
FUNCTIONAL SERVICING & STORMWATER MANAGEMENT REPORT

VANMAR DEVELOPMENTS

167-171 King Street South, Waterloo, Ontario
Project No.: 2024-0507-10

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WALTERFEDY

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ISSUANCE AND REVISION RECORD					
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1.0 INTRODUCTION

WalterFedy Group Inc. has been retained by VanMar Developments (VanMar) to provide civil engineering consulting services in support of an Official Plan Amendment and Zoning By-law Amendment for 167-171 King Street South in Waterloo. The proposed development is currently planned to include 2 residential towers consisting of 30 and 38 stories with a shared podium, as well as amenity space and ground floor retail space.

The purpose of this Functional Servicing and Stormwater Management report is to identify how the development will be serviced, including water, sanitary, and storm connections to existing municipal infrastructure. The report will discuss existing boundary servicing conditions and the availability in the municipal system to accommodate the development. A preliminary stormwater management design has been presented, demonstrating adherence to the City of Waterloo and Region of Waterloo design criteria.

1.1 Background

The site is located immediately south of Uptown Waterloo, located at 167-171 King Street South, and consists of the Erb & Good Family Funeral Home. The site has an area of approximately 0.53 ha and has frontage onto and driveway access from King Street South to the north, Caroline Street South to the south and Kuntz Lane to the west. The site is also bound by a mixed-use development to the east (181 King Street South), and a retirement residence to the west (100 Caroline Street South). The existing Kuntz-Labatt House on site is designated under Part IV of the Ontario Heritage Act and is proposed to be relocated within the site.

The current development concept consists of approximately 56,455 m² of building floor area, with retail space accounting for 816 m². A mix of 1, 2, and 3-bedroom units are proposed, with a total unit count of 796. The podium will primarily consist of parking from levels 2-5, with some parking also available on the first floor (for a total gross construction area of 15,871 m², along with the retail space and some amenity space. Outdoor amenity space is also proposed on top of the podium on the 6th level. Tower A will front onto Caroline Street, and Tower B will front onto King Street. Vehicular access to the site will be from Kuntz Lane and Caroline Street, utilizing the existing entrances. Road widenings along King Street and Caroline Street will be required.

The site is currently zoned Uptown Mixed-Use (U2-81) with site specific C159, which does permit multi-unit residential buildings. To allow for the proposed building height, density, reduced setbacks and to alter built form regulations, an Official Plan Amendment and Zoning By-Law Amendment are required.

Given the size of the development, construction will be completed in phases, with Tower A expected to be developed first.

1.2 Reference Reports and Drawings

In the preparation of this functional servicing and stormwater management report, the following reports/drawings were referenced:

1. Geotechnical Investigation, Proposed Mixed-Use Development, 167-171 King Street South, Waterloo, Ontario, Chung & Vander Doelen Engineering Ltd., dated August 23, 2016.
2. Design Guidelines and Supplemental Specifications for Municipal Services, by the Region of Waterloo and Area Municipalities, dated January 2025.
3. Plan, Profile, Storm, Sanitary and Watermain Information from the City of Waterloo and Region of Waterloo.

2.0 EXISTING INFORMATION

2.1 Existing Topography

A topographic survey was completed by WalterFedy in September 2024. Legal boundary information for the site was obtained from McKechnie Surveying Ltd. in August 2016. The site currently contains the Erb & Good Family Funeral Home and associated surface parking.

The elevation of the site ranges from approximately 330.0 m near the southwestern limits, to approximately 326.5 m at the northwestern limits. The eastern property line ranges from an elevation of approximately 329.0 m at the southeastern corner to approximately 327.0 m at the northeastern corner. Runoff from the majority of the site appears to sheet flow from south to north towards the Kuntz Lane and King Street right-of-ways. The runoff towards Kuntz Lane also flows towards King Street. A catchbasin exists at the eastern side of the building, however it appears to connect internally to the building. This catchbasin only captures a small, slightly sunken area of the parking lot. There are no other low spots on site. The parking lot is generally sunken from Caroline Street and the neighbouring retirement home.

2.2 Geotechnical Conditions

A geotechnical investigation was completed by Chung and Vander Doelen Engineering Ltd. (CVD) in August 2016. Eleven (11) boreholes were advanced within the site boundaries, with monitoring wells being installed within five (5) of these borehole locations. The boreholes were advanced to depths between 4.42 m and 17.98 m below the surface. Boreholes 1 to 4 were advanced the deepest.

The asphalt pavement was found to consist of 50 mm to 125 mm of asphalt, with 300 mm to 790 mm of granular base. The pavement layers were underlain with loose fill materials at Boreholes 4, 5, 9 and 10 to depths between 0.76 m and 1.83 m. This fill material consists mostly of sandy silt to silty sand with some gravel. Silty sand was encountered at Boreholes 4, 7 and 10 below the pavement structure or fill material to depths between 0.76 m and 2.97 m.

Underneath these layers, clayey silt was encountered at all boreholes, except for Borehole 4, to a depth of 2.20 m and 3.35 m. Boreholes 2 and 5 encountered very stiff clayey silt lenses that are approximately 1.5 m thick. Borehole 11 was terminated in this layer. The silty sand at Borehole 4, as well as the clayey silt at all other boreholes is underlain with silt, extending to depths between 5.49 m and 7.77m.

Fine to medium sand underlays the silt and extends to depths between 13.11 m and 15.70 m in Boreholes 1 to 4. Boreholes 5-10 were terminated in this sand layer. Clayey silt till was encountered beneath the sand at Boreholes 1-4 and extended to termination depth.

Stabilized groundwater levels were measured within the monitoring wells on three separate days in August 2016. The depth ranged from 3.5 m to 5.6 m below the surface, with the corresponding water elevation being between 323.11 m and 323.71 m. It should be noted that groundwater elevations are expected vary seasonally in and response to weather events.

2.3 Existing Servicing and Utilities

Services on and around the site were identified as part of the topographic survey by WalterFedy and Plan and Profile drawings provided by the City of Waterloo and the Region of Waterloo.

A 300-mm-diameter sanitary exists on King Street South fronting the site, conveying flows from east to west. A 375-mm-diameter sanitary sewer fronts the site along Caroline Street south, also conveying flows from east to west. Both of these sewers combine with the 675-mm-diameter trunk sewer on William Street.

A 300-mm-diameter watermain exists on King Street South, and a 250-mm-diameter watermain exists on Caroline Street South fronting the site. Both watermain are part of the same overall municipal distribution system. A municipal hydrants exist southwest of the site along Caroline Street, and across King Street at the intersection of King and George Street.

A 300-mm-diameter storm sewer also exists along King Street fronting the site, draining towards the west. The site is also included in the Region of Waterloo's Stormwater Area Plan for King Street, assuming a runoff coefficient of 0.7. There is no storm sewer fronting the site along Caroline Street, but a 300-mm-diameter sewer begins near the southeastern corner of the site and drains towards the east.

Hydro, gas, and telecommunications services can be provided to the site from King Street and Caroline Street.

3.0 REVIEW AGENCIES

3.1 City of Waterloo

The City of Waterloo will be responsible for the review and approval of this functional site servicing, grading, and stormwater management design for the purposes of the zone change and ultimate site plan application.

3.2 Region of Waterloo and Keolis Grand River LP

Given the proximity of the lands to the existing ION LRT tracks, Keolis Grand River LP, on behalf of the Region of Waterloo (authority having jurisdiction), will likely review and comment on the proposed plans.

The Region of Waterloo will also review and comment on Source Water Protection as it relates to the subject development. King Street and Caroline Street fronting the site are both Regional Roads, so any work within the right-of-ways will also be subject to review and approval by the Region.

