



FUNCTIONAL SERVICING REPORT

1316 Carling Avenue, Ottawa, ON

Residential Apartments

Prepared For:

Homestead Land Holdings Limited

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1. Introduction

LeBlanc Engineering Inc. has been retained by Homestead Land Holdings Limited to provide engineering services for the zoning bylaw amendment application required to permit the proposed development consisting of the construction of a 20-storey residential apartment building with underground parking located within the site identified 1316 Carling Avenue, in the City of Ottawa. Included in the engineering services to be provided by LeBlanc Engineering Inc. is this Functional Servicing Report (FSR), which is to be submitted to the City of Ottawa and other required agencies in support of Zoning Bylaw Amendment. The FSR will demonstrate how the proposed development will connect to the existing municipal infrastructure and manage stormwater runoff from the site. This FSR will examine the property's functional servicing with relation to:

- Water Supply
- Sanitary Sewerage
- Stormwater management
- Utilities

1.1. Supporting & Reference Documents

The following documents have been referenced in the preparation of this report:

- MECP, Stormwater Management Planning and Design Manual (2003)
- MECP, Guidelines for the Design of Sanitary Sewage Works and Water Works (2008)
- City of Ottawa Design Guidelines – Water Distribution (2010) & Technical Bulletins
- City of Ottawa Sewer Design Guidelines (2012) & Technical Bulletins
- Fire Underwriters Survey – “Water Supply for Public Fire Protection” (2020)
- Ontario Building Code (2024)

1.2. Subject Property

The subject property is located within the Carlington Neighbourhood in the City of Ottawa and is municipally known as 1316 Carling Avenue. The legal description of the property is Part of Block 8, Part of Lot 23, and Lots 26 and 27 on the Registered Plan 221 in the City of Ottawa. A Survey Plan prepared by Annis, O’Sullivan, Vollebakk Ltd. is provided in Appendix B.

The subject site is approximately 0.87 ha in area and is bounded by Carling Avenue to the north, Thames Street to the south and mixed-use development to the east and west. The site has approximately 63 m of frontage along Carling Avenue with entrances established to provide vehicular and pedestrian access to the site from the east and west limits.

The site was previously developed with a 21-storey residential apartment building, which is serviced by private connections to municipal infrastructure located within the Carling Avenue right-of-way. The property in existing conditions is predominantly comprised of impervious surface areas including building roof area, concrete walkways, asphalt laneways and parking areas.

A marked up aerial image of the subject site and property boundary is provided in Figure 1 below. The base imaging for Figure 1 is provided from the City of Ottawa GeoMap website.

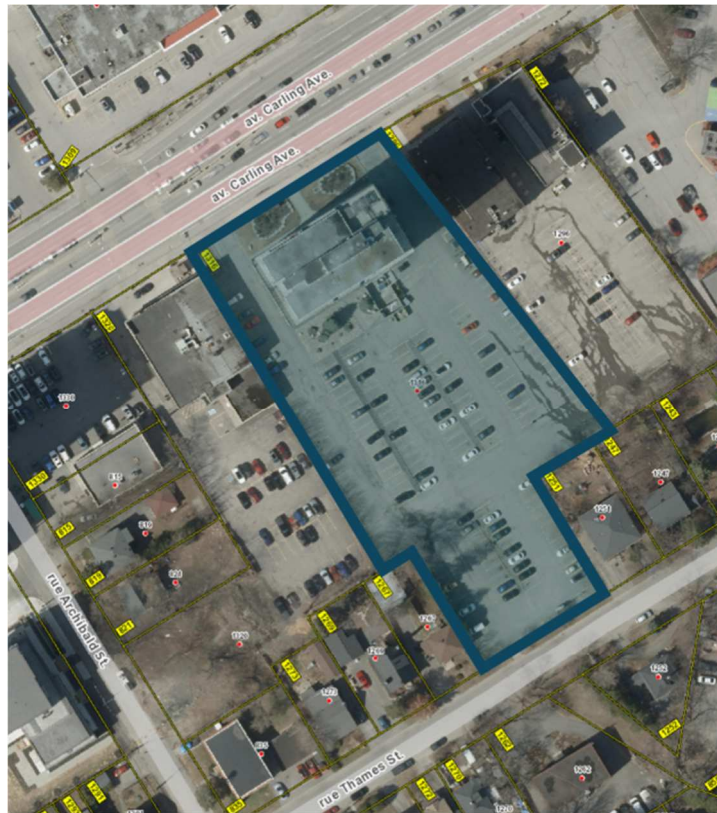


Figure 1 – Subject Property Sketch

1.3. Proposed Land Use

The proposed development consists of the new construction of a residential apartment building (16,362 m² GFA) that is 20-storeys in height, stepped down to 9-storeys and then further down to 4-storeys as the building approaches the south property line. The building incorporates above and below grade parking along with landscape and amenity areas. The proposed development also includes a new entrance from Thames Street at the southeast corner of the property to improve traffic flows for both vehicles and pedestrians. In addition to the site development, it is proposed to convey approximately 826 m² of the site area to the City of Ottawa for parkland dedication. The proposed Site Plan prepared by Alexander Wilson Architects Inc, attached in Appendix B, with the proposed unit counts summarized in Table 1 below.

Table 1 – Proposed Unit Counts	
Unit Type	Unit Count
One Bedroom	58
One Bedroom + Den	11
Two Bedroom	109
Two Bedroom + Den	23
Total	201

2. Servicing

2.1. Overview

Reference documents and record drawings have been collected from the City of Ottawa for review to determine the existing municipal infrastructure adjacent to the site available to provide servicing for the proposed development. Review of these documents indicate that there is existing infrastructure within the Carling Avenue and Thames Street right-of-ways to provide services for the development, which is to be confirmed through analysis and calculations completed in the subsequent sections of this report.

It is proposed to retain the existing services provided to the existing 21-storey residential apartment building, which are connected to the infrastructure within the Carling Avenue right-of-way and to construct new services for the proposed development by connections to the infrastructure within the Thames Street right-of-way, with the exception of the storm sewer.

The developments internal water distribution and wastewater collection systems will be constructed as per the City of Ottawa, Ontario Building Code (OBC) and the Ministry of Environment, Conservation, and Parks (MECP) design guidelines as applicable. It is proposed to service the development by completing connections to the City's water and sanitary distribution and collection systems adjacent to the site on Thames Street as per the City of Ottawa standards. The site's internal water distribution system will be designed to account for both domestic and fire protection requirements, and the internal wastewater collection system will be designed to convey the calculated design peak flows.

2.2. Design Criteria

The City of Ottawa Design Guidelines referenced in Section 1.1, provide estimated per capita flows for domestic water and sanitary demand calculations including max day demand and peak hour factors. A summary of the water and wastewater design criteria is as follows:

General Information

Density – Apartments One Bedroom (69 units)	= 1.4 ppu
Density – Apartments Two Bedroom (132 units)	= 2.1 ppu
Proposed Development Population (201 units)	= 374 pers

Wastewater Criteria

Average Day Demand Residential	= 280 L/cap/day
Peak Hour Factor	= Harmon
Extraneous Flows	= 0.33 L/s/ha
Minimum Velocity	= 0.6 m/s
Maximum Velocity	= 3 m/s

Water Criteria

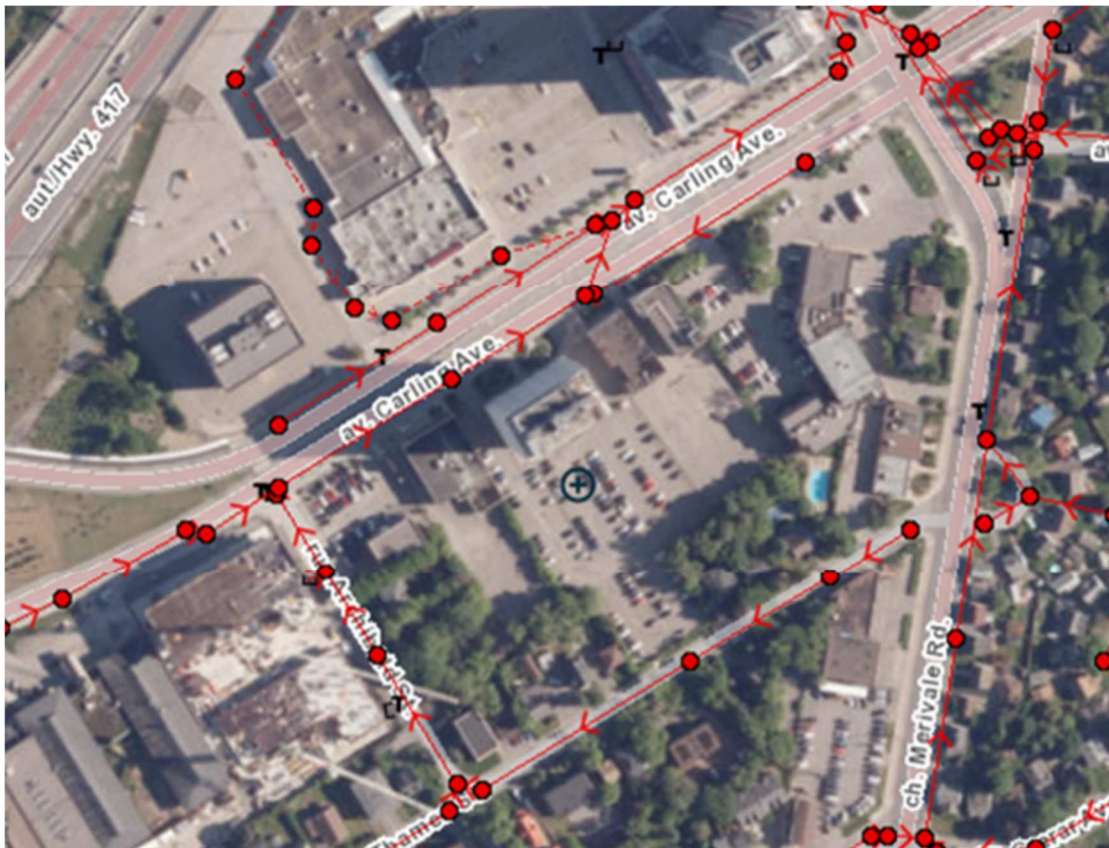
Average Day Demand (ADD)	= 280 L/cap/day
Max Day Demand (MDD)	= 2.5 x ADD
Peak Hour Demand (PHD)	= 2.2 x MDD
Minimum pressure in system	= 345 kPa
Maximum pressure in system	= 552 kPa
Minimum pressure in system at Peak Hour Demand	= 280 kPa
Minimum pressure in system at Fire + Max Day Demand	= 140 kPa

3. Sanitary Servicing

The projected average day (excluding extraneous flows) and peak hour (including extraneous flows) sewage flow from the proposed development are calculated in accordance with Section 4 of the Ottawa Sewer Design Guidelines (2012) updated with Technical Bulletins. The resulting sanitary design flows are summarized in Table 2 below, with detailed calculations provided in Appendix A.

Table 2 – Sanitary Design Flows	
Average Day Demand	1.2 L/s
Peak Hour Flow	4.4 L/s

The anticipated peak wastewater design flows for the proposed development are to be reviewed by the City of Ottawa staff and incorporated into the municipal sanitary sewer system model to determine that there is sufficient capacity within the receiving sewer system downstream of the site. The site wastewater will be discharged to the existing Thame Street municipal sanitary sewer, which conveys flows west along Thames Street, north along Archibald Street and finally discharging to the 900 mm concrete trunk sewer within the Carling Avenue right-of-way. A depiction of the municipal infrastructure adjacent to the subject site is provided below.



3.1. Proposed Sanitary Connection Point

The proposed development is to be serviced by a 200 mm PVC sanitary sewer lateral connected to the existing municipal 300 mm PVC sanitary sewer located within the Thames Street right-of-way. It is proposed to make the connection by cutting a section of the existing sewer and installing a pre-manufactured wye-connection fitting with repair sleeves. As per the City of Ottawa design guidelines, a sanitary monitoring manhole is to be constructed at the property line within the private site boundary.

The City of Ottawa drawings indicate that the existing 300 mm PVC municipal sanitary sewer is sloped at 1%, which has capacity to convey up to 96.7 L/s when flowing full. The proposed development will contribute a peak sanitary design flow of approximately 4.4 L/s. Confirmation of available residual capacity within the receiving sanitary sewer system, including existing upstream loading, is subject to review by City of Ottawa staff and/or the City's municipal sanitary sewer model.

3.2. Internal Sanitary Servicing

The proposed sanitary servicing system will be designed and constructed in accordance with the City of Ottawa Sewer Design Guidelines, the Ontario Building Code (OBC), applicable Ministry of the Environment, Conservation and Parks (MECP) guidelines, and applicable Ontario Provincial Standard Specifications and Drawings (OPSS/OPSD). A brief summary of the design criteria is provided below:

- Sanitary sewer piping is specified as 200 mm diameter CSA-approved PVC DR 35 material.
- Minimum (0.6 m/s) and Maximum (3 m/s) design flow velocities
- A developed length of the building sewer between the building and first manhole will not exceed 30 m as per OBC Subsection 7.4.7.2, "Size and Spacing of Cleanouts"

The proposed development will be serviced by a 200 mm diameter PVC sanitary sewer connected to a proposed sanitary monitoring manhole located at the property line. From the monitoring manhole, the sanitary sewer will be routed through the site to the proposed building through an internal system of sanitary piping and manholes, as required. The proposed 200 mm sanitary sewer will be installed at a minimum slope of 1.0% and will generally maintain a minimum ground cover of 2.0 m.

The calculated peak-hour sanitary design flow for the proposed development is 4.4 L/s. At the minimum design slope of 1.0%, the proposed 200 mm diameter PVC sanitary sewer has a full-flow capacity of approximately 32.8 L/s. Under peak design flow conditions, the proposed sewer will therefore convey approximately 13% of its full-flow capacity, with a calculated design flow velocity of approximately 0.72 m/s. The proposed sanitary sewer provides sufficient hydraulic capacity to accommodate the anticipated peak sanitary discharge while maintaining an acceptable design velocity. The detailed sanitary flow and hydraulic calculations are provided on the Sanitary Sewer Design Sheet in Appendix A.

In accordance with Section 4.4.5, *Sanitary Backwater Valves*, of the City of Ottawa Sewer Design Guidelines (2012), including applicable Technical Bulletins, a full-port backwater valve will be provided within the building. The valve will be installed in an accessible location with sufficient space to permit inspection and maintenance.

The final selection, design, and specification of the sanitary backwater valve will be coordinated and provided by the mechanical engineer.

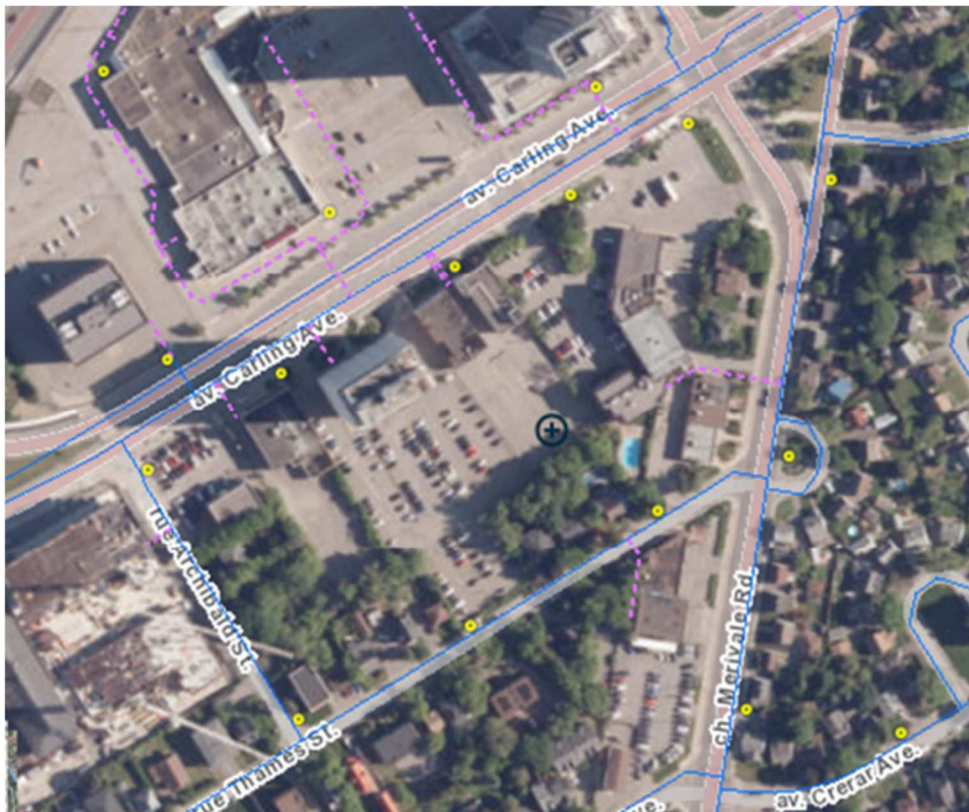
4. Water Supply and Distribution

4.1. Domestic Water Demand

The projected average day, maximum day and peak hour demand flows for the proposed development are calculated in accordance with Section 4 of the Ottawa Design Guidelines – Water Distribution (2012) updated with Technical Bulletins. The resulting design demand flows are summarized in Table 3 below, with detailed calculations provided in Appendix A.

Table 3 – Domestic Water Demand Design Flows	
Average Day Demand	1.2 L/s
Max Day Demand	3.0 L/s
Peak Hour Demand	6.7 L/s

The water demand design flows for the proposed development are to be reviewed by City of Ottawa Staff and incorporated into the municipal watermain distribution system model to determine that there is sufficient capacity within the existing infrastructure. There is an existing 200 mm PVC municipal watermain within the Thames Street right-of-way, which is looped from Archibald Street (150 mm watermain) and Merivale Road (300 mm watermain) to Carling Avenue (400 mm). A depiction of the municipal infrastructure adjacent to the subject site is provided below.



4.2. Fire Flow Analysis

The fire flow analysis and demand calculations are completed in accordance with the 2020 version of “Water Supply for Public Fire Protection” prepared by the Fire Underwriters Survey (FUS). The subject building is 20-storeys in height with a residential occupancy. The subject building will be constructed such that it will be classified as non-combustible construction (Type II) with protected vertical openings. In addition, the building will be equipped with a standard water supply and a fully supervised sprinkler system designed and constructed in accordance with NFPA 13 standards as well as tested and maintained in accordance with NFPA 25 standards. The Effective Area for Type II buildings is to be calculated as 25% of the largest floor area plus the area of the two immediately adjoining floors. This results in a Total Effective Area of approximately 1,655 m². The minimum fire flows for this specific building and projected occupancy are calculated in Appendix A and summarized as 50 L/s at 20 Psi.

The closest municipal hydrant to the proposed building is Hydrant 364027H246, located at the southwest property corner within the municipal right-of-way on the north side of Thames Street. The 150 mm hydrant lead is connected to the 200 mm PVC DR 18 municipal watermain within the Thames Street right-of-way and is representative of the available flows from the water distribution system to service the proposed development. The hydrant has a light blue bonnet indicating available flows of 94.6 L/s or greater but is limited to a maximum capacity of 94.6 L/s in accordance with Table 18.5.4.3 of the City of Ottawa Design Guidelines – Water Distribution (2010) & technical bulletins for hydrants with distances less than 76 m to the building. The anticipated flow of 94.6 L/s is larger than the calculated minimum fire flow requirement and therefore it is anticipated that the adjacent infrastructure has capacity to service the development. A hydrant flow test will be required at the Site Plan Control application stage to confirm available fire flows at Hydrant 364027H246.

The building is to be sprinklered and equipped with a Siamese fire department connection at the main entrance along the eastern wall. A private hydrant for the site is required to meet the Ontario Building Code Section 3.2.5.16 requirements with respect to distance from the hydrant to the fire department connection such that the distance is less than 45 m. The hydrant is required to be tested and rated prior to occupancy. Refer to the servicing plans attached in Appendix B for the proposed hydrant location and details.

4.3. Proposed Water Connection Point

The proposed development is to be serviced by two connections to the existing municipal 200 mm PVC DR 18 watermain located within the Thames Street right-of-way by live tap, sleeve and valve in accordance with the City of Ottawa requirements. It is proposed to install a 150 mm domestic water service and a 150 mm fire water service from the existing watermain to the property line, where they will connect to individual gate valves. As per the City of Ottawa design guidelines, an isolation valve is provided between the two connections, which will require a cut, valve installation and repair sleeves to complete.

4.4. Internal Water Servicing

The proposed water servicing system will be designed and constructed in accordance with the City of Ottawa Design Guidelines – Water Distribution, the Ontario Building Code (OBC), applicable Ministry of the Environment, Conservation and Parks (MECP) guidelines, and applicable Ontario Provincial Standard Specifications and Drawings (OPSS/OPSD). A brief summary of the design criteria is provided below:

- Water service piping is specified as 150 mm diameter CSA-approved PVC DR 18 material.

- Maximum design flow velocities of 1.5 m/s and turnover times less than 24 hours
- Sized for max day demand plus fire flows

The proposed development will be serviced by two 150 mm diameter PVC water services connected to the gate valves to be installed at the property line. From the gate valves, the services will be routed through the site to the proposed building through an internal system of water piping and fittings, as required. The proposed 150 mm water services will be installed at a gradual gradient, avoiding high points, and will generally maintain a minimum ground cover of 2.4 m.

The MECP Design Guidelines for Drinking-Water Systems (2008) provides direction that the watermain or large diameter service is to be sized based on the larger calculated flow of the max day demand plus fire flow or the peak hour flow alone. For this specific site, the larger flow is the resultant of the max day demand plus fire flow, which is equal to 53 L/s. A 150 mm water service ensures that under normal operating conditions (average and max day demands), that the service lines will not exceed 1.5 m/s and the turnover time will be less than 5 minutes. The water services are to be constructed and tested in accordance with the City of Ottawa, Ontario Building Code, NFPA 24 and MECP Guidelines. The detailed water demand flow calculation and fire flows are provided in Appendix A.

In accordance with the City of Ottawa Design – Water Distribution Guidelines (2010), including applicable Technical Bulletins, a water meter is to be installed in the building on the domestic service line with a bypass for the fire line. Both the domestic and fire services are to be equipped with backflow preventors immediately after the water meter and bypass. The water meter and backflow preventors will be installed in an accessible location with sufficient space to permit inspection and maintenance.

The final selection, design, and specification of the backflow preventer and water meters will be coordinated and provided by the mechanical engineer.

5. Storm Drainage and Stormwater Management

A key component of the Development is the need to address environmental and related Stormwater Management (SWM) issues. These are examined in a framework aimed at meeting the City of Ottawa, Rideau Valley Conservation Authority (RVCA), and MECP requirements. SWM parameters have evolved from an understanding of the location and sensitivity of the site's natural and existing systems.

It is understood that the objectives of the SWM plan are to:

- Protect life and property from flooding and erosion.
- Maintain water quality for ecological integrity, recreational opportunities etc.
- Protect and maintain groundwater flow regime(s).
- Protect aquatic and fishery communities and habitats.
- Maintain and protect significant natural features.
- Protect and provide diverse recreational opportunities that are in harmony with the environment.

5.1. Existing Drainage Conditions

The subject site has a total area of approximately 0.87 ha, including an approximately 0.21 ha north portion of the site that was previously developed under a separate Site Plan Control application and is therefore not subject to further stormwater management requirements as part of the proposed development.

Existing ground cover consists primarily of impervious surface areas comprised of building rooftop, concrete walkways, and asphalt parking areas with some pervious surface areas for landscaping and amenity areas. Existing drainage areas, including minor system conveyances and major overland flow routes, are illustrated on Drawing SWM-1 in Appendix B.

Under existing conditions, the site is considered a single catchment area. Stormwater runoff is conveyed by overland flows to a network of catchbasins, which collect the runoff and discharge to an internal underground storm sewer network, that ultimately discharges to the existing municipal 800 mm concrete storm sewer located within the Carling Avenue right-of-way.

Referencing the MECP Stormwater Management Planning and Design Manual (2003), the composite runoff coefficients for the existing drainage conditions are detailed in Appendix A and summarized in Table 4 below.

Table 4 – Existing Development Composite Runoff Coefficients		
Area ID	Area (ha)	R-Value
X-1	0.865	0.81
Total	0.865	0.81

5.2. Proposed Drainage Conditions

The proposed site development includes the construction of a 20-storey residential apartment building with associated asphalt parking areas and concrete walkways, and a larger amount of landscape and amenity area than the existing conditions. The development results in a decrease in overall site imperviousness relative to the existing conditions. However, in accordance with the City of Ottawa pre-consultation meeting feedback, the site runoff is to be controlled to a rate less than the 5-year peak flow from a site having an equivalent

runoff coefficient of 0.50. The post-development drainage areas, including minor system conveyances and major overland flow routes, are described below and illustrated on Drawing SWM-2 in Appendix B.

The site is presently serviced by an existing 200 mm diameter PVC storm sewer lateral that connects to the existing municipal 800 mm concrete storm sewer within the Carling Avenue right-of-way.

Area P-1 (Controlled Roof Drains)

The subcatchment Area P-1 consists of approximately 0.13 ha and has a corresponding runoff coefficient of 0.90. The roof drainage from each roof level will be conveyed to Zurn ZCF130 roof drains equipped with weirs to restrict a maximum flow rate of 1.55 L/s, when the maximum ponding height of 150 mm is reached at the drain. The roofs will be equipped with scuppers to provide an emergency overflow route if the design storm event is exceeded, or a roof drain becomes blocked.

Area P-2 to P-8 (Tributary to Underground Chamber)

The subcatchment areas P-2 to P-8 consist of approximately 0.57 ha and has a weighted runoff coefficient equivalent to 0.72. The areas are comprised of varying ground level surface types that drain to on-site catchbasins/area drains, which collect and convey flow to the internal underground stormwater management chamber located in the northeast corner of the underground parking level P1. The chamber will collect and store water in the chamber, which is to be equipped with a duplex pumping system that will be pumped at a controlled rate to drawdown stormwater events based on float elevations. The stormwater will be discharged from the pump to the external gravity sewer, where it will flow through an oil and grit separator prior to discharging to the Carling Avenue municipal system.

In the event of a catchbasin/area drain blockage or a storm event exceeding the 100-year design event, surface runoff will temporarily pond within the designated on-site ponding areas. Depending on the catchbasin or area drain location, a maximum ponding depth of approximately 0.30 m is anticipated prior to runoff spilling over to the designated overland flow route towards the Carling Avenue right-of-way.

Area P-9 (Controlled Parkland Block)

The subcatchment area P-9 consists of approximately 0.08 ha and has a corresponding runoff coefficient equivalent to 0.25; however, the coefficient is increased to 0.30 for the purpose of calculations to accommodate future pathways and hardscape areas for the parkland. This site area is to be conveyed to the City of Ottawa for parkland dedication. The area will consist of grassed area, which is to drain by overland flows to a catchbasin equipped with an orifice plate that will control discharge to Thames Street to allowable levels. Quantity control will be provided by an orifice plate, with storage attenuation provided by an on-site open bottom chamber system, which provides flexibility for future park development. Quality control is not required as the surface area consists of pervious grass and landscape materials not subject to significant TSS loading.

