FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

IN SUPPORT OF OFFICIAL PLAN AND ZONING BY-LAW AMENDMENT

170 Northfield Drive West

City of Waterloo, Ontario

8395 Jane Street, Suite 100
Vaughan, Ontario L4K 5Y2
Tel: (905) 326-1404

File Number: 22051

Prepared For:

Forgestone Capital Management LP

No.	Revision	Date
2	First Submission	2024-03-25
1	Draft for Client Review	2024-02-16

EXECUTIVE SUMMARY

This Functional Servicing Report has been prepared by Counterpoint Engineering Inc. (CPE) on behalf of Forgestone Capital Management LP to support the proposed severance, Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA) and redevelopment of the existing site at 170 & 180 Northfield Drive and 595-630 Parkside Drive in the City of Waterloo (the "Subject Lands") for high density residential and commercial uses. The subject site is bounded by Northfield Drive West to the south, the Canadian National Railway (CNR) corridor to the east, Weber Street North to the west and industrial sites to the north. The servicing strategy for the proposed development is summarized as follows:

Water Servicing:

There are existing 300mm and 600mm watermains on the Northfield Drive road allowance, a private 300mm watermain within the subject site and a 300mm watermain on Weber Street North. Phases 1 and 2 will be serviced by a new 300mm watermain connection to the existing 300m watermain on Northfield Drive. Phase 3 will be serviced by a new 200mm watermain connection to the existing 300mm watermain on Northfield Drive. The existing commercial plaza will continue to be serviced by the existing connections to Weber Street and Northfield Drive watermains. Peak domestic water demands for the proposed development are estimated to be 6,400 L/min and the maximum day plus fire flows were determined to be 14,900 L/min. Confirmation of the pressure district by Region of Waterloo staff and a hydrant test will be required to confirm the system pressure will be adequate to support the proposed development.

Sanitary Servicing:

The existing commercial plaza and the Phase 3 parcel will continue to be serviced by the existing 250mm sanitary sewer. A sanitary sewer easement will be required within the Phase 3 parcel to allow the conveyance of sanitary flows from the existing commercial plaza to the Northfield Drive sanitary sewer. The development area will be provided with one connection to the existing municipal sanitary sewer system on Northfield Drive. The sanitary peak flow for the development area is **67.33 L/s**. The design sanitary peak flow for the ultimate development (development parcel + future development of the Phase 3 parcel) condition is **94.58 L/s**. The

peak sanitary flows from the initial phase of development (Buildings A-D) will be **53.28 L/s**. The available capacity of the downstream sanitary trunk sewer will need to be confirmed with the City of Waterloo staff. The development phasing will be dependent on sanitary allocation to be confirmed by the City of Waterloo staff.

Storm Servicing and Stormwater Management (SWM):

Stormwater quantity control is to be designed based on the City and Region of Waterloo's post-to-pre-development control approach. Additionally, Canadian National Railway criteria may apply for drainage directed to the rail corridor. As per the existing conditions, two post-development storm drainage outlets are proposed – one to the Northfield Drive storm sewer and another to the rail corridor. Quantity control will be implemented using oversized storm sewers, manholes and underground storage chambers within the private roadways and parking lots and in stormwater management cisterns in the underground parking structures of Buildings A-D. Two oil grit separator units are proposed downstream of each control manhole to meet the MECP 'Enhanced' level of protection (80% TSS removal). The subject lands fall within the Forwell Creek Subwatershed, which has an infiltration target of 12.5mm. Water balance measures will be implemented within the development area and the Phase 3 parcel only (11.08 Ha) and the existing commercial plaza's water balance will remain as per current conditions. Water balance mitigation shall be provided through infiltration facilities within the parking areas for commercial/industrial buildings, landscaped areas and onsite reuse in Buildings A-D. The existing commercial plaza and a portion of the Phase 3 parcel will continue to be serviced by the existing storm sewer connection to the Northfield Drive storm sewer.

Grading

Site grading for the existing commercial plaza and the Phase 3 parcel will be maintained as per the existing conditions. Overland flows from the private roadways within the south half of the development area be directed towards Northfield Drive while the overland flows from the north half of the development area will be directed through the parking lot between Buildings J and L and onto the CNR corridor.

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1.0 INTRODUCTION

1.1 BACKGROUND

Forgestone Capital Management LP (Forgestone) has retained Counterpoint Engineering Inc. (CPE) to prepare this Functional Servicing and Stormwater Management Report (FSSR) to support the Official Plan Amendement (OPA) and Zoning By-law Amendment (ZBA) for the lands municipally known as 170 & 180 Northfield Drive and 595-630 Parkside Drive in Waterloo (the 'subject lands').

Under existing conditions, the subject site consists of single-storey commercial buildings on the southwest side, surface parking accessible from Parkside Drive and vacant lands along the east and north sides.

The subject site is 16.05 Ha in area and is bounded by Northfield Drive to the south, the Canadian National Railway (CNR) corridor to the east, Weber Street North to the west and commercial buildings to the north. It is anticipated that three separate consent applications to divide the lands into three parcels will be submitted after rezoning. Two of these parcels (Phases 1 and 2) are proposed for redevelopment while the third parcel (Phase 3) is proposed to remain as existing. Phases 1 and 2 (the "development area") and Phase 3 are to be included in the OPA and ZBA application. Approximately 0.04 Ha of the subject site will be reserved for the road widening of Northfield Drive.

Refer to **Figure 1** for the location of the subject lands within the City of Waterloo and **Figure 2** for the land severance schematic.

1.2 PROPOSED DEVELOPMENT

The proposed development is a mix of residential, employment and commercial uses with high-density housing being the predominant land use. The residential portion of the proposed development will be comprised of Building A (29 storeys), Building B1/B2 (40 storeys), Buildings C1/C2 (25 and 38 storeys, respectively), Buildings D1 and D2 (35 and 25 storeys, respectively), associated multi-storey above-ground and underground parking structures, private roadways and park spaces. The commercial portion of the proposed development will

consist of industrial/commercial buildings and associated parking and loading dock areas. A 20m wide landscaped buffer is proposed along the east property limit and adjacent to the CNR corridor.

1.3 PURPOSE OF THE REPORT AND STUDY PARAMETERS

The intent of this report is to demonstrate the viability of water and wastewater servicing, storm drainage and stormwater management with respect to applicable guidelines, policies and design criteria. This report will demonstrate the impact of the proposed development on the infrastructure capacity of the area. The SWM section of this report will identify the rate, quantity and quality impacts of stormwater discharge on existing infrastructure and/or downstream receivers, due to the change in existing conditions. The report will determine if improvements to any private and/or public municipal servicing infrastructure are required to support the proposed development and where applicable, provide strategies for reducing or eliminating negative impacts through mitigation measures.

This report has been prepared based on a review of the topographic survey, background studies and record drawings provided by the City of Waterloo and the Region of Waterloo. The conceptual design is documented on functional servicing plans which are contained in **Appendix A**. The following were referenced in the preparation of this report:

- Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS), February 2022
- Development Charges Background Study, Hemson Consulting, January 2020
- The City of Waterloo Comprehensive Engineering and Landscape Manual, Volume 5 – Underground Servicing, Grading and Utilities, Volume 6 – Stormwater Management
- Design Guidelines for Drinking-Water Systems, Updated May 2023 (MOE Guidelines)
- MECP Stormwater Management Planning and Design Manual (SWMPD, 2003)
- Fire Underwriters Survey (FUS), Water Supply for Public Fire Protection Manual 2020

2.0 WATER SUPPLY

2.1 EXISTING WATER SUPPLY

Based on available City of Waterloo and Region of Waterloo records, the existing municipal watermains along the adjacent rights-of-way include the following:

- Existing 600mm feeder watermain on the north side of Northfield Drive.
- Existing 300mm watermain on the south side of Northfield Drive.
- Existing 300mm watermain on Weber Street.
- Existing 300mm watermain located south of Northfield Drive along Parkside Drive stubbed at the Northfield and Parkside Drive intersection.
- Existing 300mm watermain on Parkside Drive is situated between on private roadway (Parkside Drive) and terminates at an existing hydrant east of the single-storey commercial building (#180 Northfield Drive).

There is minimal information available regarding the existing internal site servicing layout. However, it is assumed the existing commercial buildings are supplied by the existing private watermain on Parkside Drive. There are also four existing hydrants within the site supplied by the existing private watermain on Parkside Drive. All existing water infrastructure within the subject lands (watermain, water services, site fire hydrants and valve boxes) will need to be removed prior to construction. Refer to **Drawing C-100 – Existing Servicing Plan** for the existing watermain layout.

2.2 DOMESTIC AND FIRE FLOW DEMAND

The DGSSMS states that governing flows shall be the greater of a) maximum day demand plus fire flow, or b) maximum hour demand. Due to a lack of historical data for the subject lands, average daily consumption rates and peaking factors were determined following MECP design guidelines for drinking water systems. For residential demand, an average daily consumption rate of 300 L/c/day and peaking factors of 3.0 and 2.0 were used to determine maximum hour and maximum day demand, respectively. Commercial/Industrial water demand was assumed to be 55 cu.m/day/ha (0.64 L/s/ha) and peaking factors of 2.0 and 4.0 were used to determine

maximum hour and maximum day demand. The combined residential and industrial demands are as follows:

- Maximum Day = 2,348 L/min (development area only)
- Maximum Hour Demand = 3,995 L/min (development area only)

The Fire Underwritey's Survey (FUS) guidelines were used to estimate the required fire flow for the development area. The governing building is assumed to be **Building L**, which will require a fire flow of 11,000 L/min, resulting in a maximum day demand plus fire flow of 13,348 L/min. A hydrant flow test will be completed at a later date once the pressure district is confirmed by Region of Waterloo staff to ensure the following pressure criteria are met:

System Pressures

Per the DGSSMS, the preferred design pressure ranges are:

- Average Day and Maximum Day: 350 kPa (50 psi) to 550 kPa (80 psi)
- Minimum Hour and Peak Hour: 275 kPa (40 psi) to 700 kPa (100 psi)

Pressures outside of these ranges are acceptable to the following limits:

- Maximum static pressure (All Scenarios) = 700 kPa (100 psi)
- Minimum pressure (Non-Fire Scenarios) = 140 kPa (20 psi)
- Minimum pressure (Fire Flow + Maximum Day) = 140 kPa (20 psi).

Refer to **Appendix B** for water demand calculations.

2.3 PROPOSED WATER SERVICING STRATEGY

2.3.1 EXISTING COMMERCIAL PLAZA

The existing commercial plaza will continue to be serviced by the existing connections to Weber Street and Northfield Drive watermains. The new parcel's water services terminate within the property limits (i.e. disconnected from services on other parcels).

Refer to **Drawing C-100 – Existing Servicing Plan** for the existing watermain layout for the existing commercial plaza.

2.3.2 PHASE 3

The Phase 3 parcel will be provided with a new 200mm watermain connection to the existing 300mm watermain on Northfield Drive. The new watermain will branch into 200mm fireline and 100mm domestic watermain with a meter in chamber and a backflow preventer in the chamber at the property line. The fireline and domestic watermain will further branch into two to service the two commercial/office buildings within Phase 3.

Refer to **Drawing C-101 – General Servicing Plan** for the proposed watermain layout for the Phase 3 parcel.

2.3.3 DEVELOPMENT AREA

The existing private watermain along the development area will be removed. A new 300mm watermain connection to the existing 300mm watermain that is currently stubbed at the Northfield Drive and Parkside Drive intersection. A domestic/fireline split will be made at the property limit and a backflow preventor in chamber shall be provided for at the property line on the fireline. A water meter in chamber will be provided on the domestic watermain.

The proposed residential buildings will be provided with separate connections to the internal fireline/domestic line within the private roadway. The commercial buildings will be provided with separate connections to the internal fireline/domestic line within the private roadway (Parkside Drive). The fireline will terminate at a hydrant and autoflusher within the cul-de-sac on the private roadways.

Refer to **Drawing C-101 – General Servicing Plan** for the proposed watermain layout for the development area.

3.0 SANITARY SERVICING

3.1 EXISTING SANITARY SERVICING

There is an existing 375mm sanitary sewer draining west to east along Northfield Drive and east of Parkside Drive. West of Parkside Drive, the sanitary sewer is 300mm and it extends beyond Weber Street. The adjacent lands (commercial buildings including Sobeys) to the west are serviced by a 250mm sanitary sewer that traverses the subject lands at the southwest corner. The existing buildings (#180 Northfield Drive and 595 Parkside Drive) are connected to this sewer. Refer to **Drawing C-100 – Existing Servicing Plan** for the layout of the existing sanitary sewers

As per the City of Waterloo Sanitary Master Plan (2015) and the Region of Waterloo Wastewater Treatment Master Plan (2018), the subject lands are situated within the Waterloo Waste Water Treatment Plant (WWTP) service area. Sanitary flows from the Northfield Drive sanitary sewer are discharged into the Forwell sanitary trunk sewer just west of Highway 85. The Forwell sanitary trunk sewer traverses the west side of Highway 85 and Forwell Creek valleylands and ultimately discharges into Waterloo WWTP which is located just northwest of the Highway 85 interchange with University Avenue. A map excerpted from the City Sanitary Master Plan indicating the location of subject lands within the Waterloo WWTP service area including the Forwell sanitary trunk sewer is included in **Appendix C**.

In preconsultation with the City of Waterloo staff, concerns over the capacity of the downstream Laurel Creek Trunk Sanitary Sewer and local sewers adjacent to the vicinity of the rail corridor were raised. It is understood that the sewer capacity is to be confirmed by the City of Waterloo staff once the ZBA application is received and intensification of the area including other proposed developments in the surrounding area is considered. Counterpoint has reviewed available existing sanitary drainage plans of the area surrounding the subject site and has determined that the existing 300mm sanitary sewer on Northfield Drive has a design capacity of 124 L/s at a slope of 0.50%. The existing sanitary design sheet indicates an existing sanitary

design flow of 65 L/s and available capacity of 59 L/s. Refer to the existing sanitary drainage plan and design sheet included in **Appendix C**.

3.2 PROPOSED SANITARY SERVICING

3.2.1 EXISTING COMMERCIAL PLAZA AND PHASE 3

The existing commercial plaza and Phase 3 will continue to be serviced by the existing 250mm sanitary sewer connection to the Northfield Drive sanitary sewer. A sanitary sewer easement will be required within the Phase 3 parcel to allow the conveyance of sanitary flows from the existing commercial plaza to the Northfield Drive sanitary sewer. As there are no proposed site changes within the existing commercial plaza and Phase 3 parcels, there will be no change in the sanitary flows and the existing sanitary flow conditions will be maintained.

3.2.2 DEVELOPMENT AREA

As per the DGSSMS, the sanitary servicing within the development area shall be designed to meet the following criteria:

- 2.07 persons per unit (Apartments)
- Average Flow – 275 L/c/d (Residential)
- Average Flow – 0.40 L/s/ha (Commercial/Industrial)
- Harmon's peaking factor (Residential)
- Infiltration Allowance of 0.25 L/s/ha

The development area will be provided with a new 300mm sanitary sewer connection to the existing 375mm sanitary sewer on Northfield Drive at an existing manhole (F31-4).

The sanitary drainage area for the development area is 8.03 Ha. which consists of a commercial/industrial tributary area of 5.25 Ha., a residential area of 2.78 Ha and an equivalent residential population of 5,181 persons, which has been determined from the conceptual site plans prepared by Turner Fleischer Architects Inc.. The resulting sanitary peak flow is **67.33 L/s**. Refer to the sanitary design sheet and drainage area plan included in **Appendix C**.

The sanitary drainage area for the ultimate development area (development area + future development of Phase 3) is 11.08 Ha. The future development lands are anticipated to consist of 1,764 residential units and 1.04 Ha of commercial area. The resulting sanitary peak flow for the ultimate development condition is **94.58 L/s**. Refer to the ultimate design sanitary flow calculation sheet included in **Appendix C**.

The development area will be serviced with a new 300mm sanitary sewer that will connect to the Northfield Drive sewer. Each building will be provided with a sanitary service. An internal sanitary sewer system will be situated within the private roadways to convey sanitary flows to Northfield Drive. Refer to **Figure C-101 – General Servicing Plan** for the proposed sanitary servicing layout.

4.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

4.1 STORMWATER MANAGEMENT CRITERIA

SWM criteria for the subject lands have been established based on several background documents including:

- Grand River Conservation Authority: Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulations
- MECP Stormwater Management Planning and Design Manual (SWMPD, 2003)
- TRCA Low Impact Development SWM Planning and Design Guide (2010)
- City of Waterloo Engineering Design Criteria (Volume 6 – Stormwater management)
- Forwell Creek Functional Drainage Study Class EA, 2001
- DGSSMS

4.1.1 QUANTITY CONTROL

Quantity control is to be designed based on the City and Region of Waterloo's post-to-pre-development control approach. Additionally, the available capacity of the existing Northfield Drive sewer is to be considered. For drainage to the CNR corridor to the east, control of post-

development flows to pre-development levels will be proposed. The subject lands are to be outside of the Northland Industrial Area (Phases I, II, III & IV) and Dearborn Industrial Area and as such the unit release rates for those lands are not applicable.

4.1.2 QUALITY CONTROL

In accordance with the SWMPD Manual, an Enhanced Level of protection is required for SWM quality control. This requirement is consistent with the City of Waterloo Design Criteria.

4.1.3 WATER BALANCE

In accordance with the Grand River Source Protection Plan, water balance measures will be incorporated into the design of the subject lands. The objective of the water balance criteria is to capture and manage annual rainfall on-site to preserve the pre-development hydrology. Water balance consists of runoff, infiltration and evapotranspiration. Per the City of Waterloo Stormwater Management criteria, the designs for all development shall strive to match pre-development water balance conditions. As per the Forwell Creek Functional Drainage Study, the runoff volume to be infiltrated or evapotranspirated is based on a 12.5mm rainfall depth over the proposed impervious area of the development area.

4.2 EXISTING HYDROGEOLOGICAL AND GEOTECHNICAL CONDITIONS

The following documents were prepared for the subject site:

- Preliminary Geotechnical Investigation report prepared by Pinchin Limited, dated November 22, 2023
- Preliminary Hydrogeotechnical Assessment report prepared by Pinchin Limited, dated January 24, 2024

The reports state the following findings:

- The highest groundwater level elevation is 346.65 masl measured September 12, 2023.
- Short-term dewatering estimates for the construction within the development area range from 6,902 L/day to 85,972 L/day. An EASR registration will be required for the construction dewatering activities and a PTTW may not be needed.

- Long-term dewatering estimates for most of the development area ranges up to 62,990 L/day, with a PTTW being required for the building within Building A.
- A groundwater quality assessment completed as per the Waterloo Region Sewer Use Bylaw indicated no exceedances for the analyzed parameters, except for an exceedance of the Storm Sewer By Law for TSS.

4.3 EXISTING STORMWATER DRAINAGE

According to the City of Waterloo Stormwater Management Master Plan (SWMP), the subject lands are situated within the Forwell Creek subwatershed area. There are no watercourses or regulated floodplains within the subject lands and the closest watercourse is Forwell Creek which is approximately 400m to the east. Forwell Creek is a tributary of Laurel Creek which ultimately discharges into the Grand River. A map excerpted from the City's SWMP that shows the location of the subject lands within the Forwell Creek subwatershed area is included in **Appendix D**.

Under pre-development conditions, drainage from the subject site is directed towards two outlet locations namely the CNR corridor and the Northfield Drive storm sewer. The pre-development drainage patterns and areas are indicated on **Figure 3 – Pre-Development Drainage Plan.** Drainage Area A101 represents the area tributary to the CNR corridor and Drainage Area 102 represents the area tributary to the existing Northfield Drive storm sewer (within the development area only). Drainage area A103 represents the portion of the Phase 3 parcel that will continue draining towards the existing Northfield Drive storm sewer and has been considered in the assessment of stormwater management for the subject lands. Drainage area RW represents the portion of the subject lands that will be ceded to the road widening of Northfield Drive and as such is excluded from the SWM analysis of the development area. It should be noted that there are earthen material stockpiles at the northeast corner of the subject lands and they have no impact on the overall drainage patterns within the subject site. Drainage Area 104 represents the existing commercial plaza whose drainage (minor and major system) is conveyed towards Northfield Drive.

Drainage to the CNR corridor is conveyed by sheetflow over the existing asphalt and softscape surfaces. There is a ditch within the CNR corridor between the track and pathway that drains towards Northfield Drive. Drainage from the adjacent properties to the north is self-contained (no external drainage from the north) and overland flow drainage from the adjacent property to the west is conveyed by the existing driveway along the property line. The storm sewer conveying minor system drainage from the existing commercial plaza traverses a portion of the Phase 3 parcel just west of the existing building (#180 Northfield Drive).