4.0 SOURCE WATER PROTECTION

According to the Province of Ontario's Source Protection Information Atlas, the site is located within A Wellhead Protection Area (WHPA) B, with a vulnerability score of 6. The site is also located within an Issue Contributing Area (ICA), and low stress water quantity Wellhead Protection Area (Q1 and Q2). **Table I** provides the source protection details for the Site.

Table I: Source Protection Details

Source Protection Area	Grand River
Water Quality	
Wellhead Protection Area	B, Score = 6
Wellhead Protection Area E (GUDI):	No
Intake Protection Zone:	No
Issue Contributing Area:	Yes
Significant Groundwater Recharge Area:	No
Highly Vulnerable Aquifer:	No
Event Based Area:	No
Water Quantity	
Wellhead Protection Area Q1:	Yes; Low Risk
Wellhead Protection Area Q2:	Yes; Low Risk
Intake Protection Zone Q:	No

A WHPA refers to a zone in which it takes groundwater up to 2- years to reach a wellhead but is outside a 100 m radius from the wellhead. A vulnerability score of 6 means the source water is at a medium risk of being contaminated.

An ICA is an area there activities are deemed to be contributing to potential water quality issues.

A Wellhead Protection Area Q1 (WHPA-Q1) refers to an area where activities that take water without returning it to the same source may be a threat. A Wellhead Protection Area Q2 (WHPA-Q2) refers to an area where activities that reduce recharge may be a threat.

Based on a review of applicable Source Protection Policies for the Region of Waterloo under the Grand River Source Protection Plan and a review of 2017-2018 Table of Drinking Water Threats, the activities proposed on this Site are not considered to be threats to drinking water at any risk level.

5.0 SANITARY SERVICING

5.1 Existing Sanitary Servicing

The City of Waterloo defers to the Region of Waterloo's Design Guidelines and Supplementary Specifications for Municipal Services (DGSSMS) 2025. The current site use can be considered core commercial, which results in an average flow rate of 0.95 L/s/ha, with a peak factor of 2.5. However, the Sanitary Area Plan compared by Grandling in 2014 considers the land as industrial, which constitutes an average flow rate of 0.40 L/s/ha. A peak factor of 2.5 is used for calculation purposes to coincide with the actual land use. The industrial average flow rate will also result in a more conservative existing sanitary demand. An extraneous flow rate of 0.25 l/s/ha is to be coupled with the peak flow. **Table II** provides a summary of the total existing sanitary demand for the site, assuming industrial use.

Table II: Existing Sanitary Demand

Site Area	0.53 ha
Average Industrial Daily Flow	0.40 L/s/ha
Peaking Factor	2.5
Industrial Peak Flow	0.53 L/s
Extraneous Flow Allowance	0.25 L/s/ha
Total Extraneous Flow	0.13 L/s
Total Sanitary Flow	0.66 L/s

5.2 Proposed Sanitary Servicing

In accordance with the City of Waterloo Engineering Standards and the Design Guidelines and Supplementary Specifications for Municipal Services (DGSSMS) 2025, the sanitary flows from the subject development are to be calculated based on the split in land uses between residential and commercial developments within the site.

Sanitary flows for the residential component are to be calculated using an average daily flow of 275 L/c/day, peaked using the Harmon Formula. For the residential towers, the Region of Waterloo stipulates a population density of 1.77 people per unit (ppu), which correlates to a design population of 1,409 people. Similarly, the commercial flows are to be estimated using a daily flow allowance of 0.95 L/s/ha for core commercial areas, peaked using a peaking factor of 2.5. This combined sanitary demand is to be coupled with an extraneous flow allowance of 0.25 L/s/ha. **Table III** below provides a summary of the anticipated peak sanitary demand from the proposed development.

Table III: Proposed Sanitary Demand

Site Area	0.53 ha
Number of Residential Units	796 units
Design Population Density	1.77 ppu
Design Population	1,409 persons
Average Residential Daily Flow	275 L/c/d
Residential Peaking Factor	3.699
Total Residential Sanitary Peak Flow	16.59 L/s
Commercial Floor Area	0.082 ha
Average Commercial Daily Flow	0.95 L/s/ha
Commercial Peaking Factor	2.5
Commercial Sanitary Flow	0.20 L/s
Extraneous Flow Allowance	0.25 L/s/ha
Total Extraneous Flow	0.13 L/s
Total Sanitary Flow	16.92 L/s

The anticipated peak sanitary flow rate from the proposed development is 16.92 L/s. Supporting calculations can be found in Appendix A. Therefore, the proposed development is expected to generate an additional peak sanitary demand of 16.26 L/s. It is understood that the City of Waterloo will assist in verifying capacity in the local system using the city-wide sanitary sewer model.

5.3 Sanitary Service Connection

Wastewater from the development is proposed to connect to the existing 375-mm-diameter sanitary sewer on Caroline Street. The flow from the development can be accommodated with a 200-mm-diameter service sloped at 0.60%.

The design of the sewers was completed using the Chézy-Manning formula with a roughness coefficient of 0.013 in accordance with the DGSSMS. **Table IV** below illustrates the design considerations for the connection to the existing municipal sewer to ensure compliance with MECP, City of Waterloo, and Region of Waterloo requirements and provide self-cleansing velocities within the pipe.

Table IV: Sanitary Service Design

Diameter of Service	200	mm
Minimum Slope of Service	0.60	%
Full Flow Capacity	25.41	L/s
Full Flow Velocity	0.81	m/s
Utilized Capacity	67	%

6.0 WATER SERVICING

The 250-mm-diameter PVC watermain fronts the site along Caroline Street, and a 300-mm-diameter PVC watermain fronts the site along King Street. Due to the phasing strategy, it is desired to connect to the municipal watermain on Caroline Street.

Design Criteria

The Region of Waterloo requires that watermain distribution systems be able to convey the larger of maximum daily demand and fire flow or the peak hourly demand. Additionally, the Region of Waterloo DGSSMS recommends that the average daily flow from any development be conveyed with a resulting pressure within the range of 350 kPa (50 psi) to 550 kPa (80 psi).

The Region also stipulates that the minimum resultant pressure under any non-fire demand scenario shall not be less than 275 kPa (40 psi). With the inclusion of fire flows, the minimum residual pressure in the distribution system shall not be less than 140 kPa (20 psi) and shall not cause velocities in the system to be greater than 5 m/s.

Should the static pressure within the system exceed 550 kPa (80 psi), the Region requires the use of individual pressure-reducing valves for new developments. The distribution system is also required to be designed to ensure that pressures do not exceed 700 kPa (100 psi) at any point in the system.

6.1 Domestic Demand

Calculations of the water demand for the proposed development have been performed using the DGSSMS and the MECP's *Design Guidelines for Drinking-Water Systems*.

In accordance with the DGSSMS, the average residential demand for the proposed development was estimated using a demand of 225 L/c/day. The same design population used for the sanitary demand was used for the water demand calculations. A peaking factor of 1.42 was used to convert the average daily demand into a maximum day demand. This peaking factor is in accordance with the *Tri-City Water Distribution Masterplan*. Similarly, a peaking factor of 3.75 was used to convert the average daily demand into the peak hourly demand in accordance with Table 3-1 of the MECP guidelines for a design population between 1,001 and 2,000 persons.

For commercial uses, an allowance of 28 m³/ha/day was utilized, factored for a 16-hour operating period per day, resulting in a demand of 42 m³/ha/operating hour. Peaking factors of 1.42 for the maximum day demand and 2.0 for the peak hourly demand were used, since the demand is not expected to fluctuate throughout the day.

The existing domestic water demand is summarized in **Table V**, and the proposed domestic water demand is summarized in **Table VI**.