Area P-10 (Uncontrolled Existing Development)

The subcatchment area P-10 consists of approximately 0.21 ha of developed site area and has a corresponding runoff coefficient equivalent to 0.72. The area consists of an existing residential high-rise apartment building, concrete walkways, asphalt lanes/parking and landscaped area. There is no further development proposed and an existing system of catchbasins and storm sewers that collect runoff from the area and convey flows through the on-site storm sewer system prior to discharging to the Carling Avenue municipal storm sewer system.

Referencing the MECP Stormwater Management Planning and Design Manual (2003), the composite runoff coefficients for the proposed drainage conditions are detailed in Appendix A and summarized in Table 5 below.

Table 5 – Post Development Composite Runoff Coefficient (P-1 to P-10)		
Area ID	Area (ha)	R-Value
P-1	0.133	0.90
P-2	0.097	0.65
P-3	0.060	0.76
P-4	0.145	0.73
P-5	0.030	0.84
P-6	0.021	0.90
P-7	0.081	0.41
P-8	0.006	0.64
P-1 to P-8 Controlled Area)	0.573	0.72
P-9 (Parkland Site)	0.085	0.30
P-10 (Existing Unchanged)	0.207	0.72

5.3. Hydrology Model Results

Given the size of the site (less than 12 ha), the Rational Method will be used to determine the existing, allowable and anticipated peak stormwater release rates:

Table 6 – Stormwater Calculation Parameters	
Catchment Area	= 0.865 ha
Runoff Coefficient	= 0.81 (Existing)
	= 0.68 (Proposed)
Time of Concentration	= 10 minutes
Rainfall Intensity	= MacDonald Cartier Airport (1996-1997)
Peaking Factor	= 1.10 (25-Year Event)
	= 1.20 (50-Year Event)
	= 1.25 (100-Year Event)
Peak Runoff Rate	= $R \times I \times A \times 360^{-1}$

The detailed stormwater calculations for the existing and post development release rates tributary to the Carling Avenue and Thames Street stormwater infrastructure are provided in Appendix A and summarized in Table 7 and 8 below:

Table 7 – Existing, Allowable & Post Development Release Rates to Carling Avenue						
Return Period	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Existing Release Rate (m ³ /s)	0.151	0.205	0.240	0.313	0.381	0.439
Allowable Release Rate (m ³ /s)	0.121	0.132	0.140	0.155	0.169	0.182
Post Development Release Rate (m ³ /s)	0.125	0.169	0.199	0.259	0.315	0.363

Table 8 – Existing, Allowable & Post Development Release Rates to Thames Street						
Return Period	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Existing Release Rate (m ³ /s)	0.000	0.000	0.000	0.000	0.000	0.000
Allowable Release Rate (m ³ /s)	0.012	0.012	0.012	0.012	0.012	0.012
Post Development Release Rate (m ³ /s)	0.005	0.007	0.009	0.011	0.014	0.016

5.4. Stormwater Quantity Control

As anticipated, the proposed development will generate peak stormwater runoff rates exceeding the site's allowable release rates, which are based on the City of Ottawa pre-consultation meeting feedback, such that stormwater is controlled to an equivalent release rate of the 5-year event for a site having a runoff coefficient of 0.50. Stormwater quantity controls are therefore required to ensure that post-development release rates do not exceed the allowable rates. The proposed quantity-control measures include controlled-flow roof drains, an on-site storm sewer system, and an internal underground pumped stormwater chamber.

The building is proposed to be equipped with controlled roof drains forming a blue roof system to implement stormwater management quantity controls. The stormwater runoff from the new roof areas (1,331 m²) will be conveyed to the controlled roof drains, each equipped with one weir and having a maximum release rate of 1.55 L/s. The roof drains are preliminary at this stage, and it is anticipated that a maximum of 10 roof drains is to be permitted. No single drain will collect an area larger than 250 m² and have a maximum ponding height of 0.15 m at the drain location before spilling over to scuppers. Calculations of available roof storage capacity and the corresponding rating curve for the controlled roof system is provided in Appendix A.

The runoff from the asphalt parking areas and surrounding landscaped areas are directed by surface flows to on-site catchbasins/area drains, which discharge to the internal storm sewers tributary to the proposed stormwater chamber to be constructed underground at the northeast corner of the P-1 level underground parking garage and pumped at a controlled rate less than or equal to the allowable release rates prior to discharge into the municipal storm sewer system within the Carling Avenue right-of-way.

Table 9 – Controlled Site Release Rates to Carling Avenue

Return Period	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Allowable Release Rate (m ³ /s)	0.121	0.132	0.140	0.155	0.169	0.182
Controlled Release Rate (m ³ /s)	0.071	0.123	0.135	0.150	0.164	0.176
Required Storage (m ³)	9	11	13	22	34	46

The parkland block requires quantity control equal to or less than the calculated allowable release rates. The block will be graded to direct drainage by overland flows towards a single catchbasin, which will collect the drainage before discharging to the existing 450 mm municipal storm sewer main within the Thames Street right-of-way. It is proposed to implement an orifice plate at the outlet of the catchbasin to reduce peak flows to the allowable release rates. The required attenuation storage is proposed to be provided by an underground chamber system, which can be expanded on in future should the block be developed with significant hard surface areas.

Table 10 – Controlled Site Release Rates to Thames Street

Return Period	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Allowable Release Rate (m ³ /s)	0.012	0.012	0.012	0.012	0.012	0.012
Controlled Release Rate (m ³ /s)	0.004	0.005	0.006	0.007	0.008	0.009
Required Storage (m ³)	1.1	1.6	1.9	2.7	3.4	4.1

5.5. Pumped Stormwater Chamber Design

5.5.1. General

The proposed stormwater pump chamber is to consist of a cast-in-place reinforced concrete chamber designed to provide the required stormwater storage volume and accommodate the proposed pumping equipment, controls, piping, valves, and associated appurtenances. The chamber will receive stormwater from the controlled drainage area and provide temporary storage prior to discharge through the proposed pumping system.

The stormwater pumping system consists of two submersible pumps arranged in a duplex lead-lag configuration. Each pump discharges through an individual 150 mm diameter discharge branch complete with a check valve and isolation valve. The two 150 mm discharge branches combine at a common header within the pump chamber, which transitions to a 250 mm diameter force main. The 250 mm force main conveys pumped stormwater from the chamber to the downstream gravity storm sewer system. During lower flow conditions, the lead pump operates independently, while the lag pump is activated at the upper control level such that both pumps operate in parallel through the common discharge force main.

5.5.2. Wet Well Sizing

The proposed pump chamber has been sized to provide sufficient active storage to attenuate peak stormwater inflows while limiting discharge from the development to the allowable release rates. The chamber has a plan area of approximately 25 m², with a base elevation of 70.45 m. The normal pump operating range begins with the pump-off elevation at 70.85 m, the lead pump start elevation at 70.95 m, and the lag pump start elevation at 71.25 m.

Storage requirements were determined through hydrograph routing using the proposed staged pumping rates. The lead pump has a preliminary operating discharge of approximately 39 L/s, while operation of both pumps in parallel provides a combined discharge of approximately 84 L/s. The 100-year event governs the wet well storage requirement, requiring approximately 46 m³ of active storage. The resulting required storage volumes are summarized in Table 11 below.

Table 11 – Required Wet Well Storage Volume						
Return Period	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Required Storage (m ³)	9	11	13	22	34	46

5.5.3. Level Control

Ultrasonic level detection devices are proposed as the primary means of wet-well level monitoring and pump control. Redundant level switches will be provided as a backup control and alarm system in the event of failure of the primary ultrasonic level sensor.

Key Elevations are listed as follows:

- Chamber Bottom 70.45 m
- Pump #1 and 2 OFF 70.85 m
- Pump # 1 ON (Lead) 70.95 m
- Pump # 2 ON (Lag) 71.25 m
- 100-Year HWL 72.69 m
- High Level Alarm 72.90 m
- Force Main Discharge 72.97 m
- Emergency Overflow 73.05 m
- Top of Chamber 73.95 m

The lead and lag pump assignments will alternate following each pumping cycle to provide balanced operating time between the two pumps.

5.5.4. Pump/System Curve

Variable frequency drives will be provided on both pumps to permit adjustment of pump speed and discharge rate during operation. Three system conditions have been analyzed to establish the range of expected operating conditions and corresponding pump/system curves:

Condition 1 (70.95 m) – Low Wet-Well Level: Represents operation at the lead-pump start elevation and corresponds to the highest static head condition

Condition 2 (71.25 m) – Intermediate Wet Well Level: Represents operation at the lag-pump start elevation and corresponds to an intermediate static head condition

Condition 3 (72.69 m) – High Wet-Well Level: Represents operation at the 100-year design high-water level and corresponds to the lowest static head condition and the highest potential pump discharge rate

A copy of the single-pump performance curve and calculated system curves is included in Appendix A. Under single-pump operation, the preliminary operating point is approximately 39 L/s at 2.8 m Total Dynamic Head (TDH), based on the proposed 150 mm diameter individual pump discharge piping connecting to the common 250 mm diameter force main. Under parallel operation, the two pumps are designed to provide a combined discharge of approximately 84 L/s, or approximately 42 L/s per pump.

The proposed variable frequency drives will permit adjustment of the pump operating speed during commissioning and operation, with the combined pump discharge controlled to remain below the maximum allowable release rate of 90 L/s. Table 12 summarizes the static head, friction and minor losses, and resulting TDH for the applicable operating conditions.

Table 12 – Force Main Calculations							
		Condition 1		Condition 2		Condition 3	
250mm Force Main Velocity (m/s)	Q (L/s)	C=140		C=140		C=140	
		Lift= 2.02 m		Lift= 1.72 m		Lift= 0.28 m	
		H _f (m)	TDH (m)	H _f (m)	TDH (m)	H _f (m)	TDH (m)
0.79	39	0.74	2.76	N/A	N/A	N/A	N/A
1.71	84	N/A	N/A	1.34	3.06	1.34	1.62

Friction and minor losses have been estimated based on the anticipated pump discharge piping, valves, and fittings. Each pump is assumed to discharge through approximately 2.1 m of 150 mm diameter branch piping prior to combining into approximately 12 m of 250 mm diameter common force main. Pipe friction losses have been calculated using the Hazen-Williams equation with a coefficient of C = 140. Minor losses associated with check valves, isolation valves, bends, tees, transitions, and the force main discharge have been calculated separately and included in the determination of Total Dynamic Head (TDH).

5.5.5. Pump Selection

To accommodate the design peak pumped flow of approximately 84 L/s at 3.1 m of Total Dynamic Head, two Flygt NP 3102 MT 3~ Adaptive 465 submersible pumps with 152 mm impellers are selected. Under parallel operation, the pumping system is designed to provide a combined discharge of approximately 84 L/s. The VFDs will be commissioned to limit the combined discharge to the design rate and, in all cases, below the maximum allowable pumped release rate of 90 L/s. A copy of the pump performance curve is included in Appendix A. In accordance with the applicable MECP guidelines for pumping stations, the pumps are to be non-clog type and capable of passing the required solids size, providing a conservative basis for the proposed stormwater application.

5.5.6. Force Main

From the proposed pumping station, the force main is designed to maintain a minimum ground cover of 1.2 m, penetrate the underground parking garage wall, and discharge to a new proposed manhole. The nominal velocities resulting from the anticipated single- and dual-pump operating flow rates for various force main diameters are summarized in Table 13.

Table 13 – Force Main Velocities			
		1 Pump	2 Pumps
Diameter (mm)	Area (m ²)	Q= 39 L/s	Q= 84 L/s
100	0.008	4.97	10.70
150	0.018	2.21	4.75
200	0.031	1.24	2.67
250	0.049	0.79	1.71

Based on the anticipated operating flow range, a 250 mm diameter force main is proposed. The resulting velocities are approximately 0.79 m/s under single-pump operation and 1.71 m/s under dual-pump operation, providing a suitable operating range while limiting friction losses through the discharge system. The force main is proposed to consist of 250 mm diameter HDPE DR11 pipe, with a nominal pressure rating of approximately 1,103 kPa (160 Psi), for the conveyance of pumped stormwater.

5.6. Stormwater Quality Control During Construction

To ensure stormwater quality control during construction, it is imperative that effective environmental and sedimentation controls be in place throughout the entire area subject to construction activities. With the requirement of earth grading, there will be a potential of soil erosion. It is therefore recommended that the following be implemented to assist in achieving acceptable stormwater runoff quality:

- Restoration of exposed surfaces with vegetation and non-vegetative material as soon as construction schedules permit;
- Installation of filter strips, silt fences and rock check dams or other similar facilities throughout the site, and specifically during all construction activities;
- Reduce stormwater drainage velocities where possible;
- Ensure that disturbed areas that are left inactive for more than 45 days shall be vegetated and stabilized as instructed by the Engineer;
- Minimize the amount of existing vegetation removed.

5.7. Permanent Quality Control

The objective of the permanent SWM quality controls will be to ensure MECP's Enhanced Protection corresponding to 80% TSS removal for the annual average rainfall, as specified in the City of Ottawa pre-consultation meeting feedback. As per the site's statistics, the post development total imperviousness is calculated as follows:

Impervious Area=	$TIMP = A_{\text{impervious}} / A_{\text{total}}$
Total Area= 8,653 m ²	= 5,679/8,653
	=65.6%

As previously discussed in Section 5.2 of this report, there are essentially four subcatchments to consider for quality control within the site boundary.

Area P-1 (Controlled Roof Drains)

The subcatchment Area P-1 consists of approximately 0.13 ha and has a corresponding runoff coefficient of 0.90. The roof drainage area is tributary to the underground chamber. The roof runoff does not require quality control as it is generally considered clean runoff only subjected to atmospheric contaminants and given the height of the building those levels are assumed to be negligible. However, the internal storm system routes the roof drainage to the underground chamber system, which is then pumped through a proposed oil and grit separator.

Area P-2 to P-8 (Tributary to Underground Chamber)

The subcatchment areas P-2 to P-8 consist of approximately 0.57 ha and has a weighted runoff coefficient equivalent to 0.74. The areas are comprised of varying ground level surface types that drain to on-site catchbasins/area drains, which collect and convey flow to the internal underground stormwater management chamber located in the northeast corner of the underground parking level P1. The chamber is then pumped through a proposed oil and grit separator.

Area P-9 (Controlled Parkland Block)

The subcatchment area P-9 consists of approximately 0.08 ha and has a corresponding runoff coefficient equivalent to 0.25; however, the coefficient is increased to 0.30 for the purpose of calculations to accommodate future pathways and hardscape areas for the parkland. Quality control is not required as the surface area consists of pervious grass and landscape materials not subject to significant TSS loading.

Area P-10 (Uncontrolled Existing Development)

The subcatchment area P-10 consists of approximately 0.21 h of developed site area and has a corresponding runoff coefficient equivalent to 0.72. The area consists of an existing residential high-rise apartment building, concrete walkways, asphalt lanes/parking and landscaped area. In existing conditions, the flows are directly tributary to the Carling Avenue storm sewer system and given that there is no further development proposed to this portion of the site, it is reasonable to not require quality control for this area.

To appropriately represent the distribution of pollutant loading across the site, an Equivalent Effective TSS loading rate has been assigned to the various site surface areas. This approach recognizes that TSS loading is not uniformly distributed across the entire site, and that treatment efficiencies should reflect the relative pollutant contribution of each drainage surface (ie. TSS cannot be removed from areas that are not significantly loaded).

- Grassed and landscaped areas are not considered significant sources of suspended solids and are assigned an effective TSS loading factor of 0%

- Impervious areas are typically subject to vehicular and pedestrian traffic, winter sanding and salting operations, and the accumulation of sediments that are mobilized during rainfall events. Accordingly, these areas are assigned an effective TSS loading factor of 100%. It is proposed to provide quality control for these areas by the implementation of an oil and grit separator downstream of the pumped chamber prior to discharge to the municipal storm sewer system.
- Building roof areas are generally exposed only to atmospheric deposition and are considered a relatively clean source of runoff. Consistent with Section 3.4 of the MECP Stormwater Management Planning and Design Manual (2003), and given the height of the roof, runoff from these areas are assigned an effective TSS loading rate of 0%

The proposed oil and grit separator is to be designed at the Site Plan Control stage; however, it is conservative to assume a theoretical TSS removal efficiency of 80% is achievable. Although laboratory testing has demonstrated higher TSS removal performance for the oil and grit separator systems, a conservative field removal efficiency of 65% has been applied in the analysis to account for differences between controlled laboratory conditions and field operation. The overall water-quality treatment assessment is summarized in Table 14 below.

Surface	Area (m ²) & (% of site area)	Effective Loading Rate (%)	Effective Removal Rate (%)	Equivalent TSS Removal (%)
Impervious Area	776 (9%)	100	0	0
Impervious Area (OGS)	2,755 (32%)	100	65	20.8
Permeable Area	2,974 (34%)	0	100	34
Roof Area	2,148 (25%)	0	100	25
Total	8,653 (100%)			79.8

As summarized in Table 13, the proposed site design effectively achieves approximately 79.8% of average annual TSS removal from stormwater runoff tributary to the municipal storm sewer system. This represents a negligible shortfall relative to prescribed MECP Enhanced Level Protection target; however, the assessment includes existing developed site areas that are not subject to redevelopment. Given the limited opportunity to implement additional quantity control measures without significant disruption to these areas, no further quality control is proposed or recommended. It should also be noted that the post development conditions also represent a significant improvement in quality control of runoff from the existing conditions.

5.8. Erosion and Sediment Control

To ensure Stormwater runoff quality is controlled during construction, an erosion and sediment control strategy will be implemented to mitigate transportation of silt off-site to the existing roads, sewers and waterbodies. It is imperative that effective controls be put in place and maintained until all areas are stabilized.

All erosion and sediment control Best Management Practices (BMP) shall be designed, constructed and maintained where possible. Items that will be addressed for both temporary and permanent erosion and sediment controls are based on the following:

- Site location description, area and vegetative cover
- Existing and proposed land use and drainage routes
- Proposed site works and drainage outlets
- Permits required
- Sediment filters and barriers - silt fences, catchbasin covers and ditch protection
- Construction entrance location

To prevent construction generated sediments from entering the storm sewers or leaving the site by overland flow, the following measures should be implemented during the construction phase:

- Temporary sediment control fencing should be erected around the perimeter of the grading activities.
- Temporary silt sacs should be installed on existing and proposed catch basins until surface cover has been stabilized.
- A temporary construction access mud mat should be implemented to reduce the amount of materials that may be transported off site.
- Construction during drier months should be monitored for wind-borne transport of sediments. At the direction of the engineer, the contractor may be directed to water down exposed earth areas with an aqueous solution of calcium chloride.
- All disturbed areas not under immediate construction for 45 days or not intended for building activities within a 3-month time period, should be stabilized with seeding.
- Built up sediment should be removed and disposed off-site at least once a month, or more frequently as directed by the engineer.

Details have been provided on drawing ESC-1 and can be found in Appendix B.

6. Operations and Maintenance

The long-term performance of the proposed stormwater management system is dependent upon routine inspection and maintenance of the collection system, roof drainage controls, and underground chamber system. The property owner shall be responsible for implementing an ongoing maintenance program to ensure the system continues to function as designed. For the purposes of this section, a significant storm event is considered an event having more than 25 mm of rainfall in a 24-hour period.

6.1. Catchbasin and Storm Sewer System

The catchbasin/area drains and storm sewer network shall be inspected on a regular basis and after significant storm events to ensure the system remains free of obstructions. Maintenance activities shall include:

- Inspection of catchbasin, area drains and manhole frame/grates and removal of accumulated debris
- Flushing and cleaning of storm sewer pipes where sediment accumulation or reduced hydraulic capacity is observed
- Repair or replacement of damaged storm sewer components as required

6.2. Pump Chamber System

The pump chamber system should be inspected annually and following significant storm events during the first year of operation to confirm proper performance. Routine maintenance should include:

- Inspection of all inlet and outlet structures for sediment accumulation and debris
- Inspection of ports and observation wells, where provided, to verify proper drainage and drawdown following storm events
- Verification that the chamber system drains within the anticipated drawdown period
- Inspection of overflow structures and outlet control devices for blockage or damage
- Repair or replacement of damaged chamber components in accordance with the manufacturer's specifications
- Routine pump maintenance as per the manufacturer's operation and maintenance manual specifications

6.3. Blue Roof & Controlled Roof Drains

The building roofs have been designed as a blue roof system utilizing controlled-flow roof drains to temporarily store stormwater runoff and regulate discharge to the on-site storm sewer system. To ensure continued performance, the property owner shall implement a routine inspection and maintenance program as follows:

- Inspection of all roof drain inlets, strainers and flow-control devices a minimum of twice annually (spring and fall) and following significant rainfall events
- Removal of leaves, sediment, vegetation, litter and other debris that may obstruct roof drains
- Verification that roof ponding depths remain consistent with the design assumptions and that no localized ponding occurs outside of the intended storage areas
- Inspection of roof membranes, flashing and penetrations for deterioration or leakage annually

7. Conclusions

A summary of the servicing recommendations is as follows:

Water Servicing – The proposed development will be serviced by two new 150 mm diameter PVC DR18 water services connected to the existing 200 mm municipal watermain within the Thames Street right-of-way. The proposed services are intended to accommodate both domestic and fire protection demands, with calculated average day, maximum day, and peak hour demands of approximately 1.2 L/s, 3.0 L/s, and 6.7 L/s, respectively, and a calculated minimum fire flow requirement of 50 L/s. Final confirmation of available municipal capacity and fire flow will be subject to City of Ottawa review and hydrant flow testing.

Sanitary Servicing – The proposed development will be serviced by a new 200 mm diameter PVC DR35 sanitary sewer connected to the existing 300 mm municipal sanitary sewer within the Thames Street right-of-way. The proposed development is anticipated to generate an average day sanitary flow of approximately 1.5 L/s and a peak hour design flow of approximately 4.4 L/s, which can be accommodated by the proposed on-site sanitary sewer system. Confirmation of available residual capacity within the downstream municipal sanitary sewer system will be subject to review by the City of Ottawa.

Stormwater Drainage and Management – Stormwater runoff from the proposed development will be managed through a combination of controlled-flow roof drains, on-site storm sewer collection, underground storage, a duplex pumped stormwater chamber, and controlled discharge to the municipal storm sewer systems. The proposed systems are designed to maintain post-development release rates within the applicable allowable limits while providing emergency overflow and permanent stormwater quality treatment measures

The analysis and design outlined in this report demonstrates that the servicing of this proposed Development is feasible, is based on sound engineering principles and, the development will become a cohesive part of the City of Ottawa.

All of which is respectfully submitted,

LeBlanc Engineering Inc.



Dan LeBlanc, P.Eng
Civil Engineer

APPENDIX A – Design Calculations

SANITARY SEWER DESIGN SHEET

Reference Documents	Site Information	Parameters	Formulae																																				
MECP Design Guidelines for Sewage Works, 2008 City of Ottawa - Sewer Design Guidelines (2012) with Technical Bulletins Ontario Building Code (2024)	<table><tr><th colspan="2">Residential</th></tr><tr><td>Total Site Area (ha)</td><td>0.865</td></tr><tr><td>Unit Count</td><td>201</td></tr><tr><td>Population</td><td>374</td></tr></table>	Residential		Total Site Area (ha)	0.865	Unit Count	201	Population	374	Minimum Velocity= 0.6 m/s Maximum Velocity= 3 m/s Minimum Lateral Size= 100 mm Minimum Main Size= 200 mm Sewers ≤ 375 mm: d/D < 0.50 Sewers > 375 mm: d/D < 0.85 Residential q= 350 L/cap/day Commercial q= 0.58 L/ha/sec Infiltration q= 0.28 L/ha/sec Harmon Formula Peaking Factor: 2 ≤ M ≤ 4	<table><tr><th colspan="2">Domestic Sanitary Sewage Flows</th><th colspan="2">Extraneous Sanitary Sewage Flow</th></tr><tr><td colspan="2">Average Daily Demand= P*q_r</td><td colspan="2">Extraneous Flow= I * A</td></tr><tr><td>Where:</td><td>P= population q_r= Average Daily per capita domestic flow (L/cap*d)</td><td>Where:</td><td>I= Peak extraneous flows (L/ha*s) A= Gross Area tributary in hectares</td></tr><tr><td colspan="2"></td><td colspan="2"></td></tr><tr><th colspan="4">Total Sanitary Sewage Flow</th></tr><tr><td colspan="4">Peak Demand, Q= ((P*q_r*M) / 86.4) +Q_c+ I*A</td></tr><tr><td>Where:</td><td colspan="3">Q= Total Peak Flow Peaking Factor, M= 1 + (14 / (4+(P/1000)^{0.5})) Q_c= Peak Commercial Flow</td></tr></table>	Domestic Sanitary Sewage Flows		Extraneous Sanitary Sewage Flow		Average Daily Demand= P*q _r		Extraneous Flow= I * A		Where:	P= population q _r = Average Daily per capita domestic flow (L/cap*d)	Where:	I= Peak extraneous flows (L/ha*s) A= Gross Area tributary in hectares					Total Sanitary Sewage Flow				Peak Demand, Q= ((P*q _r *M) / 86.4) +Q _c + I*A				Where:	Q= Total Peak Flow Peaking Factor, M= 1 + (14 / (4+(P/1000) ^{0.5})) Q _c = Peak Commercial Flow		
Residential																																							
Total Site Area (ha)	0.865																																						
Unit Count	201																																						
Population	374																																						
Domestic Sanitary Sewage Flows		Extraneous Sanitary Sewage Flow																																					
Average Daily Demand= P*q _r		Extraneous Flow= I * A																																					
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Where:	Q= Total Peak Flow Peaking Factor, M= 1 + (14 / (4+(P/1000) ^{0.5})) Q _c = Peak Commercial Flow																																						

DESCRIPTION					RESIDENTIAL FLOW									COMMERCIAL FLOW					EXTRANEEOUS FLOW			DESIGN DATA												
Location	From MH	To MH	Sub Basin ID	Sub Basin Area	Incremental Residential Area (ha)	Total Residential Area (ha)	Number of Units	Person Per Units	Incremental Population	Total Population	Harmon Factor	Per Capita Flow (L/cap/day)	Domestic Flow (L/s)	Incremental Commercial GFA (m ²)	Total Commercial GFA(m ²)	Commercial Rate (L/ha/sec)	Peaking Factor	Commercial Flow (L/s)	Total Area (ha)	Extraneous Rate (L/s)	Extraneous Flow (L/s)	Total Flow (L/s)	Length (m)	Pipe Size (mm)	Upstream Invert (m)	Downstream Invert (m)	Gradient (%)	Mannings "n"	Capacity (L/s)	Velocity Flowing Full (m/s)	Percentage of Full Flow	d/D	Percentage of Full Velocity	Velocity at Design Flow (m/s)
1316 Carling Ave.	BLDG	SAN MH	N/A	N/A	0.865	0.865	201	Varies	374	374	3.43	280	4.16	0	0	0.00	0.00	0.00	0.865	0.33	0.29	4.44	15.80	200	72.72	72.56	1.00	0.013	32.80	1.04	14%	25%	70%	0.73
Thames Street	SAN MH	SAN MAIN	N/A	N/A	0	0.865	0	N/A	0	374	3.43	280	4.16	0	0	0.00	0.00	0.00	0.865	0.33	0.29	4.44	9.40	200	72.53	72.44	1.00	0.013	32.80	1.04	14%	25%	70%	0.73

SANITARY SERVICING DEMAND

Reference Documents

MECP Design Guidelines for Sewage Works (2008)
City of Ottawa - Sewer Design Guidelines (2012) with Technical Bulletins
Ontario Building Code (2024)