The predevelopment drainage and peak flows are summarized on **Table 4.1** as follows:

Table 4.1: Existing Drainage Conditions

Area ID	Area (Ha)	Runoff Coefficient	Outlet	5-Year Peak Flow Rate (L/s)	100-Year Peak Flow Rate (L/s)
A101	4.24	0.50*	CNR Lands	641	1,461
A102	3.79	0.50*	Northfield Drive	573	1,306
A103	3.04	0.50*	Northfield Drive	459	1,047
A104	5.40	0.85	Northfield Drive	1,388	3,163

** Maximum RC of 0.5 used to calculate the allowable release rate. Actual RC is higher.*

There is an existing 300 mm storm sewer that drains north to south on Weber Street North. This existing storm sewer turns onto Northfield Drive and continues to drain eastwards where it increases to 525mm and 750mm east and west of Parkside Drive, respectively. There is a storm sewer system that services the existing commercial plaza and a portion of the Phase 3 parcel. This storm sewer system connects to the existing Northfield Drive storm sewer just west of the existing building (#180 Northfield Drive). The majority of the Phase 3 parcel including the existing Parkside Drive roadway is serviced by a separate storm system that connects to the existing Northfrield Drive West storm sewer at the Parkside Drive intersection. There are two OGS units at the property lines for each of the existing storm sewer system that provides quality control for their respective service areas. The remainder of the subject site drains by sheet flows towards Northfield Drive and the CNR corridor.

Refer to the existing storm servicing indicated on **Drawing C-100 - Existing Servicing Plan**.

4.4 QUANTITY CONTROL

Per the City of Waterloo stormwater management guidelines, post-development peak flows shall be attenuated to be less than or equal to pre-development levels. Given that the development area under the existing condition has two drainage outlets, the proposed SWM strategy will implement two drainage systems – one draining to Northfield Drive and the other draining to the CNR corridor.

The SWM strategy for the lands draining to the CNR corridor (development parcel + small portion of the Phase 3 parcel) shall be to control post-development peak flow rates to be less than or equal to respective pre-development levels for all storms up to and including the 100-year storm event.

The SWM strategy for the lands tributary to the Northfield Drive outlet shall be to control post-development peak flows for all storms up to and including the 100-year storm to the 5-year pre-development peak flow rate of **1,213 L/s** (Northfield Drive Storm sewer outlet – A102 + A103). The existing commercial plaza (Area A104) will remain unchanged in the post-development condition.

Refer to **Appendix D** for allowable release rate calculations and **Figure 4 – Post Development Drainage Plan** proposed drainage patterns, areas and runoff coefficients**.**

4.4.1 NORTHFIELD DRIVE OUTLET

Major and minor flows from the proposed development and the Phase 3 parcel that are tributary to the Northfield Drive outlet will be captured and conveyed by storm sewers and catchbasins within the private roadways. Oversized pipes within the roadways will provide detention storage and an orifice at MH103 are proposed to restrict flows to less than or equal to the allowable release rate. A proposed 525mm tube orifice at MH103 will control stormwater discharge to **1,002 L/s**, which is less than the allowable release rate to the Northfield Drive storm sewer. As a result, the orifice control at MH103 will require **159 m^3** of detention storage, and the total

available underground storage of **180 m^3** as indicated on **Drawing C101 – General Servicing Plan**. Refer to Appendix D for orifice sizing calculations, as well as available and required storage calculations.

Buildings A-D will be provided with stormwater management controls (upstream of the orifice at MH103). The buildings will discharge onto the storm sewer on private roadway at a combined **350 L/s** for the 1:100 return period storm event and approximately **500 m^3** of detention storage will be required and provided through cisterns located within the underground parking structures. Providing controlled flows and detention storage within the residential buildings/underground parking structures allows for a reduced volume of detention storage within the private roadway and as such no stormwater management facility (SWM pond) will be required for the Northfield Drive outlet.

In the post-development condition, a portion of the Phase 3 parcel (Drainage Area 204 on **Figure 4 – Post Development Drainage Plan**) will continue to drain towards the Northfield Drive storm sewer through the development parcel. The south portion of the office building (Area 205) will drain uncontrolled towards Northfield Drive. The development parcel will receive uncontrolled drainage from Drainage Area 204. The orifice at MH103 will overcontrol to compensate for the upstream uncontrolled drainage from Drainage Area 204 and uncontrolled Drainage Area 205 and to ensure discharge to the Northfield Drive storm sewer is less or equal to the allowable rate.

4.4.2 CNR CORRIDOR OUTLET

Stormwater management will be applied to all areas (development and the Phase 3 parcel) that are tributary to the CNR outlet to ensure post-development drainage outletting to the CNR lands is equal to or less than pre-development conditions.

Stormwater is proposed to be captured and conveyed by storm sewers and outlet to the CNR corridor through a level spreader. A control orifice will be provided at DCBMH201 to attenuate stormwater flows from the portion of the development area and Phase 3 parcel (Drainage Areas 201 and 202 as indicated on Figure 4 – **Post Development Drainage Plan**). Onsite measures such as an underground storage facility (Cultec system), rooftop detention (Buildings J, K and

L) and oversized storm sewers and manholes will be implemented to provide the required stormwater storage and as such no SWM facility will be required for the CNR corridor outlet.

The SWM strategy for the CNR corridor outlet assumes all development areas will discharge stormwater into the road allowance at the allowable release rates. Oversized pipes within the road allowance will provide detention storage and a control manhole with orifice/weir controls (at CBMH204) are proposed to restrict flows to be less than or equal to the respective allowable release rate. The SWM controls for the road allowance portion (CNR corridor outlet) will require **671 m^3** of stormwater storage for the 1:100-year return period storm event. There is a total available underground storage of **690 m^3** as indicated on **Drawing C101 – General Servicing Plan**. Buildings J, K and L will be provided with controlled flow roof drains (at 125 L/s/Ha) which will discharge at a combined **240 L/s** upstream of the control orifice at DCBMH201 and approximately **583 m^3** of roof storage (Buildings J, K and L) will be required for the 1:100-year return period storm event.

Refer to **Appendix D** for orifice sizing calculations, as well as available and required storage calculations.

4.5 QUALITY CONTROL AND WATER BALANCE

Given that the proposed severance or development will require no changes to the stormwater management for the commercial plaza there will be no additional quality control or water balance measures required and as such the analysis and mitigation measures are provided for the development and Phase 3 parcels only.

An OGS unit is proposed downstream of each control manhole to meet the MECP ‘Enhanced’ level of protection (80% TSS removal).

- OGS device (OGS1) for the Northfield Drive outlet will be a CDS-8-C unit (offline):
- OGS device (OGS2) for the CNR outlet shall be a CDS-10-C unit (off line)

The subject lands fall within the Forwell Creek Subwatershed, which has an infiltration target of 12.5mm across the development area and Phase 3 parcel (11.08 Ha). To retain the 12.5mm

event throughout the development area requires **1,385 m^3** of water balance retention storage. Water balance shall be provided through infiltration and onsite reuse as follows:

- Landscaping – Initial Abstraction (5mm initial abstraction): **62.5 m^3**
- Onsite Reuse – Buildings A-D (30mm initial abstraction): **574.6 m^3**
- Buildings J, K & L Infiltration Galleries (40mm initial abstraction): **768.4 m^3**

Refer to **Figure 5 – Water Balance Plan** for the delineation of areas used in the water balance assessment. The details of quality control/water balance mitigation measures for the proposed development shall be provided at the SPA/detail design stages. Preliminary designs for OGS units and water balance calculations are included in **Appendix D**.

4.6 STORM DRAINAGE AND SERVICING FOR THE EXISTING COMMERCIAL PLAZA

In the post-development condition, the existing commercial plaza (Drainage Area 104 which includes the parking lot on the west side of the buildings on the Phase 3 parcel) will continue to drain towards the Northfield Drive storm sewer as per the existing condition and no additional quantity controls will be required. The existing storm servicing for the existing commercial plaza will remain and a sewer easement is proposed on the Phase 3 parcel to permit conveyance of stormwater to the Northfield Drive storm sewer. Refer to **Drawing C101 – General Servicing Plan** for the location of the proposed storm sewer servicing for the commercial plaza.

5.0 GRADING

Based on a review of the topographic survey, the subject lands (development area only) slopes from an elevation of 349.55m at the southwest corner of the Phase 3 parcel down to 339.08m at the south-east corner of the development parcel equating to a differential of 10.47m and an average slope of 2.6%.

The design grades along the southern limit of the development area will be established based on the existing grades. The design grades along the CNR corridor are assumed to match

existing grades and will need to be coordinated with the City of Waterloo with regard to the potential northward extension of the multi-use pathway.

Given that the proposed commercial buildings (#180 Northfield Drive and 595 Parkside Drive) are proposed to remain, a temporary retaining wall and transition sloping on the adjacent lands will be required on the west side of the development area. The existing grades at the existing buildings and parking lot within the commercial plaza and Phase 3 parcels will remain. A key element in the grading strategy of the development area is to maintain existing drainage patterns as much as possible. Given that there are two delineated storm outlets as outlined in **Section 4**, the grading design will direct minor system and overland flows to the two outlets – Northfield Drive storm sewer and the CNR corridor. A high point will be required on the private roadway (Parkside Drive between Buildings A and J). Overland flows from the private roadways within the south half of the development area be directed towards Northfield Drive while the overland flows from the north half of the development area will be directed through the parking lot between Buildings J and L and onto the CNR corridor.

Elsewhere, existing grades will be maintained at the property lines/development limits. Within the development area, subject lands are to be graded in accordance with the City of Waterloo engineering guidelines, which require that paved areas range from 0.5% to 5.0% and that sodded slopes range from 2.0% to 5.0%. For large grade differentials, a maximum slope of 3H:1V can be used for embankments. Based on a review of the GRCA regulation mapping, the subject site is not located in an area that is regulated by the GRCA. A permit is therefore not required under Ontario Regulation 166/06 prior to commencing earthworks.

The preliminary grading design (**Drawing C-201 General Grading Plan**) is included in **Appendix A**.

6.0 DEVELOPMENT PHASING

The applicant intends to proceed with the development of Buildings A-D in the initial phase of development (Phase 1). It is assumed the development of the commercial area (Buildings J, K & L) will proceed after the approval of Buildings A-D (Phase 2). This report has considered the future development of the Phase 3 parcel however that parcel is not part of the ZBA application of the development parcel.

For sanitary servicing, the sanitary flows shall be phased as follows:

- Phase 1 (Buildings A-D) – **53.28 L/s**. The existing Phase 3 parcel will continue to discharge to the Northfield Drive sanitary sewer using the existing sanitary connection. The existing 300mm Northfield Drive sanitary sewer has an available capacity of 59 L/s (equivalent to approximately 2,700 residential units) and as such it may be sufficient to service Phase 1 (assuming sanitary flows from other developments within the sanitary drainage area are excluded and available capacity in the Laurel Creek Trunk Sanitary Sewer is confirmed).
- Phase 2 (Buildings A-D and commercial/industrial buildings) – **67.33 L/s**
- Phase 3 (Full buildout of the development area + Phase 3 parcel) – **94.58 L/s**.

Development of Phases 2 and 3 will require upgrading of the existing sanitary sewer on Northfield Drive. Phase 1 may also require upgrading of the existing sanitary sewer should other developments within the sanitary drainage area be allocated the available capacity. The available capacity of the sanitary trunk sewer will need to be confirmed with the City of Waterloo staff. The development phasing will depend on sanitary allocation for the trunk sewer to be confirmed by the City of Waterloo staff.

For storm sewer servicing and SWM, development phasing shall be as follows:

- Phase 1 (Northfield Drive storm sewer outlet) – controlled at 1,213 L/s maximum for the 1:100-year event. The existing commercial building (#180 Northfield Drive and parking lot only) will continue to discharge to the Northfield Drive storm sewer through the development parcel.

- Phase 1 (CNR corridor outlet) – a temporary SWM facility (located near the level spreader outlet) may be necessary to provide the required level of SWM quantity and quality for that outlet as determined in **Section 4**. Drainage from the existing building (595 Parkside Drive) and the private road will be directed towards that temporary temporary SWM facility.
- In Phase 2, conditions for the Northfield Drive storm sewer outlet will remain the same as in Phase 1. For the CNR corridor outlet, Phase 2 SWM control will be implemented as outlined in **Section 4**. Uncontrolled drainage from the existing building (595 Parkside Drive) and private road will be directed towards the SWM controls within the development area.
- In Phase 3, the subject site will be provided with permanent SWM controls to meet the requirements outlined in **Section 4.**

7.0 EROSION AND SEDIMENT CONTROLS

Construction activity, especially operations involving the handling of earthen material, dramatically increases the availability of particulate matter for erosion and transport by surface drainage. In order to mitigate the adverse environmental impacts caused by the release of silt-laden stormwater runoff, measures for erosion and sediment control are required for construction sites. The impact of construction on the environment is recognized by the Greater Golden Horseshoe Area Conservation Authorities (GHACA). In December 2006, the GHACA released the document titled “Erosion & Sediment Control Guidelines for Urban Construction”. This document provides guidance for the preparation of effective erosion and sediment control plans. The following is a summary of ESC measures to be implemented:

- Silt fences are to be installed adjacent to all property limits subject to drainage from the development area prior to topsoil stripping and in other locations, such as at the bases of topsoil stockpiles.
- Mud mat is to be installed at the construction entrance prior to commencing earthworks to minimize the tracking of mud onto municipal roads.

- Sediment traps are to be installed at all catchbasin and area drain locations once the storm sewer system has been constructed to prevent silt-laden runoff from entering the municipal storm sewer system.
- For the topsoil stripping and earthworks stages of construction, a temporary sediment control basin (TCSB) will be implemented to clarify silt-laden stormwater runoff by promoting sedimentation of the suspended particles in the runoff through long detention times. The sediment basins are typically sized based on a required storage volume of 250 m^3 per hectare of disturbed area (125 m^3/ha of permanent pool and 125 m^3/ha of active storage). The outlet for TSCB will be provided with a pump and a flexible pipe to discharge clarified stormwater to a suitable outlet along the CNR corridor.

8.0 CONCLUSIONS

Our conclusions as they relate to the proposed land severance, and more specifically, the submission requirements required in connection with the application to amend the Zoning By-law, are as follows:

- There are available municipal watermains to service the proposed development. A hydrant test will be completed to confirm if there is adequate system pressure to service the proposed development.
- The existing storm servicing can support the proposed development.
- Sanitary flow allocation/development phasing will need to be confirmed with the City of Waterloo staff through additional consultation.
- There are two storm drainage outlets, one to the Northfield Drive storm sewer and another to the CNR corridor. SWM quantity controls within the development area are proposed to meet the applicable SWM criteria.
- Water balance will be achieved through onsite reuse measures, landscaping surfaces and infiltration galleries.
- Stormwater quantity controls to achieve an Enhanced Level of protection will be implemented within the development area.
- Site grading will be designed in accordance with the City of Waterloo design criteria.

- Erosion and sediment controls are to be implemented during construction to prevent silt laden runoff from leaving the site.

Based on the assessment provided above, the proposed land severance and development can meet all applicable engineering criteria of the City of Waterloo, the Region of Waterloo and the Grand River Conservation Authority. Sanitary flow allocation/development phasing will need to be confirmed with the City of Waterloo staff through additional consultation.

We trust the information provided in the report meets your requirements. Should there be any questions or comments, please feel free to contact the undersigned.

Sincerely,

Counterpoint Engineering Inc.





Pula Mathumo, P.Eng
pmathumo@counterpointeng.com

Linda Chan, EIT
lchan@counterpointeng.com

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APPENDIX A

Site Plan, Development Statistics and Drawings/Figures

ADJACENT LANDS:
± 50,500m²

DEVELOPMENT LANDS:
± 74,481.90m²

TOTAL SUBJECT SITE AREA:
± 161,866.05m²

BUILDING K
INDUSTRIAL
1 STOREY

BUILDING L
INDUSTRIAL
1 STOREY

BUILDING J - TRAIL AREA: 1,650.5m²

TRAIL TOTAL AREA: 4,434.49m²

PROPOSED PUBLIC ROAD

EXISTING PRIVATE ROAD

EXTENT OF EXISTING PRIVATE ROAD

BUILDING I
FLEX COMMERCIAL
1 STOREY

BUILDING J
FLEX COMMERCIAL
1 STOREY

BUILDING J - TRAIL AREA: 885.75m²

BUILDING F1
35 STOREY

6 STOREY

BUILDING E
27 STOREY

BUILDING A
29 STOREY

6 STOREY

BUILDING B1
40 STOREY

BUILDING B2
40 STOREY

6 STOREY

BUILDING B - TRAIL AREA: 808.93m²

BUILDING F2
30 STOREY

PROPOSED POPS
AREA: 1,777.7m²

PROPOSED POPS
AREA: 1,442.29m²

BUILDING C1
25 STOREY

6 STOREY

BUILDING C2
36 STOREY

BUILDING C - TRAIL AREA: 889.26m²

PROPOSED PRIVATE DRIVEWAY

PROPOSED PRIVATE DRIVEWAY

BUILDING G1
28 STOREY

6 STOREY

BUILDING G2
25 STOREY

6 STOREY

BUILDING H1
27 STOREY

BUILDING D1
35 STOREY

6 STOREY

BUILDING D2
25 STOREY

6 STOREY

TEMPORARY EASMENT 87.28m²

EXTENT OF EXPROPRIATED LAND 1005.24m²

EXISTING EASMENT 306.46m²

WATERLOO FIRE STATION 3

ROAD WIDENING 364.69m²

WEBER ST N

NORTHFIELD DR. W

150.00 m FROM NORTHFIELD DR

ADJACENT LANDS:
± 50,500m²

OFFICE LANDS:
± 28,570.10m²

DEVELOPMENT LANDS:
± 74,481.90m²

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TURNER FLEISCHER

Turner Fleischer Architects Inc.

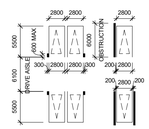
67 Lesmill Road
Toronto, ON. M3B 2T8
T 416 425 2222
turnerfleischer.com

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TYPICAL PARKING DIMENSIONS:

AISLE WIDTH: MIN 6.1m

TYPICAL PARKING SPACE:
MIN 2.8 x 5.5 x 2.0m HIGH



TYPICAL BARRIER FREE SPACE:

MIN 3.7 x 5.5 x 2.1m HIGH



#	DATE	DESCRIPTION	BY
1	2024-02-28	ISSUED FOR REZONING	DVI

PROJECT

170 Northfield Drive West, Waterloo

170 Northfield Drive West, Waterloo, Ontario

DRAWING

OVERALL SITE PLAN

PROJECT NO.	22.237P01
PROJECT DATE	2024-02-28
DRAWN BY	DVI
CHECKED BY	RMM
SCALE	1:750

ONTARIO ASSOCIATION OF ARCHITECTS
RUSSELL L.FLEISCHER
LICENCE
5004

DRAWING NO. RZ013

REV. 1

BUILDING AREA SUMMARY	m²	ft²	% GROSS SUBJECT SITE AREA
DEVELOPMENT LANDS SUMMARY			
BUILDING A	3,382.95	36,414	2.09%
BUILDING B	6,482.01	69,773	4.00%
BUILDING C	5,345.53	57,539	3.30%
BUILDING D	5,986.20	64,435	3.70%
BUILDING J	11,707.43	126,016	7.23%
BUILDING K	13,157.27	141,624	8.13%
BUILDING L	24,594.31	264,731	15.19%
POPS	1,442.29	15,525	0.89%
PRIVATE DRIVEWAY	2,383.81	25,659	1.47%
DEVELOPMENT LANDS SUB-TOTAL	**74,481.90**	**801,716**	**46%**
OFFICE LANDS SUMMARY			
BUILDING E	3,399.43	36,591	2.10%
BUILDING F	5,215.23	56,136	3.22%
BUILDING G	4,302.32	46,330	2.66%
BUILDING H	2,842.65	30,598	1.76%
BUILDING I	8,478.20	91,259	5.24%
POPS	1,777.72	19,135	1.10%
PRIVATE DRIVEWAY	2,554.47	27,496	1.58%
OFFICE LANDS SUBTOTAL	**28,570.10**	**307,526**	**18%**
ROADS AND PUBLIC LANDS SUMMARY			
PARKSIDE DRIVE	6,248.45	67,258	3.86%
PARKSIDE DRIVE CUL-DE-SAC (TEMP)	392.63	4,226	0.24%
NORTHFIELD DR ROAD WIDENING	363.58	3,914	0.22%
EXPROPRIATED LANDS	1,002.96	10,796	0.62%
EXISTING EASEMENT	306.46	3,299	0.19%
PUBLIC LANDS SUB-TOTAL	**8,314.10**	**89,492**	**5%**
ADJACENT LANDS	**50,500**	**543,576**	**31%**
GROSS SITE AREA	**161,866.05**	**1,742,312**	**100.00%**

DEFINITIONS:

CITY OF WATERLOO ZONING BY-LAW 2018-050

BUILDING FLOOR AREA
means the gross floor area of a BUILDING measured between the outside of all exterior walls. Includes an attic with a clear ceiling of 2.15m for at least 50% of the attic floor area. Excludes STRUCTURED PARKING.