Table V: Existing Domestic Water Demand

Site Area	0.53 ha
Average Demand (MECP)	42 m ³ /ha/day
Peaking Factors	
Max Day	1.42
Max Hour	2.00
Total Max Day Demand	0.37 L/s
Total Max Hour Demand	0.52 L/s

Table VI: Proposed Domestic Water Demand

Design Population	1,409
Average Demand (DGSSMS)	225 L/cap/day
Peaking Factors	
Max Day	1.42
Max Hour	3.75
Residential Max Day Demand	5.22 L/s
Residential Max Hour Demand	13.76 L/s
Commercial Floor Area	0.082 ha
Average Demand (MECP)	42 m ³ /ha/day
Peaking Factors	
Max Day	1.42
Max Hour	2.00
Commercial Max Day Demand	0.06 L/s
Commercial Max Hour Demand	0.08 L/s
Total Max Day Demand	5.28 L/s
Total Max Hour Demand	13.84 L/s

The proposed maximum day demand is 5.28 L/s and the proposed maximum hour demand is 13.84 L/s. Refer to Appendix B for the domestic water demand calculations.

6.2 Fire Flow Demand

In addition to the daily domestic demand for the proposed development, fire flow demands were calculated to assess the adequacy of the proposed watermain system. The Region of Waterloo specifies that all fire flow requirements shall be determined in accordance with the current issue of *Water Supply for Public Fire Protection* published by the Fire Underwriters Survey (FUS), and the Ontario Building Code.

A fire and life safety report was not available for review at the time of writing; however, based on our experience, such buildings are typically classified as non-combustible construction in accordance with OBC 3.1.5. Such a building is also typically provided with:

- Floors constructed as fire separations with a resistance rating of 2 hours.
- Roofs intended for occupancy, such as roofs having exterior amenity or terrace space, will be constructed as fire separations equal to the floor assembly (i.e., 2 hr).
- Load-bearing walls, columns, and arches will have a fire-resistance rating not less than that required for the supported assembly.

The *OFM - TG-03-1999: Fire Protection Water Supply Guidelines for Part 3 in the Ontario Building Code* (October 1999) requires that the buildings shall be provided with a supply of water not less than the total volume of the building, multiplied by the water supply coefficient from Table 1 of the technical bulletin, and the spatial coefficient values obtained from Figure 1 of the technical bulletin. Regardless of the size of the building, the maximum fire flow resulting from this methodology is 9,000 L/min, or 150 L/s.

To facilitate the FUS calculations, it is necessary to determine whether buildings are to be protected by a sprinkler system, as the resulting requirement for fire flow is calculated differently for buildings with or without sprinkler systems. Based on the Building Code Analysis, it is noted that the proposed building will be fitted with a sprinkler system. As such, the fire flow for the site will need to be designed per NFPA 13 *Standard for Installation of Sprinkler Systems* (2013), which stipulates the criteria used for determining fire flow for buildings with sprinklers. Tower A used for FUS calculations due to exposure charges to neighbouring buildings.

The FUS fire demand for the proposed development is summarized in **Table VII**, and can also be found in Appendix B.

Table VII: Fire Flow Demand

Type of Construction	Non-Combustible Construction (C=0.8)
Effective Floor Space	19,359 m ²
Occupancy Charge	Limited-Combustible Contents (-15%)
Automated Sprinkler Protection	Yes
Designed to NFPA 13 Standard	Yes (-30%)
Standard Water Supply to Sprinklers and Standpipes	Yes (-10%)
Fully Supervised System	Yes (-10%)
Exposure Charges	+10%
Fire Flow Demand	200 L/s (3170 usgpm)

The FUS fire demand for the proposed development is 200 L/s.

6.3 Service Design

As per the DGSSMS, the water service required shall be able to convey the combination of the Maximum Day Demand (MDD) and the Fire Demand, within the pressure and velocity ranges as specified. The combined demand is 205.28 L/s when using the FUS method, and 155.28 L/s when using the OBC method for fire demand. A 200 mm diameter service is proposed to service the development, which ensures the velocity is less than 5.0 m/s when considering the OBC fire demand calculations. A 250-mm-diameter water service would be required when considering the FUS method, however the Region of Waterloo no longer allows 250-mm-diameter watermain within the right-of-way. The watermain on Caroline Street is a 250-mm-diameter watermain, so a 300-mm-diameter water service would not be allowed. It is recommended that the OBC fire demand calculations be used for the proposed development. The actual fire demand will be dependent on the sprinkler design.

In accordance with Ontario Building Code Clause 3.2.9.4(4), “if a building is 84 m or more high, measured between grade and the ceiling level of the top storey, the building shall be served by no fewer than two sources of water supply from a public water system”. As such, the proposed development will require two service connections to the municipal system separated by a valve on the municipal main.

6.4 Modelling and Results

A hydrant flow test was completed by Vipond fronting the site for a different project located near 180 King Street South. This test was completed in December 2022. The results of the test indicate that there is an availability of approximately 306 L/s at 20 psi.

A new hydrant flow test should be conducted on Caroline Street prior to detailed design to confirm the availability within the municipal system where the proposed water service is located. Alternatively, a formal modelling simulation could be requested from the Region of Waterloo to confirm the available flow.

It is currently assumed that there is adequate capacity within the system due to the size of developments around the site, and the size of the watermain on King Street and Caroline Street.

7.0 STORM SERVICING AND STORMWATER MANAGEMENT

7.1 Stormwater Management Objectives and Design Criteria

As per City of Waterloo regulations, the following stormwater management criteria are typically applicable:

- 'Enhanced' water quality control with 80% long-term average-annual total suspended solids (TSS) removal; and
- Post-to-pre-development peak flow control for the 5-year through the 100-year return period design storms.
- Limit surface ponding in hardscaped areas to 30 cm.

City of Waterloo storm parameters are presented below.

Table VIII: City of Waterloo Design Storm Parameters

Return Period	A	B	C
5-year	1755	12.347	0.895
100-year	4692	17.437	0.956

The Stormwater Area Plans prepared by Grandlinq in 2016 included the entirety of the site in the Area 3 drawing (CU-1002). This catchment considered an area of 0.56 ha, and a runoff coefficient of 0.70. Using the rational method, this results in a pre-development 5-year peak flow rate of 118.5 L/s, and a 100-year pre-development peak flow rate of 215.4 L/s. The existing conditions of the site actually appear to be more impervious (approximately 85%) than a runoff coefficient of 0.70 would translate to, so these pre-development peak flow rates are to be considered the allowable release rates for the proposed development. The Grandlinq drawing has been included in Appendix C for reference.

7.2 Stormwater Management Design

The proposed development is expected to be mostly impervious, with the building encompassing the majority of the site. As a result, stormwater quantity controls will be required to meet the pre-development peak flows. Infiltration and surface parking lot ponding is not feasible for the site. Flow control roof drains are proposed to accommodate stormwater rate control. It should also be noted that the site is within a City of Waterloo Policy Area; Subwatershed 320, and runoff volumes during major storm events must be released as quickly as possible, without delay, to ensure peak flow rates from the Uptown area are released from the system prior to upstream tributaries entering this area. This will be taken into consideration when designing the controls for the site.

Although roof area will make up the majority of the site, the at-grade parking level will contain vehicle-tracked areas and presumably be directed to a storm sewer. As such, a snout or other form of quality control, such as an OGS will likely be required to service this at-grade parking level.

The runoff from the site will be directed to Kuntz Lane which drains to King Street where existing flows are directed. In this way there is no direct connection to King Street, but we have respected the existing surface storm outlet. The connection of Phase 1 and Phase 2 storm building drains can be efficiently accommodated with the proposed private manhole at the property line which connects via one storm sewer to the new manhole on Kuntz Lane. An extension of the municipal storm sewer on Kuntz Lane will be required to accommodate the storm connection from the site. Detailed stormwater management design will be presented during Site Plan Approval.

8.0 SITE GRADING

The grading of the site will respect the existing grades along all property lines. Proposed grading will conform with slopes outlined as part of the Accessibility for Ontarians with Disabilities Act (AODA) and City of Waterloo Development Engineering Guidelines.