Design Criteria

Total Site Area (ha)	0.865
Residential Site	
Site Area (ha)	0.865
Unit Count	201
Population	374.0

Formulae

Total Sewage Flows

Average Daily Demand= $P \cdot q$

Peak Demand, $Q = ((P \cdot q_r \cdot M) / 86.4) + Q_c + I \cdot A$

Harmon Peaking Factor, $M = 1 + (14 / (4 + (P/1000)^{0.5}))$

Where:

P= population in thousands

q= Average Daily per capita domestic flow (L/cap*d)

Q_c = Peak domestic flow (L/s)

Q_c = Peak commercial flow (L/s)

I= Peak extraneous flows (L/ha*s)

A= Gross Area tributary in hectares

M= Harmon Formula Peaking Factor ($2 \leq M \leq 4$)

PEAK SANITARY SERVICING DEMAND

DESCRIPTION		DOMESTIC FLOW				COMMERCIAL FLOW				INFILTRATION			TOTAL
Location	Occupancy	Total Population	Harmon Factor	Per Capita Flow (L/cap/day)	Domestic Flow (L/s)	Total Commercial GFA (m ²)	Commercial Rate (L/day/9.3m ² GFA)	Peaking Factor	Commercial Flow (L/s)	Total Area (ha)	Infiltration Rate (L/ha/sec)	Infiltration Flow (L/s)	Total Flow (L/s)
1316 Carling	Residential	374	3.4	280	4.2	0	0.00	0.00	0.00	0.865	0.33	0.3	4.4

WATER SERVICING DEMAND

Reference Documents

MECP Design Guidelines for Drinking Water Systems (2008)
City of Ottawa Design Guidelines - Water Distribution (2010)
Ontario Building Code (2024)

Design Criteria

Total Site Area (ha)	0.865
Residential Site	
Residential Area (ha)	0.9
Units	201
Persons per unit	varies
Total Population	374
Per Capita Flow (L/cap/day)	280

Formulae

Water Demand

$$\text{ADD} = (P \cdot q_r) + (q_c \cdot A)$$

$$\text{MDD} = (\text{MDF}_r \cdot P \cdot q_r) + (\text{MDF}_c \cdot q_c \cdot A)$$

$$\text{PHD} = (\text{PHF}_r \cdot P \cdot q_r) + (\text{PHF}_c \cdot q_c \cdot A)$$

Where:

P= population (persons)

q= flow rate (units vary)

A= Area (ha)

MDF= Max Day Factor

PHF= Peak Hour Factor

AVERAGE DAY DEMAND

DESCRIPTION		DOMESTIC FLOW				COMMERCIAL FLOW				TOTAL
Location	Occupancy	Total Population	Factor	Per Capita Flow (L/cap/day)	Domestic Flow (L/s)	Total Commercial GFA (m ²)	Factor	Commercial Flow (L/day/9.3m ² GFA)	Commercial Flow (L/s)	Total Flow (L/s)
1316 Carling	Residential	374	1.0	280	1.2	0	0.0	0.00	0.0	1.2
Total ADD										1.2

MAX DAY DEMAND

DESCRIPTION		DOMESTIC FLOW				COMMERCIAL FLOW				TOTAL
Location	Occupancy	Total Population	Factor	Per Capita Flow (L/cap/day)	Domestic Flow (L/s)	Total Commercial GFA (m ²)	Factor	Commercial Flow (L/day/9.3m ² GFA)	Commercial Flow (L/s)	Total Flow (L/s)
1316 Carling	Residential	374	2.50	280	3.0	0	0.00	0.00	0.0	3.0
Total MDD										3.0

PEAK HOUR DEMAND

DESCRIPTION		DOMESTIC FLOW				COMMERCIAL FLOW				TOTAL
Location	Occupancy	Total Population	Factor	Per Capita Flow (L/cap/day)	Domestic Flow (L/s)	Total Commercial GFA (m ²)	Factor	Commercial Flow (L/day/9.3m ² GFA)	Commercial Flow (L/s)	Total Flow (L/s)
1316 Carling	Residential	374	2.2 x MDD	280	6.7	0	0.00	0.00	0.0	6.7
Total PHD										6.7

FIRE UNDERWRITERS SURVEY (2020) FIRE FLOW DEMAND

Reference Documents	Building Information
Fire Underwriters Survey (2020)	Building Classification Residential - Group C
Site Plan Completed by AWA, dated July 15, 2026	Number of Storeys 20
Note: Building information collected from site plan	Total GFA 1987
	Largest Floor Area 1139
	Adjoining FloorArea Above 1139
	Adjoining Floor Area Below 924.5

1. BASE RFF

Parameters	Required Fire Flow
Construction Type Coefficient	RFF = $220 \times C \times VA$
Type II Noncombustible Construction 0.8	Where: RFF = Required fire flow in litres per minute (L/min) C = The construction coefficient related to the type of building construction A = The total effective floor area (m ²)
Total Effective Area	7000 Required Fire Flow (L/min)
Total GFA 1655	117 Required Fire Flow (L/s)

2. OCCUPANCY & CONTENTS ADJUSTMENT

Parameters	Required Fire Flow Adjusted
Occupancy and Contents Adjustment	RFF ₂ = $220 \times C \times VA + a1$
Limited Combustible Contents -15%	Where: RFF ₂ = Adjusted required fire flow in litres per minute (L/min) C = The construction coefficient related to the type of building construction A = The total effective floor area (m ²) a1 = Flow adjustment for occupancy & contents (L/min)
	-1050 Flow Adjustment (L/min)
	5950 Adjusted Required Fire Flow (L/min)
	99 Adjusted Required Fire Flow (L/s)

3. SPRINKLER ADJUSTMENT

Parameters	Fire Flow Adjustments
NFPA 13 Sprinkler Standard Adjustment	a2 = RFF ₂ * TSA
YES -30%	Where: RFF ₂ = Adjusted required fire flow in litres per minute (L/min) from step 2 a2 = Flow adjustment for sprinklers (L/min) TSA = Total sprinkler adjustment (%)
Standard Water Supply Adjustment	-2975 Flow Adjustment (L/min)
YES -10%	-50 Flow Adjustment (L/s)
Fully Supervised System Adjustment	
YES -10%	

4. EXPOSURE ADJUSTMENT

Parameters	Fire Flow Adjustments
North Separation Distance Adjustment	a3 = RFF ₂ * TSA
Distance to Exposure= 20.1 m to 20 m 0%	Where: RFF ₂ = Adjusted required fire flow in litres per minute (L/min) from step 2 a3 = Flow adjustment for exposure (L/min)
Length-Height Ratio= Over 100	TSA = Total separation adjustment (%) up to a maximum of 75%
East Separation Distance Adjustment	0 Flow Adjustment (L/min)
Distance to Exposure= 10.1 m to 20 m 0%	0 Flow Adjustment (L/s)
Length-Height Ratio= 21 to 40	
South Separation Distance Adjustment	
Distance to Exposure= Greater than 30 m 0%	
Length-Height Ratio= Over 100	
West Separation Distance Adjustment	
Distance to Exposure= 10.1 m to 20 m 0%	
Length-Height Ratio= 0 to 20	

REQUIRED FIRE FLOW DEMAND

TOTAL REQUIRED FIRE FLOW	TARGET DURATION	MINIMUM VOLUME
3000.0 L/min	1.3 Hours	225000 L
50.0 L/s		225 m ³
793 USGPM		59439 USG

RUNOFF COEFFICIENT CALCULATIONS

Reference Material	Parameters								
MECP SWM Planning and Design Guidelines (2003)	<table> <tr> <th>Surface Area</th><th>Runoff Coefficient</th></tr> <tr> <td>Pervious</td><td>0.25</td></tr> <tr> <td>Impervious</td><td>0.90</td></tr> <tr> <td>Building Roof</td><td>0.90</td></tr> </table>	Surface Area	Runoff Coefficient	Pervious	0.25	Impervious	0.90	Building Roof	0.90
Surface Area	Runoff Coefficient								
Pervious	0.25								
Impervious	0.90								
Building Roof	0.90								

WEIGHTED RUNOFF COEFFICIENTS

Area ID	Total Area (m ²)	Pervious	Impervious	Building Roof	Weighted Runoff Coefficient
Predevelopment Sub Areas					0.82
X-1	8653	1100	6705	848	0.82
Total	8653	1100	6705	848	0.82
Post Development Sub Areas					0.68
P-1	1330	0	0	1330	0.90
P-2	970	367	603	0	0.65
P-3	600	132	468	0	0.76
P-4	1450	390	959	101	0.73
P-5	300	26	274	0	0.84
P-6	210	0	210	0	0.90
P-7	810	605	205	0	0.41
P-8	60	24	36	0	0.64
P-9	850	850	0	0	0.25
P-10	2073	580	776	717	0.72
Total	8653	2974	3531	2148	0.68
Controlled Roof Area (P-1)					0.90
Total	1330	0	0	1330	0.90
Controlled Area (P-2 to P-8)					0.67
Total	4400	1544	2755	101	0.67
Controlled Parkland (P-9)					0.30
Total	850	850	0	0	0.30
Controlled Roof					0.90
Total	1330	0	0	1330	0.90

CONTROLLED ROOF DRAINS AND ROOFTOP STORAGE

Parameters

Number of Drains	10	Max Storage (m ³)	31.92
Number of Weirs	10	Equivalent Radius (m)	20.58
Discharge/weir (L/s)	1.55	New Radius (m)	7.48
Total Discharge (L/s)	15.5	Ponding Depth (m)	0.05
Max Ponding Depth (m)	0.15	Total Storage (m ³)	66.5
Tributary Area (m ²)	1330		
Roof Runoff Coefficient	0.95 (100-year Event)		
$I = A \cdot t^B$			

Rating Curve

Where:	t=Time of Concentration (hours)	Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
	A= 1735.688	0.00	0.000	0.00
	B= 6.014	0.03	0.003	13.30
	C=0.820	0.06	0.006	26.60
		0.09	0.009	39.90
		0.12	0.012	53.20
		0.15	0.016	66.50

1316 Carling Avenue Building Roof

Time (minutes)	Intensity (mm/hr)	Q _{total} (m ³ /s)	Q _{discharge} (m ³ /s)	Q _{storage} (m ³ /s)	Volume Required (m ³)	Volume Available (m ³)	Sufficient Storage
5	242.70	0.085	0.0155	0.0697	20.90	66.50	PASS
10	178.56	0.063	0.0155	0.0472	28.30	66.50	PASS
15	142.89	0.050	0.0155	0.0347	31.19	66.50	PASS
20	119.95	0.042	0.0155	0.0266	31.92	66.50	PASS
30	91.87	0.032	0.0155	0.0167	30.14	66.50	PASS
40	75.15	0.026	0.0155	0.0109	26.10	66.50	PASS
50	63.95	0.022	0.0155	0.0069	20.84	66.50	PASS
60	55.89	0.020	0.0155	0.0041	14.82	66.50	PASS

PRE AND POST DEVELOPMENT RELEASE RATES

IDF Curve Parameters

Storm Event	Coeff A	Coeff B	Coeff C
2-Year	732.951	6.199	0.810
5-Year	998.071	6.053	0.814
10-Year	1174.184	6.014	0.816
25-Year	1402.884	6.018	0.819
50-Year	1569.58	6.014	0.820
100-Year	1735.688	6.014	0.820

Site Statistics

Predevelopment	
Total Site Area (ha)	0.87
Runoff Coefficient, C	0.82
Time of Concentration (mins)	10
Post Development	
Total Site Area (ha)	0.87
Runoff Coefficient, C	0.68
Time of Concentration (mins)	10

Formulae

Rainfall Intensity, I (mm/hr) = $A/(tc+B)^C$
 Release Rate, Q (m³/s) = $C_i C A / 360$

Where:
 t_c = Time of Concentration (min)
 C_i = Peaking Coefficient
 C = Runoff Coefficient
 I = Rainfall Intensity (mm/hr)
 A = Area (ha)

PREDEVELOPMENT RELEASE RATES

Return Rate	Peaking Coefficient, C_i	Runoff Coefficient, C	Rainfall Intensity (mm/hr)	Release Rate (m ³ /s)	Allowable Release Rate (m ³ /s)
2-Year	1	0.82	76.81	0.151	0.121
5-Year	1	0.82	104.19	0.205	0.132
10-Year	1	0.82	122.14	0.240	0.140
25-Year	1.1	0.82	144.69	0.313	0.155
50-Year	1.2	0.82	161.47	0.381	0.169
100-Year	1.25	0.82	178.56	0.439	0.182

POST DEVELOPMENT RELEASE RATES

Return Rate	Peaking Coefficient, C_i	Runoff Coefficient, C	Rainfall Intensity (mm/hr)	Release Rate (m ³ /s)
2-Year	1	0.68	76.81	0.125
5-Year	1	0.68	104.19	0.169
10-Year	1	0.68	122.14	0.199
25-Year	1.1	0.68	144.69	0.259
50-Year	1.2	0.68	161.47	0.315
100-Year	1.25	0.68	178.56	0.363

Note: Release rates from the existing portion of the site to remain are added to the allowable release rates of the proposed development area

SUB AREA POST DEVELOPMENT RELEASE RATES

IDF Curve Parameters				Site Statistics				Formulae	
Storm Event	Coeff A	Coeff B	Coeff C	Controlled Roof Area (P-1)		Controlled Parkland (P-9)		Rainfall Intensity, I (mm/hr)= A/(tc+B)*C Release Rate, Q (m³/s)=C*IA/360	
2-Year	732.951	6.199	0.810	Total Site Area (ha)	0.13	Total Site Area (ha)	0.09		
5-Year	998.071	6.053	0.814	Runoff Coefficient, C	0.90	Runoff Coefficient, C	0.30	Where: t _c =Time of Concentration (min) C _p = Peaking Coefficient C= Runoff Coefficient I= Rainfall Intensity (mm/hr) A= Area (ha)	
10-Year	1174.184	6.014	0.816	Time of Concentration (mins)	10	Time of Concentration (mins)	10		
25-Year	1402.884	6.018	0.819	Controlled Area (P-2 to P-8)		Uncontrolled Existing Development (P-10)			
50-Year	1569.58	6.014	0.820	Total Site Area (ha)	0.44	Total Site Area (ha)	0.21		
100-Year	1735.688	6.014	0.820	Runoff Coefficient, C	0.67	Runoff Coefficient, C	0.72		
				Time of Concentration (mins)	10	Time of Concentration (mins)	10		

RELEASE RATES TRIBUTARY TO CONTROLLED ROOF SYSTEM (P-1)

Return Rate	Peaking Coefficient, C _p	Runoff Coefficient, C	Rainfall Intensity (mm/hr)	Release Rate (m³/s)	Allowable Release Rate (m³/s)
2-Year	1	0.90	76.81	0.026	0.019
5-Year	1	0.90	104.19	0.035	0.019
10-Year	1	0.90	122.14	0.041	0.019
25-Year	1.1	0.90	144.69	0.053	0.019
50-Year	1.2	0.90	161.47	0.064	0.019
100-Year	1.25	0.90	178.56	0.074	0.019

RELEASE RATES TRIBUTARY TO CONTROL SYSTEM (P-2 to P-8)

Return Rate	Peaking Coefficient, C _p	Runoff Coefficient, C	Rainfall Intensity (mm/hr)	Release Rate (m³/s)	Allowable Release Rate (m³/s)
2-Year	1	0.67	76.81	0.063	0.070
5-Year	1	0.67	104.19	0.086	0.070
10-Year	1	0.67	122.14	0.100	0.070
25-Year	1.1	0.67	144.69	0.131	0.070
50-Year	1.2	0.67	161.47	0.159	0.070
100-Year	1.25	0.67	178.56	0.183	0.070

RELEASE RATES TRIBUTARY TO CONTROLLED PARKLAND (P-9)

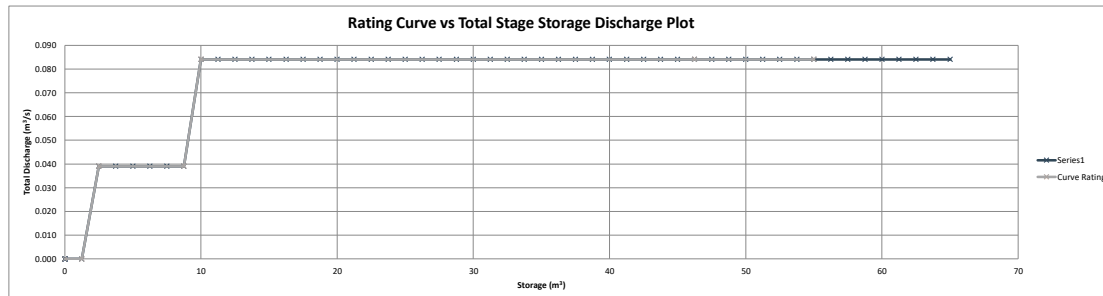
Return Rate	Peaking Coefficient, C _p	Runoff Coefficient, C	Rainfall Intensity (mm/hr)	Release Rate (m³/s)	Allowable Release Rate (m³/s)
2-Year	1	0.30	76.81	0.005	0.012
5-Year	1	0.30	104.19	0.007	0.012
10-Year	1	0.30	122.14	0.009	0.012
25-Year	1.1	0.30	144.69	0.011	0.012
50-Year	1.2	0.30	161.47	0.014	0.012
100-Year	1.25	0.30	178.56	0.016	0.012

RELEASE RATES FROM UNCONTROLLED AREAS (P-10)

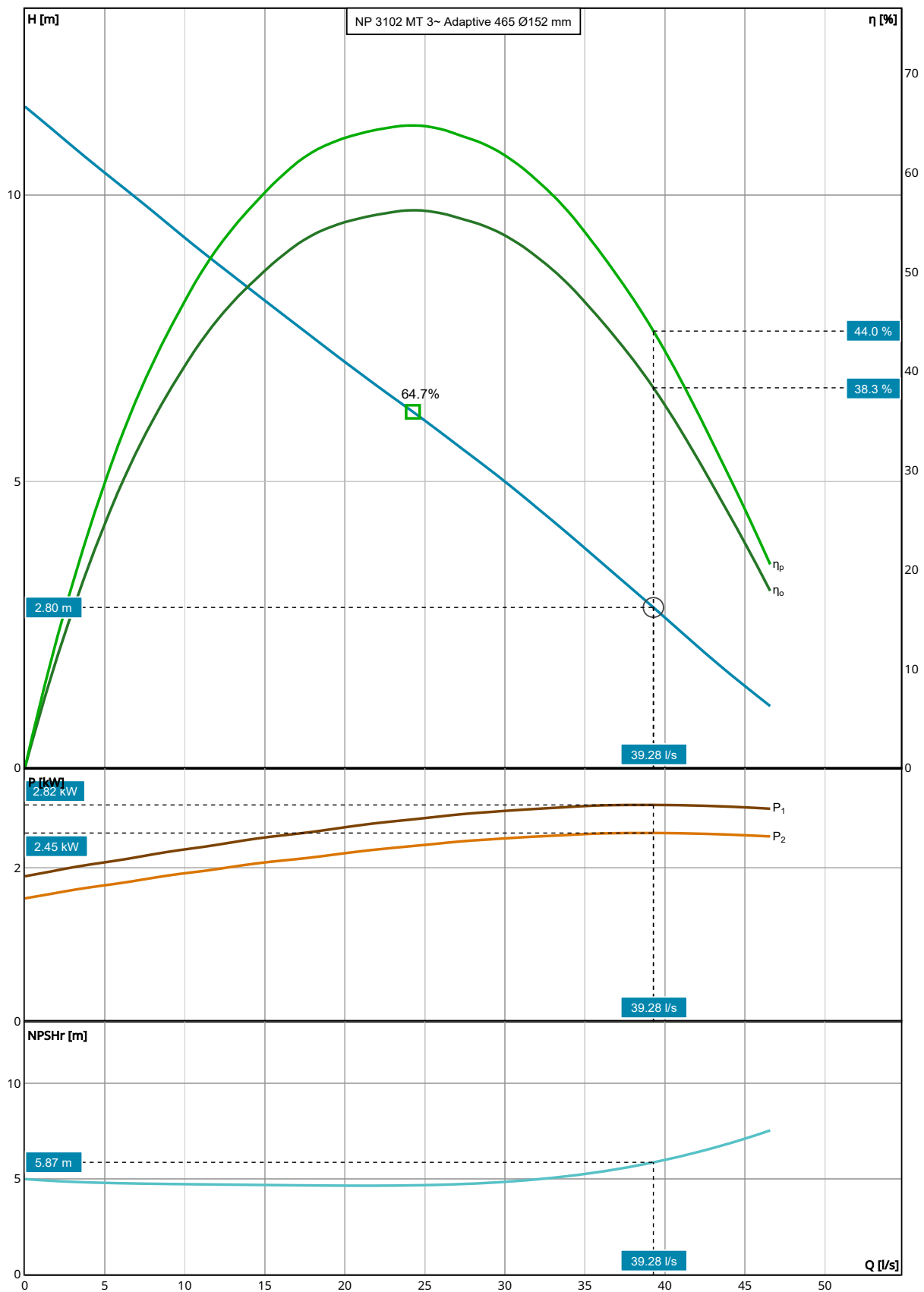
Return Rate	Peaking Coefficient, C _p	Runoff Coefficient, C	Rainfall Intensity (mm/hr)	Release Rate (m³/s)	Allowable Release Rate (m³/s)
2-Year	1	0.72	76.81	0.032	0.032
5-Year	1	0.72	104.19	0.043	0.043
10-Year	1	0.72	122.14	0.051	0.051
25-Year	1.1	0.72	144.69	0.066	0.066
50-Year	1.2	0.72	161.47	0.080	0.080
100-Year	1.25	0.72	178.56	0.092	0.092

Note an increased runoff coefficient of 0.30 is used for the park to account for future pathways and hardscape.

STAGE STORAGE DISCHARGE													
Formulae				Quantity Control Systems				Rating Curve Data Points				Notes:	
Quantity Control Orifice Release Rate, $Q (m^3/s) = C^*A^*h^{1.5}$ Where: C= Orifice Constant (0.82 pipe, 0.63 plate) A= Area (m^2) g= gravitational constant (m/s^2) h= Head loss across orifice (m)				Quantity Control Orifice 1 Diameter (mm): 0.000 Elevation (m): 7.00 Constant: 0.82 Centroid (m): 7.00				Elevation (m) Outflow (m^3/s) Storage (m^3) 70.45 0.000 0.00 70.90 0.000 1.25 70.95 0.039 2.50 71.20 0.039 8.75 71.25 0.084 10.00 72.70 0.084 46.25 73.05 0.084 55.00					
Over Flow Weir Release Rate, $Q (m^3/s) = C^*h^{1.5}$ Where: C= Rectangular C h=Depth of flow above weir (m) w=width of weir (m)				Quantity Control Orifice 2 Diameter (mm): Elevation (m): Constant: Centroid (m):				Check Storm Event Allowable (m^3/s) Controlled (m^3/s) Storage (m^3) Release Storage 2-Year 0.121 0.071 9 PASS PASS 5-Year 0.132 0.123 11 PASS PASS 10-Year 0.140 0.135 13 PASS PASS 25-Year 0.155 0.150 22 PASS PASS 50-Year 0.169 0.164 34 PASS PASS 100-Year 0.182 0.176 46 PASS PASS					
Rectangular C Equation $y = (a+bx)/(1+cx+dx^2)$ Where: a -10383.48985 b 3418997.012 c 2131595.078 d -235014.2466				Over Flow Weir Width (m): Side Slopes: Bottom Elevation (m): Length of Weir (m):									
Elevation (m)	Incremental Depth (m)	Area (m^2)	Active Storage Volume (m^3)	Head Loss Across Orifice (m)	Calculated Release from Orifice (m^3/s)	Head Loss Across Orifice (m)	Calculated Release from Orifice (m^3/s)	Depth of Flow Above Weir (m)	Overflow (x)	Rectangular 'C'	Calculated Release from Weir (m^3/s)	Total Flow (m^3/s)	
70.45	0.00	25.0	0	63.45	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.000	Bottom of Wet Well
70.50	0.05	25	0	63.50	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.000	
70.55	0.05	25	0	63.55	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.000	
70.60	0.05	25	0	63.60	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.000	
70.65	0.05	25	0	63.65	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.000	
70.70	0.05	25	0	63.70	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.000	
70.75	0.05	25	0	63.75	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.000	
70.80	0.05	25	0	63.80	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.000	
70.85	0.05	25	0	63.85	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.000	
70.90	0.05	25	1	63.90	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.000	Pumps OFF
70.95	0.05	25	2	63.95	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.039	Lead Pump ON
71.00	0.05	25	4	64.00	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.039	
71.05	0.05	25	5	64.05	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.039	
71.10	0.05	25	6	64.10	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.039	
71.15	0.05	25	7	64.15	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.039	
71.20	0.05	25	9	64.20	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.039	
71.25	0.05	25	10	64.25	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	Lag Pump ON
71.30	0.05	25	11	64.30	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.35	0.05	25	12	64.35	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.40	0.05	25	14	64.40	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.45	0.05	25	15	64.45	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.50	0.05	25	16	64.50	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.55	0.05	25	17	64.55	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.60	0.05	25	19	64.60	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.65	0.05	25	20	64.65	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.70	0.05	25	21	64.70	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.75	0.05	25	22	64.75	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.80	0.05	25	24	64.80	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.85	0.05	25	25	64.85	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.90	0.05	25	26	64.90	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
71.95	0.05	25	27	64.95	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.00	0.05	25	29	65.00	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.05	0.05	25	30	65.05	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.10	0.05	25	31	65.10	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.15	0.05	25	32	65.15	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.20	0.05	25	34	65.20	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.25	0.05	25	35	65.25	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.30	0.05	25	36	65.30	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.35	0.05	25	37	65.35	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.40	0.05	25	39	65.40	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.45	0.05	25	40	65.45	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.50	0.05	25	41	65.50	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.55	0.05	25	42	65.55	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.60	0.05	25	44	65.60	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.65	0.05	25	45	65.65	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.70	0.05	25	46	65.70	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	100-Year Design HWL
72.75	0.05	25	47	65.75	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.80	0.05	25	49	65.80	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.85	0.05	25	50	65.85	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.90	0.05	25	51	65.90	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
72.95	0.05	25	52	65.95	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.00	0.05	25	54	66.00	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.05	0.05	25	55	66.05	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	Emergency Overflow Pipe
73.10	0.05	25	56	66.10	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.15	0.05	25	57	66.15	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.20	0.05	25	59	66.20	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.25	0.05	25	60	66.25	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.30	0.05	25	61	66.30	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.35	0.05	25	62	66.35	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.40	0.05	25	64	66.40	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.45	0.05	25	65	66.45	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.50	0.05	25	66	66.50	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.55	0.05	25	67	66.55	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.60	0.05	25	69	66.60	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.65	0.05	25	70	66.65	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.70	0.05	25	71	66.70	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.75	0.05	25	72	66.75	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.80	0.05	25	74	66.80	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.85	0.05	25	75	66.85	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.90	0.05	25	76	66.90	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	
73.95	0.05	25	77	66.95	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.084	