BUILDING HEIGHT

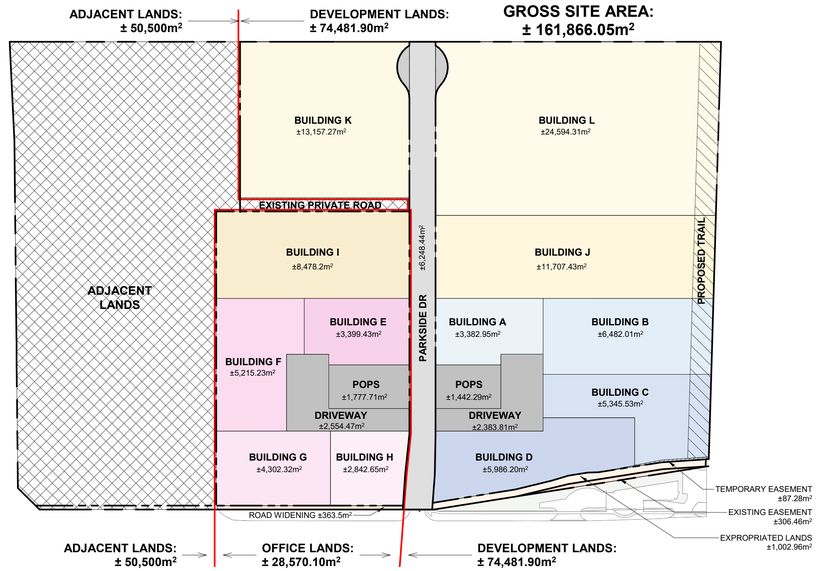
means the vertical distance from the finished ground level abutting the FRONT BUILDING FACADE, measured as the average of five (5) points CITY OF WATERLOO ZBL 2018 - 050 PAGE 1 6 equally spaced apart adjacent to the entire FRONT BUILDING FAÇADE to:

a.) for a flat roof, the highest point of:
- the roof's surface; or
- the parapet, where the parapet exceeds 1.2 metres in height, whichever is higher;

b.) for a mansard roof, the roof deck line;
c.) for a gable, hipped, cottage, gambrel, or peaked roof, the mid-point measured between the eaves and the ridges. .

The following shall be disregarded when calculating BUILDING HEIGHT:

- chimney
- church spire, church steeple, church belfry, and the like
- rooftop mechanical, ventilation, electrical, utility and service equipment not exceeding four metres in height
- enclosed stairwell roof access not exceeding four metres in height
- elevator penthouse not exceeding six metres in height
- rooftop architectural feature (see section 3.A.5)
- mechanical and service equipment noise barriers
- elevator penthouse



1 R2001 SITE AREA DIAGRAM
1 : 2000

BUILDING LEGEND

- BUILDING A
- BUILDING B
- BUILDING C
- BUILDING D
- BUILDING E
- BUILDING F
- BUILDING G
- BUILDING H
- BUILDING I
- BUILDING J
- BUILDING K
- BUILDING L

BUILDING	GROSS BUILDING AREA						AMENITY BREAKDOWN (INCLUDED IN BFA)				GROSS CONSTRUCTION AREA	
	RESIDENTIAL BFA		COMMERCIAL BFA		TOTAL BFA		INDOOR PROVIDED		OUTDOOR PROVIDED			
	m2	ft2	m2	ft2	m2	ft2	m2	PER UNIT	m2	PER UNIT	m2	ft2
BUILDING A TOWER A (29 STY)	29,830	321,088			29,830	321,088	1,161	3.2	1,759.1	4.9	43,788	471,337
BUILDING B TOWER B1 (40 STY) TOWER B2 (40 STY)	62,108	668,527			62,108	668,527	1,874	2.0	3,530.9	3.8	96,787	1,041,816
BUILDING C TOWER C1 (35 STY) TOWER C2 (36 STY)	47,843	514,982			47,843	514,982	903	1.5	973.0	1.6	76,077	818,896
BUILDING D TOWER D1 (35 STY) TOWER D2 (25 STY)	50,819	547,017	360.9	3,884.7	50,819	547,017	1,739	2.9	3,160.5	5.3	76,147	819,647
TOTAL	**190,599.5**	**2,051,613**	**360.9**	**3,885**	**190,599.5**	**2,051,613**	**5,677.4**	**2.3**	**9,423.5**	**3.8**	**292,799.7**	**3,151,696**

BUILDING	RESIDENTIAL BFA		COMMERCIAL BFA		TOTAL BFA		INDOOR PROVIDED		OUTDOOR PROVIDED		TOTAL GCA	
BUILDING E TOWER E (27 STY)	29,454	317,043			29,454	317,043	1,216	3.6	1,777.3	5.2	42,624	458,801
BUILDING F TOWER F1 (35 STY) TOWER F2 (30 STY)	48,416	521,153			48,416	521,153	2,153	3.5	2,163.5	3.5	73,760	793,952
BUILDING G TOWER G1 (28 STY) TOWER G2 (25 STY)	40,917	440,431			40,917	440,431	1,633	3.1	1,669.0	3.1	60,081	646,715
BUILDING H TOWER H1 (27 STY)	21,782	234,466			21,782	234,466	886	3.2	1,251.8	4.5	33,047	355,720
TOTAL	**140,569.7**	**1,513,093**			**140,569.7**	**1,513,093**	**5,887.8**	**3.3**	**6,861.6**	**3.9**	**209,512.1**	**2,255,188**

BUILDING	RESIDENTIAL BFA		COMMERCIAL BFA		TOTAL BFA		INDOOR PROVIDED		OUTDOOR PROVIDED		TOTAL GCA	
GRAND TOTAL	**331,169.3**	**3,564,706**	**360.9**	**3,885**	**331,169.3**	**3,564,706**	**11,565.2**	**2.7**	**16,285.2**	**3.8**	**502,311.8**	**5,406,884**

BUILDING	RESIDENTIAL BFA		COMMERCIAL BFA		TOTAL BFA		INDOOR PROVIDED		OUTDOOR PROVIDED		TOTAL GCA	
BUILDING I			2,714.4	29,217.8	2,714	29,218					2,714	29,218
BUILDING J			3,890.5	41,877.3	3,891	41,877					3,891	41,877
BUILDING K			4,855.5	52,264.6	4,856	52,265					4,856	52,265
BUILDING L			10,460.4	112,595.7	10,460	112,596					10,460	112,596
TOTAL			**21,920.8**	**235,955**	**21,920.8**	**235,955**					**21,920.8**	**235,955**

BUILDING	RESIDENTIAL BFA		COMMERCIAL BFA		TOTAL BFA		INDOOR PROVIDED		OUTDOOR PROVIDED		TOTAL GCA	
GRAND TOTAL	**331,169.3**	**3,564,706**	**22,281.7**	**239,840**	**353,090.1**	**3,800,662**	**11,565.2**	**2.7**	**16,285.2**	**3.8**	**524,232.6**	**5,642,840**

PARKING BREAKDOWN					
REQUIRED	PROVIDED	PER UNIT	VISITOR RATE	RESIDENT RATE	
#	#	#	#	#	
358	369	1.03	0.10	0.93	
924	1,117	1.21	0.10	1.11	
622	697	1.12	0.10	1.02	
599	675	1.13	0.10	1.03	
2,503	**2,858**	**1.14**	**0.10**	**1.02**	
REQUIRED	PROVIDED	PER UNIT	VISITOR RATE	RESIDENT RATE	
341	351	1.03	0.10	0.93	
612	644	1.05	0.10	0.95	
533	545	1.02	0.10	0.92	
278	300	1.08	0.10	0.98	
1,764	**1,840**	**1.04**	**0.10**	**0.95**	
REQUIRED	PROVIDED	PER UNIT	VISITOR RATE	RESIDENT RATE	
4,267	**4,698**	**1.10**	**0.10**	**0.95**	

REQUIRED	PROVIDED	PER 100SF
41	112	4.13
59	103	2.65
73	69	1.42
157	157	1.50
330	**441**	**2.01**

UNIT BREAKDOWN							
UNITS	STUDIO	1B	1B+D	2B	2B+D	3B	3B+D
#	#	#	#	#	#	#	#
358	44	119		136		59	
924	66	363	264	99		132	
622		360		262		7	
599	18	225		240		116	
2,503	**128**	**1,047**	**264**	**598**	**72**	**394**	
	126	**1,311**		**670**		**394**	
		57.49%		26.77%		15.74%	
341	40	82		156		63	
612	79	245					
533	40	284		208		1	
278	20	146		110		2	
1,764	**179**	**757**		**762**		**66**	
	179	**757**		**762**		**66**	
		53.06%		43.20%		3.74%	
UNITS	STUDIO	1B	1B+D	2B	2B+D	3B	3B+D
4,267	**307**	**1,804**	**264**	**1,360**	**72**	**460**	
	7%	**48%**		**34%**		**11%**	

PROPOSED UNIT COUNT FOR THIS SUBMISSION (INTERIM CONDITION)

PROPOSED UNIT COUNT FOR FUTURE WORKS

TOTAL UNITS FOR ENTIRE SITE (ULTIMATE CONDITIONS)

TURNER FLEISCHER

Turner Fleischer Architects Inc.

67 Lesmill Road
Toronto, ON, M3B 2T8
T 416 425 2222
turnerfleischer.com

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DRAWING LIST

DRAWING NUMBER	DRAWING NAME	Revision Date
RZ000	COVER SHEET	2024-02-28
RZ001	STATISTICS-SUMMARY	2024-02-28
RZ002	STATISTICS-BLOCK A	2024-02-28
RZ003	STATISTICS-BLOCK B	2024-02-28
RZ004	STATISTICS-BLOCK C	2024-02-28
RZ005	STATISTICS-BLOCK D	2024-02-28
RZ006	STATISTICS-BLOCK E	2024-02-28
RZ007	STATISTICS-BLOCK F	2024-02-28
RZ008	STATISTICS-BLOCK G	2024-02-28
RZ009	STATISTICS-BLOCK H	2024-02-28
RZ010	CONTEXT PLAN	2024-02-28
RZ011	SURVEY BY J.D.BARNES COMPLETED ON JULY 27, 2023	2024-02-28
RZ012	MASTERBLOCK PLAN	2024-02-28
RZ013	OVERALL SITE PLAN	2024-02-28
RZ014	SITE PLAN / ROOF PLAN - RESIDENTIAL	2024-02-28
RZ101	UNDERGROUND LEVEL 01	2024-02-28
RZ151	FLOOR 01	2024-02-28
RZ152	FLOOR 02	2024-02-28
RZ153	FLOOR 03-06 (TYPICAL)	2024-02-28
RZ154	FLOOR 07 (AMENITY)	2024-02-28
RZ155	FLOOR 08 (TYPICAL)	2024-02-28
RZ161	SITE PLAN / ROOF PLAN - COMMERCIAL	2024-02-28
RZ162	FLOOR 01 - COMMERCIAL	2024-02-28
RZ301	ELEVATIONS	2024-02-28
RZ302	ELEVATIONS	2024-02-28
RZ303	ELEVATIONS	2024-02-28
RZ304	ELEVATIONS	2024-02-28
RZ401	BUILDING SECTIONS	2024-02-28
RZ402	BUILDING SECTIONS	2024-02-28
RZ403	BUILDING SECTIONS	2024-02-28
RZ901	3D PERSPECTIVE	2024-02-28
RZ902	3D PERSPECTIVE	2024-02-28
RZ903	3D PERSPECTIVE	2024-02-28
RZ904	3D PERSPECTIVE	2024-02-28
RZ905	3D PERSPECTIVE	2024-02-28
RZ906	3D PERSPECTIVE	2024-02-28
RZ911	SHADOW STUDIES	2024-02-28
RZ912	SHADOW STUDIES	2024-02-28
RZ913	SHADOW STUDIES	2024-02-28
RZ914	SHADOW STUDIES	2024-02-28
RZ915	SHADOW STUDIES	2024-02-28
RZ916	SHADOW STUDIES	2024-02-28
RZ917	SHADOW STUDIES	2024-02-28
RZ918	SHADOW STUDIES	2024-02-28
RZ919	SHADOW STUDIES	2024-02-28
RZ920	SHADOW STUDIES	2024-02-28

#	DATE	DESCRIPTION	BY
1	2024-02-28	ISSUED FOR REZONING	DVI

PROJECT
170 Northfield Drive West, Waterloo
170 Northfield Drive West, Waterloo, Ontario

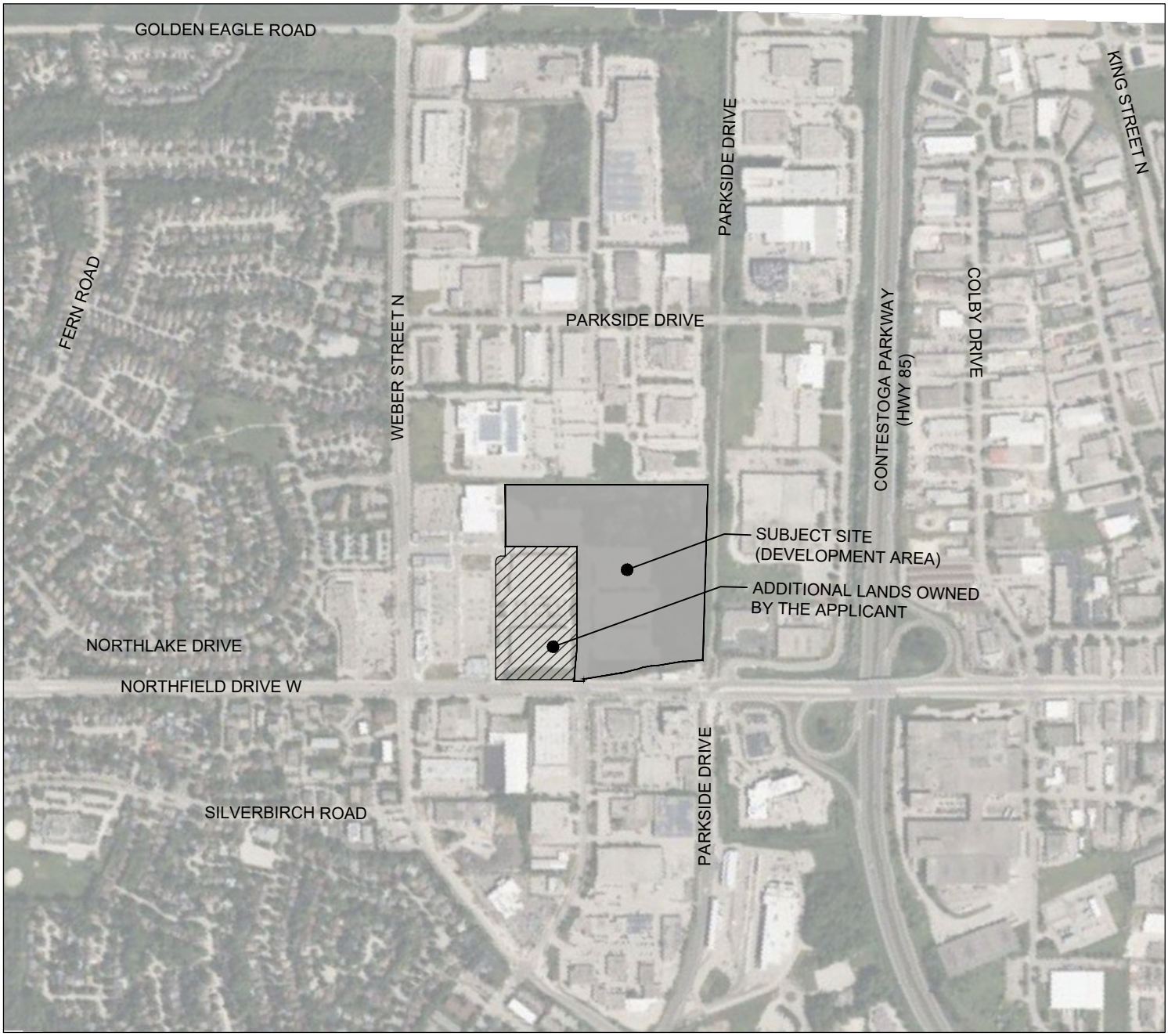
DRAWING
STATISTICS-SUMMARY

PROJECT NO. 22.237P01
PROJECT DATE 2024-02-28
DRAWN BY DVI
CHECKED BY RMM
SCALE As indicated

ONTARIO ASSOCIATION OF ARCHITECTS
RUSSELL L.FLEISCHER
LICENCE
5004

DRAWING NO. RZ001
REV. 1

2024-02-28 10:27:23 AM





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8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

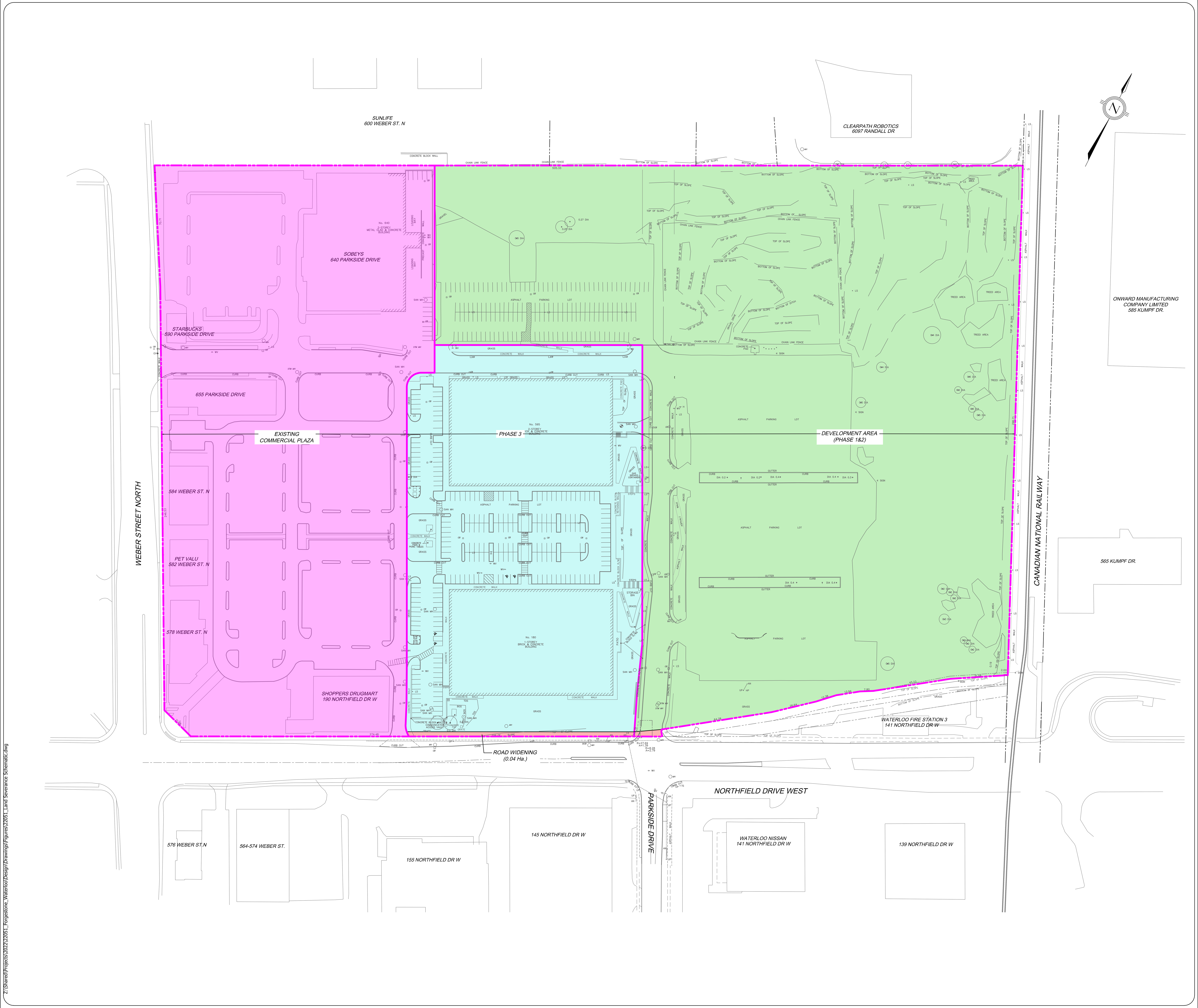
2833 16TH AVENUE

WATERLOO, ONTARIO

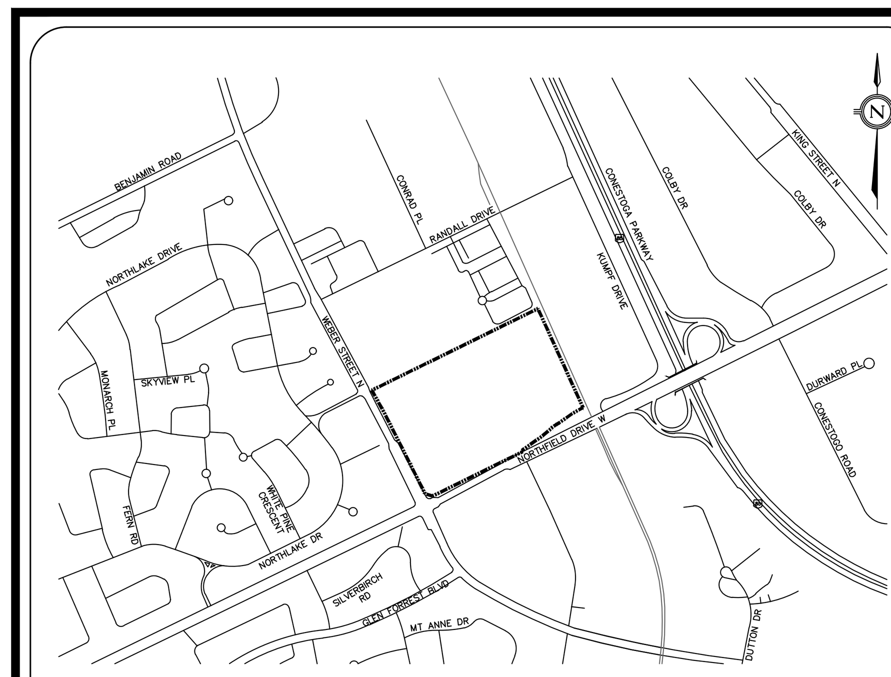
SITE LOCATION PLAN

DESIGNED BY: ML	DATE: NOV 13, 2023
CHECKED BY: PM	PROJECT No. 22051
DRAWING BY: ML	
CHECKED BY: PM	FIGURE No. 1
SCALE: NTS	

Z:\Shared\Projects\2022\22051_Forgestone_Waterloo\Design\Drawings\Figures\22051_Location Plan.dwg



Z:\Shared\Projects\2022\22051_Forgestone_Waterloo\Design\Drawings\Figures\22051_Land Severance Schematic.dwg



KEY PLAN

LEGEND

PROPERTY LINE

SEVERANCE LINE

DEVELOPMENT LANDS

INCOME LANDS

EXISTING COMMERCIAL

ROAD WIDENING

LEGAL & TOPOGRAPHY

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TEL/FAX (519) 578–2220 / (519) 650–5625
www.jdbarnes.com

BENCHMARK:

ELEVATIONS ARE GEODETIC ORIGIN (CGVD–1928: 1978), AND ARE DERIVED FROM GNSS OBSERVATIONS AND NATURAL RESOURCES CANADA'S GEOID MODEL HT2.0.