The proposed grading also allows for conveyance of major overland flow towards King Street or via Kuntz Lane to King Street. West. Refer to the Functional Grading and Servicing Plan (C201).

8.1 On-Site and Excess Soil Management Provincial Regulations

The MECP regulation O.Reg. 406/19 “On-Site and Excess Soil Management” under the Environmental Protection Act states that the excavation of excess material, and subsequent off-site disposal of excess soils from this site, will require testing and reporting in the MECP’s Environmental Activity and Sector Registry (EASR). The Owner and Contractor will be responsible for complying with all of the noted requirements.

9.0 EROSION AND SEDIMENT CONTROL

Sediment and erosion controls to be implemented during construction will include stabilized construction entrances, a perimeter silt fence, and sediment interceptor swales with installation of coir log check dams.

Prior to the start of any construction, all erosion and sediment control measures installed will be inspected by the Consultant. The controls will be maintained, and accumulated sediments removed once their capture capacity has been decreased by one-third. The measures will also be periodically inspected and upgraded/changed as Site conditions change. Periodic inspections will consist of visual observation of the effectiveness of the control measures and sediment migration offsite.

Any sediment tracked onto the roadway during construction will be cleaned by the Contractor. To minimize the amount of mud tracked onto the roadway, a mud-mat will be installed at all construction exits and the Contractor will be required to ensure that vehicles leave through the exit. The mud-mat will be periodically inspected and cleaned/maintained as required to ensure it is functioning as intended.

To prevent sediment runoff from the Site, light-duty silt fencing (in accordance with OPSD 219.110) will be installed along the perimeter of the Site and at the base of all stockpiles. Stockpiles are to be visually monitored after rainfall events and will be hydraulically seeded if the stockpiles are to remain undisturbed for extended periods of time.

The outlets from the Site will be inspected for evidence of sediment migration offsite. In the event that sediments have migrated offsite, additional sediment controls shall be implemented as necessary to ensure that no additional sediment escapes from the Site. Any excessive sediment that has migrated offsite shall be removed and the area restored to pre-construction conditions.

As the servicing phase of the construction proceeds, each inlet structure will have an insert installed and/or filter fabric will be wrapped around the lids of all manholes to prevent intrusion of sediment into the storm sewer network. The inserts will be cleaned once they reach one-third their sediment accumulation capacity or as per the manufacturer’s recommendations.

All erosion and sediment control measures will be removed at the end of construction.

10.0 SALT MANAGEMENT

Given the nature of the development as residential apartments, only sodium chloride, through the use of de-icing salt, is expected to be a concern to ground water sources, as a result of this development.

The Region of Waterloo relies on groundwater as its primary source of drinking water. As such, a comprehensive Salt Management Plan and Winter Maintenance Worksheet are required to outline measures incorporated into the development to protect groundwater resources from impacts from road salt. The main objective of the Salt Management Plan is to achieve a reduction in salt impacts through the promotion and adoption of best management practices, and it will be created during the detailed design stage of the project.

In general, the design of the proposed development will take into account salt and the impacts of salt to neighbouring features. Salt-laden runoff from the parking lot and pedestrian walkways will be directed to private sewers and away from infiltration areas. Asphalt areas will be designed with a slope of 1.0%-5.0% in general to promote quick drainage towards collection structures, minimizing the exposure of runoff to the cold weather and, therefore, minimizing freezing. Larger slopes will also minimize the possibility of ponding or pooling of water on the surface in the event of post-construction settlement.

The stormwater management measures on the site also respect the objective to protect ground water sources. The City's stormwater management criteria are met without the need of subsurface infiltration from any salt-laden surfaces on the site.

Salt application and handling will be coordinated with a private contractor who will be expected to meet basic operational requirements such as not overloading material in spreaders to reduce spillage of salt. Preference should be given to contractors who are Smart About Salt™ Certified. Spreaders will not be washed on site. It is expected that the private contractor will keep track of application rates and adjust these rates to suit weather forecasts. Direct application of liquid materials or pre-wetted sand and salt have been proven methods to achieve salt reductions, and will be communicated to the contractor. All salt handling is to be limited to the paved asphalt area. The asphalt pavement will prohibit infiltration of salt into the ground.

It is also assumed the site will not receive bulk salt deliveries and no salt will not be stored on site (beyond small, covered bins). The future Condominium Corporations are to ensure that any salt spills are cleaned up immediately, using a broom and shovel, before the salt has a chance to dissolve and enter the storm system.

Further best practice measures include sand and salt mixing is occurring offsite. Mixing is to occur in good weather to reduce loss of salt due to precipitation and wind, and to reduce the moisture content of the mixture. A homogenous mixture is to be ensured to minimize the amount of salt required to prevent freezing of the pile. The sand used for the mixture is to be dry to minimize amount of salt required to prevent freezing. Mixture is to be stored in the covered bins as soon as possible and the mix area is to be swept clean. The storage bins and the covering are to be checked periodically to ensure there are no leaks or cracks. Any damage is to be repaired immediately, with temporary measures if more permanent fixes cannot be carried out immediately. At no time should leaks be allowed to persist.

Any snow plowed from the paved asphalt area is to be directed to areas from where the meltwater will be collected into the storm system. As part of detailed design, snow storage areas will be located on impervious surfaces and in close proximity to drainage structures. Snow from offsite locations will not be stored at this facility.

During detailed design, a detailed Salt Management Plan and associated Winter Maintenance Worksheet will be completed for the development.

11.0 CONCLUSIONS

Based on the analysis presented in this report it is concluded that:

- The development is proposed to be serviced with a new 200-mm-diameter sanitary service connected to the municipal sewer on Caroline Street. It is understood that the City of Waterloo will assist in verifying capacity in the local system using the city-wide sanitary sewer model.
- A 200-mm-diameter domestic water and a 250-mm-diameter fire service connecting to the existing watermain on Caroline Street are proposed to provide the domestic and fire water demand to the development. A hydrant flow test and/or regional modelling will be completed to confirm there is sufficient capacity within the municipal system to support the development.

- Post-development peak flow rates for the 5-year and 100-year storm events will be controlled to be pre-development levels through the use of flow control roof drains.
- Although roof area will make up the majority of the site, since the at-grade parking level will contain vehicle-tracked areas, a snout or other form of inlet quality control, will likely be required to service the development.
- Site grading will match into existing grades at all property lines and ensure emergency overland flow routes are ultimately towards the King Street. The site grading also ensures surface ponding does not exceed 30 cm in hardscaped areas.
- Perimeter silt fence, silt fence at the base of all stockpiles, silt sacs in catchbasins, and construction entrance mud mats can provide erosion and sediment control. These will be included in detailed design in coordination with the proposed construction staging plan.

All of which is respectfully submitted.

APPENDIX A

Sanitary Demand Calculations

- Sanitary Sewer Design Sheet

PROJECT DETAILS				Design Data			SANITARY SEWER DESIGN CALCULATIONS						WALTERFEDY						
Project:	167-171 King St S			Min. Velocity	0.8	m/s	Residential			Commercial									
Project No:	2024-0507-10			Max. Velocity	3.0	m/s													
Date:	2026-03-26			Manning's 'n'	0.013		Peaking Factor	Harmon	Peaking Factor	2.5									
Designed By:	ZS	Checked By:	SF	Infiltration	0.25	l/s/ha	Avg. Daily Flow	275	L/c/d	Avg. Daily Flow	0.95	L/s/ha							
Site Area = 0.53 ha				Units	Density	Population	Cumulative			Commercial			Infiltration		Total Flow	Design Data			
					(people/unit)	(people)	Area	Population	Peak Factor	Area	Total Area	Area	Total Area	Diameter		Slope	Q _{FULL}	V _{FULL}	
							(ha)	(people)		(ha)	(ha)	(ha)	(ha)	(mm)	(%)	(L/s)	(m/s)		
Residential (PPU)				796	1.77	1409	-	1409	3.699			0.00	0.00	16.589	200	0.60	25.41	0.81	
Commercial						0				0.08	0.08	0.00	0.00	0.195	200	0.60	25.41	0.81	
Combined				796	1.77	1409	-	1409	3.699	0.08	0.08	0.53	0.53	16.916	200	0.60	25.41	0.81	