NP 3102 MT 3~ Adaptive 465 | Hydraulic Data & Performance Curve



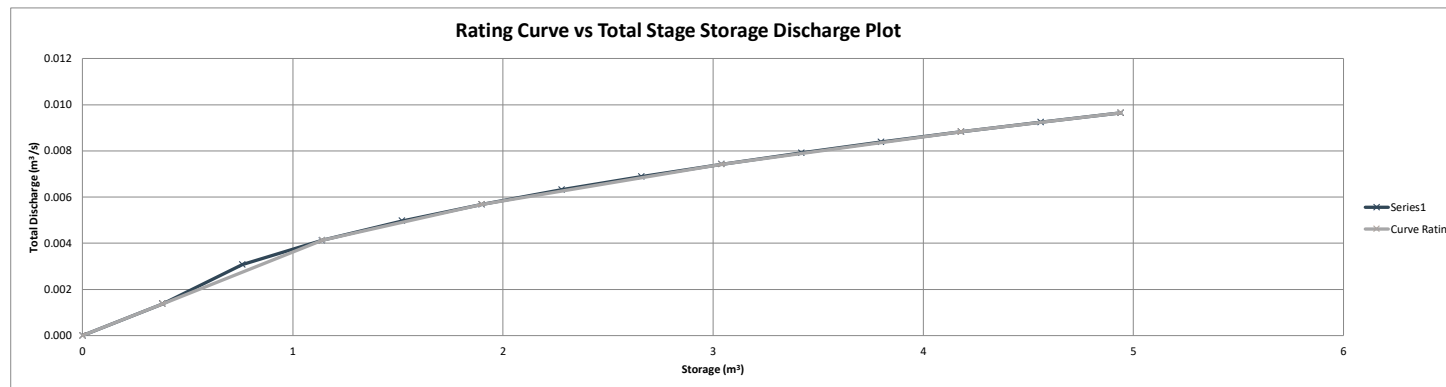
Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

STAGE STORAGE DISCHARGE

Formulae	Quantity Control Systems	Rating Curve Data Points	Notes:
Quantity Control Orifice Release Rate, $Q \text{ (m}^3/\text{s)} = C^*A*(2*g*h)^{0.5}$ Where: c= Orifice Constant (0.82 pipe, 0.63 plate) A= Area (m^2) g= gravitational constant (m/s^2) h= Head loss across orifice (m)	Quantity Control Orifice 1 Diameter (mm): 75.000 Elevation (m): 72.84 Constant: 0.63 Centroid (m): 72.88 Quantity Control Orifice 2 Diameter (mm): Elevation (m): Constant: Centroid (m):	Elevation (m) Outflow (m^3/s) Storage (m^3) 72.84 0.000 0.00 72.89 0.001 0.38 72.99 0.004 1.14 73.09 0.006 1.90 73.24 0.007 3.04 73.39 0.009 4.18 73.49 0.010 4.94	
Over Flow Weir Release Rate, $Q \text{ (m}^3/\text{s)} = C*(h^{3/2})*w$ Where: C= Rectangular C h=Depth of flow above weir (m) w=width of weir (m)	Over Flow Weir Width (m): Side Slopes: Bottom Elevation (m): Length of Weir (m):	Check Storm Event Allowable (m^3/s) Controlled (m^3/s) Storage (m^3) Release Storage 2-Year 0.012 0.004 1.1 PASS PASS 5-Year 0.012 0.005 1.6 PASS PASS 10-Year 0.012 0.006 1.9 PASS PASS 25-Year 0.012 0.007 2.7 PASS PASS 50-Year 0.012 0.008 3.4 PASS PASS 100-Year 0.012 0.009 4.1 PASS PASS	
Rectangular C Equation $y = (a+bx)/(1+cx+dx^2)$ Where: a -10383.48985 b 3418997.012 c 2131595.078 d -235014.2466			

Elevation (m)	Incremental Depth (m)	Area (m^2)	Active Storage Volume (m^3)	Head Loss Across Orifice (m)	Calculated Release from Orifice (m^3/s)	Head Loss Across Orifice (m)	Calculated Release from Orifice (m^3/s)	Depth of Flow Above Weir (m)	Overflow (x)	Rectangular 'C'	Calculated Release from Weir (m^3/s)	Total Flow (m^3/s)
72.84	0.00	8	0	0.00	0.000	0.00	0.000	0.00	0.00	0.00	0.00	0.000
72.89	0.05	8	0.4	0.01	0.001	0.00	0.000	0.00	0.00	0.00	0.00	0.001
72.94	0.05	8	0.8	0.06	0.003	0.00	0.000	0.00	0.00	0.00	0.00	0.003
72.99	0.05	8	1.1	0.11	0.004	0.00	0.000	0.00	0.00	0.00	0.00	0.004
73.04	0.05	8	1.5	0.16	0.005	0.00	0.000	0.00	0.00	0.00	0.00	0.005
73.09	0.05	8	1.9	0.21	0.006	0.00	0.000	0.00	0.00	0.00	0.00	0.006
73.14	0.05	8	2.3	0.26	0.006	0.00	0.000	0.00	0.00	0.00	0.00	0.006
73.19	0.05	8	2.7	0.31	0.007	0.00	0.000	0.00	0.00	0.00	0.00	0.007
73.24	0.05	8	3.0	0.36	0.007	0.00	0.000	0.00	0.00	0.00	0.00	0.007
73.29	0.05	8	3.4	0.41	0.008	0.00	0.000	0.00	0.00	0.00	0.00	0.008
73.34	0.05	8	3.8	0.46	0.008	0.00	0.000	0.00	0.00	0.00	0.00	0.008
73.39	0.05	8	4.2	0.51	0.009	0.00	0.000	0.00	0.00	0.00	0.00	0.009
73.44	0.05	8	4.6	0.56	0.01	0.00	0.000	0.00	0.00	0.00	0.00	0.009
73.49	0.05	8	4.9	0.61	0.01	0.00	0.000	0.00	0.00	0.00	0.00	0.010



2-YEAR RELEASE RATES AND HYDROGRAPHS

Site Statistics				
Controlled Roof Area (P-1)			Controlled Parkland (P-9)	
Total Site Area (ha)	0.13		Total Site Area (ha)	0.09
Runoff Coefficient, C	0.80		Runoff Coefficient, C	0.30
Storm Duration (mins)	20		Storm Duration (mins)	20
2-Year Release Rate (m ³ /s)	0.026		2-Year Release Rate (m ³ /s)	0.005
Controlled Area (P-2 to P-8)			Uncontrolled Existing Development (P-10)	
Total Site Area (ha)	0.44		Total Site Area (ha)	0.21
Runoff Coefficient, C	0.67		Runoff Coefficient, C	0.72
Storm Duration (mins)	20		Storm Duration (mins)	20
2-Year Release Rate (m ³ /s)	0.063		2-Year Release Rate (m ³ /s)	0.032

Roof Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
0.00	0.000	0.00
0.03	0.003	13.30
0.06	0.006	26.60
0.09	0.009	39.90
0.12	0.012	53.20
0.15	0.016	66.50

Pump Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
70.45	0.000	0.00
70.90	0.000	1.25
70.95	0.039	2.50
71.20	0.039	6.75
71.25	0.084	10.00
72.70	0.084	46.25
73.05	0.084	55.00

Parkland Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
72.84	0.000	0.00
72.89	0.001	0.38
73.09	0.004	1.14
73.29	0.006	1.90
73.24	0.007	3.04
73.39	0.009	4.18
73.49	0.010	4.94

Formulas	
$Q_u = Q_p(t)/270^\circ$	
Q_{up} —Computer Generated using rating curve data points	
Storage (m ³)=Cumulative storage _{up} +A Storage	
A Storage (m ³)= $(Q_u - Q_{up}) \times t_{up} \times 60$	
Where:	
Q_u —Flow rate tributary to the system at a given time (m ³ /s)	
Q_{up} —Flow rate out of the system at a given time (m ³ /s)	
T_p —Storm Duration (min)	
T_p —Time(s)	

Hydrograph Data (Controlled Roof Area)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.003	0.000	0.15	0.15
2	0.005	0.000	0.30	0.46
3	0.008	0.000	0.45	0.91
4	0.010	0.000	0.60	1.51
5	0.013	0.000	0.74	2.26
6	0.015	0.001	0.89	3.14
7	0.018	0.001	1.03	4.17
8	0.020	0.001	1.17	5.34
9	0.023	0.001	1.30	6.64
10	0.026	0.002	1.44	8.08
11	0.029	0.002	1.27	9.25
12	0.020	0.002	1.10	10.44
13	0.018	0.002	0.93	11.37
14	0.015	0.002	0.76	12.13
15	0.013	0.003	0.60	12.73
16	0.010	0.003	0.43	13.16
17	0.008	0.003	0.28	13.44
18	0.005	0.003	0.12	13.56
19	0.003	0.003	-0.04	13.52
20	0.000	0.003	-0.18	13.33
21	0.000	0.003	-0.19	13.15
22	0.000	0.003	-0.18	12.96
23	0.000	0.003	-0.18	12.78
24	0.000	0.003	-0.18	12.60
25	0.000	0.003	-0.18	12.42
26	0.000	0.003	-0.17	12.25
27	0.000	0.003	-0.17	12.08
28	0.000	0.003	-0.17	11.91
29	0.000	0.003	-0.17	11.74
30	0.000	0.003	-0.16	11.58
31	0.000	0.003	-0.16	11.42
32	0.000	0.003	-0.16	11.26
33	0.000	0.003	-0.16	11.10
34	0.000	0.003	-0.16	10.95
35	0.000	0.003	-0.15	10.79
36	0.000	0.003	-0.15	10.64
37	0.000	0.002	-0.15	10.49
38	0.000	0.002	-0.15	10.35
39	0.000	0.002	-0.14	10.20
40	0.000	0.002	-0.14	10.06

Max Storage

Hydrograph Data (Pumped Underground Chamber)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.006	0.000	0.18	0.18
2	0.013	0.000	0.76	1.14
3	0.019	0.000	1.14	2.28
4	0.025	0.011	0.40	1.88
5	0.032	0.016	0.74	2.63
6	0.038	0.030	0.04	2.58
7	0.045	0.030	0.35	2.93
8	0.051	0.030	0.75	3.68
9	0.058	0.030	1.14	4.82
10	0.065	0.030	1.54	6.35
11	0.069	0.030	1.18	7.53
12	0.053	0.030	0.82	8.35
13	0.047	0.030	0.46	8.81
14	0.040	0.030	0.09	8.77
15	0.034	0.030	-0.33	8.44
16	0.028	0.030	-0.65	7.80
17	0.022	0.030	-1.02	6.78
18	0.016	0.030	-1.40	5.38
19	0.009	0.030	-1.77	3.61
20	0.003	0.030	-2.15	1.46
21	0.003	0.003	-0.20	1.26
22	0.003	0.002	0.17	1.43
23	0.003	0.004	0.19	1.62
24	0.003	0.008	0.13	1.41
25	0.003	0.004	-0.12	1.29
26	0.003	0.002	0.10	1.39
27	0.003	0.003	0.09	1.30
28	0.003	0.001	0.06	1.38
29	0.003	0.003	-0.07	1.31
30	0.003	0.003	0.06	1.36
31	0.003	0.003	0.05	1.31
32	0.003	0.003	0.04	1.36
33	0.003	0.003	0.04	1.32
34	0.003	0.002	0.03	1.35
35	0.003	0.001	-0.03	1.32
36	0.003	0.001	-0.15	1.16
37	0.002	0.002	-0.02	1.12
38	0.002	0.001	0.02	1.14
39	0.002	0.002	-0.03	1.13
40	0.002	0.002	-0.01	1.13

Max Storage

Hydrograph Data (Uncontrolled Existing Development)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.003	0.003	0.00	0.00
2	0.006	0.006	0.00	0.00
3	0.010	0.010	0.00	0.00
4	0.013	0.013	0.00	0.00
5	0.016	0.016	0.00	0.00
6	0.019	0.019	0.00	0.00
7	0.022	0.022	0.00	0.00
8	0.025	0.025	0.00	0.00
9	0.029	0.029	0.00	0.00
10	0.032	0.032	0.00	0.00
11	0.029	0.029	0.00	0.00
12	0.025	0.025	0.00	0.00
13	0.022	0.022	0.00	0.00
14	0.019	0.019	0.00	0.00
15	0.016	0.016	0.00	0.00
16	0.013	0.013	0.00	0.00
17	0.010	0.010	0.00	0.00
18	0.006	0.006	0.00	0.00
19	0.003	0.003	0.00	0.00
20	0.000	0.000	0.00	0.00
21	0.000	0.000	0.00	0.00
22	0.000	0.000	0.00	0.00
23	0.000	0.000	0.00	0.00
24	0.000	0.000	0.00	0.00
25	0.000	0.000	0.00	0.00
26	0.000	0.000	0.00	0.00
27	0.000	0.000	0.00	0.00
28	0.000	0.000	0.00	0.00
29	0.000	0.000	0.00	0.00
30	0.005	0.005	0.00	0.00
31	0.000	0.000	0.00	0.00
32	0.000	0.000	0.00	0.00
33	0.000	0.000	0.00	0.00
34	0.000	0.000	0.00	0.00
35	0.000	0.000	0.00	0.00
36	0.000	0.000	0.00	0.00
37	0.000	0.000	0.00	0.00
38	0.000	0.000	0.00	0.00
39	0.000	0.000	0.00	0.00
40	0.000	0.000	0.00	0.00

Total Release Tributary to Carling Avenue Sewer	
Minute	Out Flow (m ³ /s)
0	0.000
1	0.003
2	0.006
3	0.010
4	0.013
5	0.016
6	0.019
7	0.022
8	0.025
9	0.029
10	0.032
11	0.029
12	0.025
13	0.022
14	0.019
15	0.016
16	0.013
17	0.010
18	0.006
19	0.003
20	0.000
21	0.000
22	0.000
23	0.000
24	0.000
25	0.000
26	0.001
27	0.004
28	0.002
29	0.004
30	0.002
31	0.004
32	0.002
33	0.003
34	0.002
35	0.003
36	0.002
37	0.003
38	0.002
39	0.003
40	0.002

Max Release

Hydrograph Data (Controlled Parkland)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.001	0.000	0.033	0.033
2	0.001	0.000	0.058	0.091
3	0.002	0.000	0.078	0.169
4	0.002	0.001	0.094	0.263
5	0.003	0.001	0.106	0.369
6	0.003	0.001	0.116	0.484
7	0.004	0.002	0.123	0.607
8	0.004	0.002	0.139	0.736
9	0.005	0.003	0.114	0.850
10	0.005	0.003	0.137	1.007
11	0.005	0.004	0.075	1.082
12	0.004	0.004	0.026	1.107
13	0.004	0.004	-0.013	1.095
14	0.003	0.004	-0.042	1.052
15	0.003	0.004	-0.066	0.987
16	0.002	0.004	-0.084	0.902
17	0.002	0.003	-0.098	0.804
18	0.001	0.003	-0.110	0.694
19	0.001	0.003	-0.118	0.576
20	0.000	0.002	-0.125	0.451
21	0.000	0.002	-0.099	0.352
22	0.000	0.001	-0.077	0.276
23	0.000	0.001	-0.060	0.216
24	0.000	0.001	-0.047	0.169
25	0.000	0.001	-0.017	0.152
26	0.000	0.000	-0.029	0.103
27	0.000	0.000	-0.022	0.081
28	0.000	0.000	-0.018	0.063
29	0.000	0.000	-0.014	0.049
30	0.000	0.000	-0.011	0.039
31	0.000	0.000	-0.008	0.030
32	0.000	0.000	-0.007	0.024
33	0.000	0.000	-0.005	0.019
34	0.000	0.000	-0.004	0.015
35	0.000	0.000	-0.003	0.011
36	0.000	0.000	-0.002	0.009
37	0.000	0.000	-0.002	0.007
38	0.000	0.000	-0.002	0.005
39	0.000	0.000	-0.001	0.004
40	0.000	0.000	-0.001	0.003

Max Storage

Total Release Tributary to Thames Street Sewer	
Minute	Out Flow (m ³ /s)
0	0.000
1	0.000
2	0.000
3	

5-YEAR RELEASE RATES AND HYDROGRAPHS

Site Statistics			
Controlled Roof Area (P-1)		Controlled Paved Area (P-9)	
Total Site Area (ha)	0.13	Total Site Area (ha)	0.09
Runoff Coefficient, C	0.90	Runoff Coefficient, C	0.30
Storm Duration (mins)	20	Storm Duration (mins)	20
5-Year Release Rate (m ³ /s)	0.035	5-Year Release Rate (m ³ /s)	0.007
Controlled Area (P-2 to P-8)		Uncontrolled Existing Development (P-10)	
Total Site Area (ha)	0.44	Total Site Area (ha)	0.21
Runoff Coefficient, C	0.67	Runoff Coefficient, C	0.72
Storm Duration (mins)	20	Storm Duration (mins)	20
5-Year Release Rate (m ³ /s)	0.086	5-Year Release Rate (m ³ /s)	0.043

Roof Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
0.00	0.000	0.00
0.03	0.003	13.30
0.06	0.006	26.60
0.09	0.009	39.90
0.12	0.012	53.20
0.15	0.015	66.50

Pump Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
70.45	0.00	0.00
70.90	0.00	1.25
70.95	0.04	2.50
71.20	0.04	8.75
71.25	0.08	10.00
72.70	0.08	46.25
73.05	0.08	55.00

Parkland Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
72.84	0.000	0.00
72.89	0.001	0.38
72.99	0.004	1.14
73.09	0.006	1.90
73.24	0.007	3.04
73.39	0.009	4.18
73.49	0.010	4.94

Formulas	
$Q_{in} = Q_{in}/(1/2)^n$	
Q_{in} —Computer Generated using rating curve data points	
Storage (m ³)—Cumulative storage, n=4 Storage	
A Storage (m ³)= $(Q_{in} - Q_{out}) \times (t - t_0) \times 60$	
Where:	
Q_{in} —Flow rate tributary to the system at a given time (m ³ /s)	
Q_{out} —Flow rate out of the system at a given time (m ³ /s)	
T —Storm Duration (min)	
T_0 —Time (min)	

Hydrograph Data (Controlled Roof Area)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.003	0.000	0.21	0.21
2	0.007	0.000	0.41	0.62
3	0.010	0.000	0.61	1.24
4	0.014	0.000	0.81	2.05
5	0.017	0.000	1.01	3.06
6	0.021	0.001	1.20	4.26
7	0.024	0.001	1.40	5.66
8	0.028	0.001	1.58	7.24
9	0.031	0.002	1.77	9.01
10	0.035	0.002	1.95	10.97
11	0.039	0.003	1.72	12.68
12	0.028	0.003	1.49	14.17
13	0.024	0.003	1.26	15.43
14	0.021	0.004	1.03	16.46
15	0.017	0.004	0.81	17.27
16	0.014	0.004	0.59	17.86
17	0.010	0.004	0.37	18.23
18	0.007	0.004	0.16	18.39
19	0.003	0.004	-0.05	18.34
20	0.000	0.004	-0.25	18.09
21	0.000	0.004	-0.25	17.83
22	0.000	0.004	-0.25	17.58
23	0.000	0.004	-0.25	17.34
24	0.000	0.004	-0.24	17.09
25	0.000	0.004	-0.24	16.86
26	0.000	0.004	-0.24	16.62
27	0.000	0.004	-0.23	16.39
28	0.000	0.004	-0.23	16.16
29	0.000	0.004	-0.24	15.92
30	0.000	0.004	-0.22	15.71
31	0.000	0.004	-0.22	15.49
32	0.000	0.004	-0.22	15.27
33	0.000	0.004	-0.21	15.06
34	0.000	0.004	-0.21	14.85
35	0.000	0.003	-0.21	14.64
36	0.000	0.003	-0.20	14.44
37	0.000	0.003	-0.20	14.23
38	0.000	0.003	-0.20	14.04
39	0.000	0.003	-0.20	13.84
40	0.000	0.003	-0.19	13.65

Max Storage

Hydrograph Data (Pumped Underground Chamber)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.0000	0.00	0.00
1	0.009	0.0000	0.51	0.51
2	0.017	0.0000	1.03	1.54
3	0.026	0.0001	1.00	2.54
4	0.035	0.0000	1.27	3.77
5	0.043	0.0020	0.68	2.95
6	0.052	0.0030	0.78	3.74
7	0.061	0.0090	1.31	5.05
8	0.070	0.0090	1.85	6.90
9	0.079	0.0090	2.38	9.28
10	0.088	0.0090	1.78	11.06
11	0.080	0.0090	0.77	10.79
12	0.071	0.0090	-0.76	10.04
13	0.063	0.0090	-1.25	8.79
14	0.055	0.0090	-0.87	7.92
15	0.047	0.0090	-1.51	6.41
16	0.038	0.0090	-0.94	5.47
17	0.030	0.0090	-0.53	4.94
18	0.021	0.0090	-1.06	3.88
19	0.013	0.0090	-1.57	2.31
20	0.004	0.0090	-2.08	0.24
21	0.004	0.0090	-2.09	-0.76
22	0.004	0.0000	0.25	1.01
23	0.004	0.0000	0.75	1.75
24	0.004	0.0001	0.24	1.49
25	0.004	0.0005	-0.21	1.28
26	0.004	0.0009	-1.08	0.46
27	0.004	0.0006	-1.35	-0.30
28	0.004	0.0015	-0.14	1.44
29	0.004	0.0028	-1.12	0.31
30	0.004	0.0020	-1.01	1.42
31	0.004	0.0052	-0.09	1.32
32	0.004	0.0021	0.08	1.40
33	0.004	0.0048	-0.07	1.33
34	0.004	0.0025	0.06	1.39
35	0.003	0.0044	-0.09	1.34
36	0.003	0.0017	0.04	1.38
37	0.003	0.0041	-0.04	1.34
38	0.003	0.0028	0.03	1.37
39	0.003	0.0018	0.03	1.44
40	0.003	0.0028	0.03	1.37

Max Storage

Hydrograph Data (Uncontrolled Existing Development)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.000	0.000
1	0.004	0.004	0.000	0.000
2	0.009	0.009	0.000	0.000
3	0.013	0.013	0.000	0.000
4	0.017	0.017	0.000	0.000
5	0.022	0.022	0.000	0.000
6	0.026	0.026	0.000	0.000
7	0.030	0.030	0.000	0.000
8	0.034	0.034	0.000	0.000
9	0.039	0.039	0.000	0.000
10	0.045	0.045	0.000	0.000
11	0.039	0.039	0.000	0.000
12	0.034	0.034	0.000	0.000
13	0.030	0.030	0.000	0.000
14	0.026	0.026	0.000	0.000
15	0.022	0.022	0.000	0.000
16	0.017	0.017	0.000	0.000
17	0.013	0.013	0.000	0.000
18	0.009	0.009	0.000	0.000
19	0.004	0.004	0.000	0.000
20	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000
26	0.000	0.000	0.000	0.000
27	0.000	0.000	0.000	0.000
28	0.000	0.000	0.000	0.000
29	0.000	0.000	0.000	0.000
30	0.000	0.000	0.000	0.000
31	0.000	0.000	0.000	0.000
32	0.000	0.000	0.000	0.000
33	0.000	0.000	0.000	0.000
34	0.000	0.000	0.000	0.000
35	0.000	0.000	0.000	0.000
36	0.000	0.000	0.000	0.000
37	0.000	0.000	0.000	0.000
38	0.000	0.000	0.000	0.000
39	0.000	0.000	0.000	0.000
40	0.000	0.000	0.000	0.000

Total Release Tributary to Carling Avenue Sewer	
Minute	Out Flow (m ³ /s)
0	0.000
1	0.004
2	0.009
3	0.013
4	0.017
5	0.022
6	0.026
7	0.030
8	0.034
9	0.039
10	0.045
11	0.039
12	0.034
13	0.030
14	0.026
15	0.022
16	0.017
17	0.013
18	0.009
19	0.004
20	0.000
21	0.000
22	0.000
23	0.000
24	0.000
25	0.000
26	0.000
27	0.000
28	0.000
29	0.000
30	0.000
31	0.000
32	0.000
33	0.000
34	0.000
35	0.000
36	0.000
37	0.000
38	0.000
39	0.000
40	0.000

Max Release

Hydrograph Data (Controlled Parkland)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.0000	0.000	0.000
1	0.001	0.0000	0.004	0.004
2	0.001	0.0002	0.0079	0.113
3	0.002	0.0004	0.106	0.229
4	0.003	0.0008	0.127	0.356
5	0.004	0.0013	0.144	0.500
6	0.004	0.0018	0.157	0.657
7	0.005	0.0024	0.167	0.824
8	0.006	0.0030	0.175	0.999
9	0.007	0.0036	0.181	1.180
10	0.007	0.0042	0.180	1.370
11	0.007	0.0046	0.122	1.492
12	0.006	0.0049	0.063	1.555
13	0.005	0.0050	0.011	1.566
14	0.004	0.0050	-0.051	1.515
15	0.004	0.0049	-0.075	1.437
16	0.003	0.0048	-0.110	1.348
17	0.002	0.0046	-0.141	1.207
18	0.001	0.0045	-0.148	1.059
19	0.001	0.0038	-0.182	0.877
20	0.000	0.0034	-0.187	0.691
21	0.000	0.0034	-0.146	0.545
22	0.000	0.0019	-0.114	0.431
23	0.000	0.0015	-0.089	0.342
24	0.000	0.0012	-0.070	0.271
25	0.000	0.0009	-0.055	0.197
26	0.000	0.0007	-0.043	0.154
27	0.000	0.0006	-0.033	0.120
28	0.000	0.0004	-0.026	0.094
29	0.000	0.0003	-0.020	0.074
30	0.000	0.0003	-0.016	0.058
31	0.000	0.0002	-0.013	0.045
32	0.000	0.0002	-0.010	0.035
33	0.000	0.0001	-0.008	0.028
34	0.000	0.0001	-0.006	0.022
35	0.000	0.0001	-0.005	0.017
36	0.000	0.0001	-0.004	0.013
37	0.000	0.0000	-0.003	0.010
38	0.000	0.0000	-0.002	0.008
39	0.000	0.0000	-0.002	0.006
40	0.000	0.0000	-0.001	0.005

Max Storage

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10-YEAR RELEASE RATES AND HYDROGRAPHS

Site Statistics			
Controlled Roof Area (P-1)		Controlled Parkland (P-9)	
Total Site Area (ha)	0.13	Total Site Area (ha)	0.09
Runoff Coefficient, C	0.90	Runoff Coefficient, C	0.30
Storm Duration (mins)	20	Storm Duration (mins)	20
10-Year Release Rate (m ³ /s)	0.041	10-Year Release Rate (m ³ /s)	0.009
Controlled Area (P-2 to P-8)		Uncontrolled Existing Development (P-10)	
Total Site Area (ha)	0.44	Total Site Area (ha)	0.21
Runoff Coefficient, C	0.67	Runoff Coefficient, C	0.72
Storm Duration (mins)	20	Storm Duration (mins)	20
10-Year Release Rate (m ³ /s)	0.100	10-Year Release Rate (m ³ /s)	0.051

Roof Rating Curve Data Points			
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)	
0.00	0.000	0.00	
0.03	0.003	13.30	
0.06	0.006	26.60	
0.09	0.009	39.90	
0.12	0.012	53.20	
0.15	0.015	66.50	

Pump Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
70.45	0.000	0.00
70.90	0.000	1.25
70.95	0.039	2.50
71.20	0.039	8.75
71.25	0.084	10.00
72.70	0.084	46.25
73.05	0.084	55.00

Parkland Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
72.84	0.000	0.00
72.89	0.001	0.38
72.99	0.004	1.14
73.09	0.006	1.90
73.24	0.007	3.04
73.39	0.009	4.18
73.49	0.010	4.94