LOCAL BENCHMARK FIRE HYDRANT LOCATED ADJACENT TO BUILDING No.180, ALONG THE EAST LIMITS OF PARKSIDE DRIVE AT THE SOUTHERN MOST PARKING LOT ENTRANCE, AS SHOWN ON THE FACE ON THE PLAN.

ELEVATION 346.94m.

FIRE HYDRANT LOCATED AT THE REAR OF BUILDING No.595, ALONG THE NORTH LIMITS OF PARKSIDE DRIVE AND THE EAST SIDE OF THE PARKING LOT ENTRANCE, AS SHOWN ON THE FACE OF THE PLAN.

ELEVATION: 350.43m

LEGAL DESCRIPTION:

SKETCH SHOWING TOPOGRAPHIC DETAIL 170 & 180 NORTHFIELD DRIVE, 360 & 595 PARKSIDE DRIVE, PARKSIDE DRIVE, AND PART OF NORTHFIELD DRIVE WEST, IN THE CITY OF WATERLOO, REGIONAL MUNICIPALITY OF WATERLOO.

FIELD SURVEY COMPLETED ON THE 27th DAY OF JULY, 2023.

No.	REVISIONS/ISSUED	DATE	BY	CITY
9.0	--	--		
8.0	--	--		
7.0	--	--		
6.0	--	--		
5.0	--	--		
4.0	--	--		
3.0	--	--		
2.0	FIRST SUBMISSION	2024–03–25	PM	
1.0	DRAFT – FOR CLIENT REVIEW	2024–02–16	PM	

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ENGINEER'S STAMP

APPLICANT:
FORGESTONE CAPITAL MANAGEMENT L.P.
100 YONGE STREET, SUITE 1100
TORONTO, ON
M5C 1T4

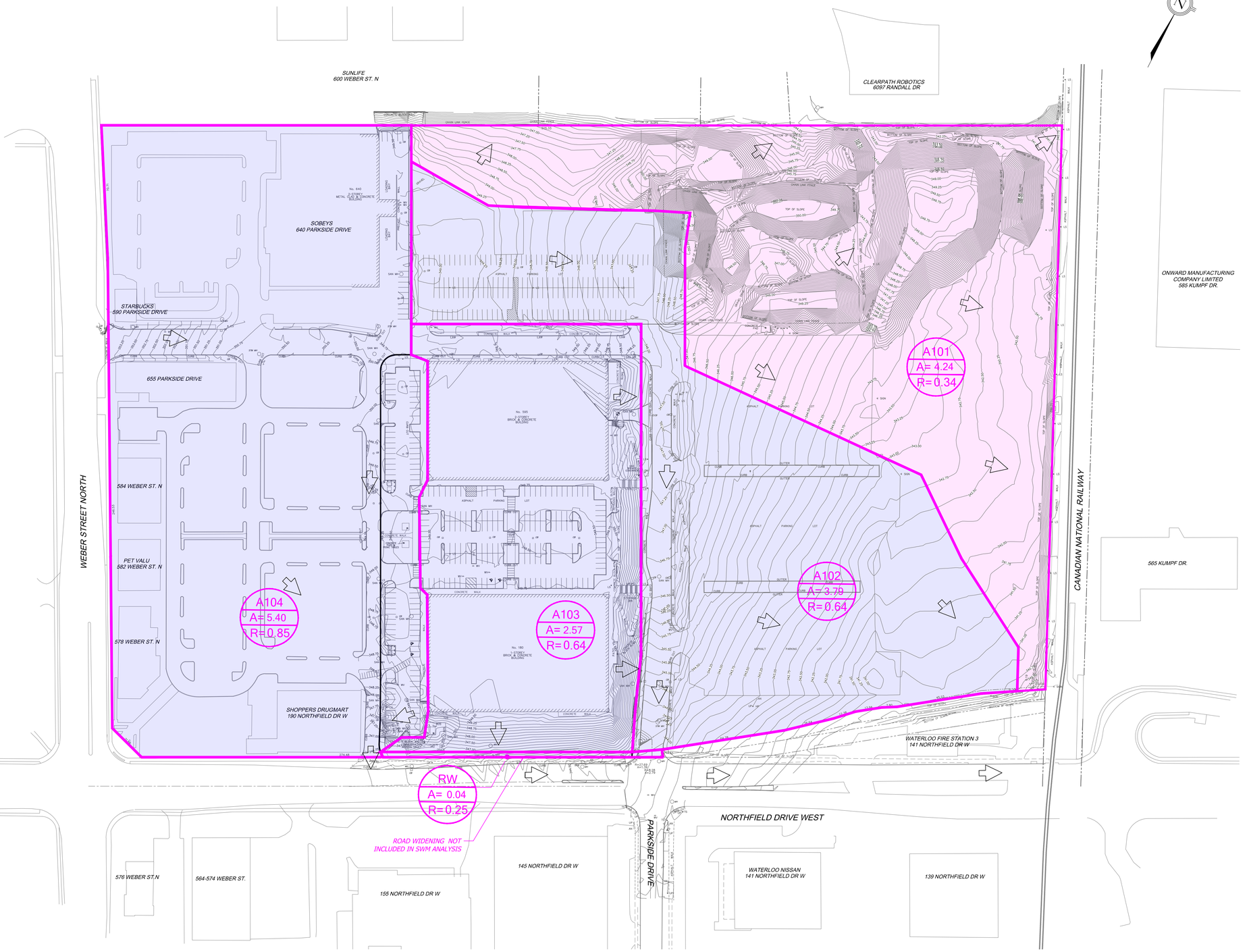
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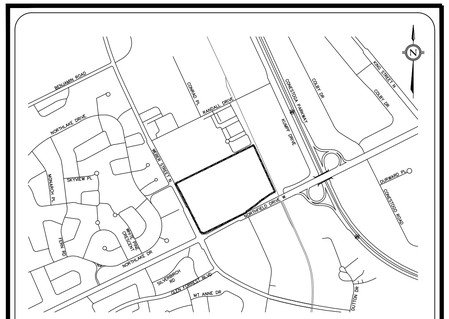
170 NORTHFIELD DRIVE
WATERLOO, ONTARIO

SEVERANCE SCHEMATIC

DESIGNED BY: PM	CHECKED BY: PW	DATE: DECEMBER 2023
DRAWING BY: ML/BB	CHECKED BY: PM	PROJECT NO. 22051
SWM BY: PM	CHECKED BY: PW	
SCALE: 1:1000 (20 0m 20 40 60)		DRAWING NO. FIG.2

REGION FILE No.:





KEY PLAN

LEGEND

A101 / A= 0.13 / R= 0.50	AREA ID / CATCHMENT AREA (Ha) / RUNOFF COEFFICIENT
	CATCHMENT PERIMETER
	OVERLAND FLOW ROUTE
	CNR CORRIDOR OUTLET
	NORTHFIELD DR. STORM SEWER OUTLET

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LOCAL BENCHMARK FIRE HYDRANT LOCATED ADJACENT TO BUILDING No.180, ALONG THE EAST LIMITS OF PARKSIDE DRIVE AT THE SOUTHERN MOST PARKING LOT ENTRANCE, AS SHOWN ON THE FACE ON THE PLAN.

ELEVATION 346.94m.

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ELEVATION 350.43m.

LEGAL DESCRIPTION:

SKETCH SHOWING TOPOGRAPHIC DETAIL 170 & 180 NORTHFIELD DRIVE, 360 & 595 PARKSIDE DRIVE, PARKSIDE DRIVE, AND PART OF NORTHFIELD DRIVE WEST, IN THE CITY OF WATERLOO, REGIONAL MUNICIPALITY OF WATERLOO.

FIELD SURVEY COMPLETED ON THE 27th DAY OF JULY, 2023.

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4.0	--	--		
3.0	--	--		
2.0	FIRST SUBMISSION	2024-03-25	PM	
1.0	DRAFT - FOR CLIENT REVIEW	2024-02-16	PM	

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ENGINEER'S STAMP

APPLICANT:
FORGESTONE CAPITAL MANAGEMENT L.P.
100 YONGE STREET, SUITE 1100
TORONTO, ON
M5C 1T4

SITE LOCATION:

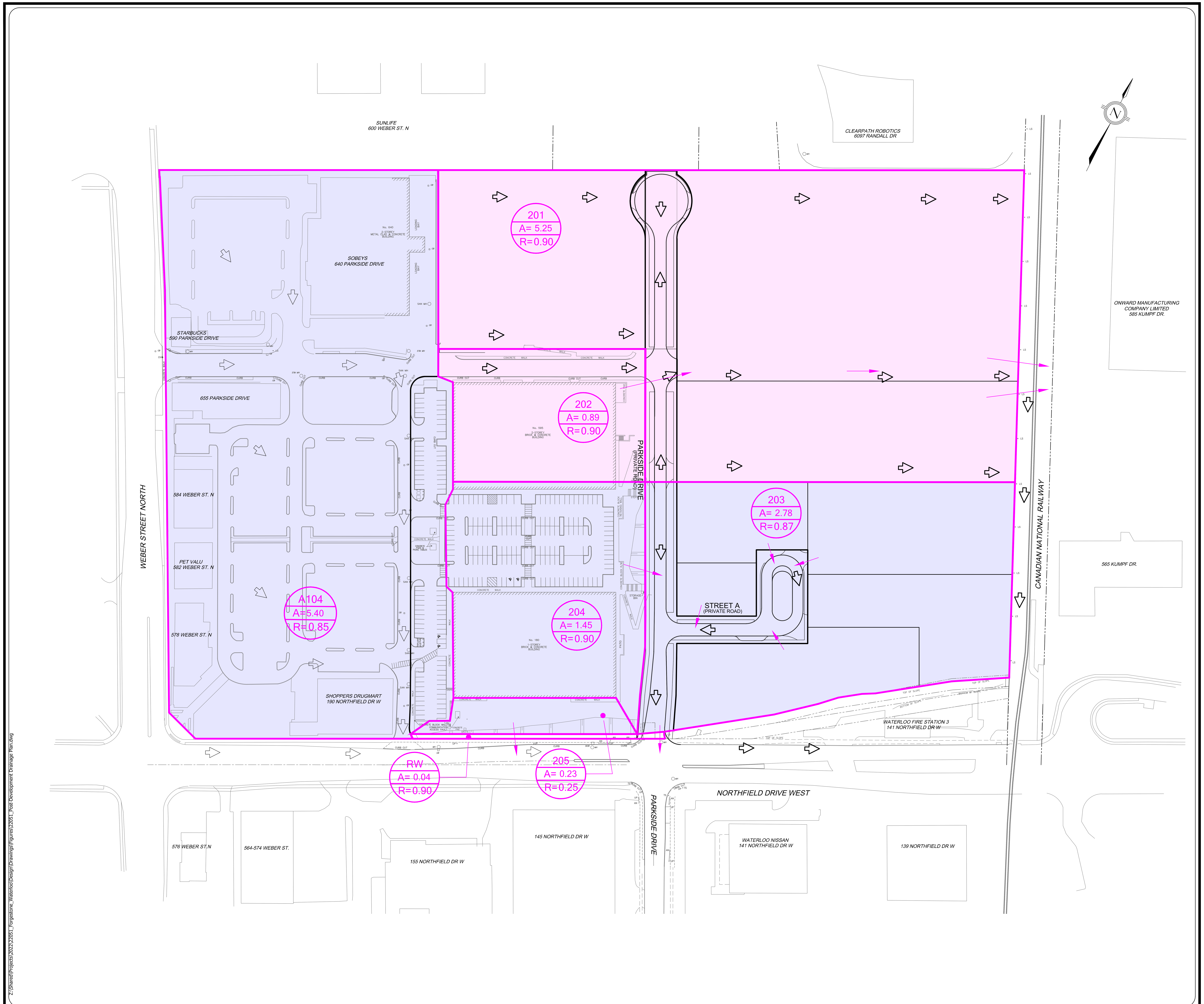
170 NORTHFIELD DRIVE
WATERLOO, ONTARIO

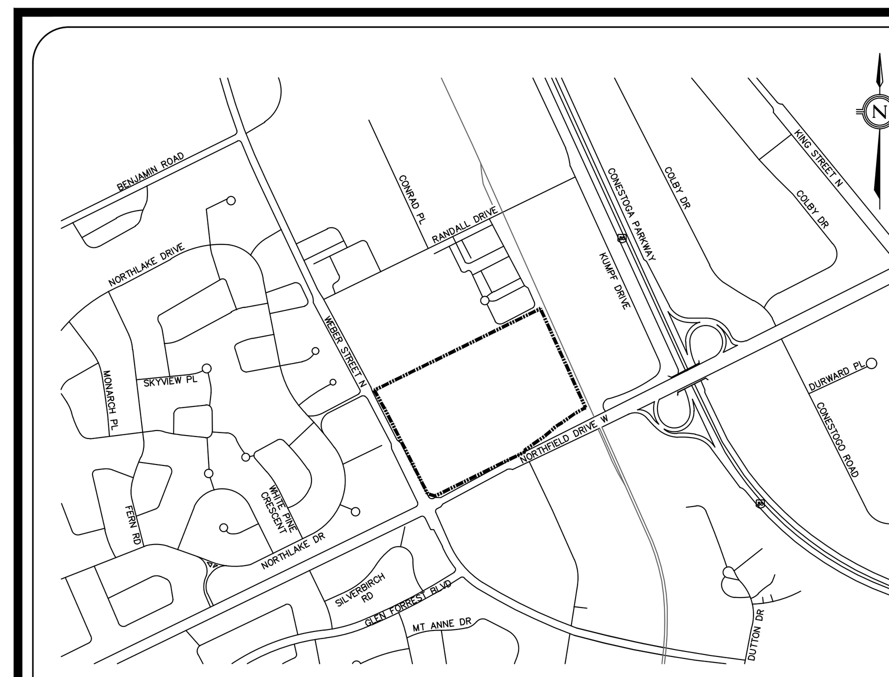
PRE DEVELOPMENT DRAINAGE PLAN

DESIGNED BY: PM	CHECKED BY: PW	DATE: DECEMBER 2023	
DRAWING BY: ML/BB	CHECKED BY: PM	PROJECT NO.	22051
SWM BY: PM	CHECKED BY: PW		
SCALE: 1:1000 (20 0m 20 40 60)		DRAWING NO.	FIG.3

REGION FILE No.:

Z:\Shared Projects\2022\22051_Forgestone_Waterloo\Design\drawings\Figures\22051_Pre-Development Storm Drainage Area Plan.dwg





KEY PLAN

LEGEND

A101 / A=0.13 / R=0.50	AREA ID CATCHMENT AREA (Ha) RUNOFF COEFFICIENT
	CATCHMENT PERIMETER
	OVERLAND FLOW ROUTE
	DRAINAGE DIRECTION
	CNR CORRIDOR OUTLET
	NORTHFIELD DR. STORM SEWER OUTLET

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ELEVATION 346.94m.

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ELEVATION: 350.43m

LEGAL DESCRIPTION:

SKETCH SHOWING TOPOGRAPHIC DETAIL 170 & 180 NORTHFIELD DRIVE, 360 & 595 PARKSIDE DRIVE, PARKSIDE DRIVE, AND PART OF NORTHFIELD DRIVE WEST, IN THE CITY OF WATERLOO, REGIONAL MUNICIPALITY OF WATERLOO.