APPENDIX B

Water Demand Calculations

- Domestic Water Demand
- Fire Flow Calculations (FUS 2020)

DGSSMS 2025 AND ONTARIO BUILDING CODE

WALTERFEDY

Project	167-171 King Street S									
Project #	2024-0507-10									
Designer	ZS									
Address	Waterloo, ON									
Description	Domestic Water Demand									
Description	Floor Area (ha)	Units	People/unit	Population	Operating Hours	Demand	Max Daily Peak Factor	Max Hourly Peak Factor	Max Daily Demand (L/s)	Max Hourly Demand (L/s)
Residential	-	796	1.77	1409	-	225 L/cap/day	1.42	3.75	5.22	13.76
Commercial	0.082				16	42 m3/ha/day	1.42	2.00	0.06	0.08
Overall Demand									5.28	13.84

REQUIRED FIRE FLOW				WALTERFEDY	
Water Supply for Public Fire Protection (FUS 2020)					
Project	167-171 King Street S				
Project #	2024-0507-10				
Designer	TK				
Address	Waterloo				
Description	Fire Demand - Tower B				
$F = 220 \times C \times \sqrt{A}$			F = Required fire flow (LPM) C = Coefficient related to type of construction A = Total floor area (including all storeys but excluding any basement levels at least 50% below grade)		
Type of Construction	Non-Combustible Construction			C =	0.8
Description	Unprotected Metal Structural Components, Masonry or Metal Walls. All Structural Members are Non-Combustible but does not qualify as Fire-Resistive				
Total Floor Area		m ²			
# Storeys	30-38				
Fire Resistant Building?	NO				
Vertical Openings and Exterior Vertical Communications protected with minimum one (1) hr rating?				NO	
Area	19359	m ²			
Description	Area of two largest floors + 50% of each of the floors above it				
Tower A+B	BFA	GCA	Total	Factored Total	
Level 1	3408	1689	5097	5097	
Level 2	736	2704	3440	3440	
Level 3	374	3870	4244	2122	
Level 4	506	3870	4376	2188	
Level 5	506	3738	4244	2122	
Level 6	1756		1756	878	
Level 7	1756		1756	878	
Level 8	1756		1756	878	
Level 9	1756		1756	878	
Level 10	1756		1756	878	
Required Fire Flow	24000	L/min			
Occupancy Charge	Limited-Combustible Contents				
Fire Flow Reduction	-15%	OR	-3600	L/min	
Required Fire Flow	20400	L/min			
Automated Sprinkler Protection	YES				
Designed to NFPA 13 Standard	YES		-30%		
Standard Water Supply to Sprinklers and Standpipes	YES		-10%		
Fully Supervised System	YES		-10%		
Fire Flow Adjustment			-10200 L/min		
Exposure 1 (North)	Distance	0	m	Charge	0%
Description	Tower B - Fully Protected				
Exposure 2 (East)	Distance	0	m	Charge	0%
Description	Existing Residential - Fully Protected				
Exposure 3 (West)	Distance	0	m	Charge	0%
Description	Retirement Home - Fully Protected				
Exposure 4 (South)	Distance	25	m	Charge	10%
Description	Norman Street Town Homes				
Total Exposure Charge	10%				
Fire Flow Adjustment	2040 L/min				
Total Required Fire Flow	12000 L/min				
Total Required Fire Flow	3170 U.S. GPM				
Total Required Fire Flow	200 L/s				

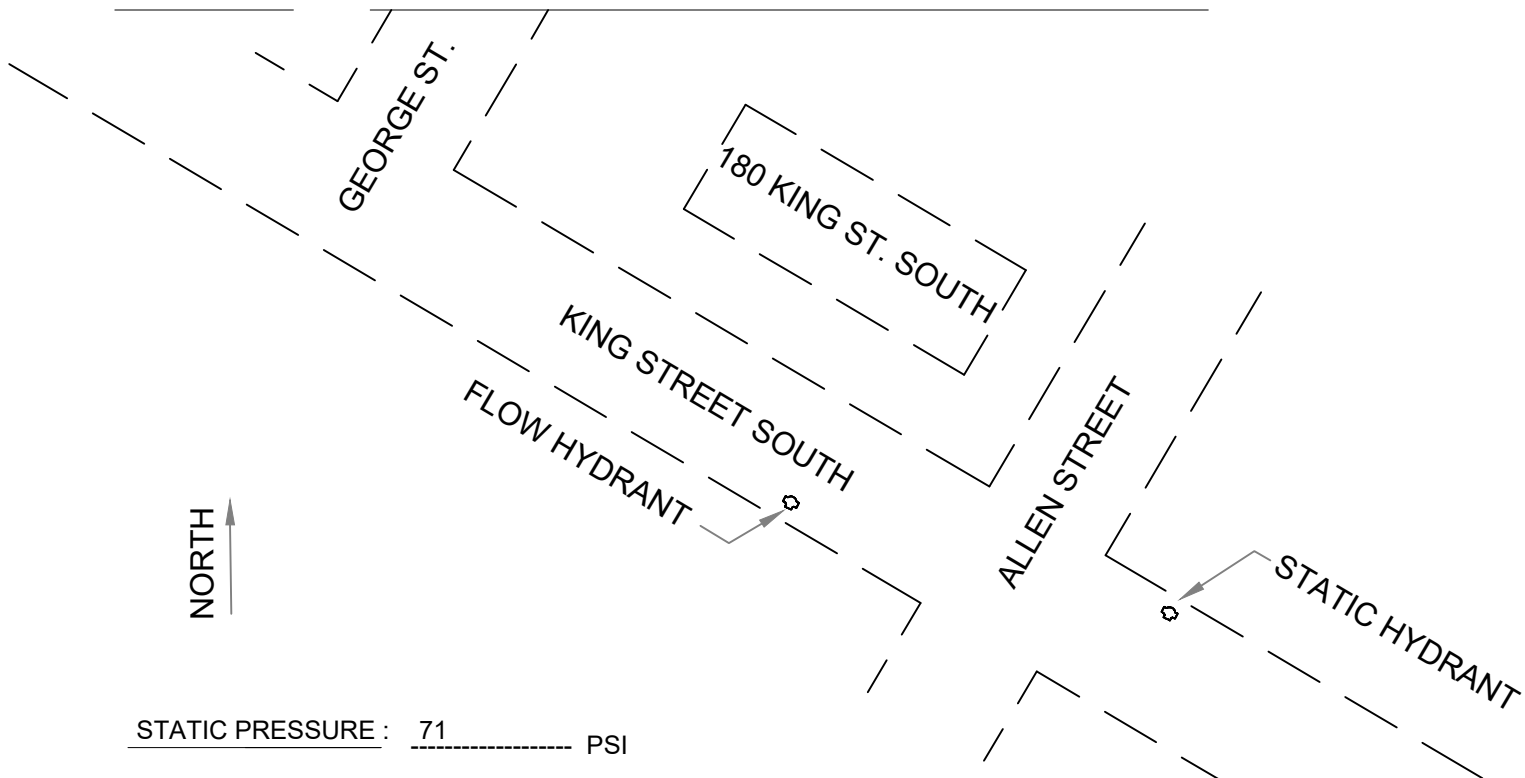


FLOW TEST RESULTS

DATE : 1 DEC. 2022 TIME : 11:00 AM

LOCATION : 180 KING STREET SOUTH
WATERLOO, ONTARIO

TEST BY : VIPOND AND PUC WATERLOO



STATIC PRESSURE : 71 PSI

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	2-1/2"	0.9	63	35	993
2	2	2-1/2"	0.9	56	28	1776
				20		4850