Formulas	
$Q_{LW} = Q_{LW} / (1/2)^{1/2}$	
Q_{LW} - Computer Generated using rating curve data points	
Storage (m ³) = Cumulative storage + no Storage	
$A \text{ Storage (m}^3\text{)} = (Q_L - Q_{LW}) \cdot t - Q_L \cdot t_{1/2}$	
Where:	
Q_L - Flow rate tributary to the system at a given time (m ³ /s)	
Q_{LW} - Flow rate out of the system at a given time (m ³ /s)	
t - Storm Duration (min)	
$t_{1/2}$ - Time (min)	

Hydrograph Data (Controlled Roof Area)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.004	0.000	0.24	0.24
2	0.008	0.000	0.48	0.73
3	0.012	0.000	0.72	1.45
4	0.016	0.000	0.96	2.40
5	0.020	0.001	1.18	3.59
6	0.024	0.001	1.41	5.00
7	0.028	0.001	1.64	6.64
8	0.032	0.002	1.86	8.49
9	0.037	0.002	2.07	10.57
10	0.041	0.002	2.29	12.86
11	0.037	0.003	2.05	14.91
12	0.032	0.003	1.74	16.65
13	0.028	0.004	1.47	18.08
14	0.024	0.004	1.21	19.29
15	0.020	0.004	0.95	20.24
16	0.016	0.005	0.69	20.93
17	0.012	0.005	0.44	21.37
18	0.008	0.005	0.19	21.56
19	0.004	0.005	-0.06	21.50
20	0.000	0.005	-0.10	21.40
21	0.000	0.005	-0.10	20.30
22	0.000	0.005	-0.29	20.01
23	0.000	0.005	-0.29	19.72
24	0.000	0.005	-0.28	19.04
25	0.000	0.005	-0.28	18.76
26	0.000	0.005	-0.28	18.48
27	0.000	0.005	-0.27	18.21
28	0.000	0.004	-0.27	18.94
29	0.000	0.004	-0.26	18.68
30	0.000	0.004	-0.26	18.42
31	0.000	0.004	-0.26	18.16
32	0.000	0.004	-0.25	17.90
33	0.000	0.004	-0.25	17.65
34	0.000	0.004	-0.25	17.41
35	0.000	0.004	-0.24	17.18
36	0.000	0.004	-0.24	16.92
37	0.000	0.004	-0.24	16.69
38	0.000	0.004	-0.23	16.45
39	0.000	0.004	-0.23	16.22
40	0.000	0.004	-0.23	16.00

Hydrograph Data (Pumped Underground Chamber)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.0000	0.00	0.00
1	0.003	0.0000	0.60	0.60
2	0.020	0.0000	1.21	1.81
3	0.030	0.0174	0.77	2.58
4	0.040	0.0390	0.59	3.17
5	0.051	0.0390	0.70	3.87
6	0.061	0.0390	1.32	4.69
7	0.071	0.0390	1.94	6.63
8	0.082	0.0390	2.57	9.20
9	0.092	0.0522	2.22	11.42
10	0.103	0.0640	1.12	12.55
11	0.093	0.0840	0.96	13.51
12	0.084	0.0840	-0.02	13.09
13	0.074	0.0840	-0.59	12.49
14	0.064	0.0840	-1.08	11.32
15	0.055	0.0840	-1.76	9.56
16	0.045	0.0840	-1.99	8.17
17	0.035	0.0390	-0.24	7.93
18	0.025	0.0390	-0.84	7.09
19	0.015	0.0390	-1.44	5.65
20	0.005	0.0390	-2.04	3.61
21	0.005	0.0390	-2.04	1.57
22	0.005	0.0099	-0.30	1.27
23	0.005	0.0005	-0.26	1.02
24	0.005	0.0006	-0.23	0.80
25	0.005	0.0014	-0.20	0.60
26	0.005	0.0025	-0.17	0.43
27	0.005	0.0021	-0.15	0.28
28	0.004	0.0067	-0.13	0.15
29	0.004	0.0025	-0.11	0.04
30	0.004	0.0060	-0.10	0.04
31	0.004	0.0029	0.08	0.13
32	0.004	0.0005	0.08	0.25
33	0.004	0.0031	0.06	0.41
34	0.004	0.0051	0.06	0.55
35	0.004	0.0031	0.05	0.60
36	0.004	0.0048	0.05	0.76
37	0.004	0.0031	0.04	0.89
38	0.004	0.0041	0.04	1.06
39	0.004	0.0014	0.03	1.09
40	0.004	0.0042	0.03	1.36

Hydrograph Data (Uncontrolled Existing Development)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.000	0.000
1	0.005	0.005	0.000	0.000
2	0.010	0.010	0.000	0.000
3	0.015	0.015	0.000	0.000
4	0.020	0.020	0.000	0.000
5	0.025	0.025	0.000	0.000
6	0.030	0.030	0.000	0.000
7	0.035	0.035	0.000	0.000
8	0.040	0.040	0.000	0.000
9	0.045	0.045	0.000	0.000
10	0.051	0.051	0.000	0.000
11	0.056	0.045	0.000	0.000
12	0.040	0.040	0.000	0.000
13	0.035	0.035	0.000	0.000
14	0.030	0.030	0.000	0.000
15	0.025	0.025	0.000	0.000
16	0.020	0.020	0.000	0.000
17	0.015	0.015	0.000	0.000
18	0.010	0.010	0.000	0.000
19	0.005	0.005	0.000	0.000
20	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000
26	0.000	0.000	0.000	0.000
27	0.000	0.000	0.000	0.000
28	0.000	0.000	0.000	0.000
29	0.000	0.000	0.000	0.000
30	0.000	0.000	0.000	0.000
31	0.000	0.000	0.000	0.000
32	0.000	0.000	0.000	0.000
33	0.000	0.000	0.000	0.000
34	0.000	0.000	0.000	0.000
35	0.000	0.000	0.000	0.000
36	0.000	0.000	0.000	0.000
37	0.000	0.000	0.000	0.000
38	0.000	0.000	0.000	0.000
39	0.000	0.000	0.000	0.000
40	0.000	0.000	0.000	0.000

Total Release Tributary to Carling Avenue Sewer	
Minute	Out Flow (m ³ /s)
0	0.000
1	0.005
2	0.010
3	0.015
4	0.020
5	0.025
6	0.030
7	0.035
8	0.040
9	0.045
10	0.051
11	0.056
12	0.040
13	0.035
14	0.030
15	0.025
16	0.020
17	0.015
18	0.010
19	0.005
20	0.000
21	0.000
22	0.000
23	0.000
24	0.000
25	0.000
26	0.000
27	0.000
28	0.000
29	0.000
30	0.000
31	0.000
32	0.000
33	0.000
34	0.000
35	0.000
36	0.000
37	0.000
38	0.000
39	0.000
40	0.000

Hydrograph Data (Controlled Parkland)				
Minute	In flow (m ³ /s)	Out flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.000	0.000
1	0.001	0.000	0.002	0.002
2	0.002	0.000	0.003	0.004
3	0.003	0.001	0.124	0.269
4	0.003	0.001	0.149	0.418
5	0.004	0.002	0.169	0.586
6	0.005	0.002	0.184	0.770
7	0.006	0.003	0.196	0.966
8	0.007	0.004	0.205	1.171
9	0.008	0.004	0.215	1.386
10	0.009	0.005	0.241	1.627
11	0.008	0.005	0.160	1.787
12	0.007	0.005	0.088	1.875
13	0.006	0.006	0.025	1.900
14	0.005	0.006	-0.090	1.810
15	0.004	0.006	-0.078	1.733
16	0.003	0.005	-0.120	1.613
17	0.003	0.005	-0.157	1.455
18	0.002	0.005	-0.190	1.265
19	0.001	0.005	-0.219	1.046
20	0.000	0.004	-0.241	0.805
21	0.000	0.003	-0.188	0.617
22	0.000	0.002	-0.147	0.510
23	0.000	0.002	-0.115	0.414
24	0.000	0.002	-0.090	0.324
25	0.000	0.001	-0.071	0.254
26	0.000	0.001	-0.055	0.198
27	0.000	0.001	-0.043	0.155
28	0.000	0.001	-0.034	0.121
29	0.000	0.000	-0.026	0.095
30	0.000	0.000	-0.021	0.074
31	0.000	0.000	-0.016	0.058
32	0.000	0.000	-0.013	0.046
33	0.000	0.000	-0.010	0.036
34	0.000	0.000	-0.008	0.028
35	0.000	0.000	-0.006	0.022
36	0.000	0.000	-0.005	0.017
37	0.000	0.000	-0.004	0.013
38	0.000	0.000	-0.003	0.010
39	0.000	0.000	-0.002	0.008
40	0.000	0.000	-0.002	0.006

25-YEAR RELEASE RATES AND HYDROGRAPHS

Site Statistics			
Controlled Roof Area (P-1)		Controlled Parkland (P-9)	
Total Site Area (ha)	0.13	Total Site Area (ha)	0.09
Runoff Coefficient, C	0.90	Runoff Coefficient, C	0.30
Storm Duration (mins)	20	Storm Duration (mins)	20
25-Year Release Rate (m ³ /s)	0.053	25-Year Release Rate (m ³ /s)	0.011
Controlled Area (P-2 to P-8)		Uncontrolled Existing Development (P-10)	
Total Site Area (ha)	0.44	Total Site Area (ha)	0.21
Runoff Coefficient, C	0.67	Runoff Coefficient, C	0.72
Storm Duration (mins)	20	Storm Duration (mins)	20
25-Year Release Rate (m ³ /s)	0.131	25-Year Release Rate (m ³ /s)	0.086

Roof Rating Curve Data Points			
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)	
0.00	0.000	0.00	
0.03	0.003	13.30	
0.06	0.006	26.60	
0.09	0.009	39.90	
0.12	0.012	53.20	
0.15	0.015	66.50	

Pump Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
70.45	0.000	0.00
70.90	0.000	1.25
70.95	0.039	2.50
71.20	0.039	8.75
71.25	0.084	10.00
72.70	0.084	46.25
73.05	0.084	55.00

Parkland Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
72.84	0.000	0.00
72.89	0.001	0.38
72.99	0.004	1.14
73.09	0.006	1.90
73.24	0.007	3.04
73.39	0.009	4.18
73.49	0.010	4.94

Formulas	
$Q_p = Q_{in}/(1/2)^{1/2}$	
Q_{in} = Computer Generated using rating curve data points	
$Storage (m^3)$ = Cumulative storage + no Storage	
$A Storage (m^3) = (Q_p - Q_{in}) \cdot (T_p - t_p) \cdot 60$	
Where:	
Q_p = Flow rate tributary to the system at a given time (m ³ /s)	
Q_{in} = Flow rate out of the system at a given time (m ³ /s)	
T_p = Storm Duration (mins)	
t_p = Time (mins)	

Hydrograph Data (Controlled Roof Area)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.000	0.000	0.00	0.00
2	0.011	0.000	0.63	0.63
3	0.036	0.000	0.94	1.89
4	0.021	0.000	1.24	3.13
5	0.026	0.001	1.54	4.68
6	0.032	0.001	1.84	6.51
7	0.037	0.002	2.13	8.65
8	0.042	0.002	2.42	11.07
9	0.048	0.003	2.70	13.77
10	0.054	0.003	2.96	16.75
11	0.048	0.004	2.62	19.37
12	0.042	0.005	2.27	21.64
13	0.037	0.005	1.92	23.56
14	0.032	0.005	1.58	25.14
15	0.026	0.006	1.24	26.38
16	0.021	0.006	0.90	27.28
17	0.016	0.006	0.57	27.85
18	0.011	0.006	0.25	28.09
19	0.005	0.007	-0.08	28.03
20	0.000	0.007	-0.19	27.83
21	0.000	0.006	-0.19	27.64
22	0.000	0.006	-0.18	26.86
23	0.000	0.006	-0.18	26.48
24	0.000	0.006	-0.17	26.11
25	0.000	0.006	-0.17	25.75
26	0.000	0.006	-0.16	25.38
27	0.000	0.006	-0.16	25.03
28	0.000	0.006	-0.15	24.58
29	0.000	0.006	-0.15	24.24
30	0.000	0.006	-0.14	24.00
31	0.000	0.006	-0.14	23.66
32	0.000	0.006	-0.13	23.33
33	0.000	0.005	-0.13	23.00
34	0.000	0.005	-0.12	22.68
35	0.000	0.005	-0.12	22.37
36	0.000	0.005	-0.11	22.05
37	0.000	0.005	-0.11	21.74
38	0.000	0.005	-0.10	21.44
39	0.000	0.005	-0.10	21.14
40	0.000	0.005	-0.10	20.84

Hydrograph Data (Pumped Underground Chamber)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.0000	0.00	0.00
1	0.011	0.0000	0.78	0.78
2	0.026	0.0000	1.17	2.95
3	0.039	0.0345	0.29	2.65
4	0.053	0.0390	0.82	3.47
5	0.066	0.0390	1.63	5.10
6	0.080	0.0390	2.43	7.53
7	0.089	0.0390	3.24	10.77
8	0.107	0.0400	3.35	14.13
9	0.120	0.0400	2.17	16.30
10	0.124	0.0400	3.00	17.29
11	0.122	0.0400	2.75	19.55
12	0.109	0.0400	1.50	21.05
13	0.097	0.0400	0.75	21.80
14	0.084	0.0400	0.00	21.80
15	0.071	0.0400	-0.77	21.03
16	0.058	0.0400	-1.53	19.50
17	0.046	0.0400	-2.31	17.19
18	0.033	0.0400	-3.08	14.11
19	0.020	0.0400	-3.86	10.25
20	0.007	0.0400	-4.63	5.60
21	0.006	0.0390	-1.95	3.64
22	0.006	0.0390	-1.96	1.69
23	0.006	0.0390	-1.44	0.25
24	0.006	0.0000	0.37	1.62
25	0.006	0.0114	-0.32	1.30
26	0.006	0.0024	-0.37	0.93
27	0.006	0.0100	-0.24	0.69
28	0.006	0.0024	-0.21	0.48
29	0.006	0.0009	-0.19	0.29
30	0.006	0.0003	-0.16	0.13
31	0.006	0.0000	-0.14	0.00
32	0.006	0.0003	-0.12	-0.08
33	0.005	0.0027	-0.13	-0.21
34	0.005	0.0039	-0.09	-0.36
35	0.005	0.0067	-0.08	-0.48
36	0.005	0.0041	-0.07	-0.55
37	0.005	0.0062	-0.06	-0.59
38	0.005	0.0042	-0.05	-0.64
39	0.005	0.0058	-0.05	-0.69
40	0.005	0.0043	-0.04	-0.73

Hydrograph Data (Uncontrolled Existing Development)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.007	0.007	0.00	0.00
2	0.013	0.013	0.00	0.00
3	0.020	0.020	0.00	0.00
4	0.026	0.026	0.00	0.00
5	0.033	0.033	0.00	0.00
6	0.039	0.039	0.00	0.00
7	0.046	0.046	0.00	0.00
8	0.053	0.053	0.00	0.00
9	0.059	0.059	0.00	0.00
10	0.066	0.066	0.00	0.00
11	0.059	0.059	0.00	0.00
12	0.053	0.053	0.00	0.00
13	0.046	0.046	0.00	0.00
14	0.039	0.039	0.00	0.00
15	0.033	0.033	0.00	0.00
16	0.026	0.026	0.00	0.00
17	0.020	0.020	0.00	0.00
18	0.013	0.013	0.00	0.00
19	0.007	0.007	0.00	0.00
20	0.000	0.000	0.00	0.00
21	0.000	0.000	0.00	0.00
22	0.000	0.000	0.00	0.00
23	0.000	0.000	0.00	0.00
24	0.000	0.000	0.00	0.00
25	0.000	0.000	0.00	0.00
26	0.000	0.000	0.00	0.00
27	0.000	0.000	0.00	0.00
28	0.000	0.000	0.00	0.00
29	0.000	0.000	0.00	0.00
30	0.000	0.000	0.00	0.00
31	0.000	0.000	0.00	0.00
32	0.000	0.000	0.00	0.00
33	0.000	0.000	0.00	0.00
34	0.000	0.000	0.00	0.00
35	0.000	0.000	0.00	0.00
36	0.000	0.000	0.00	0.00
37	0.000	0.000	0.00	0.00
38	0.000	0.000	0.00	0.00
39	0.000	0.000	0.00	0.00
40	0.000	0.000	0.00	0.00

Total Release Tributary to Carling Avenue Sewer	
Minute	Out Flow (m ³ /s)
0	0.000
1	0.007
2	0.013
3	0.020
4	0.026
5	0.033
6	0.039
7	0.046
8	0.053
9	0.059
10	0.066
11	0.059
12	0.053
13	0.046
14	0.039
15	0.033
16	0.026
17	0.020
18	0.013
19	0.007
20	0.000
21	0.000
22	0.000
23	0.000
24	0.000
25	0.000
26	0.000
27	0.000
28	0.000
29	0.000
30	0.000
31	0.000
32	0.000
33	0.000
34	0.000
35	0.000
36	0.000
37	0.000
38	0.000
39	0.000
40	0.000

Hydrograph Data (Controlled Parkland)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.001	0.000	0.08	0.08
2	0.002	0.000	0.121	0.188
3	0.003	0.001	0.162	0.350
4	0.005	0.001	0.194	0.545
5	0.006	0.002	0.220	0.764
6	0.007	0.003	0.240	1.004
7	0.008	0.004	0.255	1.259
8	0.009	0.004	0.279	1.537
9	0.010	0.005	0.312	1.849
10	0.011	0.006	0.342	2.191
11	0.010	0.006	0.241	2.432
12	0.009	0.006	0.151	2.584
13	0.008	0.007	0.070	2.654
14	0.007	0.007	-0.004	2.650
15	0.006	0.007	-0.071	2.578
16	0.005	0.007	-0.132	2.446
17	0.003	0.007	-0.188	2.258
18	0.002	0.006	-0.238	2.019
19	0.001	0.006	-0.284	1.735
20	0.000	0.006	-0.251	1.484
21	0.000	0.005	-0.282	1.133
22	0.000	0.004	-0.246	0.886
23	0.000	0.003	-0.189	0.697
24	0.000	0.003	-0.151	0.542
25	0.000	0.002	-0.118	0.424
26	0.000	0.002	-0.093	0.331
27	0.000	0.001	-0.072	0.260
28	0.000	0.001	-0.057	0.203
29	0.000	0.001	-0.044	0.159
30	0.000	0.001	-0.035	0.124
31	0.000	0.000	-0.027	0.097
32	0.000	0.000	-0.021	0.076
33	0.000	0.000	-0.017	0.060
34	0.000	0.000	-0.013	0.047
35	0.000	0.000	-0.010	0.036
36	0.000	0.000	-0.008	0.028
37	0.000	0.000	-0.006	0.022
38	0.000	0.000	-0.005	0.017
39	0.000	0.000	-0.004	0.014
40	0.000	0.000	-0.003	0.011

50-YEAR RELEASE RATES AND HYDROGRAPHS

Site Statistics			
Controlled Roof Area (P-1)		Controlled Parkland (P-9)	
Total Site Area (ha)	0.13	Total Site Area (ha)	0.09
Runoff Coefficient, C	0.80	Runoff Coefficient, C	0.30
Storm Duration (mins)	20	Storm Duration (mins)	20
50-Year Release Rate (m ³ /s)	0.064	50-Year Release Rate (m ³ /s)	0.014
Uncontrolled Area (P-2 to P-8)		Uncontrolled Existing Development (P-10)	
Total Site Area (ha)	0.44	Total Site Area (ha)	0.21
Runoff Coefficient, C	0.67	Runoff Coefficient, C	0.72
Storm Duration (mins)	20	Storm Duration (mins)	20
50-Year Release Rate (m ³ /s)	0.159	50-Year Release Rate (m ³ /s)	0.080

Roof Rating Curve Data Points			
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)	
0.00	0.000	0.00	
0.03	0.003	13.30	
0.06	0.006	26.60	
0.09	0.009	39.90	
0.12	0.012	53.20	
0.15	0.015	66.50	

Pump Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
70.45	0.000	0.00
70.90	0.000	1.25
70.95	0.039	2.50
71.20	0.039	8.75
71.25	0.084	10.00
72.70	0.084	46.25
73.05	0.084	55.00

Parkland Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
72.84	0.000	0.00
72.89	0.001	0.38
72.99	0.004	1.14
0.033	0.033	0.000
73.24	0.007	3.04
73.39	0.009	4.18
73.49	0.010	4.94

Formulas	
$Q_{in} = Q_{in}/12/24$	
$Q_{out} = \text{Computer Generated using rating curve data points}$	
$\text{Storage (m}^3\text{)} = \text{Cumulative storage} - \text{in Storage}$	
$A \text{ Storage (m}^3\text{)} = (Q_{in} - Q_{out}) \cdot t_{in} \cdot 60$	
Where:	
Q_{in} = Flow rate tributary to the system at a given time (m ³ /s)	
Q_{out} = Flow rate out of the system at a given time (m ³ /s)	
t_{in} = Storm Duration (min)	
T = Time (min)	

Hydrograph Data (Controlled Roof Area)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.006	0.000	0.39	0.39
2	0.013	0.000	0.77	1.15
3	0.019	0.000	1.14	2.30
4	0.026	0.001	1.51	3.81
5	0.032	0.001	1.88	5.69
6	0.039	0.001	2.24	7.93
7	0.045	0.002	2.60	10.53
8	0.052	0.002	2.95	13.47
9	0.058	0.003	3.29	16.76
10	0.064	0.004	3.65	20.39
11	0.058	0.005	3.19	23.59
12	0.052	0.005	2.76	26.35
13	0.045	0.006	2.34	28.69
14	0.039	0.007	1.92	30.61
15	0.032	0.007	1.50	32.11
16	0.026	0.007	1.10	33.21
17	0.021	0.008	0.70	33.90
18	0.013	0.008	0.30	34.20
19	0.006	0.008	-0.09	34.11
20	0.000	0.008	-0.48	33.63
21	0.000	0.008	-0.47	33.16
22	0.000	0.008	-0.46	32.70
23	0.000	0.008	-0.46	32.24
24	0.000	0.008	-0.45	31.79
25	0.000	0.007	-0.44	31.35
26	0.000	0.007	-0.44	30.91
27	0.000	0.007	-0.43	30.48
28	0.000	0.007	-0.43	30.05
29	0.000	0.007	-0.43	29.63
30	0.000	0.007	-0.41	29.21
31	0.000	0.007	-0.41	28.81
32	0.000	0.007	-0.40	28.40
33	0.000	0.007	-0.40	28.01
34	0.000	0.007	-0.39	27.61
35	0.000	0.006	-0.39	27.23
36	0.000	0.006	-0.38	26.85
37	0.000	0.006	-0.38	26.47
38	0.000	0.006	-0.37	26.10
39	0.000	0.006	-0.37	25.74
40	0.000	0.006	-0.36	25.38

Hydrograph Data (Pumped Underground Chamber)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.0000	0.00	0.00
1	0.016	0.0000	1.95	1.95
2	0.032	0.0000	3.91	5.87
3	0.048	0.0390	0.54	1.41
4	0.064	0.0390	1.51	4.92
5	0.080	0.0390	2.49	7.41
6	0.097	0.0390	3.47	10.88
7	0.113	0.0400	1.75	12.63
8	0.130	0.0400	2.75	15.38
9	0.146	0.0400	3.74	19.12
10	0.163	0.0400	4.74	23.86
11	0.148	0.0400	3.94	27.79
12	0.133	0.0400	2.93	30.62
13	0.118	0.0400	2.01	32.64
14	0.102	0.0400	1.09	33.73
15	0.087	0.0400	0.16	33.89
16	0.071	0.0400	-0.77	33.12
17	0.055	0.0400	-1.73	31.40
18	0.040	0.0400	-2.66	28.75
19	0.024	0.0400	-3.61	25.14
20	0.008	0.0400	-4.58	20.56
21	0.008	0.0400	-4.57	16.01
22	0.008	0.0400	-4.58	11.43
23	0.008	0.0400	-4.58	6.85
24	0.008	0.0390	-1.89	4.96
25	0.007	0.0390	-1.90	3.06
26	0.007	0.0390	-1.90	1.16
27	0.007	0.0000	-1.43	1.60
28	0.007	0.0108	-0.22	1.38
29	0.007	0.0099	-0.59	1.56
30	0.007	0.0097	-0.17	1.39
31	0.007	0.0045	0.14	1.53
32	0.007	0.0089	0.13	1.41
33	0.007	0.0048	0.11	1.51
34	0.007	0.0082	0.10	1.41
35	0.006	0.0051	0.08	1.49
36	0.006	0.0076	0.08	1.42
37	0.006	0.0053	0.06	1.48
38	0.006	0.0071	0.06	1.42
39	0.006	0.0053	0.05	1.47
40	0.006	0.0067	0.04	1.42

Hydrograph Data (Uncontrolled Existing Development)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.000	0.000
1	0.008	0.008	0.000	0.000
2	0.016	0.016	0.000	0.000
3	0.024	0.024	0.000	0.000
4	0.032	0.032	0.000	0.000
5	0.040	0.040	0.000	0.000
6	0.048	0.048	0.000	0.000
7	0.056	0.056	0.000	0.000
8	0.064	0.064	0.000	0.000
9	0.072	0.072	0.000	0.000
10	0.080	0.080	0.000	0.000
11	0.072	0.072	0.000	0.000
12	0.064	0.064	0.000	0.000
13	0.056	0.056	0.000	0.000
14	0.048	0.048	0.000	0.000
15	0.040	0.040	0.000	0.000
16	0.032	0.032	0.000	0.000
17	0.024	0.024	0.000	0.000
18	0.016	0.016	0.000	0.000
19	0.008	0.008	0.000	0.000
20	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000
26	0.000	0.000	0.000	0.000
27	0.000	0.000	0.000	0.000
28	0.000	0.000	0.000	0.000
29	0.000	0.000	0.000	0.000
30	0.000	0.000	0.000	0.000
31	0.000	0.000	0.000	0.000
32	0.000	0.000	0.000	0.000
33	0.000	0.000	0.000	0.000
34	0.000	0.000	0.000	0.000
35	0.000	0.000	0.000	0.000
36	0.000	0.000	0.000	0.000
37	0.000	0.000	0.000	0.000
38	0.000	0.000	0.000	0.000
39	0.000	0.000	0.000	0.000
40	0.000	0.000	0.000	0.000

Total Release Tributary to Carling Avenue Sewer	
Minute	Out Flow (m ³ /s)
0	0.000
1	0.008
2	0.016
3	0.024
4	0.032
5	0.040
6	0.048
7	0.056
8	0.064
9	0.072
10	0.080
11	0.072
12	0.064
13	0.056
14	0.048
15	0.040
16	0.032
17	0.024
18	0.016
19	0.008
20	0.000
21	0.000
22	0.000
23	0.000
24	0.000
25	0.000
26	0.000
27	0.000
28	0.000
29	0.000
30	0.000
31	0.000
32	0.000
33	0.000
34	0.000
35	0.000
36	0.000
37	0.000
38	0.000
39	0.000
40	0.000

