008     0.026     0.022     0.000"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                              C:\Users\DaveBolger\"
"                OneDrive - gritengineering.ca\Project Work 2025 -
Documents\1209-1\CIV\2-Design Calculations\SWM\MIDUSS\POST"
"                Output filename:                          100 YEAR post rev3.out"
"                Licensee name:                                            GRIT"
"                Company                                                      "
"                Date & Time last used:                  11/5/2025 at 3:13:34 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4692.000   Coefficient A"
"       17.437   Constant B"
"        0.956   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           239.793    mm/hr"
"             Total depth                  89.960    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Uncontrolled"
"       92.500   % Impervious"
"        0.014   Total Area"
"        2.500   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        2.500   Pervious length"
"        2.000   Pervious slope"
"        0.013   Impervious Area"
"        2.500   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.436   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.817   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.007     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.001      0.013      0.014      hectare"
"             Time of concentration  2.630      0.354      0.449      minutes"
"             Time to Centroid       96.413     84.695     85.180     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        0.94       11.65      12.59      c.m"
"             Rainfall losses        50.767     16.449     19.023     mm"
"             Runoff depth           39.193     73.511     70.937     mm"
"             Runoff volume          0.41       9.52       9.93       c.m"
"             Runoff coefficient     0.436      0.817      0.789      "
"             Maximum flow           0.000      0.007      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.007     0.007     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.007     0.007     0.007     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                total flow"
"             Maximum flow                  0.007    c.m/sec"
"             Hydrograph volume             9.931    c.m"
"                     0.007     0.007     0.007     0.007"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.007     0.000     0.007     0.007"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   Controlled"
"      100.000   % Impervious"
"        0.096   Total Area"
"       30.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       30.000   Pervious length"
"        1.000   Pervious slope"
"        0.096   Impervious Area"
"       30.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.927   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.053     0.000     0.007     0.007 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.096      0.096      hectare"
"             Time of concentration  14.382     1.937      1.937      minutes"
"             Time to Centroid       0.000      86.699     86.699     minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        0.00       86.36      86.36      c.m"