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3.0	--	--		
2.0	FIRST SUBMISSION	2024-03-25	PM	
1.0	DRAFT - FOR CLIENT REVIEW	2024-02-16	PM	

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ENGINEER'S STAMP

APPLICANT:
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100 YONGE STREET, SUITE 1100
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M5C 1T4

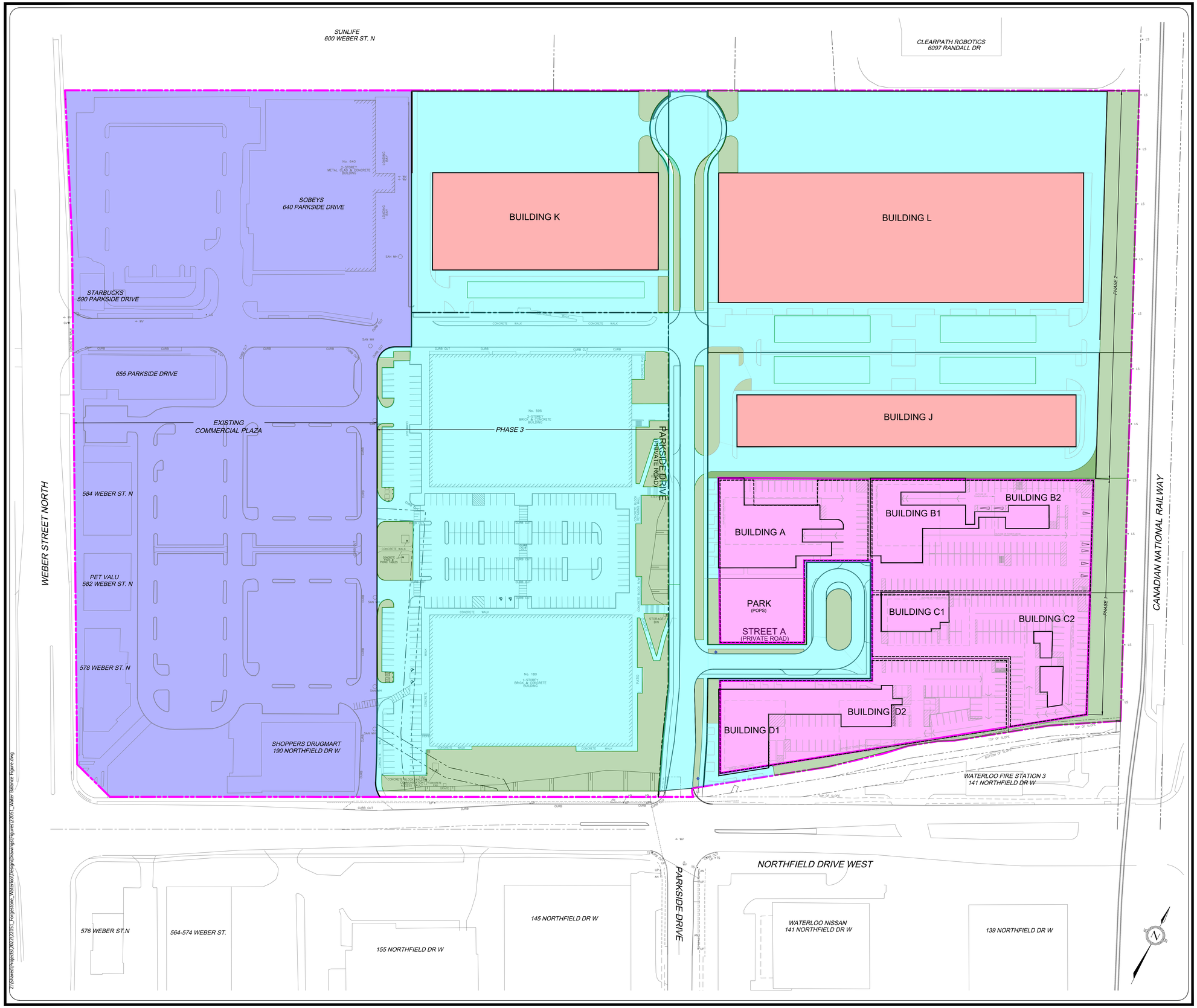
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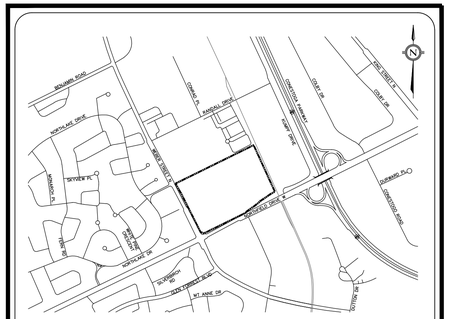
170 NORTHFIELD DRIVE
WATERLOO, ONTARIO

POST DEVELOPMENT DRAINAGE PLAN

DESIGNED BY: PM	CHECKED BY: PW	DATE: DECEMBER 2023
DRAWING BY: ML/BB	CHECKED BY: PM	PROJECT NO. 22051
SWM BY: PM	CHECKED BY: PW	
SCALE: 1:1000 (20 0m 20 40 60)		DRAWING NO. FIG.4

REGION FILE No.:





KEY PLAN

LEGEND

- PROPERTY LINE
- LANDSCAPED AREA (5mm IA)
- WATER RESUSE CISTERN TRIBUTARY AREA (30mm IA)
- IMPERVIOUS AREA WITH NO WATER BALANCE MITIGATION
- ROOF AREA TRIBUTARY TO INFILTRATION TRENCHES (40mm IA)
- EX INCOME LANDS EXCLUDED FROM WATER BALANCE ANALYSIS
- LIMIT OF UNDERGROUND PARKING

WATER BALANCE AREA BREAKDOWN	
SECTION NAME	AREA (Ha.)
LANDSCAPED AREA (5mm IA)	1.25 Ha
WATER REUSE CISTERN TRIBUTARY AREA (30mm IA)	1.92 Ha
IMPERVIOUS AREA WITH NO WATER BALANCE MITIGATION	5.99 Ha
ROOF AREA TRIBUTARY TO INFILTRATION TRENCHES (40mm IA)	1.92 Ha
TOTAL	11.08 Ha

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BENCHMARK:

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LOCAL BENCHMARK FIRE HYDRANT LOCATED ADJACENT TO BUILDING No.180, ALONG THE EAST LIMITS OF PARKSIDE DRIVE AT THE SOUTHERN MOST PARKING LOT ENTRANCE, AS SHOWN ON THE FACE ON THE PLAN.

ELEVATION 346.94m.

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ELEVATION: 350.43m

LEGAL DESCRIPTION:

SKETCH SHOWING TOPOGRAPHIC DETAIL 170 & 180 NORTHFIELD DRIVE, 360 & 595 PARKSIDE DRIVE, PARKSIDE DRIVE, AND PART OF NORTHFIELD DRIVE WEST, IN THE CITY OF WATERLOO, REGIONAL MUNICIPALITY OF WATERLOO.

FIELD SURVEY COMPLETED ON THE 27th DAY OF JULY, 2023.

No.	REVISIONS/ISSUED	DATE	BY	CITY
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4.0	--	--		
3.0	--	--		
2.0	FIRST SUBMISSION	2024-03-25	PM	
1.0	DRAFT - FOR CLIENT REVIEW	2024-02-16	PM	

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ENGINEER'S STAMP

APPLICANT:
FORGESTONE CAPITAL MANAGEMENT L.P.
100 YONGE STREET, SUITE 1100
TORONTO, ON
M5C 1T4

SITE LOCATION:

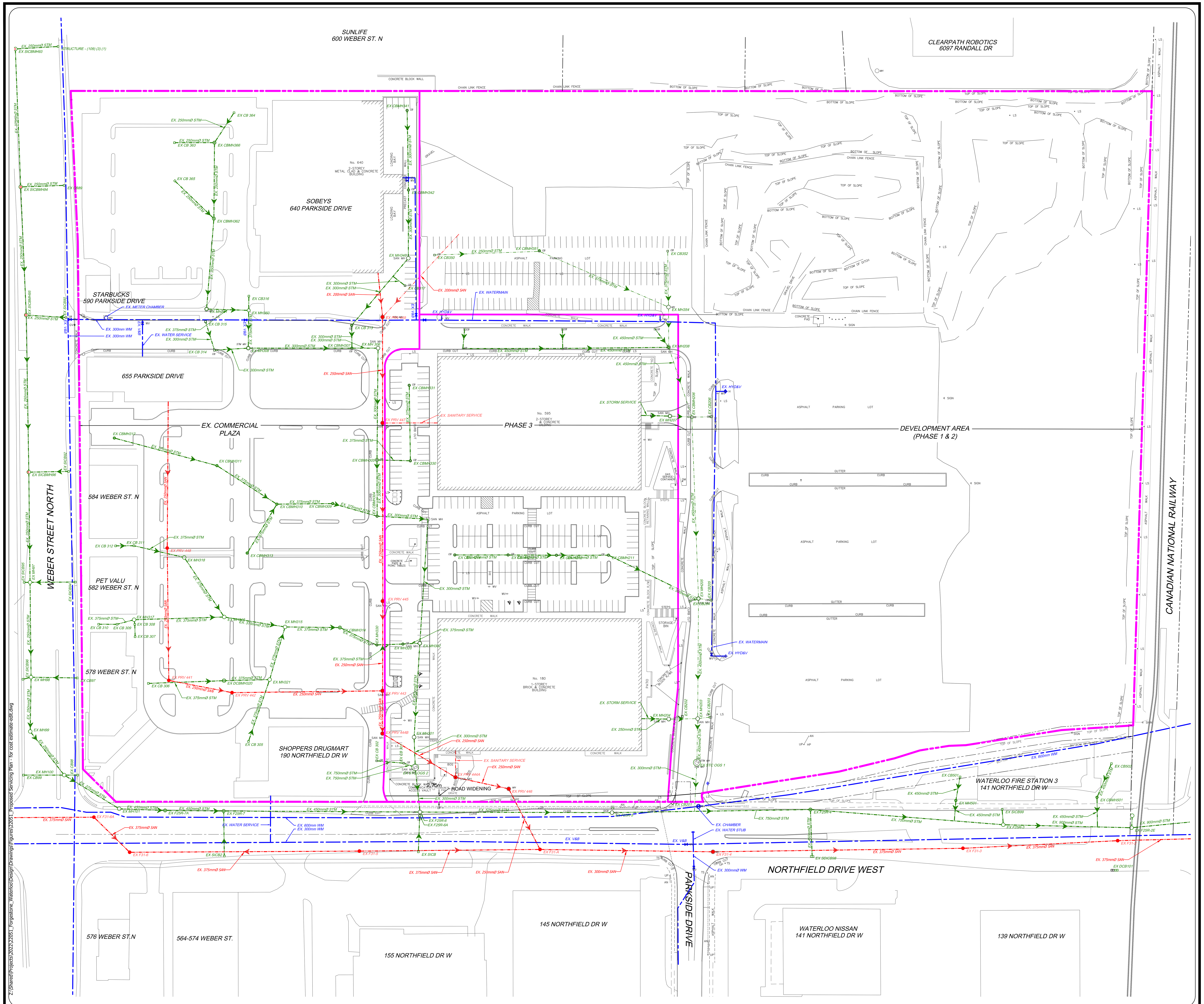
170 NORTHFIELD DRIVE
WATERLOO, ONTARIO

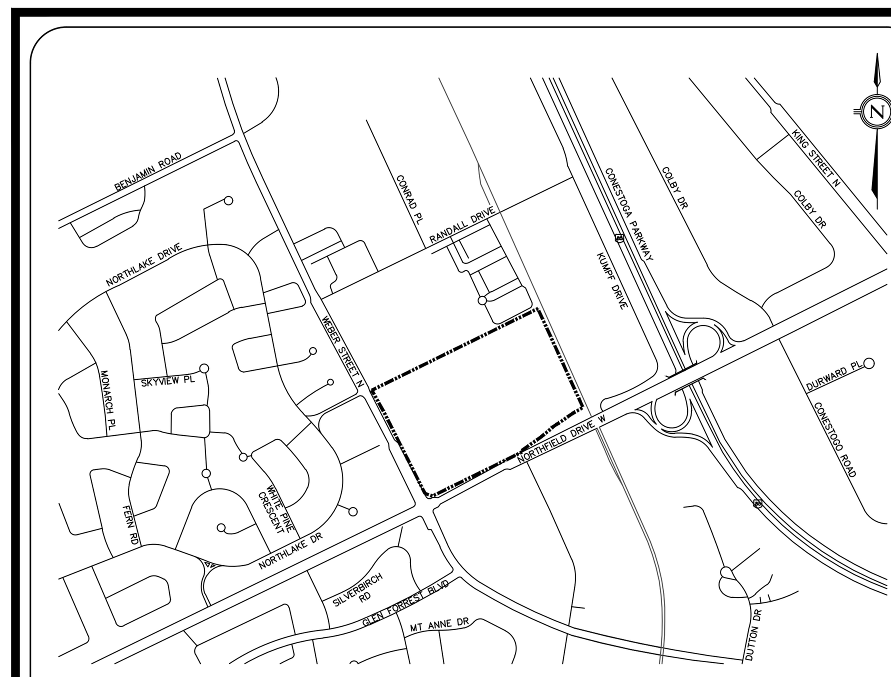
WATER BALANCE PLAN

DESIGNED BY:	PM	CHECKED BY:	PW	DATE:	DECEMBER 2023
DRAWING BY:	ML/BB	CHECKED BY:	PM	PROJECT NO.	22051
SWM BY:	PM	CHECKED BY:	PW		
SCALE: 1:800 (20 0m 10 20 30 40)				DRAWING NO.	FIG.5

REGION FILE No.:

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KEY PLAN

LEGEND

- PROPERTY LINE
- SEVERANCE LINE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING VALVE BOX/CHAMBER
- EXISTING HYDRANT & VALVE

LEGAL & TOPOGRAPHY

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LEGAL DESCRIPTION:
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3.0	--	--		
2.0	FIRST SUBMISSION	2024-03-25	PM	
1.0	DRAFT – FOR CLIENT REVIEW	2024-02-16	PM	

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APPLICANT:
FORGESTONE CAPITAL MANAGEMENT L.P.
100 YONGE STREET, SUITE 1100
TORONTO, ON
M5C 1T4

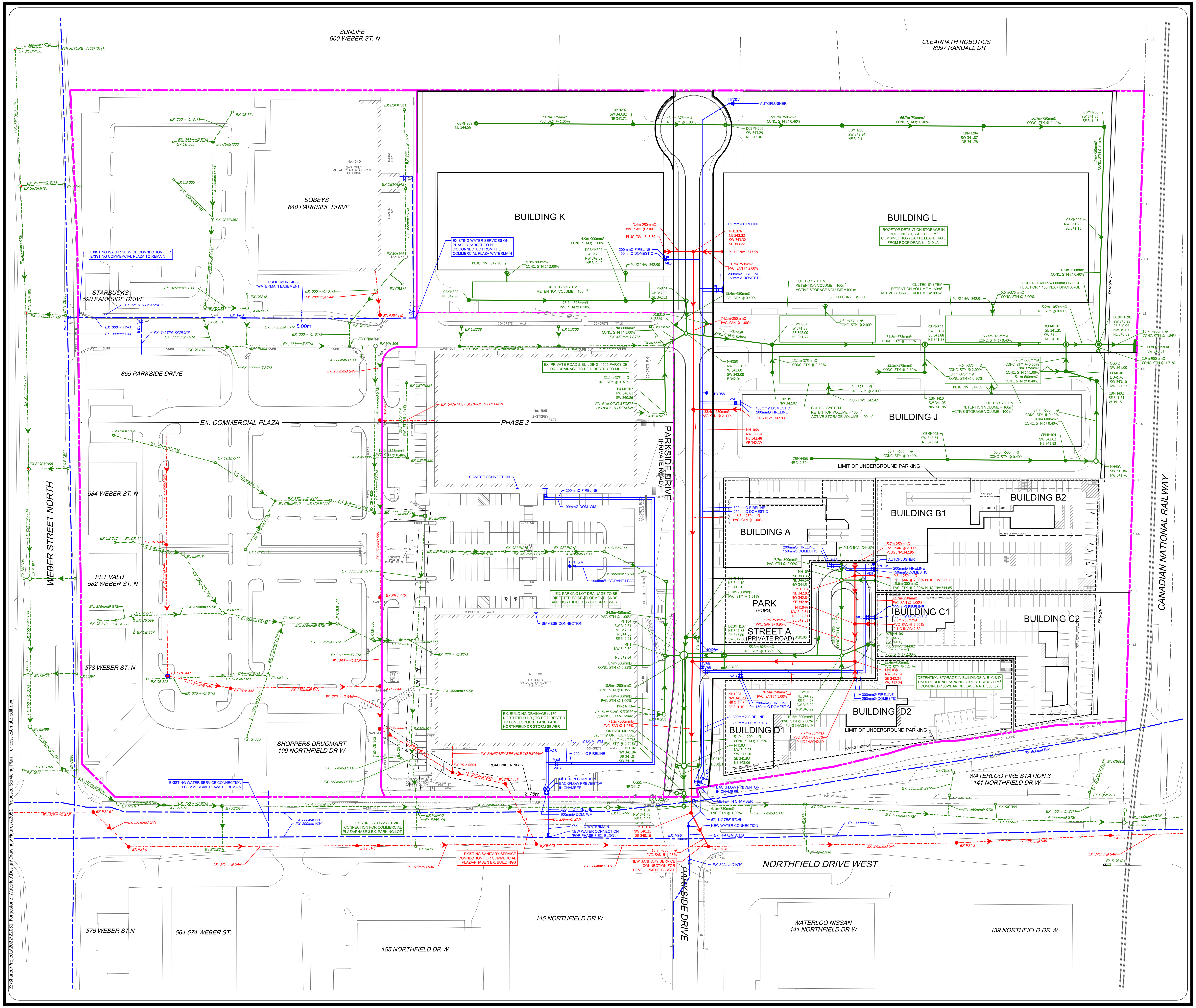
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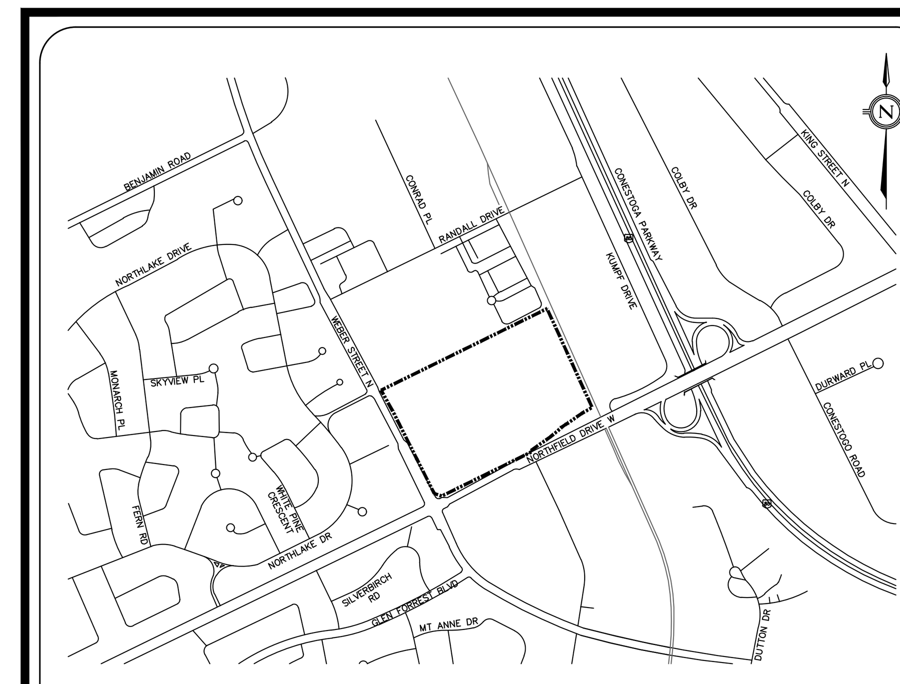
170 NORTHFIELD DRIVE
WATERLOO, ONTARIO

EXISTING SERVICING PLAN

DESIGNED BY: PM	CHECKED BY: PW	DATE: DECEMBER 2023
DRAWING BY: ML/BB	CHECKED BY: PM	PROJECT NO. 22051
SWM BY: PM	CHECKED BY: PW	
SCALE: 1:800 (20 0m 10 20 30 40)		DRAWING NO. C-100

REGION FILE No.:





KEY PLAN

LEGEND

- PROPERTY LINE
- SEVERANCE LINE
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING VALVE BOX/CHAMBER
- HYDRANT & VALVE
- PROPOSED STORM SEWER
- PROPOSED SANITARY SEWER
- PROPOSED WATERMAIN
- OVERLAND FLOW ROUTE
- PROPOSED EASEMENT
- LIMIT OF UNDERGROUND PARKING

LEGAL & TOPOGRAPHY

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4.0	--	--		
3.0	--	--		
2.0	FIRST SUBMISSION	2024–03–25	PM	
1.0	DRAFT – FOR CLIENT REVIEW	2024–02–16	PM	

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ENGINEER'S STAMP

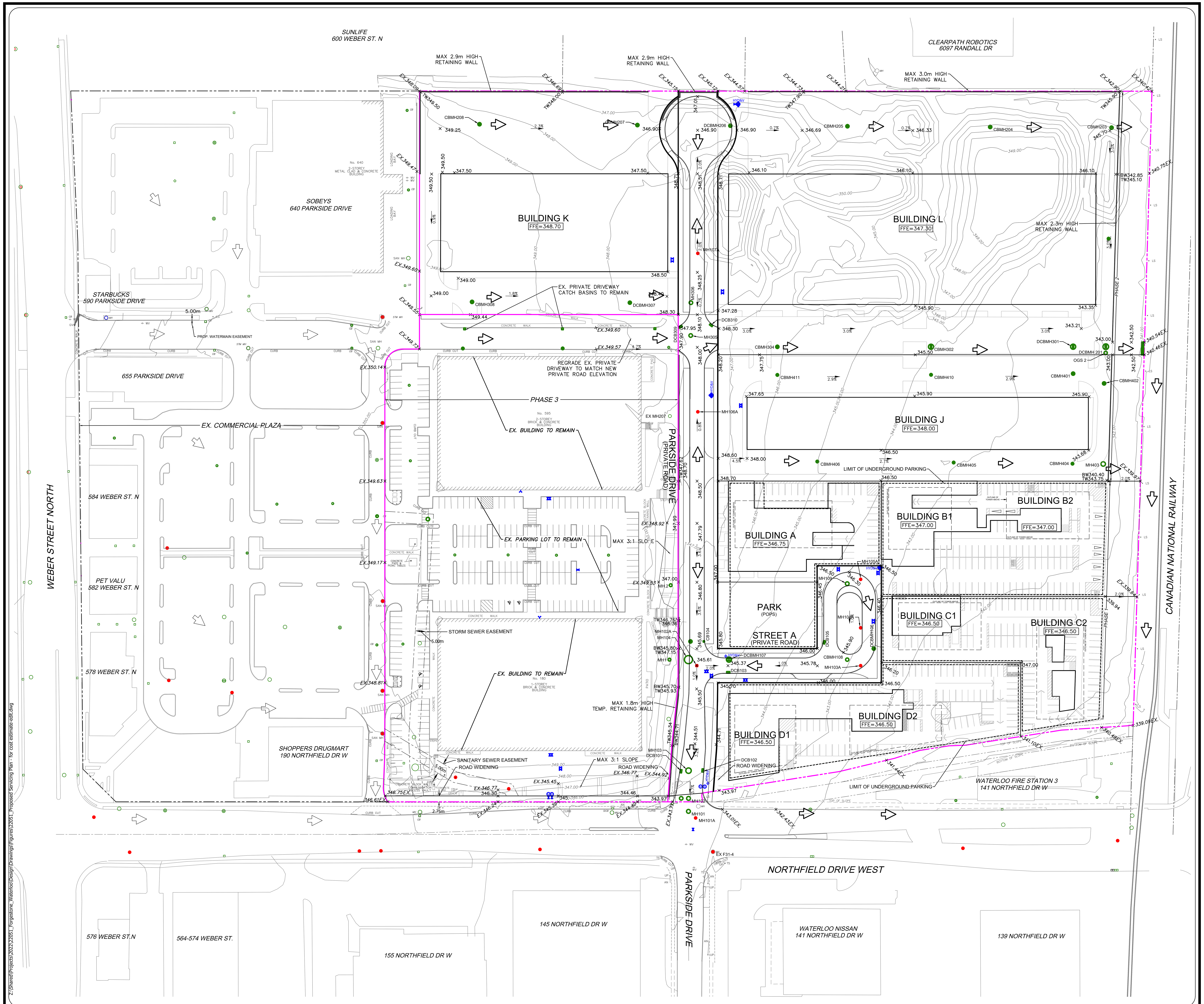
APPLICANT:
FORGESTONE CAPITAL MANAGEMENT L.P.
100 YONGE STREET, SUITE 1100
TORONTO, ON
M5C 1T4