Hydrograph Data (Controlled Parkland)				
Minute	In Flow (m³/s)	Out Flow (m³/s)	Delta Storage (m³)	Cumulative Storage (m³)
0	0.000	0.000	0.000	0.000
1	0.001	0.000	0.002	0.002
2	0.003	0.000	0.147	0.149
3	0.004	0.001	0.197	0.446
4	0.005	0.002	0.237	0.683
5	0.007	0.002	0.267	0.950
6	0.008	0.003	0.292	1.242
7	0.010	0.004	0.318	1.560
8	0.011	0.005	0.362	1.922
9	0.012	0.006	0.400	2.322
10	0.014	0.006	0.446	2.768
11	0.012	0.007	0.323	3.090
12	0.011	0.007	0.211	3.301
13	0.010	0.008	0.113	3.414
14	0.008	0.008	0.023	3.437
15	0.007	0.008	-0.061	3.376
16	0.005	0.008	-0.139	3.237
17	0.004	0.008	-0.211	3.025
18	0.003	0.007	-0.277	2.748
19	0.001	0.007	-0.334	2.413
20	0.000	0.006	-0.386	2.027
21	0.000	0.006	-0.351	1.676
22	0.000	0.005	-0.311	1.365
23	0.000	0.005	-0.273	1.092
24	0.000	0.004	-0.233	0.859
25	0.000	0.003	-0.183	0.676
26	0.000	0.002	-0.143	0.533
27	0.000	0.002	-0.112	0.421
28	0.000	0.001	-0.087	0.334
29	0.000	0.001	-0.068	0.266
30	0.000	0.001	-0.054	0.212
31	0.000	0.001	-0.042	0.170
32	0.000	0.001	-0.033	0.137
33	0.000	0.000	-0.026	0.111
34	0.000	0.000	-0.020	0.091
35	0.000	0.000	-0.016	0.075
36	0.000	0.000	-0.012	0.063
37	0.000	0.000	-0.010	0.053
38	0.000	0.000	-0.008	0.045
39	0.000	0.000	-0.006	0.039
40	0.000	0.000	-0.005	0.034

100-YEAR RELEASE RATES AND HYDROGRAPHS

Site Statistics			
Controlled Roof Area (P-1)		Controlled Parkland (P-9)	
Total Site Area (ha)	0.13	Total Site Area (ha)	0.09
Runoff Coefficient, C	0.90	Runoff Coefficient, C	0.30
Storm Duration (mins)	20	Storm Duration (mins)	20
100-Year Release Rate (m ³ /s)	0.074	100-Year Release Rate (m ³ /s)	0.016
Controlled Area (P-2 to P-8)		Uncontrolled Existing Development (P-10)	
Total Site Area (ha)	0.44	Total Site Area (ha)	0.21
Runoff Coefficient, C	0.67	Runoff Coefficient, C	0.72
Storm Duration (mins)	20	Storm Duration (mins)	20
100-Year Release Rate (m ³ /s)	0.183	100-Year Release Rate (m ³ /s)	0.092

Roof Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
0.00	0.000	0.00
0.03	0.003	13.30
0.06	0.006	26.60
0.09	0.009	39.90
0.12	0.012	53.20
0.15	0.015	66.50

Pump Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
70.45	0.000	0.00
70.90	0.000	1.25
70.95	0.039	2.50
71.20	0.039	8.75
71.25	0.084	10.00
72.70	0.084	46.25
73.05	0.084	55.00

Parkland Rating Curve Data Points		
Elevation (m)	Outflow (m ³ /s)	Storage (m ³)
72.84	0.000	0.00
72.89	0.001	0.38
72.99	0.004	1.14
73.09	0.006	1.90
73.24	0.007	3.04
73.39	0.009	4.18
73.49	0.010	4.94

Formulas	
$Q_{in} = Q_{in}/(1/2)^{1/2}$	
$Q_{out} = \text{Computer Generated using rating curve data points}$	
$\text{Storage (m}^3\text{)} = \text{Cumulative storage} - \text{in Storage}$	
$\text{A Storage (m}^3\text{)} = (Q_{in} - Q_{out}) \cdot t - \text{in Storage}$	
Where:	
Q_{in} = Flow rate tributary to the system at a given time (m ³ /s)	
Q_{out} = Flow rate out of the system at a given time (m ³ /s)	
t = Storm Duration (min)	
T = Time (min)	

Hydrograph Data (Controlled Roof Area)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.007	0.000	0.45	0.45
2	0.015	0.000	0.88	1.33
3	0.022	0.000	1.32	2.65
4	0.030	0.001	1.74	4.39
5	0.037	0.001	2.17	6.56
6	0.045	0.002	2.58	9.14
7	0.052	0.002	2.99	12.13
8	0.059	0.003	3.39	15.52
9	0.067	0.004	3.79	19.31
10	0.074	0.005	4.18	23.49
11	0.087	0.006	3.68	27.17
12	0.059	0.006	3.18	30.35
13	0.052	0.007	2.69	33.04
14	0.045	0.008	2.21	35.25
15	0.037	0.008	1.73	36.99
16	0.030	0.009	1.26	38.25
17	0.022	0.009	0.80	39.05
18	0.015	0.009	0.34	39.40
19	0.007	0.009	-0.11	39.29
20	0.000	0.009	-0.15	39.14
21	0.000	0.009	-0.14	38.99
22	0.000	0.009	-0.13	38.87
23	0.000	0.009	-0.13	38.74
24	0.000	0.009	-0.12	38.62
25	0.000	0.009	-0.11	38.51
26	0.000	0.008	-0.10	38.40
27	0.000	0.008	-0.10	38.30
28	0.000	0.008	-0.09	38.21
29	0.000	0.008	-0.08	38.13
30	0.000	0.008	-0.08	38.05
31	0.000	0.008	-0.07	37.98
32	0.000	0.008	-0.06	37.92
33	0.000	0.008	-0.06	37.86
34	0.000	0.008	-0.05	37.81
35	0.000	0.007	-0.04	37.76
36	0.000	0.007	-0.04	37.71
37	0.000	0.007	-0.03	37.66
38	0.000	0.007	-0.03	37.62
39	0.000	0.007	-0.02	37.59
40	0.000	0.007	-0.01	37.57

Max Storage

Hydrograph Data (Pumped Underground Chamber)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.0000	0.00	0.00
1	0.018	0.0000	1.09	1.09
2	0.037	0.0000	2.21	3.31
3	0.055	0.0000	0.88	4.28
4	0.074	0.0000	2.09	6.38
5	0.093	0.0000	3.22	9.60
6	0.112	0.0000	2.55	12.11
7	0.130	0.0000	2.79	14.90
8	0.149	0.0000	3.93	18.83
9	0.169	0.0000	5.07	23.90
10	0.188	0.0000	6.20	30.10
11	0.170	0.0000	5.19	35.29
12	0.153	0.0000	4.14	39.46
13	0.135	0.0000	3.08	42.54
14	0.118	0.0000	2.02	44.56
15	0.100	0.0000	0.95	45.51
16	0.082	0.0000	-0.12	45.39
17	0.064	0.0000	-1.21	44.18
18	0.046	0.0000	-2.29	41.89
19	0.028	0.0000	-3.39	38.50
20	0.009	0.0000	-4.49	34.01
21	0.009	0.0000	-4.50	29.51
22	0.009	0.0000	-4.51	25.00
23	0.009	0.0000	-4.51	20.49
24	0.009	0.0000	-4.52	15.97
25	0.009	0.0000	-4.53	11.44
26	0.008	0.0000	-4.54	6.91
27	0.008	0.0000	-4.54	2.37
28	0.008	0.0000	-1.85	3.22
29	0.008	0.0000	1.56	1.36
30	0.008	0.0004	0.27	1.63
31	0.008	0.0010	0.24	1.39
32	0.008	0.0004	0.21	1.09
33	0.008	0.0007	0.19	1.41
34	0.008	0.0009	0.16	1.56
35	0.007	0.0009	0.14	1.42
36	0.007	0.0004	0.12	1.14
37	0.007	0.0000	-0.11	1.43
38	0.007	0.0004	0.09	1.52
39	0.007	0.0004	0.08	1.44
40	0.007	0.0004	0.07	1.50

Max Storage

Hydrograph Data (Uncontrolled Existing Development)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.009	0.000	0.00	0.00
2	0.018	0.000	0.00	0.00
3	0.028	0.000	0.00	0.00
4	0.037	0.000	0.00	0.00
5	0.046	0.000	0.00	0.00
6	0.055	0.000	0.00	0.00
7	0.065	0.000	0.00	0.00
8	0.074	0.000	0.00	0.00
9	0.083	0.000	0.00	0.00
10	0.092	0.000	0.00	0.00
11	0.083	0.001	0.00	0.00
12	0.074	0.000	0.00	0.00
13	0.065	0.000	0.00	0.00
14	0.055	0.000	0.00	0.00
15	0.046	0.000	0.00	0.00
16	0.037	0.000	0.00	0.00
17	0.028	0.000	0.00	0.00
18	0.018	0.000	0.00	0.00
19	0.009	0.000	0.00	0.00
20	0.000	0.000	0.00	0.00
21	0.000	0.000	0.00	0.00
22	0.000	0.000	0.00	0.00
23	0.000	0.000	0.00	0.00
24	0.000	0.000	0.00	0.00
25	0.000	0.000	0.00	0.00
26	0.000	0.000	0.00	0.00
27	0.000	0.000	0.00	0.00
28	0.000	0.000	0.00	0.00
29	0.000	0.000	0.00	0.00
30	0.000	0.000	0.00	0.00
31	0.000	0.000	0.00	0.00
32	0.000	0.000	0.00	0.00
33	0.000	0.000	0.00	0.00
34	0.000	0.000	0.00	0.00
35	0.000	0.000	0.00	0.00
36	0.000	0.000	0.00	0.00
37	0.000	0.000	0.00	0.00
38	0.000	0.000	0.00	0.00
39	0.000	0.000	0.00	0.00
40	0.000	0.000	0.00	0.00

Total Release Tributary to Carling Avenue Sewer	
Minute	Out Flow (m ³ /s)
0	0.000
1	0.009
2	0.018
3	0.027
4	0.036
5	0.045
6	0.054
7	0.063
8	0.072
9	0.081
10	0.090
11	0.081
12	0.072
13	0.063
14	0.054
15	0.045
16	0.036
17	0.027
18	0.018
19	0.009
20	0.000
21	0.000
22	0.000
23	0.000
24	0.000
25	0.000
26	0.000
27	0.000
28	0.000
29	0.000
30	0.000
31	0.000
32	0.000
33	0.000
34	0.000
35	0.000
36	0.000
37	0.000
38	0.000
39	0.000
40	0.000

Max Release

Hydrograph Data (Controlled Parkland)				
Minute	In Flow (m ³ /s)	Out Flow (m ³ /s)	Delta Storage (m ³)	Cumulative Storage (m ³)
0	0.000	0.000	0.00	0.00
1	0.002	0.000	0.00	0.00
2	0.003	0.000	0.169	0.169
3	0.005	0.001	0.227	0.491
4	0.006	0.002	0.273	0.764
5	0.008	0.003	0.308	1.072
6	0.009	0.004	0.336	1.408
7	0.011	0.005	0.363	1.771
8	0.013	0.005	0.483	2.222
9	0.014	0.006	0.483	2.705
10	0.016	0.007	0.514	3.219
11	0.014	0.008	0.394	3.613
12	0.013	0.008	0.270	3.883
13	0.011	0.008	0.155	4.038
14	0.009	0.009	0.049	4.106
15	0.008	0.009	-0.050	4.056
16	0.006	0.009	-0.141	3.915
17	0.005	0.009	-0.225	3.690
18	0.003	0.008	-0.304	3.386
19	0.002	0.008	-0.378	3.009
20	0.000	0.007	-0.443	2.566
21	0.000	0.007	-0.402	2.164
22	0.000	0.006	-0.365	1.800
23	0.000	0.006	-0.239	1.471
24	0.000	0.005	-0.289	1.183
25	0.000	0.004	-0.253	0.930
26	0.000	0.003	-0.203	0.727
27	0.000	0.003	-0.158	0.569
28	0.000	0.002	-0.124	0.445
29	0.000	0.002	-0.087	0.348
30	0.000	0.001	-0.076	0.272
31	0.000	0.001	-0.059	0.213
32	0.000	0.001	-0.046	0.167
33	0.000	0.001	-0.036	0.130
34	0.000	0.000	-0.028	0.102
35	0.000	0.000	-0.022	0.080
36				0.062
37	0.000	0.000	-0.014	0.049
38	0.000	0.000	-0.011	0.038
39	0.000	0.000	-0.008	0.030
40	0.000	0.000	-0.007	0.023

APPENDIX B – Drawings & Figures

**PART OF BLOCK 8 AND
PART OF LOT 23 AND
LOTS 26 AND 27
REGISTERED PLAN 221
CITY OF OTTAWA**

Surveyed by Annis, O'Sullivan, Vollebakk Ltd.

Scale 1:200

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

Surveyor's Certificate

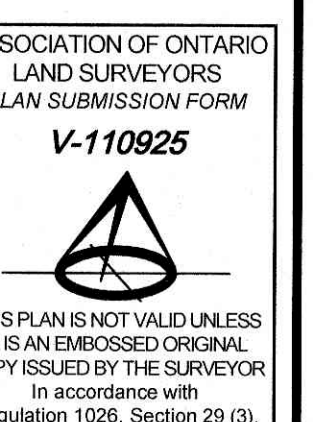
- I CERTIFY THAT:
1. This survey and plan are correct and in accordance with the Surveys Act, the Surveyors Act and the regulations made under them.
 2. The survey was completed on the 4th day of August, 2025.

August 15, 2025

Date

Mimi Aradus

Ontario Land Surveyor



Notes & Legend

- Denotes Survey Monument Planted
- Survey Monument Found
- SIB Standard Iron Bar
- SSIB Short Standard Iron Bar
- IB Iron Bar
- CP Concrete Pin
- CC Cut Cross
- WIT Witness
- Mess. Measured
- (AOG) Anis, O'Sullivan, Vollebakk Ltd.
- (P1) Registered Plan 221
- (P2) (AOG) Plan dated May 16, 2025
- (P3) Plan 4R-27050
- (P4) (AOG) Plan dated September 7, 2012
- (P5) (725) Plan dated January 30, 1991
- (P6) (857) Plan dated February 25, 1985
- (P7) (JDB) plan dated November 11, 2022
- (DI) Inst. CR677427
- (ID2) Inst. NBS5803
- CLF Chain Link Fence
- BF Board Fence
- PWF Post and Wire Fence
- RWS Stone Retaining Wall
- RWT Timber Retaining Wall
- CL Centreline
- T/G Top of Grade
- CB Catch Basin
- CB Catch Basin Inlet
- OHMT Overhead Manhole (Storm Sewer)
- OHMS Overhead Manhole (Sanitary)
- OHMT Overhead Manhole (Traffic)
- OHMT Overhead Manhole (Hydro)
- OHMT Overhead Manhole (Underside)
- OHMT Handhole
- FI Fire Hydrant
- WV Water Valve
- WP Water Stand Post
- TL Traffic Light
- UP Utility Pole
- AN Anchor
- LS Light Standard
- OW Overhead Wires
- P Underground Power
- GM Gas Meter
- HM Hydro Meter
- AC Air Conditioner
- MB Mail Box
- G Gate
- D Drain
- B Bollard
- S Sign
- MP Metal Post
- DT Deciduous Tree
- CT Coniferous Tree
- D Diameter
- E Location of Elevations
- E Location of Top of Curb Elevations
- E Location of Top of Wall Elevations

Bearings are grid, derived from Can-Nat 2016 Real Time Network GPS observations and are referenced to Specified Control Points 0191600005 and 0191600105, MTM Zone 9 (78°30' West Longitude) NAD-83 (original).

For comparison purposes, a rotation of 0°32'45" counter-clockwise was applied to bearings on plans (P4) and (P5), a rotation of 0°32'40" counter-clockwise was applied to bearings on plan (P6).

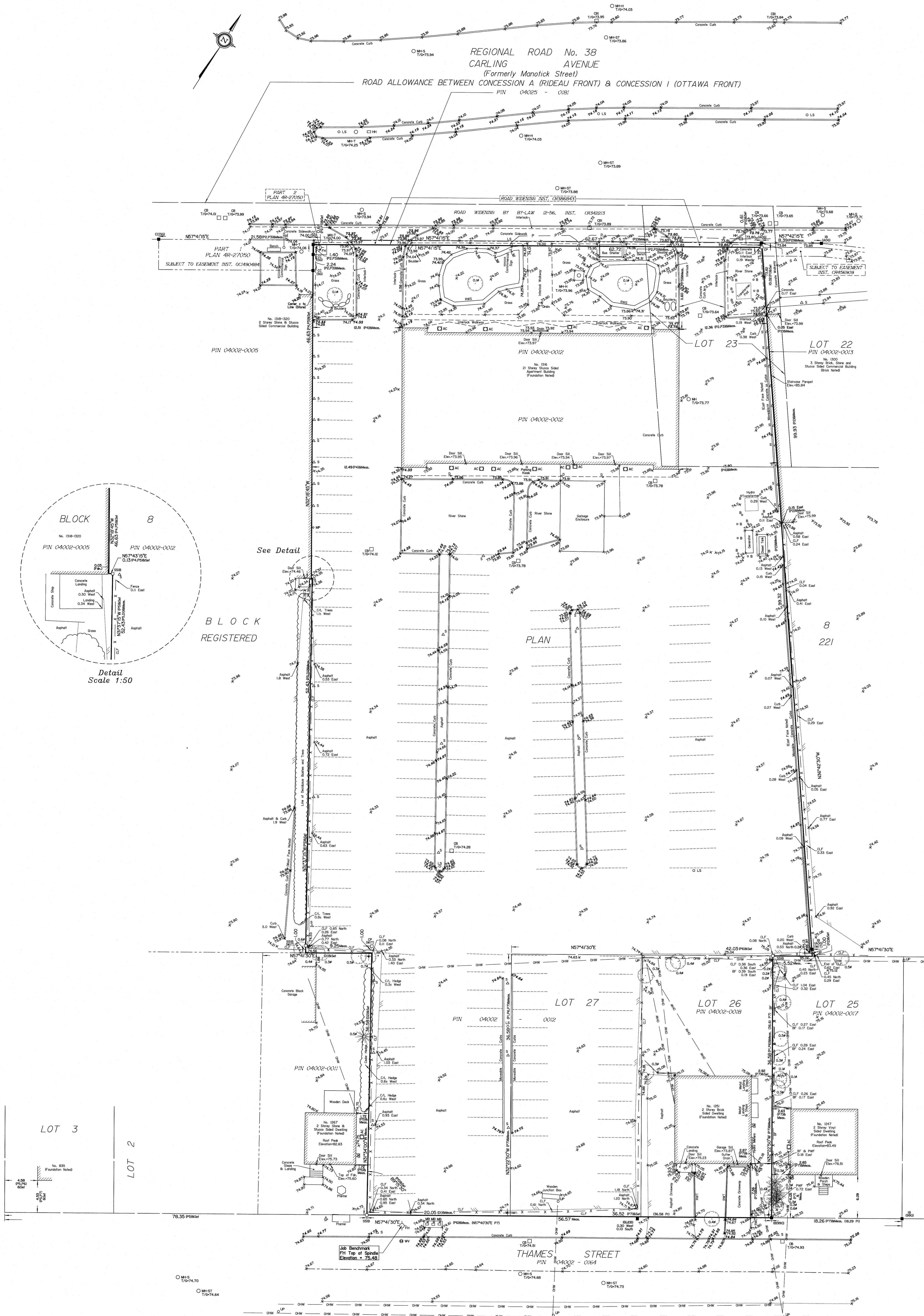
ELEVATION NOTES

1. Elevations shown are geodetic, derived from City of Ottawa Vertical Control Monument No. N-29 (index No. 86), having a published elevation of 77.347 metres, and are referred to the CGVD25 geodetic datum.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that its relative elevation and description agrees with the information shown on this drawing.

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating, etc.

ARCHIBALD STREET



UNIT MIX	
Area	Count
1 BEDROOM	
610 ft²	6
630 ft²	3
640 ft²	10
700 ft²	1
710 ft²	25
730 ft²	1
46	
1 BEDROOM + DEN	
790 ft²	10
890 ft²	1
11	
1 BEDROOM BF	
710 ft²	12
12	

2 BEDROOM	
820 ft²	5
950 ft²	16
960 ft²	1
970 ft²	5
980 ft²	5
1010 ft²	3
1030 ft²	5
1040 ft²	21
1060 ft²	11
1080 ft²	2
1120 ft²	2
1170 ft²	7
1180 ft²	2
1220 ft²	3
1240 ft²	1
1250 ft²	2
91	

2 BEDROOM + DEN	
990 ft²	5
1070 ft²	1
1080 ft²	1
1120 ft²	11
1130 ft²	1
1220 ft²	1
20	

2 BEDROOM BF	
950 ft²	19
960 ft²	2
21	
201	

UNIT MIX/ FLOOR- OBC...	1 BDRM		1 BDRM +DEN		2 BDRM		2 BDRM +DEN		TOTAL		TOTAL
UNIT AREA	(59-68m²)		(74-83m²)		(77-116m²)		(92-105m²)				
	B.F.		B.F.		B.F.		B.F.		B.F.		
LEVEL 1	1	0	1	0	5	1	2	0	9	1	10
LEVEL 2 - 4 (X3 floors)	3X3=9	0	0	0	7X3=21	1X3=3	2X3=6	0	12X3=36	1X3=3	13X3=39
LEVEL 5 - 9 (X5 floors)	3X5=15	0	0	0	6X5=30	1X5=5	1X5=5	0	10X5=50	1X5=5	11X5=55
LEVEL 10	3	0	0	0	2	2	0	0	5	2	7
LEVEL 11 - 20 (X10 floors)	2X10=20	1X10=10	1X10=10	0	3X10=30	1X10=10	1X10=10	0	7X10=70	2X10=20	9X10=90
TOTAL	48	10	11	0	88	21	23	0	170	31 (15%)	201
TOTAL	58		11		109		23		201		

LOT COVERAGE	
GROUND FLOOR AREA (Building footprint)	1,332.5 m²
PATIOS	76.75 m²
ASPHALT	1473.75 m² + 208 m² Ramp enclosure
LANDSCAPE AREA	2,809 m² (including 825 m² PARKLAND + 531 m² Hardscape + 1,453 m² Softscape)
TOTAL DEVELOPED AREA	5,900 m²
UNDEVELOPED (Existing building) AREA	2,752.8 m²
TOTAL LOT AREA	8,652.8 m² (including 825 m² PARKLAND)

BUILDING AREAS				
	GROSS FLOOR AREA	AMINETIES (INDOOR)	BALCONIES	TERRACES (OUTDOOR)
UNDERGROUND PARKING GARAGE L3 & L2	-	-	-	-
UNDERGROUND PARKING GARAGE L1	-	232.25 m² (Communal)	-	-
GROUND FLOOR AREA	924.5 m² (9,951.23 ft²)	-	76.75 m²	600 m² (6458.35 ft²) (Communal)
2ND - 4TH FLOOR AREA (X3 STOREYS)	(1,139 m² X3 =) 3,417 m² (12,260.1 X3 = 36,780.3 ft²)		(91.72m² X 3 =) 275.16 m²	-
5TH FLOOR AREA	867 m² (9,332.3 ft²)		34.23 m²	258 m²
6TH - 9TH FLOOR AREA (X4 STOREYS)	(867 m² X4 =) 3,468 m² (9,332.3 X4 = 37,329.2 ft²)		(76.88 m² X 4 =) 307.52 m²	-
10TH FLOOR AREA	711 m² (7,653.14 ft²)	175.05 m² (Communal)	36.48 m²	193.93 m² (2087.44 ft²) (Communal)
TYPICAL FLOOR AREA (11TH - 20TH) (X10 STOREYS)	(697.45 m² X10 =) 6,974.5 m² (7507.3 X10= 75,073 ft²)		57.12 m²	-
SUM GROSS AREA	16362 m² (176,119.17 ft²)	407.3 m²	780.52m²	1,051.93 m²
SUM AMENITIES (Indoor, Balconies and Terraces)	2,239.75 m² (Including 1,200.93 m² communal)			
NUMBER OF STOREYS (above grade)	20 storeys			

City of Ottawa Zoning By-Law 2008-250			
ZONING MECHANISM	REQUIRED /PERMITTED	PROPOSED	RELIEF REQ'D

AMENITIES			
Amenity Area for Residential Development (MIN.)	6 m² for every Residential Unit 6 x 201 = 1206 m²	2,238.5 m²	-
Amenity Area Provided as Commnal Space	MIN. 50 % X 1206 m² = 603 m²	1,200.93 m² (99.5%)	-

Parking Schedule		
Level	Type	Count
PARKING P3	Small Space 2400x4600	1
PARKING P3	Small Space 2400x5200	25
PARKING P3	Small Space 2600x4600	5
PARKING P3	Standard Space 2600x5200	89
PARKING P2	Small Space 2400x4600	1
PARKING P2	Small Space 2400x5200	25
PARKING P2	Small Space 2600x4600	5
PARKING P2	Standard Space 2600x5200	87
PARKING P1	BF Space Type A 3400x5200	2
PARKING P1	BF Space Type B 2750x6000	2
PARKING P1	Small Space 2400x4600	1
PARKING P1	Small Space 2400x5200	23
PARKING P1	Small Space 2600x4600	5
PARKING P1	Standard Space 2600x5200	83
GROUND FLOOR	BF Space Type A 3400x5200	3
GROUND FLOOR	BF Space Type B 2750x6000	3
GROUND FLOOR	Standard Space 2600x5200	16

SMALL SPACES : 91
STANDARD SPACES : 275
B.F. SPACES : 10

REQUIRED: TABLE 101 R12 HIGH-RISE AREA X/Y
0.5 RESIDENT / DWELLING + 0.1 VISITOR = 0.6
(No parking for first 12 units)
189 UNITS x 0.6 = 113 SPACES REQUIRED
(19 VISITOR + 94 RESIDENTIAL)

PROPOSED : 376 SPACES
169 SPACES TO REPLACE THE EXISTING SPACES
207 NEW SPACES FOR 201 UNITS = 1.03 PARKING RATE

BICYCLE SPACES :
REQUIRED : 201 LONG TERM SPACES
+ 13 SHORT TERM SPACES

PROPOSED : 206 LONG TERM SPACES (UNDERGROUND)

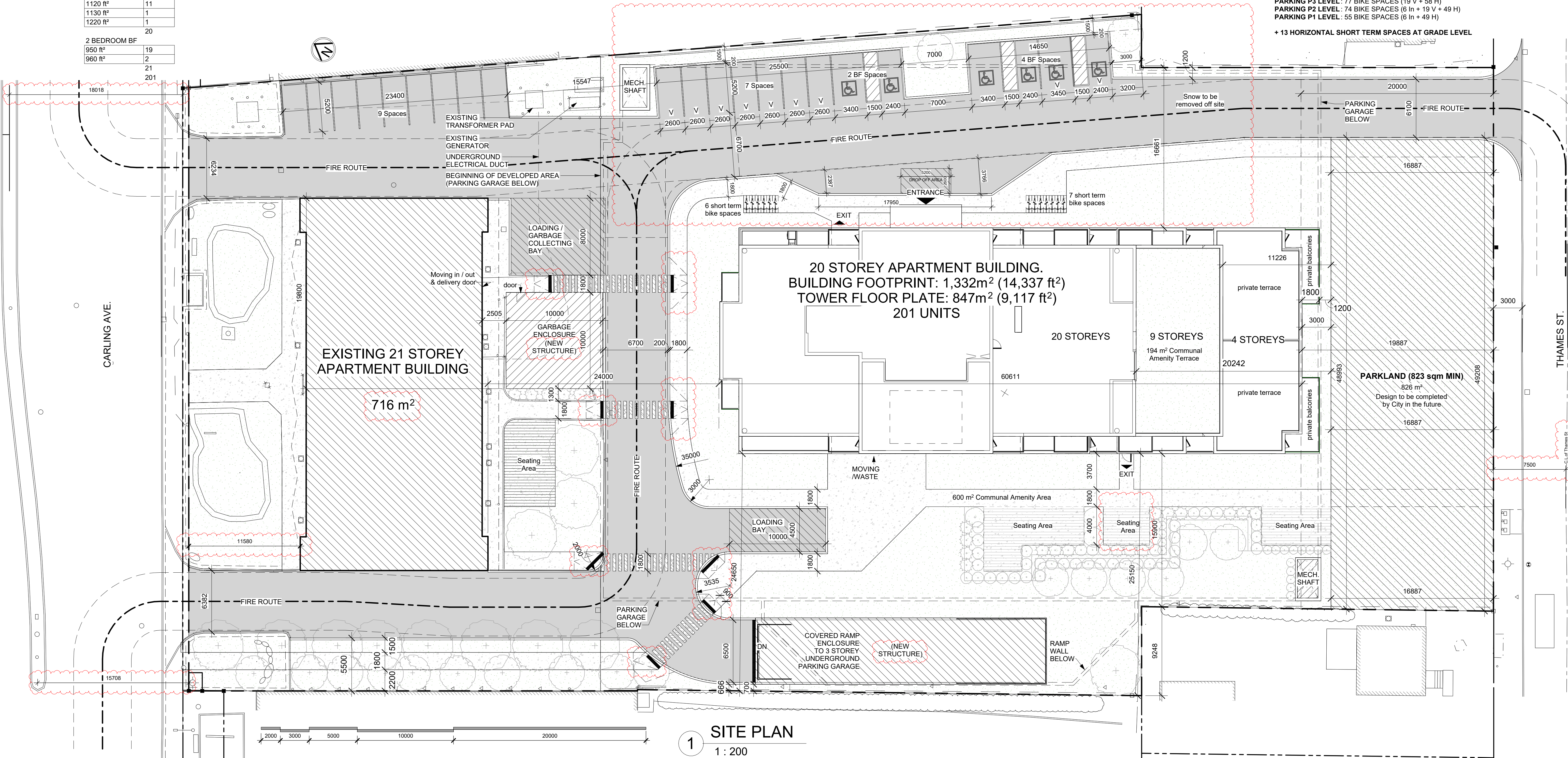
12 Inclusive spaces (1m x 2.75m x 2m)
+ 38 Vertical spaces (0.6m x 1.5m x 2m)
+ 156 Horizontal spaces (77.6%) (0.6m x 1.8m x 2m)

PARKING P3 LEVEL: 77 BIKE SPACES (19 V + 58 H)
PARKING P2 LEVEL: 74 BIKE SPACES (6 In + 19 V + 49 H)
PARKING P1 LEVEL: 55 BIKE SPACES (6 In + 49 H)

+ 13 HORIZONTAL SHORT TERM SPACES AT GRADE LEVEL

BARRIER-FREE PARKING
OTTAWA BY-LAW 2017-301
TYPE A: 3400mm WIDE
TYPE B: 2400mm WIDE

# SPACES	A	B	TOTAL
251-300	4	4	8
301-350	4	5	9
351-400	5	5	10



1 SITE PLAN
1 : 200

DO NOT SCALE DRAWINGS
CHECK AND VERIFY ALL DIMENSIONS BEFORE
PROCEEDING WITH THE WORK.
DRAWINGS NOT TO BE USED FOR CONSTRUCTION
UNLESS STAMPED AND SIGNED BY THE
CONSULTANT.
THESE DRAWINGS HAVE BEEN DESIGNED IN
COMFORMANCE WITH THE ONTARIO BUILDING
CODE.