"             Rainfall losses        89.960     6.568      6.568      mm"
"             Runoff depth           0.000      83.392     83.392     mm"
"             Runoff volume          0.00       80.06      80.06      c.m"
"             Runoff coefficient     0.000      0.927      0.927      "
"             Maximum flow           0.000      0.053      0.053      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.053     0.053     0.007     0.007"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.053     0.053     0.053     0.007"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.053     0.053     0.053     0.007"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Controlled"
"       33.200   % Impervious"
"        0.054   Total Area"
"       45.000   Flow length"
"        0.500   Overland Slope"
"        0.036   Pervious Area"
"       45.000   Pervious length"
"        0.500   Pervious slope"
"        0.018   Impervious Area"
"       45.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.443   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.919   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.011     0.053     0.053     0.007 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.036      0.018      0.054      hectare"
"             Time of concentration  22.583     3.042      12.668     minutes"
"             Time to Centroid       121.444    88.356     104.656    minutes"
"             Rainfall depth         89.960     89.960     89.960     mm"
"             Rainfall volume        32.45      16.13      48.58      c.m"
"             Rainfall losses        50.063     7.274      35.857     mm"
"             Runoff depth           39.897     82.686     54.103     mm"
"             Runoff volume          14.39      14.82      29.22      c.m"
"             Runoff coefficient     0.443      0.919      0.601      "
"             Maximum flow           0.005      0.009      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"              4   Add Runoff "
"                    0.011     0.063     0.053     0.007"
" 54          POND DESIGN"
"         0.063   Current peak flow    c.m/sec"
"         0.021   Target outflow    c.m/sec"
"         109.3   Hydrograph volume    c.m"
"            8.   Number of stages"
"       331.440   Minimum water level    metre"
"       331.800   Maximum water level    metre"
"       331.440   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 331.440     0.000     0.000"
"                 331.491   0.01878   0.05000"
"                 331.543   0.01943    0.4800"
"                 331.594   0.02006     1.790"
"                 331.646   0.02067     4.600"
"                 331.700   0.02129     9.930"
"                 331.750   0.02184    19.610"
"                 331.800    0.1253    38.620"
"            1.   WEIRS"
"                   Crest      Weir     Crest      Left     Right"
"               elevation coefficie   breadth sideslope sideslope"
"                 331.750     0.900     6.000     0.000     0.000"
"            1.   ORIFICES"
"                 Orifice   Orifice   Orifice Number of"
"                  invert coefficie  diameter  orifices"