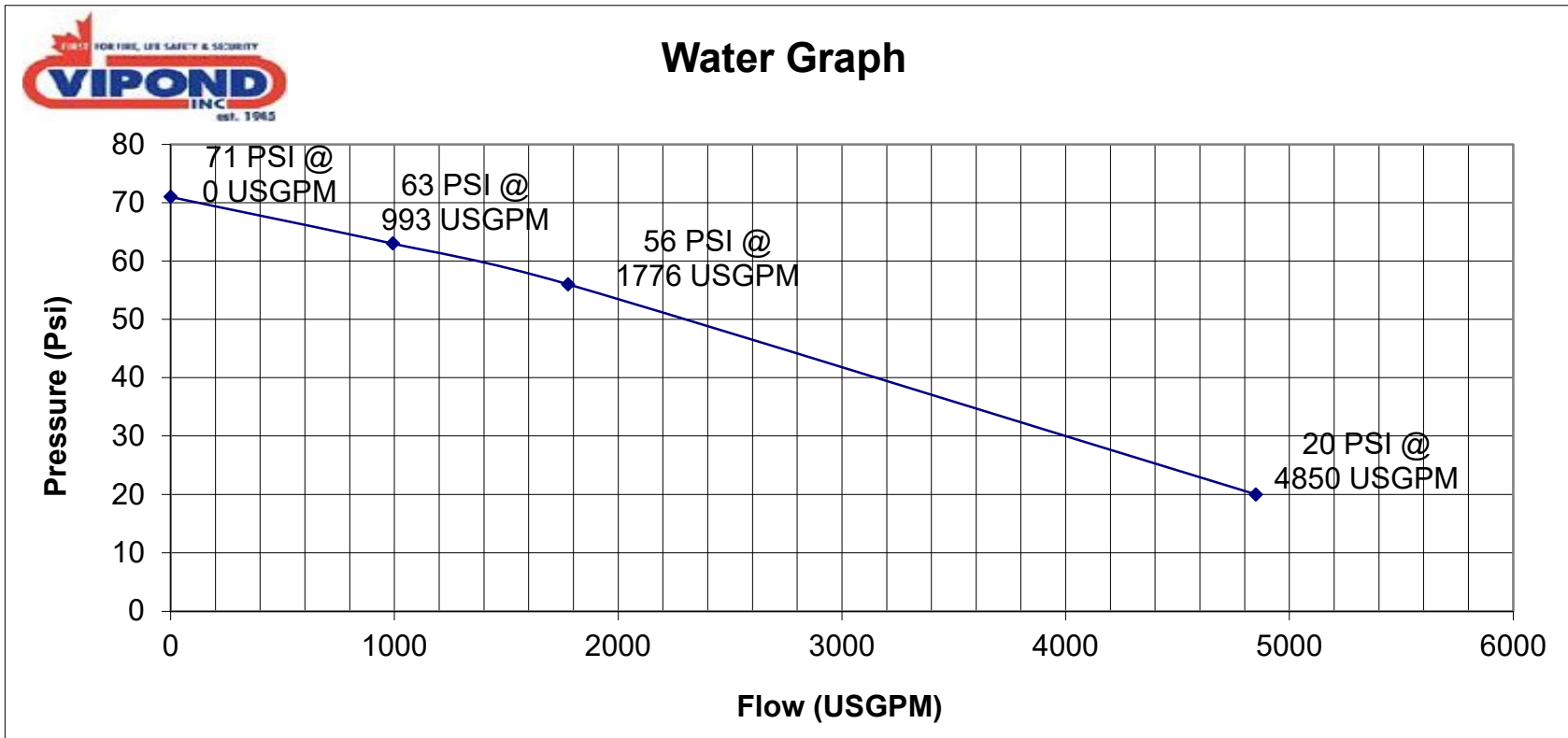
Hydrant Flow Test - 180 KING STREET SOUTH, WATERLOO

STATIC HYDRANT -ON KING STREET CORNER WITH ALLEN ST -FLOW HYDRANT-ON KING STREET ACROSS FROM 180 KING ST.SOUTH

Static Pressure (Psi)	
	71
Residual Pressure 1 (Psi)	
	63
Residual Pressure 2 (Psi)	
	56
Residual Pressure 3 (Psi)	
	20
Co efficient value	
	0.9

Pitot Reading 1	35
Outlet Size 1	2.5
Pitot Reading 2	28
Outlet Size 2	2.5
Pitot Reading 3	
Outlet Size 3	
Flow 1 Calculated	
	992.68
Flow 2 Calculated	
	1775.76
Flow 3 Calculated	
	4850.00

# of Outlets Flowed 1	1
# of Outlets Flowed 2	2
# of Outlets Flowed 3	0
Graph Data: DECEMBER 1, 2022	
Pressure Values (y-axis)	Flow Values (x-axis)
71	0
63	993
56	1776
20	4850
Time of Test :	
DEC.1/2022	11:00 AM
Performed by:	J.D. & J.S.