Revisions		
No.	Date	Description
2	27-03-2026	Issued for ZBA
3	15-07-2026	Issued for Comments

HOMESTEAD

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t: 613-545-3744
f: 613-545-1411

Project
**1316 CARLING AVE
APARTMENTS**

1316 CARLING AVE.,
OTTAWA, ON

Drawing
SITE PLAN

Drawn By FAHD A.Z. Checked By
Scale 1 : 200 Date 05/13/25
Project No. 2513 Revision 3
Drawing No. **A010**

NOTES FOR SEDIMENT & EROSION CONTROL

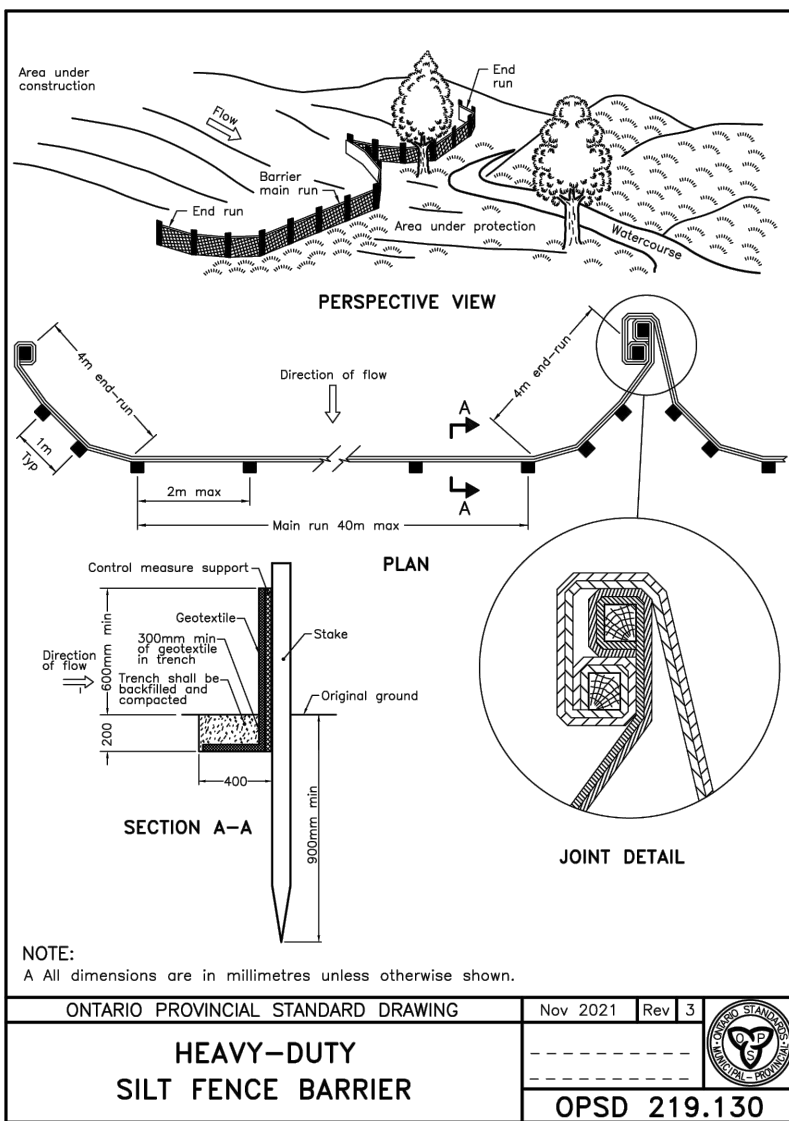
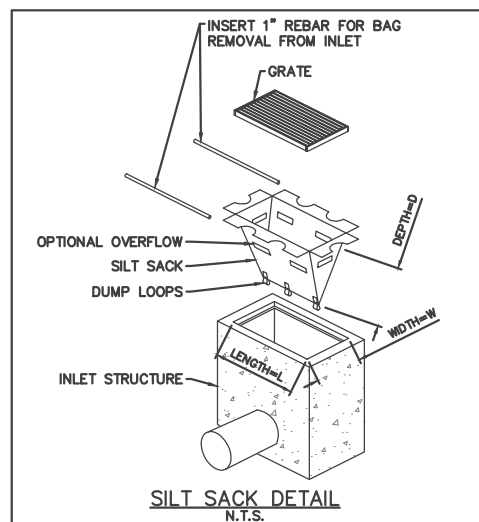
1. DISTURBED AREAS THAT HAVE FAILED TO HAVE STABLE GROUND COVER ESTABLISHED BY OCTOBER 30TH SHALL BE PROTECTED WITH A SILTATION CONTROL FENCE OR STRAW MULCH ETC. AND MAINTAINED BY THE CONTRACTOR UNTIL VEGETATION BECOMES ESTABLISHED IN THE SUBSEQUENT GROWING SEASON.
2. ANY DEWATERING WASTE SHALL BE DISCHARGED TO A VEGETATED AREA AT LEAST 30 M FROM ANY WATERCOURSE AND FILTERED. FILTERING METHODS MUST BE APPROVED BY THE SITE ADMINISTRATOR.
3. SILT FENCE SHALL BE PUT IN PLACE PRIOR TO AND MAINTAINED DURING ALL GRADING. SILT FENCE SHALL COMPLY WITH OPSD 219.110 FOR LIGHT DUTY AND / OR OPSD 219.130 FOR HEAVY DUTY; UNLESS NOTED OTHERWISE. SILT FENCE TO BE INSPECTED PRIOR TO COMMENCEMENT OF EARTH GRADING ACTIVITIES. SILT FENCE TO BE INSPECTED AND REPAIRED OR REPLACED IF DAMAGED AS DIRECTED BY THE SITE ADMINISTRATOR. SILT CONTROLS TO BE INSPECTED ON A REGULAR BASIS AND AFTER EVERY RAIN EVENT. INSTALLATION SHALL BE TO THE MANUFACTURER'S SUGGESTED SPECIFICATIONS.
4. THE CONTRACTOR SHALL BE PREPARED FOR UNEXPECTED CONDITIONS AND ACCORDINGLY HAVE STOCKPILED MATERIALS ON SITE FOR NECESSARY REPAIRS AS A RESULT OF FAILED OR INADEQUATE CONTROL MEASURES. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE A WEEK, AND AFTER EVERY RAINFALL EVENT.
5. MUD MATS WHERE CONSTRUCTION TRAFFIC ENTERS OR LEAVES THE SITE SHALL BE USED. MUD MATS TO BE 300mm IN DEPTH, 6.0m WIDE BY 20.0m LONG, FIRST 10.0m TO 1500mm CLEAR STONE WITH THE REMAINING 10.0m CONSISTING OF 50mmØ CLEAR STONE, OR MEET MUNICIPAL STANDARDS WHERE IDENTIFIED.
6. CONTRACTOR SHALL OBTAIN A CURRENT COPY AND BECOME FAMILIAR WITH OPSD 805, CONSTRUCTION SPECIFICATION FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AS WELL AS ALL APPLICABLE MUNICIPAL STANDARDS.
7. THE CONTRACTOR MAY CONSIDER ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES. SUCH MEASURES SHOULD BE PRESENTED IN WRITING FOR APPROVAL OF THE SITE ADMINISTRATOR AND MUST BE APPROVED IN WRITING BY THE CONSERVATION AUTHORITY.
8. THE TOPS OF ALL FILTER FABRIC MUST BE A MINIMUM OF 1.0 METRES ABOVE THE GROUND LEVEL AND ATTACHED TO THE FENCE WITH A CONTINUOUS STEEL WIRE. ALTERNATIVELY, THE FILTER FABRIC MUST BE FOLDED OVER THE TOP OF THE FENCE AND ATTACHED TO THE FENCE WITH WIRE LOOPED THROUGH THE FABRIC ON BOTH SIDES OF THE FENCE. FILTER FABRIC IS TO BE TERRAFIX 270R OR EQUIVALENT.
9. ALL DISTURBED GROUND LEFT INACTIVE SHALL BE STABILIZED BY SEEDING, SODDING, MULCHING, OR COVERING OR OTHER EQUIVALENT CONTROL MEASURES. THIS PERIOD OF INACTIVITY SHALL BE AT THE DISCRETION OF THE MUNICIPAL DIRECTOR OF ENGINEERING BUT SHALL NOT EXCEED (30) DAYS OR SUCH LONGER PERIOD DEEMED ADVISABLE BY THE MUNICIPAL DIRECTOR OF ENGINEERING.
10. CONTRACTOR SHALL INSTALL AND MAINTAIN CATCHBASIN SEDIMENT BARRIERS THROUGHOUT THE SITE DURING ALL CONSTRUCTION ACTIVITIES IN ORDER TO MITIGATE SEDIMENT ENTERING THE STORM STORM SEWERS.
11. NO FUEL TO BE STORED ON SITE. IN CASE OF A SPILL PLEASE CONTACT:MOECC SPILLS ACTION CENTER 1-800-268-6060.
12. SEDIMENT CONTROLS ARE TO REMAIN IN PLACE UNTIL WRITTEN DIRECTION IS RECEIVED FROM THE ENGINEER REGARDING THEIR REMOVAL.
13. EROSION AND SEDIMENT CONTROLS WILL BE INSPECTED ON AS PER MUNICIPAL REQUIREMENTS OR AFTER SIGNIFICANT RAINFALL EVENTS.

SEQUENCE OF CONSTRUCTION

1. ENGINEER AND MUNICIPALITY TO BE NOTIFIED PRIOR TO INITIATION OF ANY ON SITE WORKS.
2. SILT FENCE AND CONSTRUCTION ACCESS MATS TO BE INSTALLED PRIOR TO THE COMMENCEMENT OF ANY WORKS ONSITE.
3. VEGETATION REMOVAL MAY COMMENCE AFTER ALL SILT FENCE IS INSTALLED AND APPROVED BY THE ENGINEER.
4. COMMENCE WITH EARTH EXCAVATION AND SITE SERVICING (TO BE REMOVED FROM SITE - NO STOCKPILE).
5. EROSION CONTROL MEASURES TO BE MAINTAINED AS DIRECTED BY THE ENGINEER DURING THE CONSTRUCTION PERIOD. ADDITIONAL CONTROL MEASURES MAY BE REQUIRED AT THE DISCRETION OF THE ENGINEER.
6. ALL DISTURBED GROUND LEFT INACTIVE FOR MORE THAN 30 DAYS SHALL BE STABILIZED WITH SEED, SOD, MULCH OR OTHER ADEQUATE COVERING, AS INSTRUCTED BY THE ENGINEER.
7. ALL CONSTRUCTION VEHICLES TO ACCESS THE SITE VIA THE DESIGNATED CONSTRUCTION ENTRANCES AS SHOWN.

LEGEND

- | | | | |
|--|------------------------------------|--|----------------------|
| | SILT FENCE | | ASPHALT REMOVAL AREA |
| | ROCK CHECK DAM | | DECIDUOUS TREE |
| | STRAW BALE | | CONIFEROUS TREE |
| | SAND BAG BARRIER | | |
| | TEMPORARY SWALE | | |
| | DIRECTION OF INTERIM OVERLAND FLOW | | |



Gerrits
ENGINEERING

Barrie, ON
Tel.: 705.373.3303

Kingston, ON
Tel.: 613.217.8246

www.gerriteng.com

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dleblanc@leblanc-eng.com
613-888-1639

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This drawing may have been reduced.

0 5 10 20 30 40 50m
0" 1/4" 1/2" 1" 1 1/2" 2"

No.	Issuance Description	YY/MM/DD
1.	CLIENT REVIEW	26/03/11
2.	ZONING BY-LAW AMENDMENT	26/03/27
3.	ZONING BY-LAW AMENDMENT	26/09/14

BENCHMARK
ELEVATIONS SHOWN ARE GEODETIC. DERIVED FROM CITY OF OTTAWA VERTICAL CONTROL MONUMENT NO. N-29 (INDEX NO. 86), HAVING A PUBLISHED ELEVATION OF 77.347 METRES, AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM.

Issued For:

ZONING BY-LAW AMENDMENT

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Client

HOMESTEAD LAND HOLDINGS LIMITED
80 Johnson Street
Kingston, ON, K7L 1X7

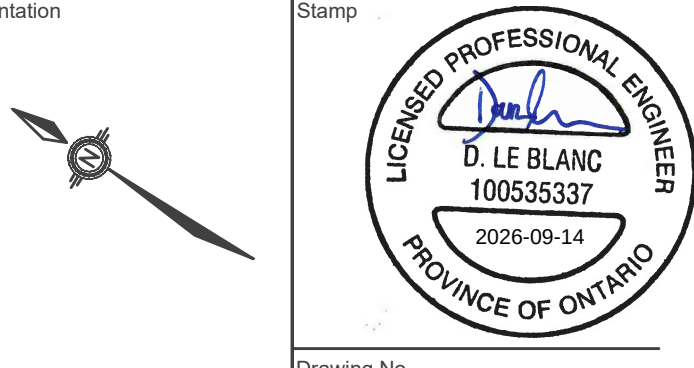
Project

RESIDENTIAL APARTMENTS
1316 Carling Avenue, Ottawa, ON

Drawing:

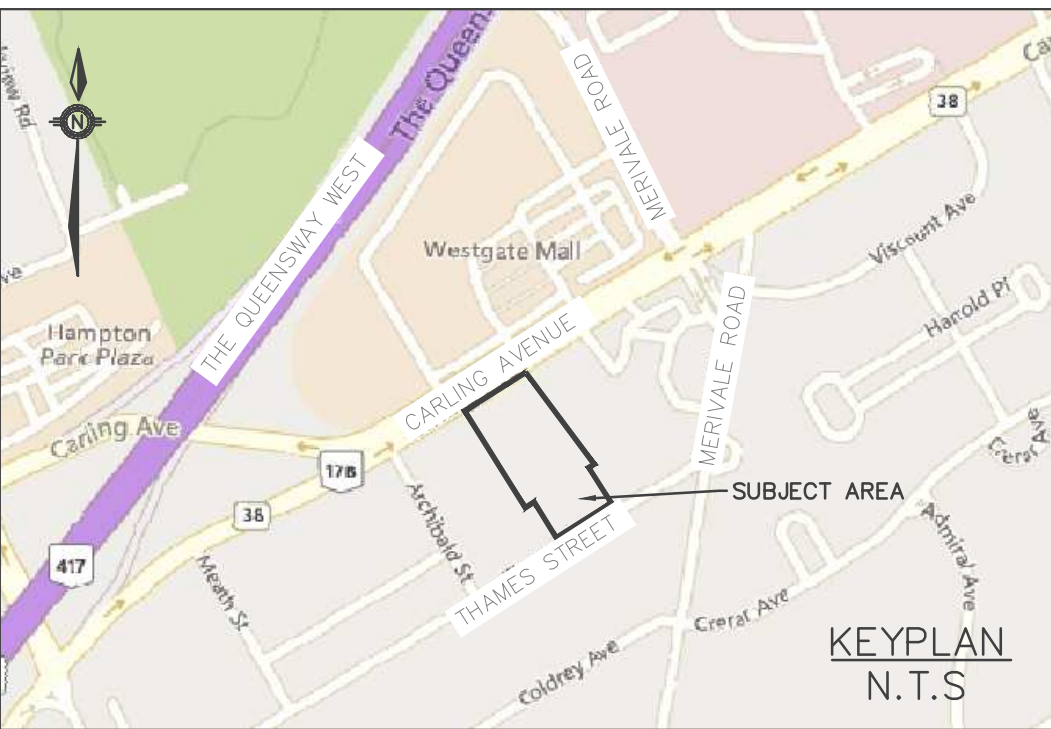
EROSION & SEDIMENT CONTROL PLAN

Project No. 2300-001-25 Designed by: IO Checked by: KF
Scale: 1:250 Drawn by: IO Approved by: DL
Orientation Stamp



Drawing No. **ESC-1**





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Tel.: 705.737.3303

Kingston, ON
Tel.: 613.217.8246

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Client

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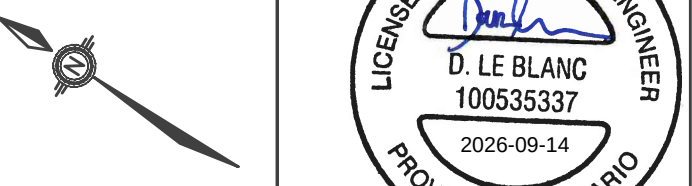
Project

RESIDENTIAL APARTMENTS
1316 Carling Avenue, Ottawa, ON

Drawing:

PRE-STORM WATER MANAGEMENT PLAN

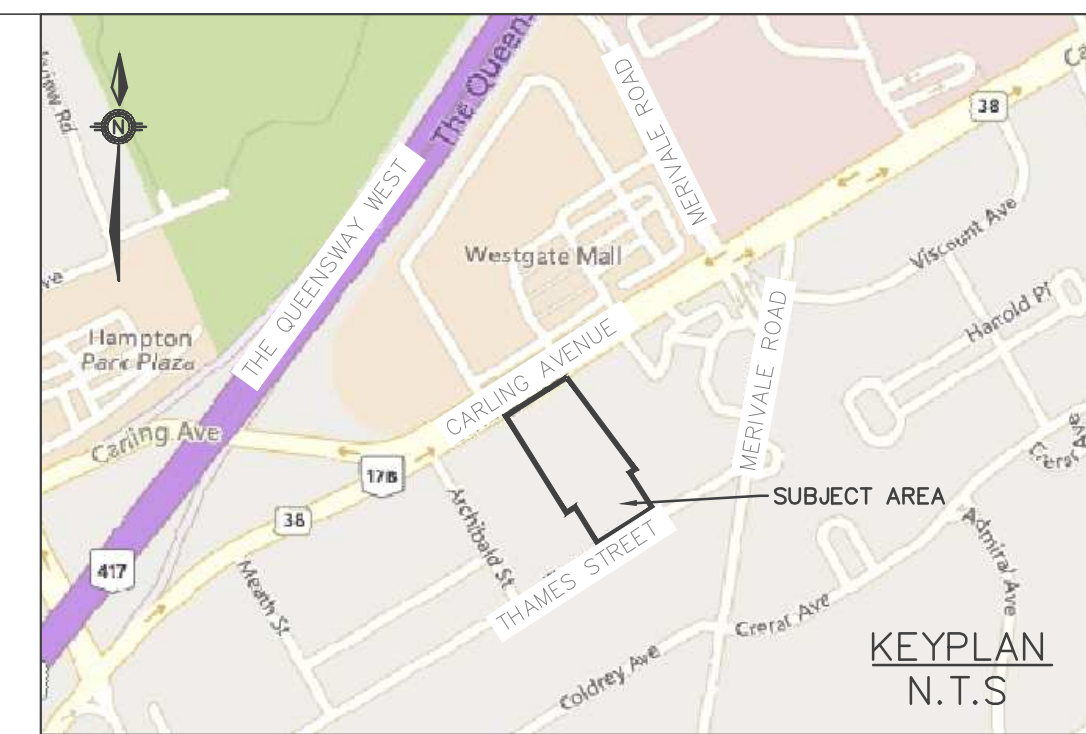
Project No. 2300-001-25 Designed by: IO Checked by: KF
Scale: 1:250 Drawn by: IO Approved by: DL
Orientation Stamp



Drawing No.

STM-1

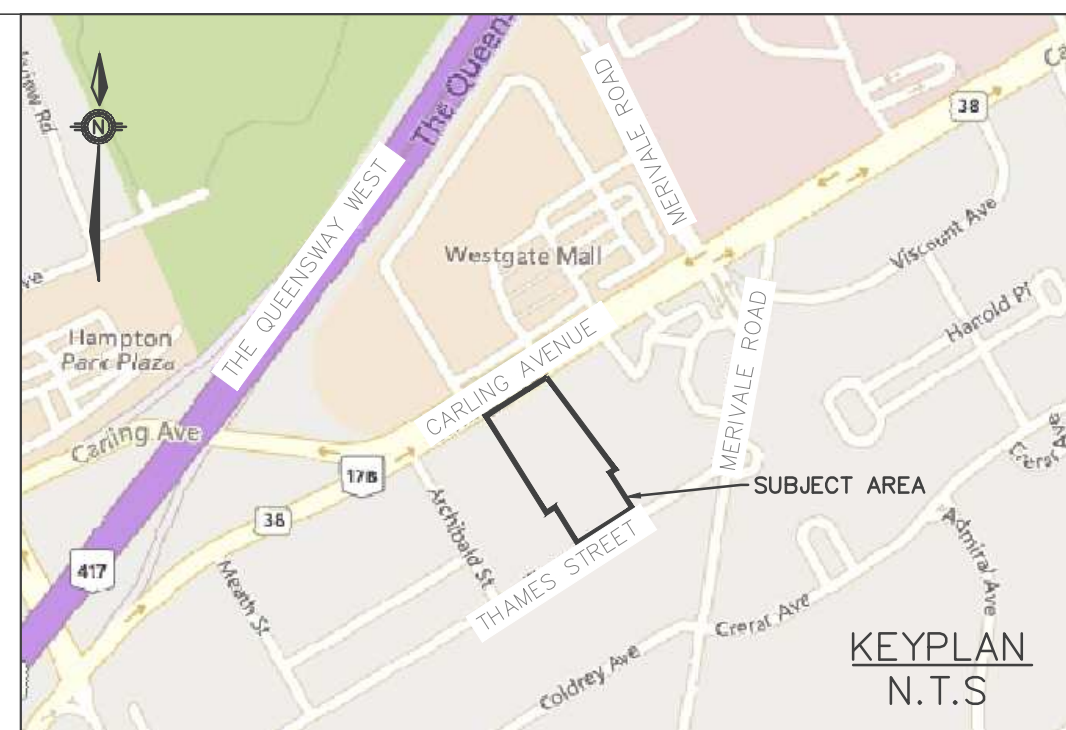
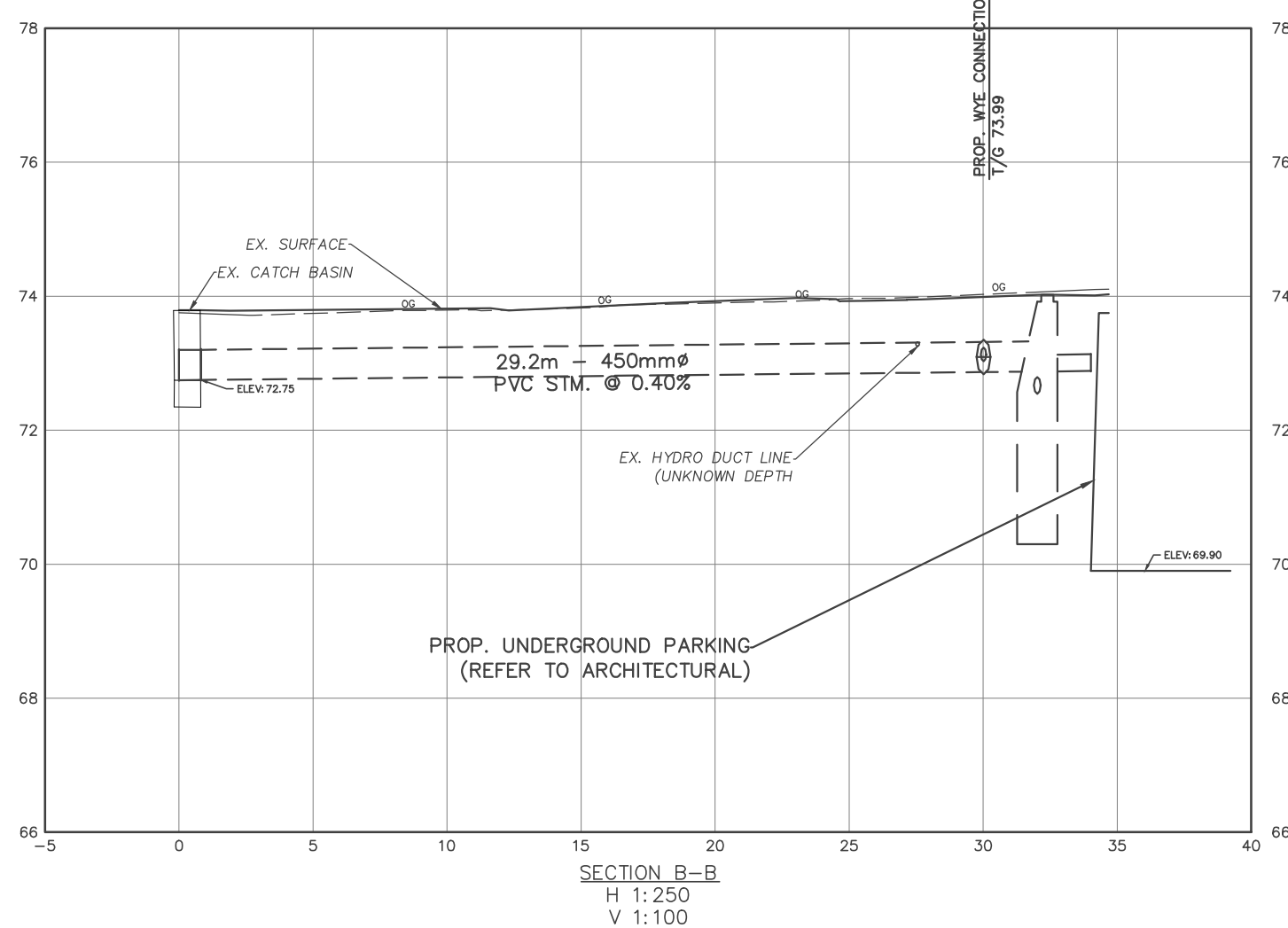




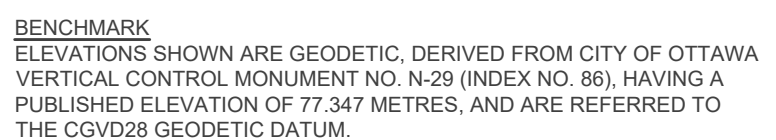
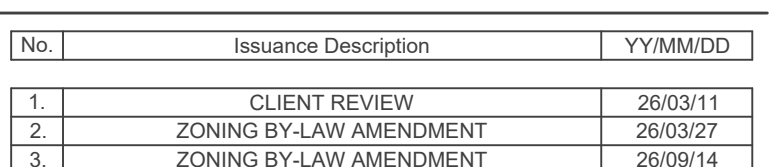
No.	Issuance Description	YY/MM/DD
1.	CLIENT REVIEW	26/03/11
2.	ZONING BY-LAW AMENDMENT	26/03/27
3.	ZONING BY-LAW AMENDMENT	26/09/14

STM-2





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AMENDMENT**

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Client

**HOMESTEAD LAND
HOLDINGS LIMITED**

80 Johnson Street
Kingston, ON, K7L 1X7

Project

RESIDENTIAL
APARTMENTS

1316 Carling Avenue, Ottawa, ON

Drawing: **SITE SERVICING PLAN**

Project No.	2300-001-25	Designed by:	IO	Checked by:	KF
Scale:	1:250	Drawn by:	IO	Approved by:	DL
Orientation	Stamp				



Drawing No.