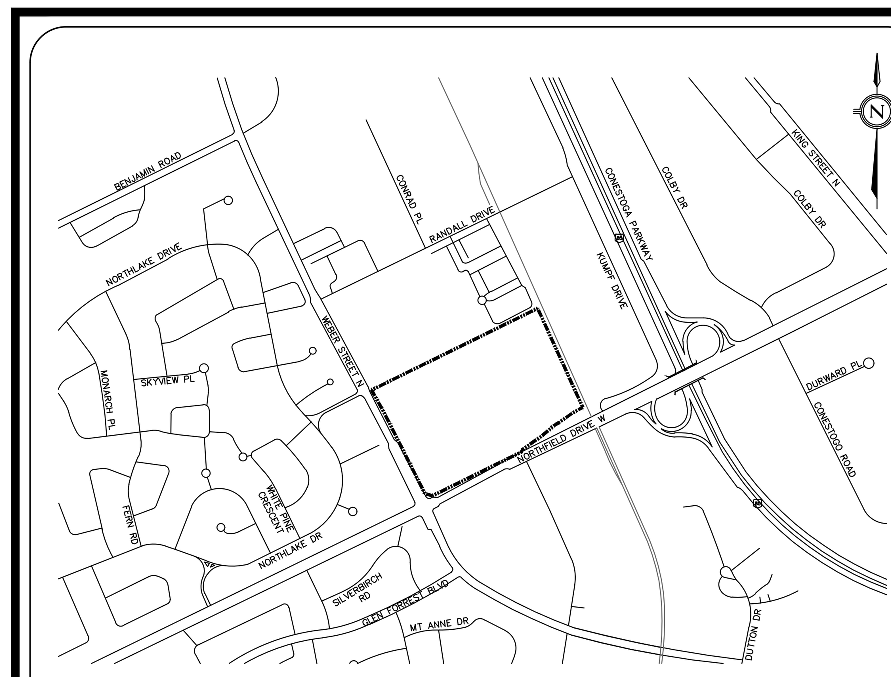
SITE LOCATION:
170 NORTHFIELD DRIVE
WATERLOO, ONTARIO

GENERAL SERVICING PLAN

DESIGNED BY: PM	CHECKED BY: PW	DATE: DECEMBER 2023	
DRAWING BY: ML/BB	CHECKED BY: PM	PROJECT NO.	22051
SWM BY: PM	CHECKED BY: PW		
SCALE: 1:800 (20, 0m, 10, 20, 30, 40)		DRAWING NO.	C-101

REGION FILE No.:





KEY PLAN

LEGEND

- PROPERTY LINE
- SEVERANCE LINE
- EX.340.01+ EXISTING ELEVATION
- 340.01+ PROPOSED ELEVATION
- 340.00 EXISTING CONTOUR & ELEVATION
- STORM MANHOLE
- SANITARY MANHOLE
- VALVE BOX/CHAMBER
- OVERLAND FLOW ROUTE
- PROPOSED EASEMENT
- LEVEL SPREADER
- LIMIT OF UNDERGROUND PARKING

LEGAL & TOPOGRAPHY

J.D. BARNES LIMITED
LIMITED INFORMATION SPECIALISTS
4273 KING ST. E, #100, KITCHENER, ON, N2P 2E9
TEL/FAX (519) 578–2220 / (519) 650–5625
www.jdbarnes.com

BENCHMARK:

ELEVATIONS ARE GEODETIC ORIGIN (CGVD–1928: 1978), AND ARE DERIVED FROM GNSS OBSERVATIONS AND NATURAL RESOURCES CANADA'S GEOID MODEL HT2.0.

LOCAL BENCHMARK FIRE HYDRANT LOCATED ADJACENT TO BUILDING No.180, ALONG THE EAST LIMITS OF PARKSIDE DRIVE AT THE SOUTHERN MOST PARKING LOT ENTRANCE, AS SHOWN ON THE FACE ON THE PLAN.

ELEVATION 346.94m.

FIRE HYDRANT LOCATED AT THE REAR OF BUILDING No.595, ALONG THE NORTH LIMITS OF PARKSIDE DRIVE AND THE EAST SIDE OF THE PARKING LOT ENTRANCE, AS SHOWN ON THE FACE OF THE PLAN.

ELEVATION: 350.43m

LEGAL DESCRIPTION:

SKETCH SHOWING TOPOGRAPHIC DETAIL 170 & 180 NORTHFIELD DRIVE, 360 & 595 PARKSIDE DRIVE, PARKSIDE DRIVE, AND PART OF NORTHFIELD DRIVE WEST, IN THE CITY OF WATERLOO, REGIONAL MUNICIPALITY OF WATERLOO.

FIELD SURVEY COMPLETED ON THE 27th DAY OF JULY, 2023.

No.	REVISIONS/ISSUED	DATE	BY	CITY
9.0	--	--		
8.0	--	--		
7.0	--	--		
6.0	--	--		
5.0	--	--		
4.0	--	--		
3.0	--	--		
2.0	FIRST SUBMISSION	2024–03–25	PM	
1.0	DRAFT – FOR CLIENT REVIEW	2024–02–16	PM	

counterpoint ENGINEERING
COUNTERPOINT ENGINEERING INC.
8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

ENGINEER'S STAMP

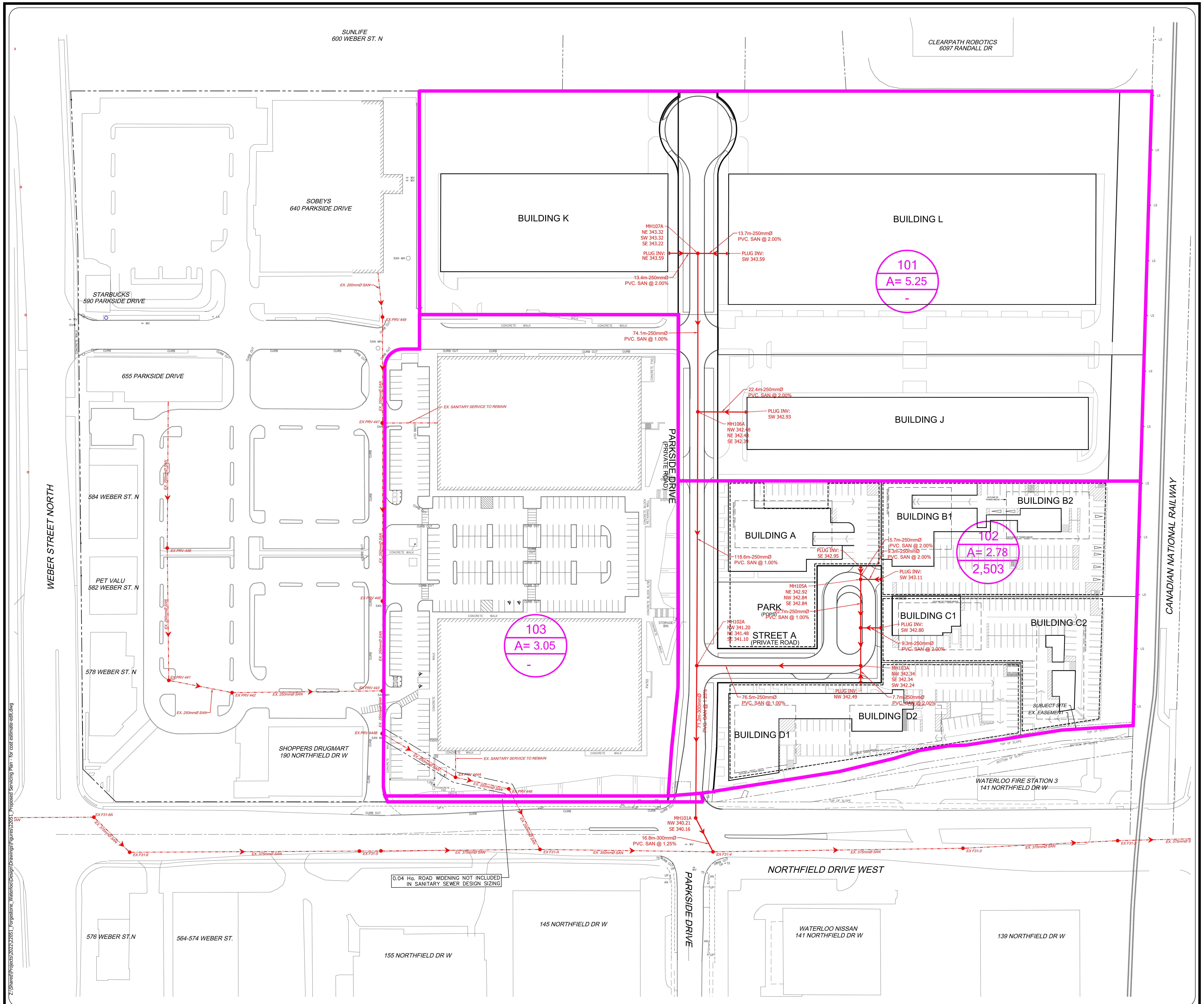
APPLICANT:
FORGESTONE CAPITAL MANAGEMENT L.P.
100 YONGE STREET, SUITE 1100
TORONTO, ON
M5C 1T4

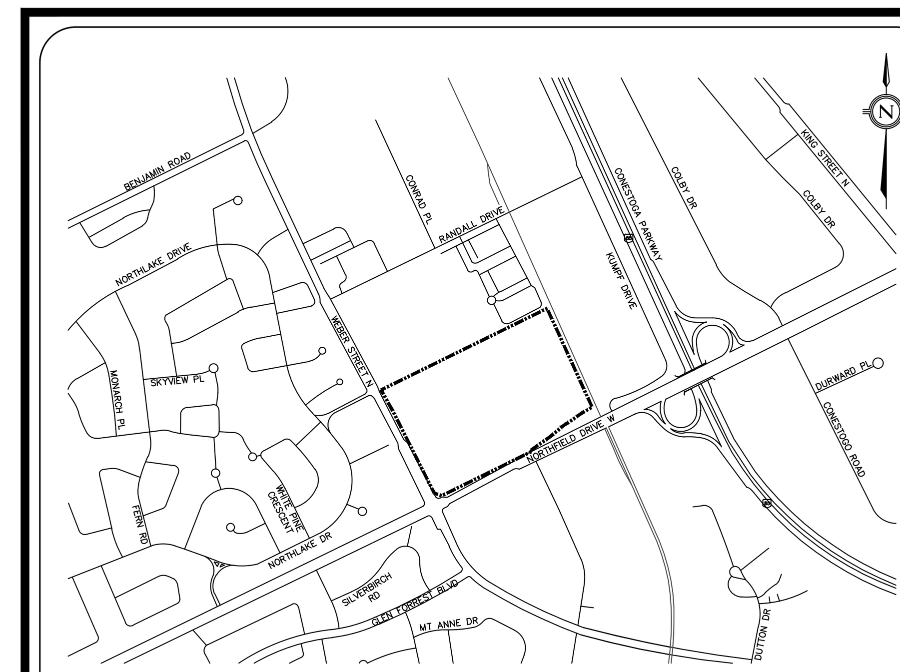
SITE LOCATION:
170 NORTHFIELD DRIVE
WATERLOO, ONTARIO

GENERAL GRADING PLAN

DESIGNED BY: PM	CHECKED BY: PW	DATE: DECEMBER 2023
DRAWING BY: ML/BB	CHECKED BY: PM	PROJECT NO. 22051
SWM BY: PM	CHECKED BY: PW	
SCALE: 1:800 (20 0m 10 20 30 40)		DRAWING NO. C-201

REGION FILE No.:





KEY PLAN

LEGEND

- PROPERTY LINE
- EXISTING SANITARY SEWER
- SANITARY MANHOLE
- PROPOSED SANITARY SEWER
- 201 — AREA ID
- A= 1.38 — DRAINAGE AREA (Ha.)
- 1,973 — RESIDENTIAL UNITS

LEGAL & TOPOGRAPHY

J.D. BARNES LIMITED
LIMITED INFORMATION SPECIALISTS
4273 KING ST. E, #100, KITCHENER, ON, N2P 2E9
TEL/FAX (519) 578-2220 / (519) 650-5625
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LOCAL BENCHMARK FIRE HYDRANT LOCATED ADJACENT TO BUILDING No.180, ALONG THE EAST LIMITS OF PARKSIDE DRIVE AT THE SOUTHERN MOST PARKING LOT ENTRANCE, AS SHOWN ON THE FACE ON THE PLAN.

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FIRE HYDRANT LOCATED AT THE REAR OF BUILDING No.595, ALONG THE NORTH LIMITS OF PARKSIDE DRIVE AND THE EAST SIDE OF THE PARKING LOT ENTRANCE, AS SHOWN ON THE FACE OF THE PLAN.

ELEVATION: 350.43m

LEGAL DESCRIPTION:

SKETCH SHOWING TOPOGRAPHIC DETAIL 170 & 180 NORTHFIELD DRIVE, 360 & 595 PARKSIDE DRIVE, PARKSIDE DRIVE, AND PART OF NORTHFIELD DRIVE WEST, IN THE CITY OF WATERLOO, REGIONAL MUNICIPALITY OF WATERLOO.

FIELD SURVEY COMPLETED ON THE 27th DAY OF JULY, 2023.

No.	REVISIONS/ISSUED	DATE	BY	CITY
9.0	--	--		
8.0	--	--		
7.0	--	--		
6.0	--	--		
5.0	--	--		
4.0	--	--		
3.0	--	--		
2.0	FIRST SUBMISSION	2024-03-25	PM	
1.0	DRAFT – FOR CLIENT REVIEW	2024-02-16	PM	

counterpoint ENGINEERING

COUNTERPOINT ENGINEERING INC.
8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

ENGINEER'S STAMP

APPLICANT:
FORGESTONE CAPITAL MANAGEMENT L.P.
100 YONGE STREET, SUITE 1100
TORONTO, ON
M5C 1T4

SITE LOCATION:

170 NORTHFIELD DRIVE
WATERLOO, ONTARIO

SANITARY DRAINAGE PLAN

DESIGNED BY: PM	CHECKED BY: PW	DATE: DECEMBER 2023	
DRAWING BY: ML/BB	CHECKED BY: PM	PROJECT NO.	22051
SWM BY: PM	CHECKED BY: PW		
SCALE: 1:800 (20 0m 10 20 30 40)		DRAWING NO.	C-301

REGION FILE No.:

APPENDIX B

Water Demand Calculations

Project No.: 22051

Counterpoint Engineering Inc.

Proposed Domestic Water Demand Design Calculations

Project:	**170 Northfield Drive W**	**Designed By**	LC
Project No:	**22051**	**Checked By**	PM
Client:	**Forgestone Capital Management LP**	**Date**	22-Mar-24
Location:	**Waterloo, ON**	**Revision Date**	

Design Parameters

Average Daily Consumption[1]

Residential	300	(l/c/d)
Light Industrial	0.64	(l/s/ha)

Note that the non-residential lands are proposed to be commercial or industrial. For the purposes of this report, the water demand calculations assume industrial landuse as it is the more conservation of the two options.

Residential Peaking Factors[2]

Minimum Hour	0.50
Maximum Day	2.00
Peak Hour	3.00

Industrial Peaking Factor[1]

Industrial	4.00

Population Density

Residential - Apartments[3]	2.07	(ppu)

Site Statistics[4]

Phase 1 and Phase 2

Residential	2,503	(units)
Commercial/Industrial	4.95	ha

Phase 3

Residential	1,764	(units)
Commercial/Industrial	0.85	ha

Water Demand

Landuse	Population/ Hectares	Nominal Demand (L/min)	Max. Hour Demand (L/min)	Max Daily Demand (L/min)
Residential	8,833	1,840	5,520	3,680
Commercial	5.7978	221	886	221
Total Peak Demand			6,406	3,902

Required Fire Flow (RFF)

RFF per FUS 2020 Gudelines (L/min)	11,000

Design Flow

Maximum Hour Demand (L/min):	6,406
Maximum Day Demand + Fire Flow (L/min):	14,902

Note 1: As recommened by MECP design guidelines for drinking water systems

Note 2: Peaking factors specificed in MECP design guidelines for drinking water systems Table 3-1

Note 3: Population density specificed in development charges background study (2020)

Note 4: Site Statistics per architectural plans circulated March 6rd, 2024

REQUIRED FIRE FLOW WORKSHEET - PROPOSED INDUSTRIAL
Fire Underwriters Survey

Project : 170 Northfield Drive W, Waterloo
Project No: 22051
Development Area: **8.03 ha**

Guide for Determination of Required Fire Flow Copyright I.S.O

$$RFF = 220C\sqrt{A}$$

Where:

RFF = the Required Fire Flow in litres per minutes (LPM)
C = the Construction Coefficient is related to the type of construction of the building
A = the Total Effective Floor Area (effective building area) in square metres of the building

Type of Construction		Coefficient
Type V	Wood Frame	1.5
Type IV-A	Encapsulated Mass Timber	0.8
Type IV-B	Rated Mass Timber	0.9
Type IV-C	Ordinary Mass Timber	1.0
Type IV-D	Un-Rated Mass Timber	1.5
Type III	Ordinary	1.0
Type II	Noncombustible	0.8
4.87	Fire Resistive	0.6

Contents		Factor
1.04	Non-Combustible	-25%
LC	Limited Combustible	0
C	Combustible	0
FB	Free Burning	0
RB	Rapid Burning	25%

1) Required Fire Flow

Type of Construction:	Type II	
C=	1.0	
A*=	10,500 m^2	**(Block 5 building)**
F=	**22,543**	**L/min**

2) Occupancy and Contents Adjustment Factor

Type of Occupancy	LC			
Contents Adjustment Factor	-15%	=	-3,381	L/min
F=	**22543L/min +**	**-3381**	**L/min =**	**19,162** **L/min**

3) System Type Reduction

NFPA 13 Sprinkler:	YES	30%			
Standard Water Supply:	YES	10%			
Fully Supervised:	YES	10%			
Total Credit		50%			
Reduction of:	50%	L/min	=	9,581	L/min
F=	**19162L/min -**	**9,581**	**L/min =**	**9,581**	**L/min**

4) Exposure Adjustment Charge

Building Face	Dist(m)	Charge
North	30+	0%
East	30+	0%
South	30+	0%
West	25	10%
Total		10% **of** 19162 **L/min** = 1,916 **L/min**

(max exposure charge can be 75%)

Separation Distance	Maximum Exposure Adjustment Charge
0 m to 3 m	25%
3.1 m to 10 m	20%
10.1 m to 20 m	15%
20.1 m to 30 m	10%
Greater than 30	0%