APPENDIX C

Stormwater Management

- Existing Conditions Parameters

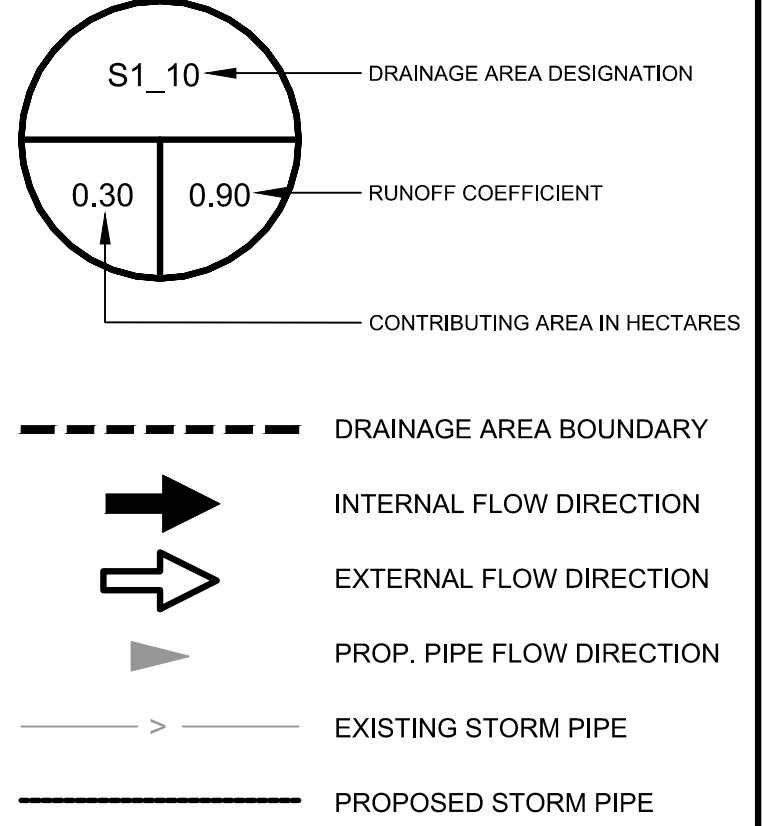


PACKAGE NAME:
ERB VIA WATERLOO TOWN SQUARE
AND KING STREET
MOE APPROVAL

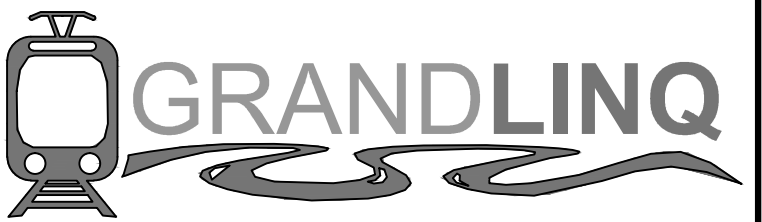
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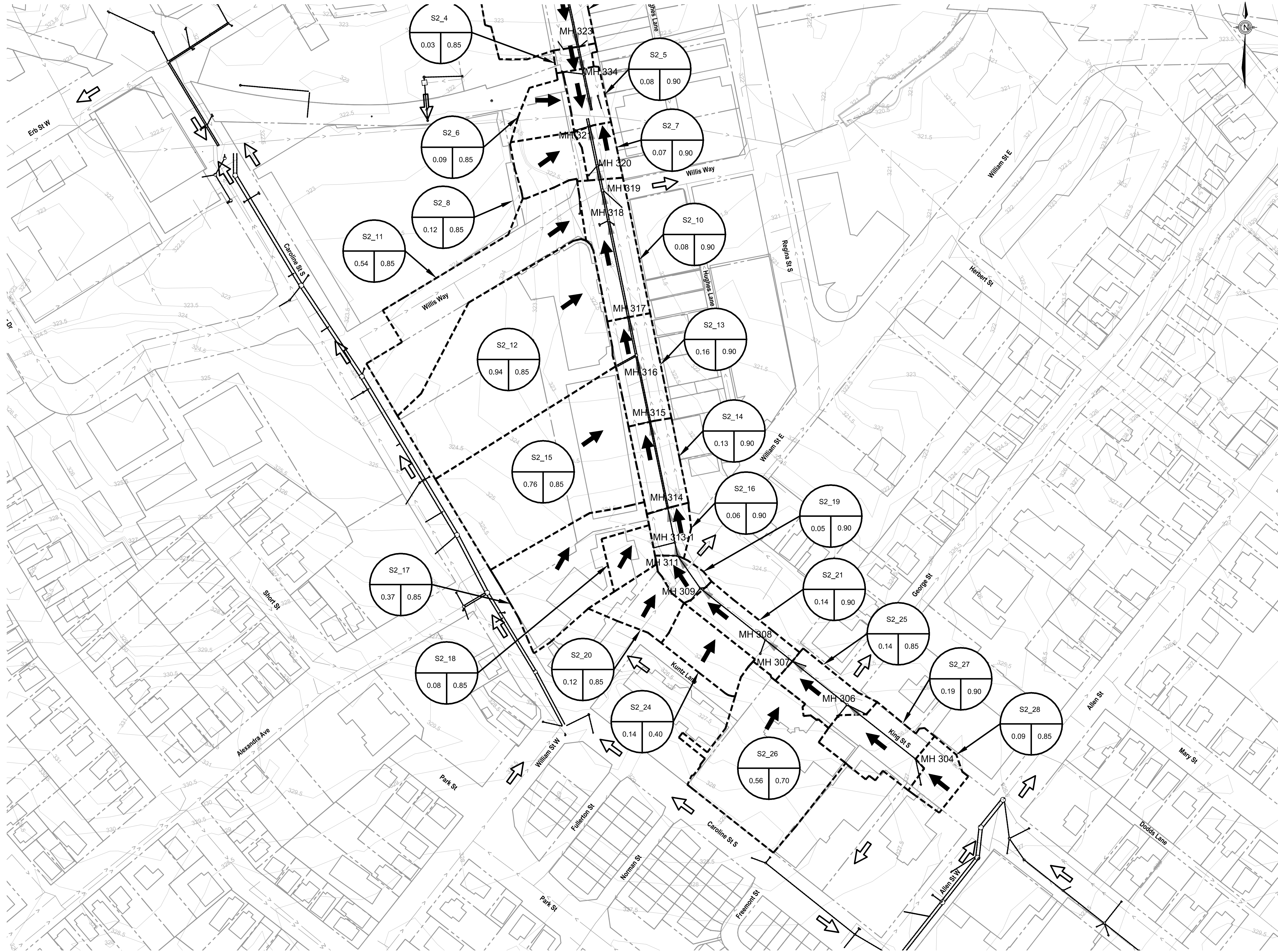


00	ISSUED FOR MOE APPROVALS	TOR	2016-05-04
REV	DESCRIPTION	BY	DATE

REGION OF WATERLOO
STAGE I
LRT PROJECT

CIVIL UTILITIES
STORMWATER AREA PLAN
AREA 3

DRAWN BY: RC	DESIGNED BY: AM	CHECKED BY: PW	SCALE: 1:1000
PACKAGE: S03A.1	DRAWING No. CU-1001	SHEET: OF	REV. 00

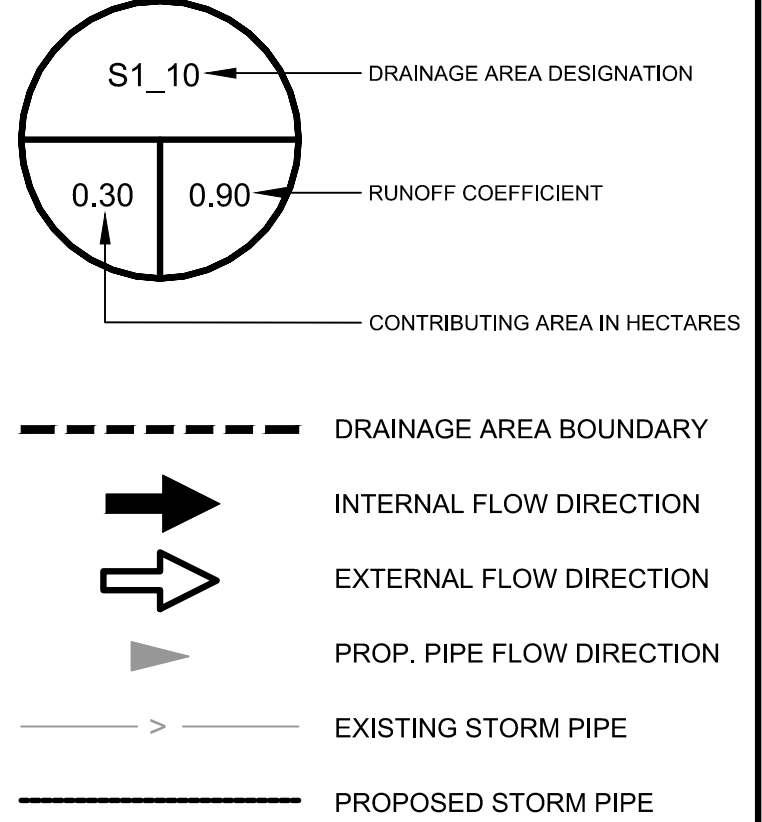


PACKAGE NAME:
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AND KING STREET
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REV	DESCRIPTION	BY	DATE