"                 330.690     0.630    0.1000     1.000"
"            1.   LAYERS"
"                  Bottom    Aspect    Bottom       Top   Average"
"                    area     ratio elevation elevation sideslope"
"                 110.000     1.000   331.210   331.850    15.000"
"              Peak outflow                  0.040    c.m/sec"
"              Maximum level                331.759    metre"
"              Maximum storage               22.937    c.m"
"              Centroidal lag                 1.659   hours"
"                   0.011     0.063     0.040     0.007 c.m/sec"
```

```
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                total flow"
"             Maximum flow                  0.043    c.m/sec"
"             Hydrograph volume           119.892    c.m"
"                     0.011     0.063     0.040     0.043"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                total flow"
"             Maximum flow                  0.043    c.m/sec"
"             Hydrograph volume           119.892    c.m"
"                     0.011     0.043     0.040     0.000"
```

# APPENDIX E – OIL-GRIT SEPARATOR DETAILS

133 REGENT STREET
STRATFORD, ON N5A 3W2
519.305.5727
gritengineering.ca

# SDD3 SIZING REPORT

**2025-10-15**

| PROJECT INFORMATION | |
|---|---|
| **Project Name** | 251 Hazel St. |
| **Location** | Waterloo |
| **Province** | Ontario |
| **Unit ID** | OGS6 |
| **Project Number** | 251015-09 |

| SITE INFORMATION | |
|---|---|
| **Site Area (hectares)** | 0.15 |
| **Runoff Coefficient** | 1 |

| SIZING CRITERA | |
|---|---|
| **Rainfall Station** | WATERLOO WELLINGTON AP |
| **Target TSS removal (%)** | 80 |
| **Particle Size Distribution** | ETV (20-1000µm) |
| **Peak or Regulated Flow (L/s)** | |

## STORMWATER TREATEMENT RECOMMENDATION

| RESULTS SUMMARY | | |
|---|---|---|
| **Model** | **TSS (%)** | **Volume(%)** |
| SDD3-900 | 85 | 100 |
| SDD3-1200 | 87 | 100 |
| SDD3-1500 | 88 | 100 |
| SDD3-1600 | 88 | 100 |
| SDD3-1800 | 88 | 100 |
| SDD3-2400 | 89 | 100 |
| SDD3-3000 | 89 | 100 |
| SDD3-3200 | 89 | 100 |
| SDD3-3600 | 89 | 100 |
| SDD3-4000 | 89 | 100 |

| Recommended Model | SDD3-1200 |
|---|---|

| Annual TSS removal efficiency (%)[1] | Manhole Diameter (mm) | Maximum Pipe Diameter (mm) | Oil Storage Capacity ($m^3$) | Sediment Storage Capacity ($m^3$) | Height from invert to SDD floor (m) | Treatment area ($m^2$) | Max treatement flow (lps) |
|---|---|---|---|---|---|---|---|
| 87 | 1220 | 900 | 0.28 | 3.66 | 2.36 | 1.17 | 51 |

## DETAILED SDD3 SIZING REPORT

| Rainfall Intensity (mm / hr) | Total Rainfall (%) | Cumulative rainfall volume (%) | Flow Rate (Lps) | Surface Loading Rate ($L/s/m^2$) | Removal Efficiency (%) | Incremental Removal (%) | Cumulative Removal (%) |
|---|---|---|---|---|---|---|---|
| 1.0 | 20.00 | 20.0 | 0 | 0.1 | 88.9 | 17.8 | 18 |
| 1.5 | 7.90 | 27.9 | 0 | 0.2 | 88.9 | 7.0 | 25 |
| 2.0 | 7.90 | 35.8 | 0 | 0.3 | 88.9 | 7.0 | 32 |
| 2.5 | 5.60 | 41.4 | 0 | 0.3 | 88.9 | 5.0 | 37 |
| 3.0 | 5.60 | 47.0 | 0 | 0.4 | 88.9 | 5.0 | 42 |
| 3.5 | 4.35 | 51.4 | 1 | 0.4 | 88.9 | 3.9 | 46 |
| 4.0 | 4.35 | 55.7 | 1 | 0.5 | 88.9 | 3.9 | 50 |
| 4.5 | 3.80 | 59.5 | 1 | 0.6 | 88.9 | 3.4 | 53 |
| 5.0 | 3.80 | 63.3 | 1 | 0.6 | 88.9 | 3.4 | 56 |