F= **9581L/min +** **1916L/min** **=** 11,497 **L/min**

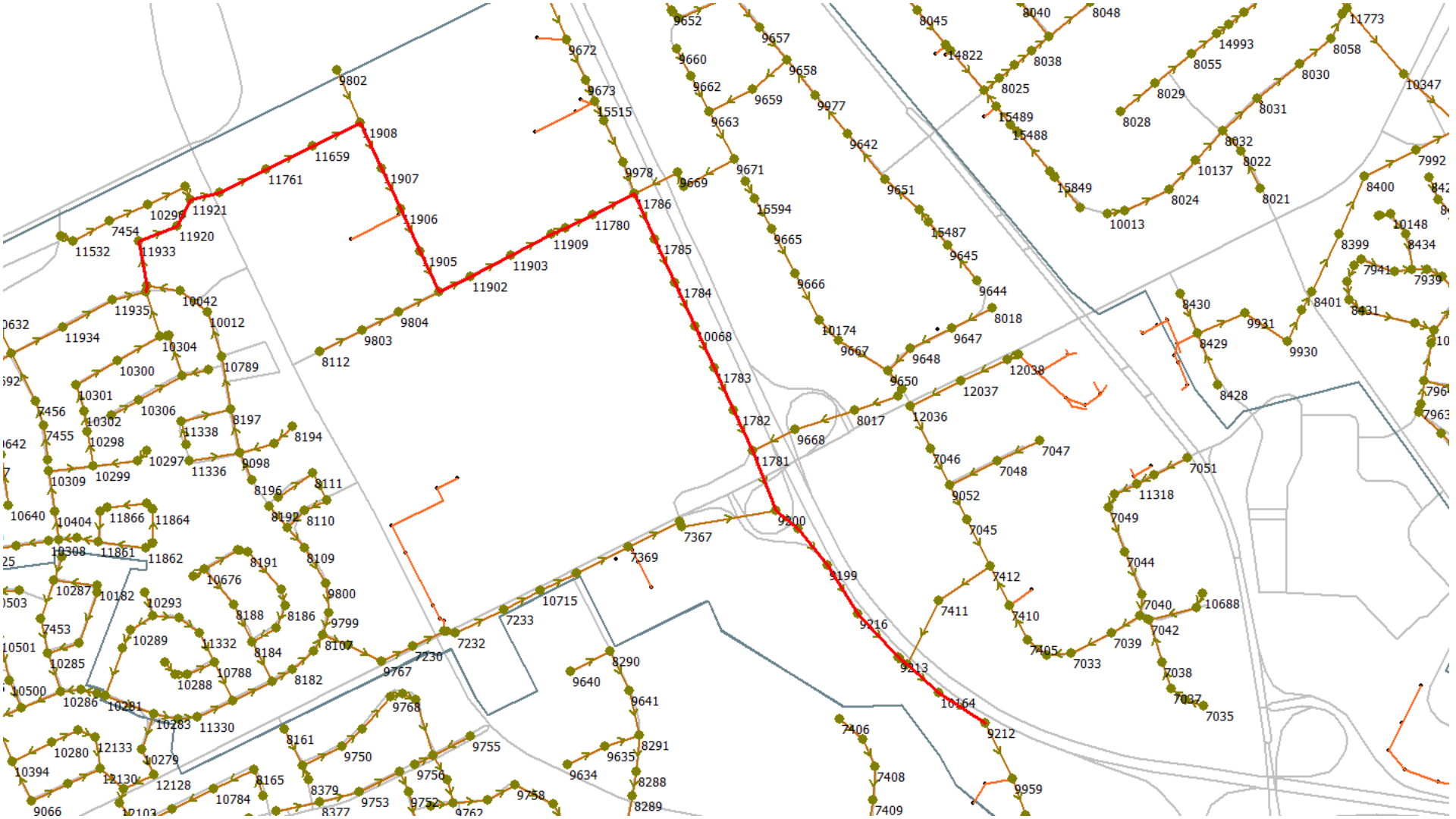
F=	11,000	**L/min**
F=	183	**L/s**
F=	2,906	**gpm**

(round to the nearest 1,000L/min)

APPENDIX C

Sanitary Design Flow Calculations

Project No.: 22051



July 2013

161111191

Stantec

Stantec Consulting Ltd.
49 Frederick Street
Kitchener, Ontario, Canada
N2H 6M7
Tel: (519) 579-4410
Fax: (519) 579-6733
www.stantec.comt

Drawing is not to be used for construction

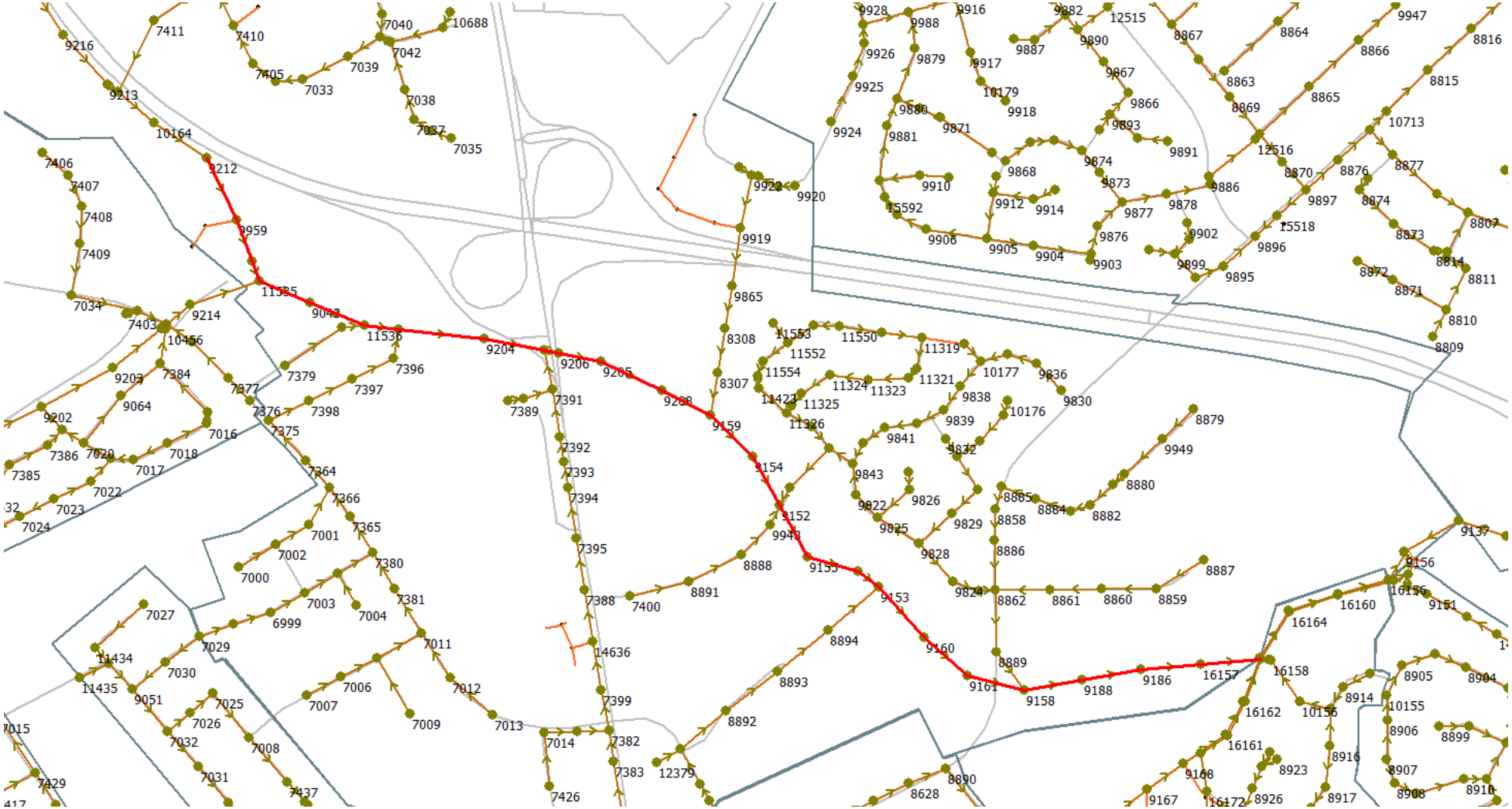
Legend

Figure No. 4

Title **Forwell Trunk Profile 2 Overview**

Client/Project City of Waterloo

Waterloo Sanitary Servicing Master Plan



July 2013
161111191

Stantec

Legend

Figure No. 6

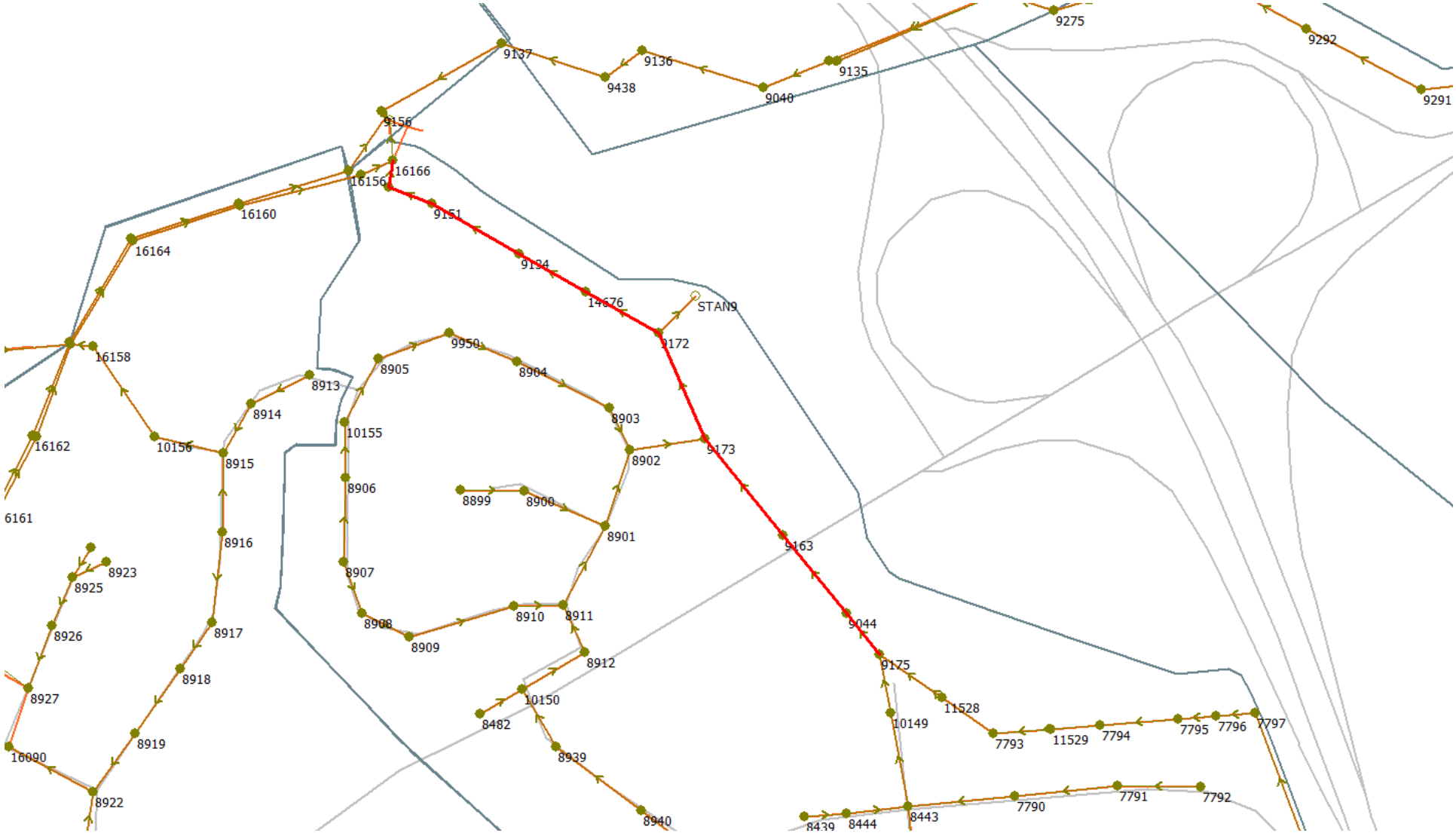
Title **Forwell Trunk Profile 3 Overview**

Stantec Consulting Ltd.
49 Frederick Street
Kitchener, Ontario, Canada
N2H 6M7
Tel: (519) 579-4410
Fax: (519) 579-6733
www.stantec.comt

Client/Project City of Waterloo

Waterloo Sanitary Servicing Master Plan

Drawing is not to be used for construction



July 2013
161111191

Stantec

Legend

Figure No. 1

Title **Glenridge Trunk Geoplan Overview**

Stantec Consulting Ltd.
49 Frederick Street
Kitchener, Ontario, Canada
N2H 6M7
Tel: (519) 579-4410
Fax: (519) 579-6733
www.stantec.comt

Client/Project City of Waterloo

Waterloo Sanitary Servicing Master Plan

Drawing is not to be used for construction

PEAK FLOW DESIGN

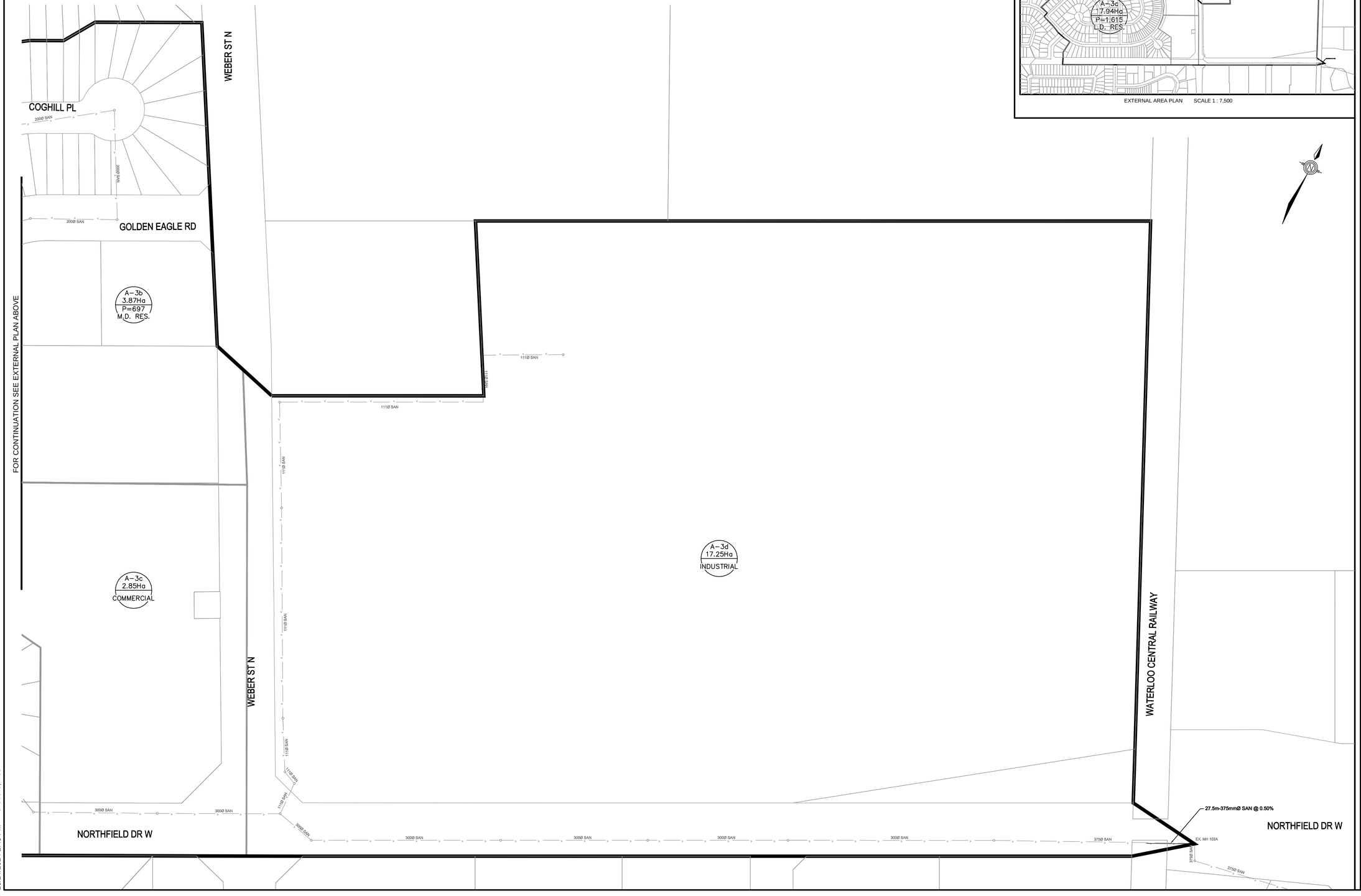
RESIDENT. RATE =	350	l/c/d
INDUSTR. RATE =	0.500	l/s/ha
COMMERC. RATE =	0.600	l/s/ha
INSTIT. RATE (SCHOOL) =	140	l/c/d
DOWNTOWN RATE =	2.200	l/s/ha
INFILT. RATE =	0.150	l/s/ha

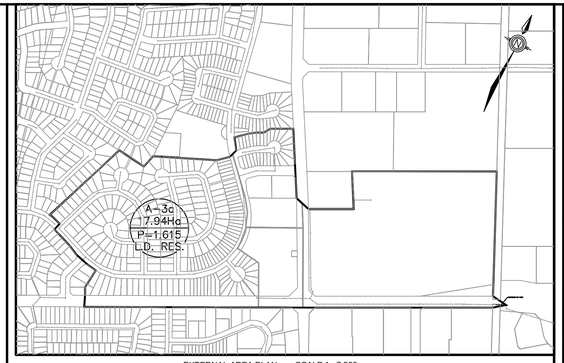
SANITARY SEWER DESIGN
STAGE 1 - LRT PROJECT

PROJECT DETAILS

PROJECT	WATERLOO LRT
MUNICIPALITY	KITCHENER-WATERLOO
JOB No.	60317130
DATE	30-Apr-14
CALCULATED BY	RG
CHECKED BY	DC

LOCATION				RESIDENTIAL AREAS											NON-RESIDENTIAL AREAS											SEWAGE FLOW				PIPE DESIGN			
				LOW DENSITY RESIDENTIAL			MED. DENSITY RESIDENTIAL			HIGH DENSITY RESIDENTIAL			TOTAL	CUM.	PEAK	PEAK	DOWNTOWN AREA		INDUSTRIAL		COMMERCIAL		INSTITUTIONAL		OPEN SPACE	TOTAL PEAK	TOTAL	INFIL.	TOTAL	CUM.	PIPE	SLOPE	CAPACITY	VELOCITY
AREA No.	STREET	FROM MH	TO MH	ZONE	Area	POPUL.	ZONE	Area	POPUL.	ZONE	Area	POPUL.	POPUL.	POPUL.	FACT'R	RES. FLOW	AREA	PEAK FLOWS	AREA	PEAK FLOWS	AREA	PEAK FLOWS	AREA	PEAK FLOWS	STREET R.O.W.	NON-RES. FLOWS	AREA	FLOW	FLOW	FLOW	DIA.		(n=0.013)	(full)
				p/ha	(ha)	(p)	p/ha	(ha)	(p)	p/ha	(ha)	(p)	(p)	(p)	M	(l/s)	(ha)	(l/s)	(ha)	(l/s)	(ha)	(l/s)	(ha)	(l/s)	AREA (ha)	(l/s)	(ha)	(l/s)	(l/s)	(l/s)	(mm)	(%)	(l/s)	(m/s)
	SECTION 1.2																																
A-3	NORTHFIELD DRIVE	EX. 375 SAN	EX. MH 103A	90	17.94	1615	180	3.87	697	360			2311	2311	3.536	33.11			17.25	21.56	2.85	4.28				25.8375	41.91	6.29	65.23	65.23	375	0.50	123.99	1.12





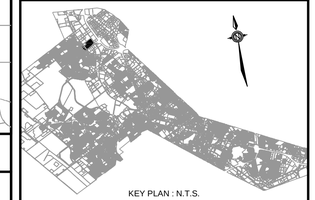
EXTERNAL AREA PLAN SCALE 1 : 7,500

PACKAGE NAME:

CIVIL & SYSTEMS

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DO NOT SCALE THIS DOCUMENT. ALL MEASUREMENTS MUST BE OBTAINED FROM STATED DIMENSIONS.



KEY PLAN : N.T.S.