REGION OF WATERLOO
STAGE I
LRT PROJECT

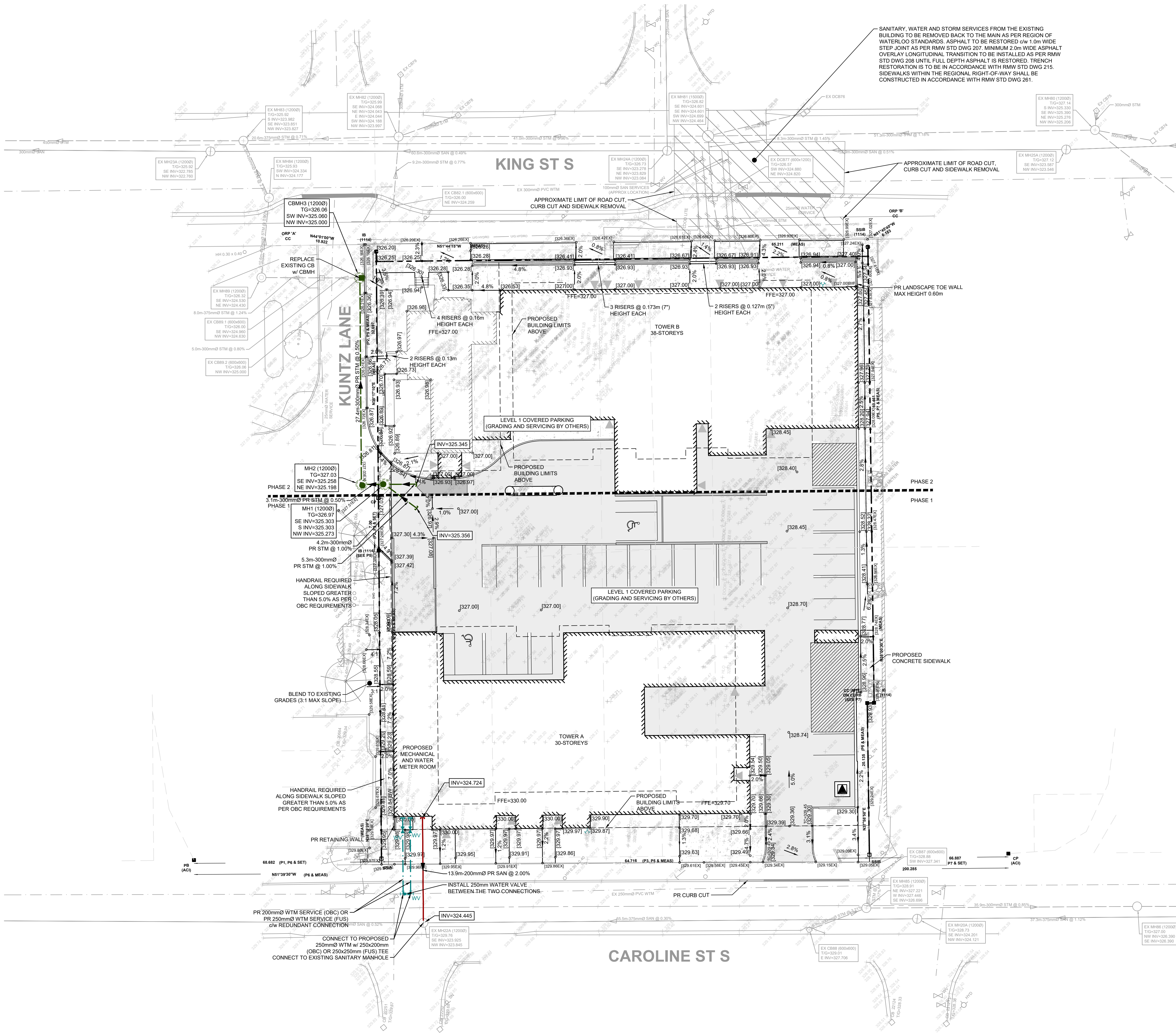
CIVIL UTILITIES
STORMWATER AREA PLAN
AREA 3

DRAWN BY: RC	DESIGNED BY: AM	CHECKED BY: PW	SCALE: 1:1000
PACKAGE: S03A.1	DRAWING No. CU-1002	SHEET: OF	REV. 00

APPENDIX D

Drawings

- Existing Conditions Plan
- Functional Grading and Servicing Plan



LEGEND

- PROPERTY LINE
- LOT LINE
- LEGAL EASEMENT
- IB IRON BAR
- SSIB STANDARD IRON BAR
- CC CUT CROSS
- EX LS EXISTING LAMP STANDARD
- EX HP EXISTING HYDRO POLE
- EX SIGN EXISTING SIGN
- EX BELL PED EXISTING BELL PEDESTAL
- EX HYDRO TRANSFORMER EXISTING HYDRO TRANSFORMER
- EX GV EXISTING GAS VALVE
- EX CB EXISTING CATCHBASIN
- EX DCR EXISTING DOUBLE CATCHBASIN
- EX MH EXISTING STORM MANHOLE
- EX CBMH EXISTING CATCHBASIN MANHOLE
- EX DCRMH EXISTING DOUBLE CATCHBASIN MANHOLE
- EX SAN MH EXISTING SANITARY MANHOLE
- EX HYD EXISTING FIRE HYDRANT
- EX WV EXISTING WATERMAIN VALVE
- BOREHOLE No EXISTING BOREHOLE LOCATION
- EXISTING SPOT ELEVATION
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING DECIDUOUS TREE
- EXISTING CONIFEROUS TREE
- EXISTING TREE DRIPLINE AND/OR VEGETATION LINE
- EXISTING SANITARY SERVICE
- EXISTING STORM SERVICE
- EXISTING WATERMAIN
- EXISTING GASMAIN
- EXISTING OVERHEAD HYDRO LINE
- EXISTING UNDERGROUND HYDRO LINE
- EXISTING BELL LINE
- PROPOSED GRADE
- EXISTING GRADE
- PROPOSED DRAINAGE ARROW/SLOPE
- PROPOSED SWALE
- PROPOSED OVERLAND FLOW ROUTE
- PROPOSED EMBANKMENT (3:1 MAX UNLESS OTHERWISE NOTED)
- PROPOSED CHAINLINK FENCE
- EXISTING CONTOUR
- PROPOSED CONCRETE SURFACE
- PROPOSED LIGHT DUTY ASPHALT SURFACE
- PROPOSED HEAVY DUTY ASPHALT SURFACE
- CBMH / DCRMH PROPOSED CATCHBASIN MANHOLE / DOUBLE CATCHBASIN MANHOLE
- MH PROPOSED STORM MANHOLE
- MH PROPOSED SANITARY MANHOLE
- WV PROPOSED WATERMAIN VALVE
- PROPOSED SANITARY SEWER/SERVICE
- PROPOSED STORM SEWER/SERVICE
- PROPOSED WATERMAIN/SERVICE
- PR HYDRO TRANSFORMER PROPOSED HYDRO TRANSFORMER

DATE	ISSUED FOR ZBA SUBMISSION	ISSUANCE	NO.
2025.07.09	ISSUED FOR ZBA SUBMISSION		1
2026.03.27	REISSUED FOR ZBA		

1:250

0 2.5 5.0 12.5

CLIENT

VanMar Developments

PROJECT

145 Goddard Crescent, Cambridge, ON

167-171 King St S - VanMar

167-171 King St S, Waterloo, ON

TITLE

FUNCTIONAL GRADING AND SERVICING PLAN

1 of 1

TORONTO | CALGARY | KITCHENER | HAMILTON

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SCALE	1:250	SHEET NO.:
DATE	2026-03-27	C201
PROJECT NO.:	2024-0507-10	
DRAWN BY:	TDK	
CHECKED BY:	ZS	

SANITARY, WATER AND STORM SERVICES FROM THE EXISTING BUILDING TO BE REMOVED BACK TO THE MAIN AS PER REGION OF WATERLOO STANDARDS. ASPHALT TO BE RESTORED c/w 1.0m WIDE STEP JOINT AS PER RMW STD DWG 207. MINIMUM 2.0m WIDE ASPHALT OVERLAY LONGITUDINAL TRANSITION TO BE INSTALLED AS PER RMW STD DWG 208 UNTIL FULL DEPTH ASPHALT IS RESTORED. TRENCH RESTORATION IS TO BE IN ACCORDANCE WITH RMW STD DWG 215. SIDEWALKS WITHIN THE REGIONAL RIGHT-OF-WAY SHALL BE CONSTRUCTED IN ACCORDANCE WITH RMW STD DWG 261.

APPROXIMATE LIMIT OF ROAD CUT, CURB CUT AND SIDEWALK REMOVAL

APPROXIMATE LIMIT OF ROAD CUT, CURB CUT AND SIDEWALK REMOVAL

PR LANDSCAPE TOE WALL MAX HEIGHT 0.60m

LEVEL 1 COVERED PARKING (GRADING AND SERVICING BY OTHERS)

LEVEL 1 COVERED PARKING (GRADING AND SERVICING BY OTHERS)

PROPOSED CONCRETE SIDEWALK

CAROLINE ST S