| 5.5 | 3.20 | 66.5 | 1 | 0.7 | 88.6 | 2.8 | 59 |
| 6.0 | 3.20 | 69.7 | 1 | 0.8 | 88.2 | 2.8 | 62 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6.5 | 2.05 | 71.8 | 1 | 0.8 | 87.7 | 1.8 | 64 |
| 7.0 | 2.05 | 73.8 | 1 | 0.9 | 87.3 | 1.8 | 66 |
| 7.5 | 1.40 | 75.2 | 1 | 1.0 | 86.9 | 1.2 | 67 |
| 8.0 | 1.40 | 76.6 | 1 | 1.0 | 86.4 | 1.2 | 68 |
| 8.5 | 1.35 | 78.0 | 1 | 1.1 | 86.0 | 1.2 | 69 |
| 9.0 | 1.35 | 79.3 | 1 | 1.2 | 85.6 | 1.2 | 70 |
| 9.5 | 1.20 | 80.5 | 1 | 1.2 | 85.1 | 1.0 | 71 |
| 10.0 | 1.20 | 81.7 | 2 | 1.3 | 84.7 | 1.0 | 72 |
| 10.5 | 1.35 | 83.1 | 2 | 1.3 | 84.3 | 1.1 | 73 |
| 11.0 | 1.35 | 84.4 | 2 | 1.4 | 84.0 | 1.1 | 75 |
| 11.5 | 1.10 | 85.5 | 2 | 1.5 | 83.7 | 0.9 | 75 |
| 12.0 | 1.10 | 86.6 | 2 | 1.5 | 83.4 | 0.9 | 76 |
| 12.5 | 0.90 | 87.5 | 2 | 1.6 | 83.2 | 0.7 | 77 |
| 13.0 | 0.90 | 88.4 | 2 | 1.7 | 82.9 | 0.7 | 78 |
| 13.5 | 0.50 | 88.9 | 2 | 1.7 | 82.6 | 0.4 | 78 |
| 14.0 | 0.50 | 89.4 | 2 | 1.8 | 82.3 | 0.4 | 79 |
| 14.5 | 0.85 | 90.3 | 2 | 1.9 | 82.1 | 0.7 | 79 |
| 15.0 | 0.85 | 91.1 | 2 | 1.9 | 81.8 | 0.7 | 80 |
| 15.5 | 0.60 | 91.7 | 2 | 2.0 | 81.5 | 0.5 | 81 |
| 16.0 | 0.60 | 92.3 | 2 | 2.1 | 81.2 | 0.5 | 81 |
| 16.5 | 0.55 | 92.9 | 2 | 2.1 | 81.0 | 0.4 | 82 |
| 17.0 | 0.55 | 93.4 | 3 | 2.2 | 80.7 | 0.4 | 82 |
| 17.5 | 0.30 | 93.7 | 3 | 2.2 | 80.4 | 0.2 | 82 |
| 18.0 | 0.30 | 94.0 | 3 | 2.3 | 80.1 | 0.2 | 82 |
| 18.5 | 0.15 | 94.2 | 3 | 2.4 | 79.9 | 0.1 | 83 |
| 19.0 | 0.15 | 94.3 | 3 | 2.4 | 79.6 | 0.1 | 83 |
| 19.5 | 0.35 | 94.7 | 3 | 2.5 | 79.3 | 0.3 | 83 |
| 20.0 | 0.35 | 95.0 | 3 | 2.6 | 79.0 | 0.3 | 83 |
| 20.5 | 0.35 | 95.4 | 3 | 2.6 | 78.8 | 0.3 | 84 |
| 21.0 | 0.35 | 95.7 | 3 | 2.7 | 78.5 | 0.3 | 84 |
| 21.5 | 0.15 | 95.9 | 3 | 2.8 | 78.2 | 0.1 | 84 |
| 22.0 | 0.15 | 96.0 | 3 | 2.8 | 77.9 | 0.1 | 84 |
| 22.5 | 0.45 | 96.5 | 3 | 2.9 | 77.7 | 0.3 | 84 |
| 23.0 | 0.45 | 96.9 | 3 | 3.0 | 77.4 | 0.3 | 85 |
| 23.5 | 0.25 | 97.2 | 4 | 3.0 | 77.1 | 0.2 | 85 |
| 24.0 | 0.25 | 97.4 | 4 | 3.1 | 76.8 | 0.2 | 85 |
| 24.5 | 0.10 | 97.5 | 4 | 3.1 | 76.6 | 0.1 | 85 |
| 25.0 | 0.10 | 97.6 | 4 | 3.2 | 76.3 | 0.1 | 85 |
| 27.5 | 0.45 | 98.1 | 4 | 3.5 | 75.0 | 0.3 | 86 |
| 30.0 | 0.45 | 98.5 | 5 | 3.8 | 73.7 | 0.3 | 86 |
| 32.5 | 0.45 | 99.0 | 5 | 4.2 | 72.4 | 0.3 | 86 |
| 35.0 | 0.45 | 99.4 | 5 | 4.5 | 71.1 | 0.3 | 87 |
| 37.5 | 0.15 | 99.6 | 6 | 4.8 | 69.8 | 0.1 | 87 |
| 40.0 | 0.15 | 99.7 | 6 | 5.1 | 68.5 | 0.1 | 87 |
| 42.5 | 0.15 | 99.9 | 6 | 5.5 | 67.2 | 0.1 | 87 |
| 45.0 | 0.15 | 100.0 | 7 | 5.8 | 65.9 | 0.1 | 87 |
| 47.5 | 0.00 | 100.0 | 7 | 6.1 | 64.7 | 0.0 | 87 |
| 50.0 | 0.00 | 100.0 | 8 | 6.4 | 63.4 | 0.0 | 87 |
| **Total cumulative rainfall (%)** | | 100 | | | **Net Annual TSS removal (%)** | | 87 |

1 Performance efficiency based on ETV (20-1000µm) particle size distribution

# SDD3 Oil Grit Separator

Performance Claim Verified by the Canadian ETV Program

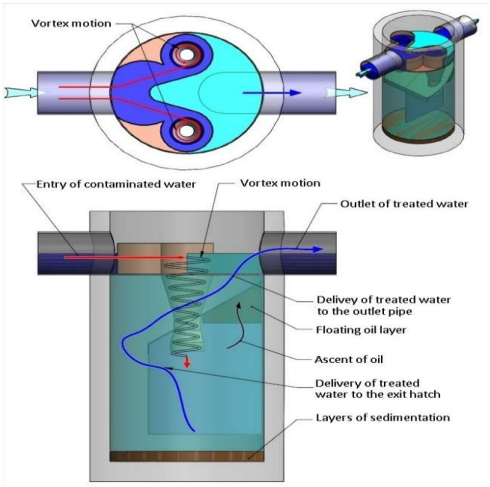



Figure 2. SDD3 operation

**HOW IT WORKS**

1- Untreated storm water enters the SDD3 unit through the inlet pipe

2- The storm water flow is directed and distributed by the double vortex device

3-Gravitational and hydrodynamic forces created by the double vortex device separate the suspended particles from the stormwater and settle them at the bottom of the unit.