SS-1



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Tel.: 613.217.8246

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Issued For:

ZONING BY-LAW AMENDMENT

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80 Johnson Street
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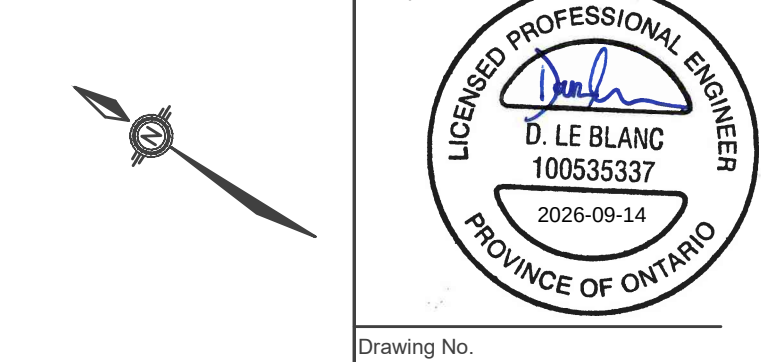
Project

RESIDENTIAL APARTMENTS
1316 Carling Avenue, Ottawa, ON

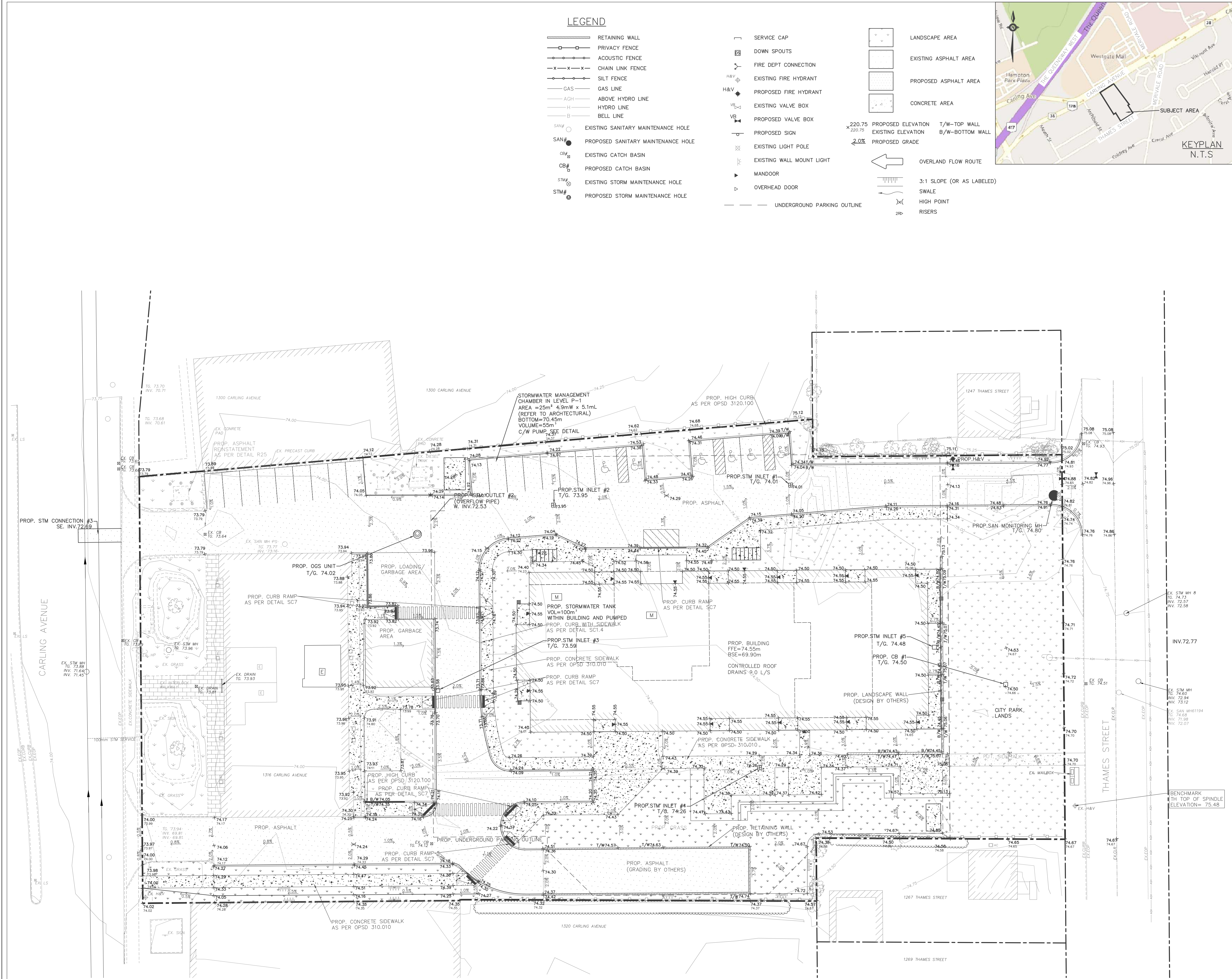
Drawing:

GRADING PLAN

Project No. 2300-001-25 Designed by: IO Checked by: KF
Scale: 1:250 Drawn by: IO Approved by: DL
Orientation

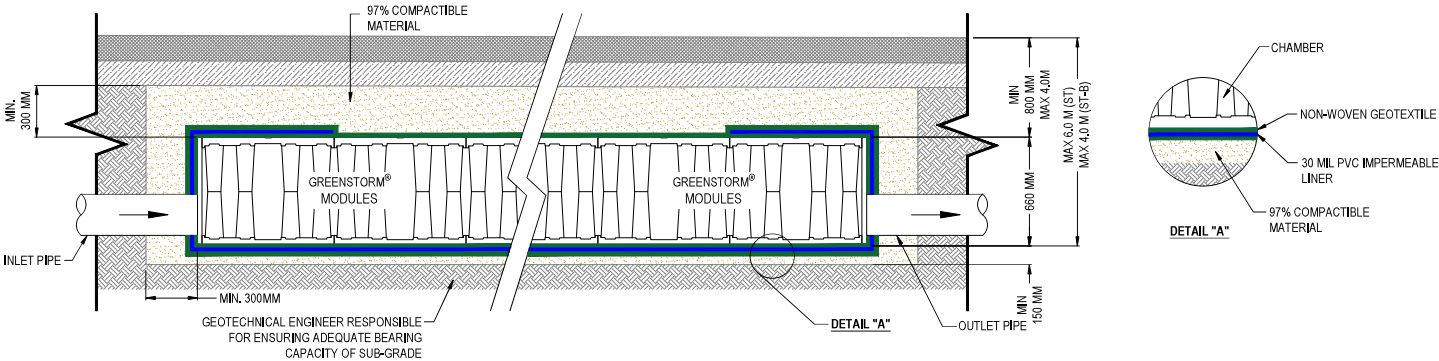


Drawing No. **GR-1**



APPENDIX C – Product Information

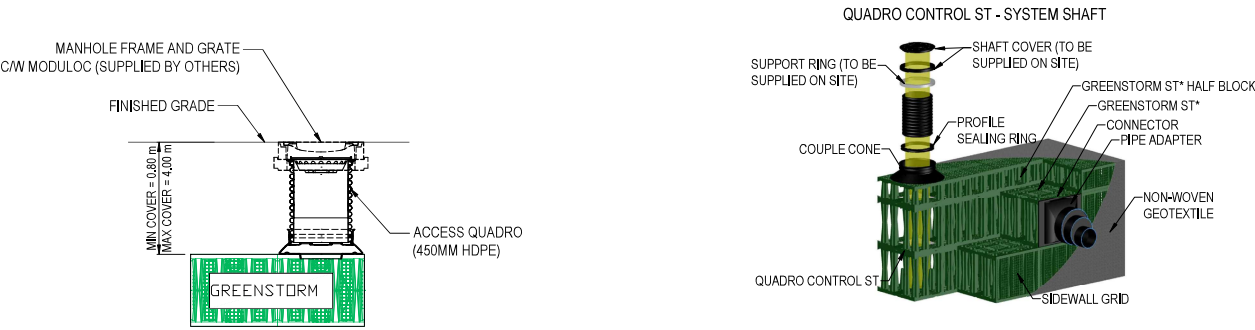
NOT FOR CONSTRUCTION



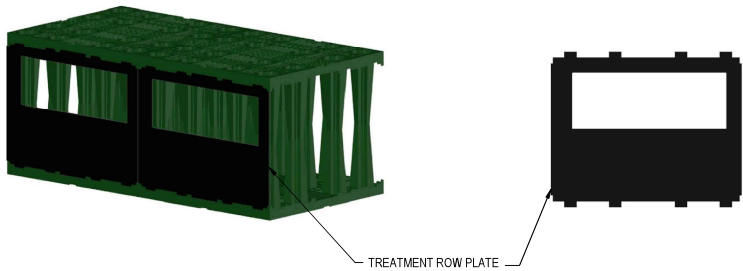
****Recommended bedding materials - HPB**

COMPACTIBLE MATERIAL LIST	LEGEND
• GRANULAR A	30MIL PVC IMPERMEABLE LINER
• GRANULAR B	8 OZ NON-WOVEN GEOTEXTILE
• 19mm CLEAR ANGULAR STONE	
• HIGH PERFORMANCE BEDDING (HPB)	
• HLB	

TYPICAL ONE LAYER GREENSTORM CROSS SECTION



GREENSTORM ACCESS QUADRO DETAIL (WHERE APPLICABLE)



STANDARD TREATMENT ROW DETAIL (WHERE APPLICABLE)

2425 Matheson Blvd East
8th Floor Office Suite#703
Mississauga, ONT L4W 5K4
www.planmac.com
TEL: 905 261-6654

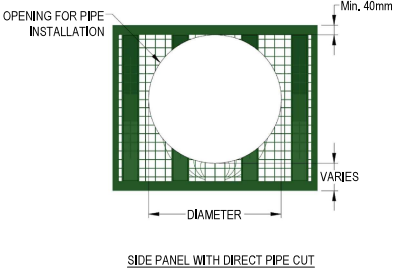
PLANMAC ENGINEERING INC. CERTIFIES THE THEORETICAL COMPETENCE OF THE PLANS PREPARED BY STORMCON, BUT IS NOT ABLE TO CERTIFY THE INTEGRITY OF THE ACTUAL CONSTRUCTION AND THEREFORE DISCLAIMS ANY LIABILITY FOR THE INTEGRITY OF THE CONSTRUCTION OF THESE WORKS, UNLESS THEY HAVE BEEN RETAINED TO PERFORM CONSTRUCTION SUPERVISION OF THE PROJECT. AS THE WORKS ARE ACTUALLY BEING BUILT, WE WILL ACCEPT NO DEVIATIONS FROM THIS REQUIREMENT IN ORDER FOR US TO CERTIFY THE BUILT WORKS.

REVIEW LIMITED TO THE STRUCTURAL CAPACITY OF THE GREENSTORM BLOCK TO RESIST THE APPLIED DEAD LOAD AND LIVE LOAD ONLY.

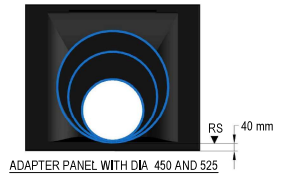
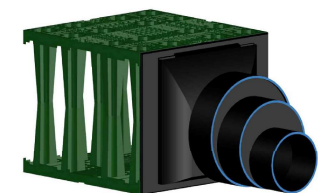
PLANMAC ENGINEERING INC. TAKES NO RESPONSIBILITY FOR THE OVERALL SYSTEM DESIGN FOR HYDRAULIC CAPACITY, SOIL BEARING CAPACITY, LAYOUT AND CHAMBER LOCATIONS OR ELEVATIONS.

LIVE LOAD: CL-625-ONT OR
LIVE LOAD: AASHTO H19-25
DEAD LOAD: 88.40 KN/m² (SLS) & 137.38 KN/m² (ULS)
PAVEMENT AND AGGREGATE MAX. COVER: 4.00m
PAVEMENT AND AGGREGATE MIN. COVER: 0.80m

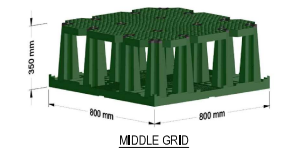
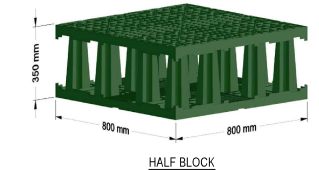
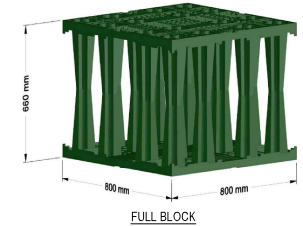
FULL CONNECTION OPTIONS
Dia 100mm, 150 mm, 200 mm, 250 mm, 300 mm AND 375 mm



STANDARD SIDE PANEL WITH DIRECT PIPE CUT



STANDARD ADAPTER PANEL WITH DIA 450 AND 525



STANDARD GREENSTORM BLOCK DETAIL



69 CONNIE CRESCENT
CONCORD, ON
L4K 1L3

SALES@STORMCON.CA
www.STORMCON.CA

THIS DRAWING WAS PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. IT IS THE ULTIMATE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE GREENSTORM SYSTEM'S DESIGN IS IN FULL COMPLIANCE WITH ALL APPLICABLE LAWS AND REGULATIONS. IT IS THE CONTRACTOR OF RECORD'S RESPONSIBILITY TO ENSURE THAT THE STORMCON PRODUCTS ARE DESIGNED IN ACCORDANCE WITH STORMCONS MINIMUM REQUIREMENTS. STORMCON DOES NOT APPROVE PLANS, SIZING, OR SYSTEM DESIGNS.

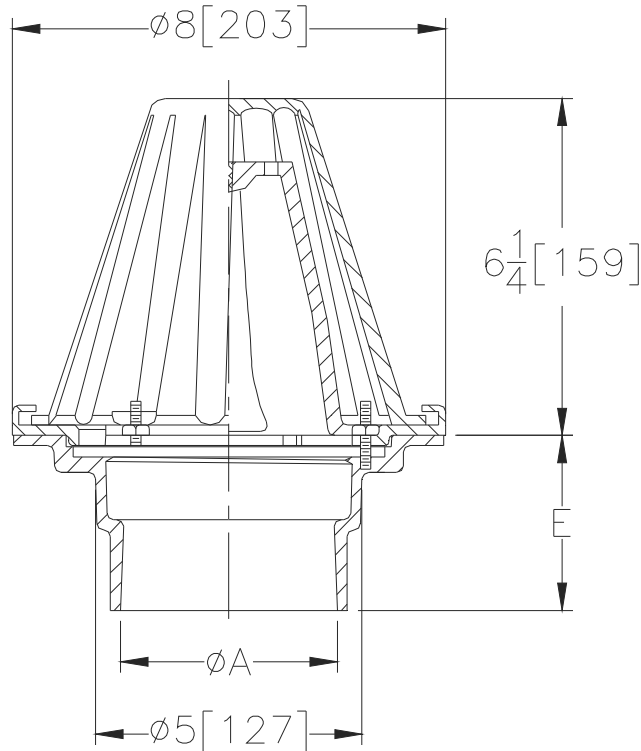
DETAILS SHEET

GREENSTORM STORMWATER CHAMBER

PROJECT NO:	DATE:
DESIGNED BY: JD	CHECKED BY: EC
SCALE: N.T.S.	SHEET NO:

**ZCF130****Ø8 [203] CONTROL-FLO ROOF DRAIN****SPECIFICATION SHEET****TAG** _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



A Pipe Size Inches / [mm]	Approx. Wt. Lbs. / [kg]	Dome Open Area Sq. In / [sq cm]
2,3,4 [51,76,102]	11 [5]	15 [97]

ENGINEERING SPECIFICATION: ZURN ZCF130

8" [203mm] diameter "Control-Flo" roof drain for dead-level roof construction, Dura-Coated cast iron body. Combination membrane flashing clamp/gravel guard, aluminum "Control-Flo" weir, and Poly-Dome. "Control-Flo" weir shall be linear functioning with flow rate of 5 GPM [23 LPM] per inch of water buildup above drain. All data shall be verified proportional to flow rates.

OPTIONS (Check/specify appropriate options)**PIPE SIZE**

2,3,4 [51,76,102]

(Specify size/type) **OUTLET**☐ NH No-Hub**E BODY HT. DIM.**

3-1/4 [83]

PREFIXES

☐ Z	D.C.C.I. Body with Poly-Dome*
☐ ZA	D.C.C.I. Body with Aluminum Dome

SUFFIXES

☐ -A	Waterproof Flange
☐ -C	Underdeck Clamp
☐ -EB	Elevating Body Plate
☐ -G	Galvanized Cast Iron
☐ -R	Roof Sump Receiver
☐ -SSM	Stainless Steel Mesh Screen Over Dome
☐ -VP	Vandal Proof Secured Top
☐ -84	Stainless Steel Perforated Gravel Guard

* Regularly furnished unless otherwise specified.

Zurn Industries, LLC | Specification Drainage Operation

1801 Pittsburgh Avenue, Erie, PA U.S.A. 16502 · Ph. 855-663-9876, Fax 814-454-7929

In Canada | **Zurn Industries Limited**

3544 Nashua Drive, Mississauga, Ontario L4V 1L2 · Ph. 905-405-8272, Fax 905-405-1292

www.zurn.com

Rev. D

Date: 9/2/15

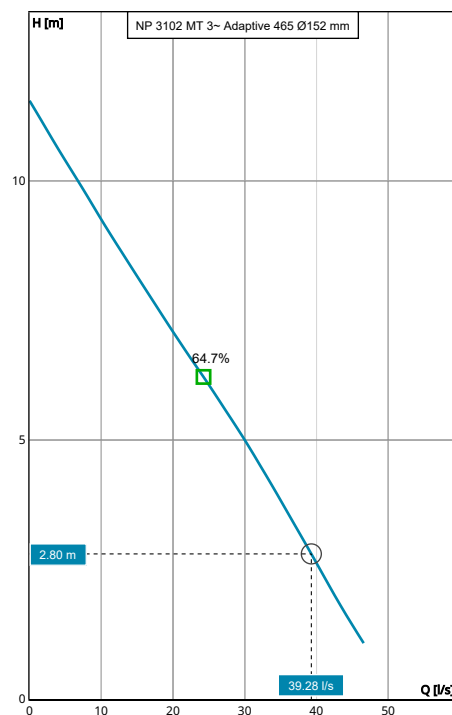
C.N. No. 133123

Prod. | Dwg. No. ZCF130

NP 3102 MT 3~ Adaptive 465 | Configuration Summary



Flygt's self-cleaning non-clog N-pumps feature innovative designs and functions that deliver high sustained efficiency and the most reliable operation. This makes them the most reliable choice available for a broad range of wastewater applications for tough applications such as unscreened sewage, wastewater and sludge up to an 8 percent solids concentration. Impeller material available in Hardened cast Iron, Hard Iron and Stainless Steel to fit any wastewater application.



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances. Please consult your local Flygt representative for additional performance guarantees.

GENERAL

Explosion Proof	Impeller Diameter
No	152 mm
Max. Pumped Media Temp.	
40 °C	

MATERIAL AND COATING

Impeller Material	Stator Cover Material
Grey Cast Iron	Grey Cast Iron
Volute Material	
Grey Cast Iron	

MOTOR

Rated Voltage	Motor Efficiency Class
460 V	Standard
Coupling	Rated Power
Y	3.7 kW

INSTALLATION

Installation Type
P - Semi-Permanent, Wet

NP 3102 MT 3~ Adaptive 465 | Product Details

Description

N 3102

Wastewater N-Technology Pump With Adaptive N® Impeller

Flygt N-pumps take on the toughest applications and get the job done. Every component is designed and manufactured to deliver sustained high efficiency. Thanks to patented N-technology with its innovative self-cleaning impeller, Flygt N-pumps deliver the highest total efficiency. They lower your energy bill and reduce unplanned maintenance costs. That adds up to total peace of mind – and big savings over the long term. Most solid objects entering the pump will pass through the impeller between the impeller vanes. If an object gets caught on the leading edge of one of the vanes, it will slide along the backswept shape towards the perimeter of the inlet. Due to the mechanical self-cleaning design, a sludge concentration up to 8% can easily be pumped.

Flexible and Modular Design

- This self-cleaning pump features innovative functions that make it the best choice for a broad range of applications. The modular hydraulic design enables you to tailor the hydraulics to meet the requirements of virtually any application.
- Replaceable wear ring in two materials, gray iron or Hard-Iron, for different operation conditions
- Hardened gray iron impeller for typical wastewater applications
- Hard-Iron impeller for abrasive and corrosive applications
- Stainless steel impeller for special applications that require duplex stainless steel
- Short shaft overhang reduces shaft deflection and increases seal and bearing life
- Motor designed for submersible use. Heat is concentrated to the stator core for improved cooling properties
- The double mechanical seal system consists of two sets of mechanical shaft seals that work independently to provide double security. Available in Tungsten carbide (WCCR) or Silicone carbide (SiC) depending on pumped media.
- Griploc mechanical face seal system secures locking to the shaft, no rubber friction, no grub screws and no shaft damage
- Motor cable SUBCAB ® specially developed for submersible use.

Product Features

- Sustained high efficiency
- Hardened cast iron, optional Duplex stainless steel and Hard-Iron impellers
- State-of-the-art wastewater pump with enhanced Adaptive N® hydraulic
- Sustained high efficiency with energy savings up to 25%
- Flexible and modular design
- Robust and reliable

Construction Materials

Impeller Material	Volute Material	Stator Cover Material
Grey Cast Iron	Grey Cast Iron	Grey Cast Iron

Motor

Rated Power	Number Of Phases	Start Current Ratio	Motor Issue
3.7 kW	3	6.09	12
Motor Denomination	Rated Motor Speed	Insulation Class	Locked Rotor Code
18-11-4AL	1,750 RPM	H	H
Motor Efficiency Class	Rated Voltage	Approval	Max starts per hour
Standard	460 V	STD	30
Version Code	Rated Current	Total moment of inertia	Power Factor 100%
160	6.6 A	0.03 kgm ²	0.82
Frequency	Start Current	Type of duty	Power Factor 75%
60 Hz	40 A	S1	0.77
Max P2 (1x)	Starting Current, Direct Starting	Stator Variant	Power Factor 50%
2.45 kW	40 A	62	0.65
Number Of Poles	Starting Current, Star Delta	Motor Module	Efficiency 100%
4	13.33 A	135	86.8 %
			Efficiency 75%
			87.5 %
			Efficiency 50%
			86.6 %
			Cooling Jacket
			-

Selection

Series	Curve Code
N 3000	465
Name	Impeller Diameter
NP 3102 MT 3~ Adaptive 465	152 mm
Frequency	Inlet Diameter
60 Hz	100 mm
Total Flow	Outlet Diameter
43.69 l/s	100 mm
Total Head	Number Of Vanes
2.99 m	2
Pump Flow	
43.69 l/s	
Pump Head	
2.99 m	
System Type	
Single Pump	
Operating Pumps	
1	
Standby Pumps	
No Standby Pump	

Design Point

Flow	Shaft power (P2)
39.28 l/s	2.45 kW
Head	NPSHR
2.8 m	5.87 m
Overall Efficiency (η_o)	Speed
38.31 %	1,770 RPM
Pump Efficiency (η_p)	Static Head
44.03 %	2.02 m
Input Power (P1)	Flow To BEP Ratio
2.82 kW	161.97 %

Fluid and Operating Conditions

Fluid Type	Density
Water	1,000 kg/m ³
Fluid Temperature	Dynamic Viscosity
4 °C	0.002 Pa·s
Specific Gravity	Fluid Vapor Pressure
1	8.14 mbar
	Atmospheric Pressure
	1,013.53 mbar
	Elevation
	0 m
	Ambient Temperature
	20 °C
	NPSH Available
	10.27 m
	Submergence
	0 m

Design Curve

Rated Speed	BEP Flow
60 Hz	24.25 l/s
Max Flow	BEP Head
46.58 l/s	6.22 m
H@QMin	Max P2
11.55 m	2.45 kW
H@QMax	Specific Energy
1.08 m	0.02 kWh/m ³
BEP	
64.74 %	

NP 3102 MT 3~ Adaptive 465 | Dimensional Data & Drawing