4- Hydrodynamic and buoyancy forces concentrate and separate the oils and the flottable materials, which naturally rise and are trapped in the oil storage area.

5- Treated storm water is finally discharged through the outlet pipe.

**INSTALLATION AND MAINTENANCE**

• The SDD3 installation is easy and similar to a conventional manhole installation. SDD3 may be installed online or offline depending on the project requirements. The inlet and outlet pipe are located at the same elevation facilitating an easier installation process.

• Inspection and maintenance is simple and easy, with no need to enter the unit.

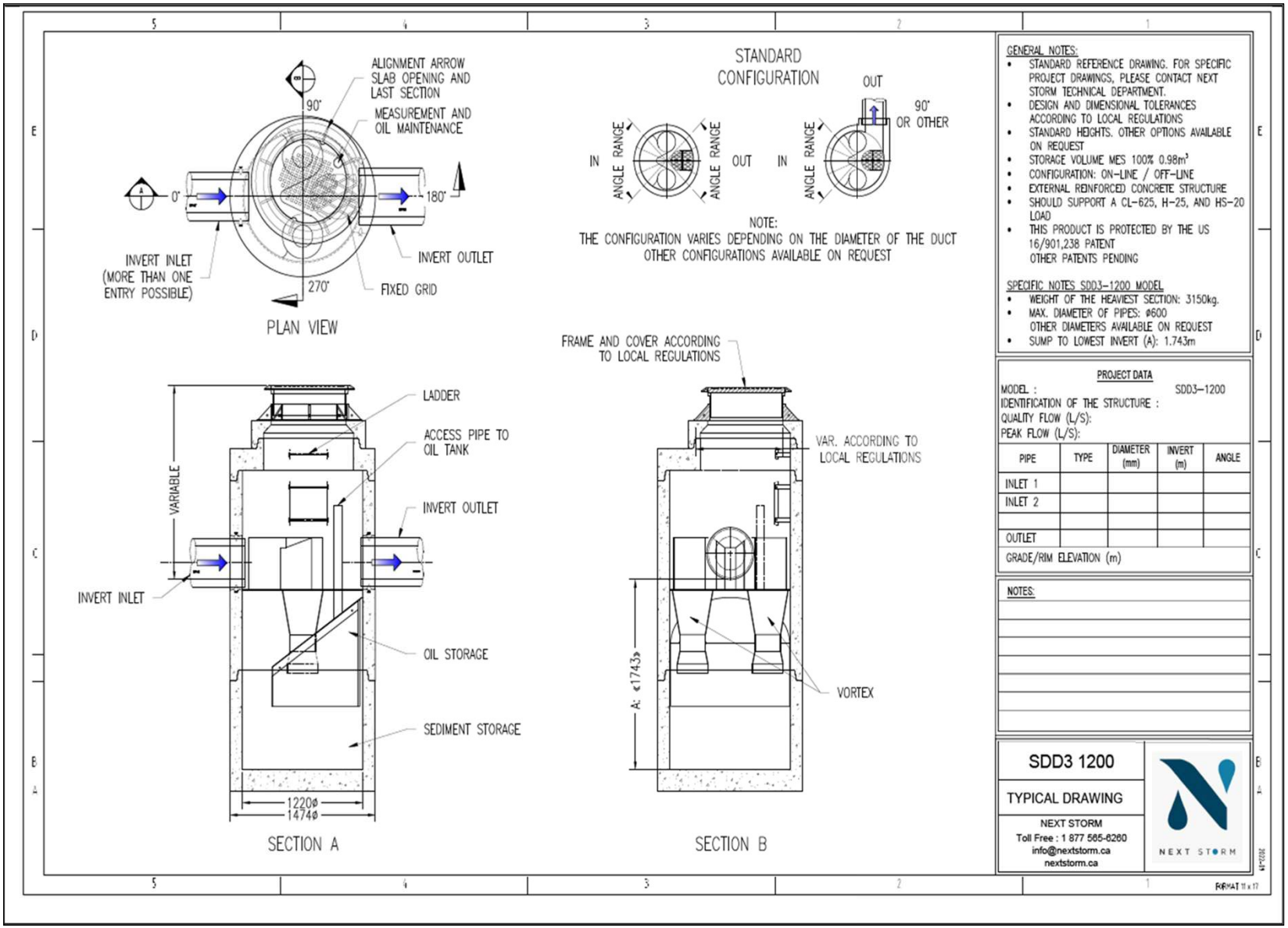
**SIZING AND DESIGN**

The SDD3 can be sized to meet project-specific stormwater requirements. The actual model selection will depend on the treatment flow, particle size distribution and local regulations.

Table 1. SDD3 models and standard capacities

| SDD3 Model | Diameter (mm) | Height from invert to SDD3 floor (m) | Sediment storage capacity ($m^3$)* | Oil storage capacity ($m^3$) |
|---|---|---|---|---|
| SDD3-900 | 915 | 1.39 | 0.51 | 0.12 |
| SDD3-1200 | 1220 | 1.74 | 0.96 | 0.28 |
| SDD3-1600 | 1600 | 2.06 | 1.77 | 0.65 |
| SDD3-1800 | 1830 | 2.36 | 3.66 | 0.98 |
| SDD3-2100 | 2130 | 2.79 | 3.94 | 1.55 |
| SDD3-2400 | 2440 | 3.15 | 6.54 | 2.33 |
| SDD3-3000 | 3048 | 3.47 | 9.84 | 4.54 |
| SDD3-3200 | 3200 | 3.69 | 12.03 | 4.54 |
| SDD3-3600 | 3660 | 3.95 | 12.39 | 7.87 |
| SDD3-4000 | 4052 | 3.972 | 16.11 | 7.87 |

*Storage capacity can be adjusted according to the specific project requirements.


ALIGNMENT ARROW
SLAB OPENING AND LAST SECTION
MEASUREMENT AND OIL MAINTENANCE
90°
0°
180°
270°
INVERT INLET (MORE THAN ONE ENTRY POSSIBLE)
INVERT OUTLET
FIXED GRID
PLAN VIEW
STANDARD CONFIGURATION
IN
ANGLE RANGE
OUT
OUT
90° OR OTHER
NOTE:
THE CONFIGURATION VARIES DEPENDING ON THE DIAMETER OF THE DUCT
OTHER CONFIGURATIONS AVAILABLE ON REQUEST
LADDER
ACCESS PIPE TO OIL TANK
INVERT OUTLET
VARIABLE
INVERT INLET
OIL STORAGE
SEDIMENT STORAGE
1220ø
1474ø
SECTION A
FRAME AND COVER ACCORDING TO LOCAL REGULATIONS
VAR. ACCORDING TO LOCAL REGULATIONS
A: ≤1743
VORTEX
SECTION B
GENERAL NOTES:
• STANDARD REFERENCE DRAWING. FOR SPECIFIC PROJECT DRAWINGS, PLEASE CONTACT NEXT STORM TECHNICAL DEPARTMENT.
• DESIGN AND DIMENSIONAL TOLERANCES ACCORDING TO LOCAL REGULATIONS
• STANDARD HEIGHTS. OTHER OPTIONS AVAILABLE ON REQUEST
• STORAGE VOLUME MES 100% 0.98m³
• CONFIGURATION: ON-LINE / OFF-LINE
• EXTERNAL REINFORCED CONCRETE STRUCTURE
• SHOULD SUPPORT A CL-625, H-25, AND HS-20 LOAD
• THIS PRODUCT IS PROTECTED BY THE US 16/901,238 PATENT
OTHER PATENTS PENDING
SPECIFIC NOTES SDD3-1200 MODEL
• WEIGHT OF THE HEAVIEST SECTION: 3150kg.
• MAX. DIAMETER OF PIPES: ø600
OTHER DIAMETERS AVAILABLE ON REQUEST
• SUMP TO LOWEST INVERT (A): 1.743m
PROJECT DATA
MODEL : SDD3-1200
IDENTIFICATION OF THE STRUCTURE :
QUALITY FLOW (L/S):
PEAK FLOW (L/S):
PIPE | TYPE | DIAMETER (mm) | INVERT (m) | ANGLE
INLET 1
INLET 2
OUTLET
GRADE/RIM ELEVATION (m)
NOTES:
SDD3 1200
TYPICAL DRAWING
NEXT STORM
Toll Free : 1 877 565-6260
info@nextstorm.ca
nextstorm.ca
NEXT STORM
FORMAT 11 x 17

# SDD3 Oil Grit Separator

Performance Claim Verified by the Canadian ETV Program

**An innnovative storm water treatment system that provides extraordinary and dependable removal of storm water pollutants while minimizing washouts**

The SDD3 by *NEXT Stormwater Solutions* is a hydrodynamic oil and grit separator that utilizes both gravitational and centrifugal forces to capture and retain suspended sediments, floating particles and oils from stormwater runoff. The SDD3 unique design ensures optimal storm water treatment during light and heavy rainfall events.

**KEY FEATURES AND ADVANTAGES**

- **Double vortex** system specially designed to maximize separation of sediments and other pollutants from stormwater runoff.
- **Designed and manufactured in Canada** and verified by an independent third party laboratory.
- The environmental performance claim for SDD3 is **verified by the Canadian ETV Program**[1].
- SDD3 provides 91% oil removal and retention[2]
- SDD3 is suitable for both **online and offline installations** and has shown to have a negligible effect on the hydraulic grade line (HGL).
- SDD3 is available in a **wide range of models** to meet the project requirements.
- **Simple installation** for it is similar to a conventional manhole.
- **Safe and easy inspection and maintenance** for all activities are performed at the surface.

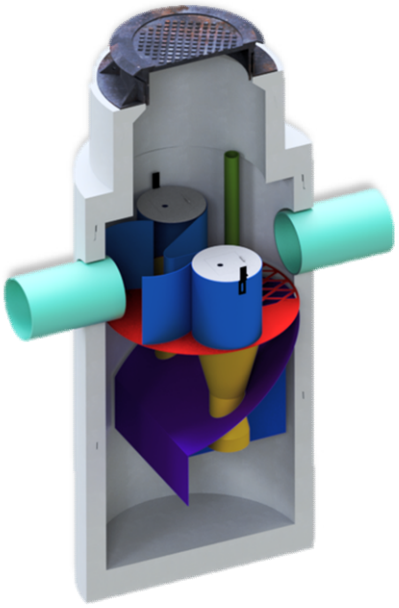


Figure 1. Typical SDD3

**COMPONENTS**

The SDD3 external structure is a reinforced concrete chamber that is suitable for HS-20 and CL-625 loads.

The internal components are made of high quality aluminum that have excellent mechanical properties and superior corrosion resistance.

[1]Canadien Environmental Technology Verification Program; [2]According to the most recent ETV protocol « *Light Liquid Retention Simulation Test*» (CETV 2018-09-0001).

**NEXT Stormwater Solutions ■ T: 647 278-7339 ■ info@nextstorm.ca ■ www.nextstorm.ca**