LEGEND:

- 62.5m-300mmØ SAN @ 1.70% — PROPOSED SANITARY SEWER
- 225Ø SAN — EXISTING SANITARY SEWER
- SANITARY AREA
- SANITARY SUB AREA

LICENSED PROFESSIONAL ENGINEER
S.Z. HAIDER
100058894
Jan 7, 2015
PROVINCE OF ONTARIO

STAMP:

Region of Waterloo

GRANDLINQ

REV.	DESCRIPTION	BY	DATE
B00	ISSUED FOR MOE APPROVALS	TOR	2015-01-08

REGION OF WATERLOO
STAGE I
LRT PROJECT

CIVIL UTILITIES
SANITARY AREA PLAN
& DESIGN SHEET

DRAWN BY:	DESIGNED BY:	CHECKED BY:	SCALE:
RG	RG	DC	1:1000

PACKAGE:	DRAWING No.	SHEET:	REV.
S01B.1	CU-4001	OF	B00

CADD FILE: S-121-CU-4001.dwg

10/14/2014 1:48 PM Grozelle, Rob

Counterpoint Engineering Inc.
Sanitary Design Calculations for Phases 1 and 2

Project:	170 Northfield Drive West	**Designed By**	LC
Project No:	22051	**Checked By**	PM
Client:	Forgestone Capital Managenet LP	**Date**	06-Mar-24
Location:	Waterloo, ON	**Revision Date**	

Phase 1 and Phase 2 Area: 8.03 ha

Region of Waterloo Design Parameters

Population Density

Residential - Apartment	2.07	(ppu)

Infiltration Allowance	0.25	(l/s/ha)

Average Flow

Residential	275	(l/c/d)
Commercial - Core	1.16	(l/s/ha)
Commercial - Shopping Mall	0.3	(l/s/ha)
Commercial - General	0.6	(l/s/ha)

Peaking Factors

Commercial	2.5
Residential[2]	3.2

(2) Residential Factor per Harmon Formula

Site Statistics[1]

Residential	2,503	(units)
Commercial - General	4.95	ha

[PHASE 1 - BLDG A, B, C, D]
[PHASE 2 - BLDG J, K, L]

(1) Site Statistics per architectural plans circulated March 6th, 2024

Sanitary Design Flows + Infiltration

Landuse	Population/ Area (ha)	Nominal Flow (l/s)	Peak Flow (l/s)	
Residential	5,181	16.49	53.28	**[PHASE 1 SANITARY FLOWS]**
Commercial - General	8.03	4.82	12.05	**[PHASE 2 SANITARY FLOWS]**
Infiltration (8.06 ha)			2.01	
Total Peak Design Flow			**67.33**	**[PHASE 1 + PHASE 2]**

Counterpoint Engineering Inc.
Sanitary Design Calculations for Phase 3

Project:	170 Northfield Drive West	**Designed By**	LC
Project No:	22051	**Checked By**	PM
Client:	Forgestone Capital Managenet LP	**Date**	06-Mar-24
Location:	Waterloo, ON	**Revision Date**	

Phase 3 Area 3.05 ha

Region of Waterloo Design Parameters

Population Density

Residential - Apartment	2.07	(ppu)

Infiltration Allowance	0.25	(l/s/ha)

Average Flow

Residential	275	(l/c/d)
Commercial - Core	1.16	(l/s/ha)
Commercial - Shopping Mall	0.3	(l/s/ha)
Commercial - General	0.6	(l/s/ha)

Peaking Factors

Commercial	2.5
Residential[2]	3.4

(2) Residential Factor per Harmon Formula

Site Statistics[1]

Residential	1,764	(units)
Commercial - General	0.85	(ha)

(BLDG E, F, G, H)
(BLDG I)

(1) Site Statistics per architectural plans circulated March 6th, 2024

Sanitary Design Flows + Infiltration

Landuse	Population/ Area (ha)	Nominal Flow (l/s)	Peak Flow (l/s)
Residential	3,651	11.62	39.15
Commercial - General	0.85	0.51	1.27
Infiltration (3.05 ha)			0.76
Total Peak Design Flow			**41.18**

[PHASE 3]

Note that the non-residential lands are proposed to be commercial or industrial. For the purposes of this report, the sanitary design flow assumes commercial landuse as it is the more conservation of the two options.

Counterpoint Engineering Inc.
Sanitary Design Calculations

Project:	170 Northfield Drive West	**Designed By**	LC
Project No:	22051	**Checked By**	PM
Client:	Forgestone Capital Management LP	**Date**	22-Mar-24
Location:	Waterloo, ON	**Revision Date**	

Total Development Area:	11.08	ha
Phase 1 and Phase 2	8.03	ha
Phase 3	3.05	ha

Region of Waterloo Design Parameters

Population Density

Residential - Apartment	2.07	(ppu)

Infiltration Allowance	0.25	(l/s/ha)

Average Flow

Residential	275	(l/c/d)
Commercial - Core	1.16	(l/s/ha)
Commercial - Shopping Mall	0.3	(l/s/ha)
Commercial - General	0.5	(l/s/ha)

Peaking Factors

Commercial	2.5
Residential[2]	3.0

[2] Residential Factor per Harmon Formula

$$F = 1 + \frac{14}{4 + \sqrt{P}} \qquad (P = \text{Population}/1{,}000)$$

Site Statistics[1]

Phase 1 and 2

Residential	2,503	(units)	(BLDG A, B, C, D)
Commercial - General	4.95	ha	(BLDG J, K, L)

Phase 3

Residential	1,764	(units)	(BLDG E, F, G, H)
Commercial - General	0.85	ha	(BLDG I)

[1] Site Statistics per architectural plans circulated March 6th, 2024

Future Sanitary Design Flows + Infiltration

Landuse	Population/ Area	Nominal Flow (l/s)	Peak Flow (l/s)
Residential	8,833	28.11	84.57
Commercial - General	5.80	2.90	7.25
Infiltration (11.08 ha)			2.77
Total Peak Design Flow			**94.58**

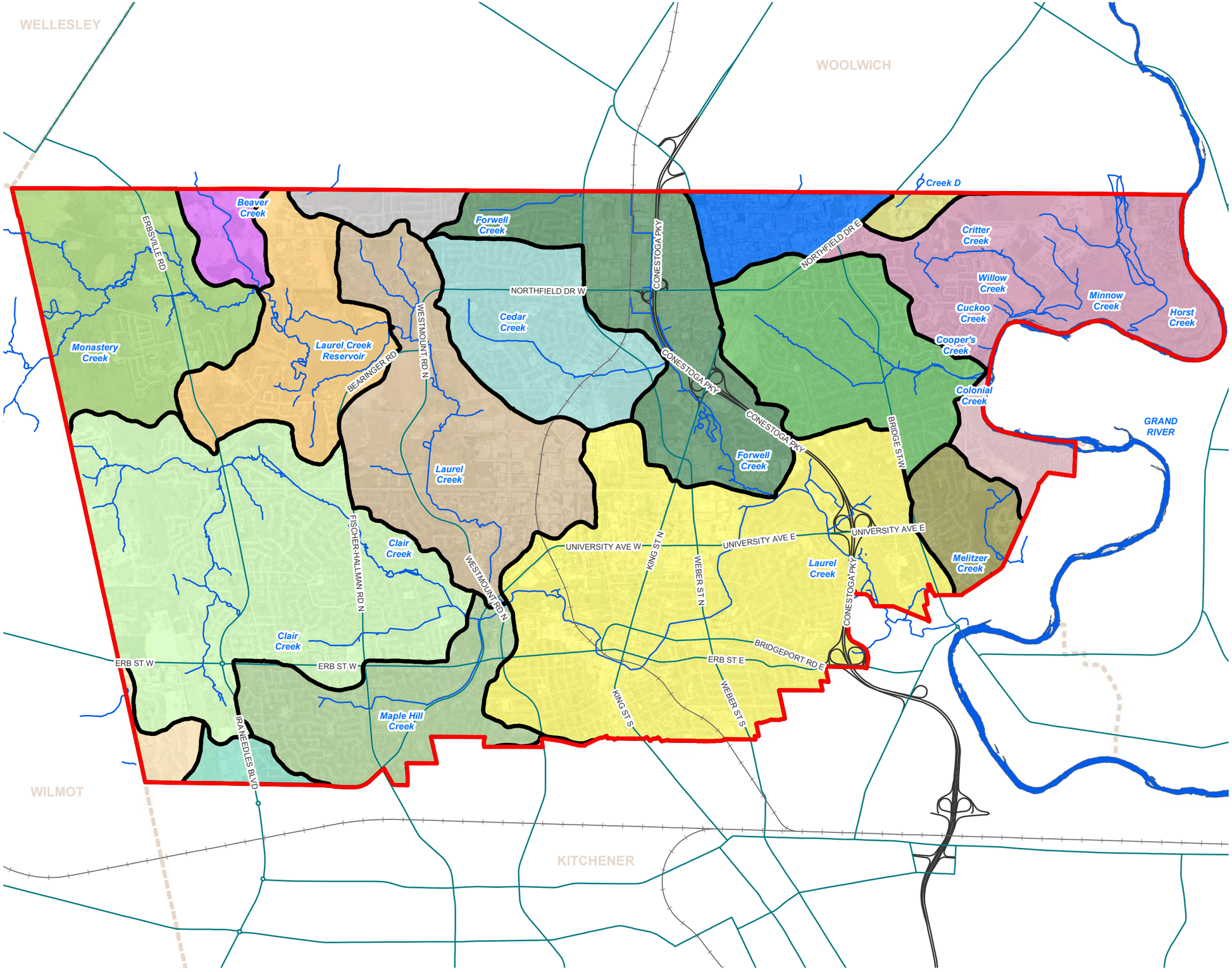
Note that the non-residential lands are proposed to be commercial or industrial. For the purposes of this report, the sanitary design flow assumes commercial landuse as it is the more conservation of the two options.

[PHASES 1, 2 & 3]

APPENDIX D

Storm Drainage and Stormwater Management Design Calculations

Project No.: 22051



THE CITY OF Waterloo

MUNICIPAL CLASS EA STORMWATER MANAGMENT MASTER PLAN

Figure 3.1.2
SUBWATERSHEDS

- Study Area
- Watercourse
- Subwatershed Boundary

Subwatersheds

- Alder Creek
- Beaver Creek
- Cedar Creek
- Clair Creek
- Colonial Creek
- Conestogo River - Lower
- Forwell Creek
- Grand River Tributaries North
- Grand River Tributaries South
- Laurel Creek Reservoir
- Lower Laurel Creek
- Maple Hill Creek
- Martin Creek East
- Martin Creek West
- Melitzer Creek
- Middle Laurel Creek
- Monastery reek
- Schneider Creek

0 0.5 1 Kilometers

N

Aquafor Beech Limited

Base data provided by The City of Waterloo, 2017 and Grand River Conservation Authority, 2017.

Date: May 2017

- Water balance approach should be be determined in consultation with the City of Waterloo Engineering Services Project Manager prior to preliminary design.
- Stormwater management plans and designs for all development shall strive to match pre-development water balance conditions
- For all sites within ICAs and/or WHPAs with adjusted vulnerability scores equal to or greater than 8, paved surfaces (roads, sidewalks and parking surfaces) should not be treated with stormwater infiltration practices due to salt-based deicers commonly used in the winter
- The Stormwater Management Master Plan: Stormwater Infiltration Policy Recommendations (2021) found on the City of Waterloo Website provides two frameworks for identifying infiltration opportunities.
    - Land Use Infiltration Plan
    - Infiltratoin Plan for Municipal Roads
- If subsurface conditions are suitable, at-source infiltration of roof drainage is encouraged as a method of quantity and quality control
- When infiltration measures are proposed, a qualified Professional must confirm the type of soil, permeability, and depth to water table in a formal Geotechnical or Hydrogeological report
- Monitoring and maintenance ports for all infiltration measures should be included

3.5 Intensity-Duration-Frequency (IDF) Relationship

Observations of rainfall at a particular geographic location can be described statistically by an Intensity-Duration-Frequency (IDF) relationship or curve. For a specific frequency or return period a curve can be defined which predicts the maximum average rainfall intensity which is likely to occur for a range of durations. High rainfall intensity is likely to occur over very short durations such as 5 or 15 minutes whereas for longer durations the average intensity is likely to be more modest.

The reliability of an IDF curve increases with the period of record for which rainfall data is available. For purposes of calculation, the IDF curves can be represented by Equation V5-1 using the values found in Table V6-1.

Equation V5-1: $$i = \frac{a}{(t_d+b)^c}$$

Where i = extreme mean average rainfall intensity in mm/hr
t_d = duration of the storm event in minutes
a,b,c = storm constants for a given return period.

TABLE V6-1 STORM CONSTANTS FOR DIFFERENT RETURN PERIODS

Return period T years	2	5	25	100
a (mm/hour)	1101	1755	3261	4692
b (minutes)	9.258	12.347	16.193	17.437
c	0.882	0.895	0.938	0.956

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SWM DESIGN CALCULATIONS
Summary of Storage Provided Calculations

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: '20-Dec-23

Prepared by: LC
Checked by: PM
Last Revised: 13-Mar-24

Rainfall Data

Location:	Waterloo, On	a	4692
Event	100-year	b	17.347
		c	0.956

Canadian National Railway (CNR) Corridor Outlet

Area ID	Area (ha)	Runoff Coefficient	TC (min)	Storage Available (m^3)	Storage Required (m^3)	Designed Release Rate (m^3/s)	Description	Orifice Size (mm)	Orifice Release Rate (m^3/s)
201, 202	6.14	1.00	15	690	1282	1.46	Underground and onsite storage.	600	1.28
Total	**6.14**			**690**	**1282**	**1.46**			

Allowable release rate m^3/s: **1.46** **[100-year storm event]**

Northfield Storm Sewer Outlet

Area ID	Area (ha)	Runoff Coefficient	TC (min)	Storage Available (m^3)	Storage Required (m^3)	Designed Release Rate (m^3/s)	Description	Orifice Size (mm)	Orifice Release Rate (m^3/s)
203, 204	4.23	0.90	15	766	659	1.04	Underground and onsite storage	525	1.00
205 Uncontrolled	0.23	0.31	15	N/A	N/A	0.04	Uncontrolled		
Total	**4.46**			**766**	**659**	**1.08**			

Allowable release rate m^3/s: **1.21** **[100-year storm event]**

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SWM DESIGN CALCULATIONS
Existing Conditions Release Rate Calculations (Rational Method)
Area 101 (CNR corridor outlet)

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: '20-Dec-23

Prepared by: BB
Checked by: PM
Last Revised: 14-Mar-24

Rational Method

$Q = KRCIA$

Where:

Q = Design flow (m^3 / sec)
K = Conversion factor (0.00278)
R = Return period factor
C = Runoff coefficient
I = Rainfall intensity (mm / hour)
A = Contributing drainage area (ha)

* Max existing conditions RC of 0.50 used

Area 101

Location	City of Waterloo
Area (ha)	4.24
Runoff Coefficient	0.50

Adjustment Factor

Up to 10-Year	1.00
25-Year	1.10
50-Year	1.20
100-Year	1.25

Event:	2-Year
a	1101.000
b	9.258
c	0.882
Runoff Coefficient	0.50
AC	2.12
Tc (min)	10
Rainfall Intensity (mm/hr)	81
Rational Flow Rate (l/s)	477

Event:	5-Year
a	1755
b	12.347
c	0.895
Runoff Coefficient	0.50
AC	2.12
Tc (min)	10
Rainfall Intensity (mm/hr)	109
Rational Flow Rate (l/s)	641

Event:	25-Year
a	3261.000
b	16.193
c	0.938
Runoff Coefficient	0.55
AC	2.33
Tc (min)	10
Rainfall Intensity (mm/hr)	152
Rational Flow Rate (l/s)	987

Event:	100-Year
a	4692.000
b	17.347
c	0.956
Runoff Coefficient	0.63
AC	2.65
Tc (min)	10
Rainfall Intensity (mm/hr)	198
Rational Flow Rate (l/s)	1,461

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SWM DESIGN CALCULATIONS
Existing Conditions Release Rate Calculations (Rational Method)
Area 102 (Northfield Dr. storm sewer outlet)

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 20-Dec-23

Prepared by: BB
Checked by: PM
Last Revised: 14-Mar-24

Area 102

Location	City of Waterloo
Area (ha)	3.79
Runoff Coefficient	0.50

Adjustment Factor

Up to 10-Year	1.00
25-Year	1.10
50-Year	1.20
100-Year	1.25

Rational Method

$$Q = KRCIA$$

Where:

Q = Design flow (m^3 / sec)
K = Conversion factor (0.00278)
R = Return period factor
C = Runoff coefficient
I = Rainfall intensity (mm / hour)
A = Contributing drainage area (ha)

* Max existing conditions RC of 0.50 used

Event:	2-Year
a	1101.000
b	9.258
c	0.882
Runoff Coefficient	0.50
AC	1.90
Tc (min)	10
Rainfall Intensity (mm/hr)	81
Rational Flow Rate (l/s)	427

Event:	5-Year
a	1755
b	12.347
c	0.895
Runoff Coefficient	0.50
AC	1.90
Tc (min)	10
Rainfall Intensity (mm/hr)	109
Rational Flow Rate (l/s)	573

Event:	25-Year
a	3261.000
b	16.193
c	0.938
Runoff Coefficient	0.55
AC	2.08
Tc (min)	10
Rainfall Intensity (mm/hr)	152
Rational Flow Rate (l/s)	883

Event:	100-Year
a	4692.000
b	17.347
c	0.956
Runoff Coefficient	0.63
AC	2.37
Tc (min)	10
Rainfall Intensity (mm/hr)	198
Rational Flow Rate (l/s)	1,306

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SWM DESIGN CALCULATIONS
Existing Conditions Release Rate Calculations (Rational Method)
Areas 103 (Northfield Dr. storm sewer outlet)

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 20-Dec-23

Prepared by: BB
Checked by: PM
Last Revised: 14-Mar-24

Rational Method

$Q = KRCIA$

Where:

Q = Design flow (m^3 / sec)
K = Conversion factor (0.00278)
R = Return period factor
C = Runoff coefficient
I = Rainfall intensity (mm / hour)
A = Contributing drainage area (ha)

* Max existing conditions RC of 0.50 used

Area 102

Location	City of Waterloo
Area (ha)	3.04
Runoff Coefficient	0.50

Adjustment Factor

Up to 10-Year	1.00
25-Year	1.10
50-Year	1.20
100-Year	1.25

Event:	2-Year
a	1101.000
b	9.258
c	0.882
Runoff Coefficient	0.50
AC	1.52
Tc (min)	10
Rainfall Intensity (mm/hr)	81
Rational Flow Rate (l/s)	342

Event:	5-Year
a	1755
b	12.347
c	0.895
Runoff Coefficient	0.50
AC	1.52
Tc (min)	10
Rainfall Intensity (mm/hr)	109
Rational Flow Rate (l/s)	459

Event:	25-Year
a	3261.000
b	16.193
c	0.938
Runoff Coefficient	0.55
AC	1.67
Tc (min)	10
Rainfall Intensity (mm/hr)	152
Rational Flow Rate (l/s)	708

Event:	100-Year
a	4692.000
b	17.347
c	0.956
Runoff Coefficient	0.63
AC	1.90
Tc (min)	10
Rainfall Intensity (mm/hr)	198
Rational Flow Rate (l/s)	1,047

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SWM DESIGN CALCULATIONS
Existing Conditions Release Rate Calculations (Rational Method)
Area 104 (Northfield Dr. storm sewer outlet)

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 20-Dec-23

Prepared by: BB
Checked by: PM
Last Revised: 14-Mar-24

Area 102

Location	City of Waterloo
Area (ha)	5.40
Runoff Coefficient	0.85

Adjustment Factor

Up to 10-Year	1.00
25-Year	1.10
50-Year	1.20
100-Year	1.25

Rational Method

$$Q = KRCIA$$

Where:

Q = Design flow (m^3 / sec)
K = Conversion factor (0.00278)
R = Return period factor
C = Runoff coefficient
I = Rainfall intensity (mm / hour)
A = Contributing drainage area (ha)

* Max existing conditions RC of 0.50 used

Event:	2-Year
a	1101.000
b	9.258
c	0.882
Runoff Coefficient	0.85
AC	4.59
Tc (min)	10
Rainfall Intensity (mm/hr)	81
Rational Flow Rate (l/s)	1,033

Event:	5-Year
a	1755
b	12.347
c	0.895
Runoff Coefficient	0.85
AC	4.59
Tc (min)	10
Rainfall Intensity (mm/hr)	109
Rational Flow Rate (l/s)	1,388

Event:	25-Year
a	3261.000
b	16.193
c	0.938
Runoff Coefficient	0.94
AC	5.05
Tc (min)	10
Rainfall Intensity (mm/hr)	152
Rational Flow Rate (l/s)	2,138

Event:	100-Year
a	4692.000
b	17.347
c	0.956
Runoff Coefficient	1.06
AC	5.74
Tc (min)	10
Rainfall Intensity (mm/hr)	198
Rational Flow Rate (l/s)	3,163

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SWM DESIGN CALCULATIONS
100-Year Flow Rate Calculations (Uncontrolled Area 205)
(Northfield Dr. sewer outlet)

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 6-Mar-24

Prepared by: LC
Checked by: PM
Last Revised: 14-Mar-24

Rainfall Data

Location:	Waterloo, On	a	4692
Event	100-year	b	17.347
		c	0.956

Site Data

Area (ha)	0.23
Runoff Coefficient	0.25
Adjusted Runoff Coefficier	0.31
AC	0.07
Tc (min)	10
Rainfall Intensity (mm/hr)	198
Rational Flow Rate (l/s)	40

The Rational Equation:

$$Q = \frac{(C)(i)(A)}{360}$$

where,

Q = the design flow (m^3/s)
C = the site specific runoff coefficient
A = the drainage area (ha)
i = rainfall intensity (mm/hr)

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SWM DESIGN CALCULATIONS
Upstream Required Storage Calculations (Buildings A, B, C & D)

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 6-Mar-24

Prepared by: LC
Checked by: PM
Last Revised:

Rainfall Data

Location:	Waterloo, On	a	4692
Event	100-year	b	17.347
		c	0.956

Site Data

Area (ha)	2.08
Runoff Coefficient	0.90
AC	1.87
Tc (min)	10
Time Increment (min)	5
Release Rate (l/s)	350
Storage Required (m^3)	**500**

The Rational Equation:

$$Q = \frac{(C)(i)(A)}{360}$$

where,

Q = the design flow (m^3/s)
C = the site specific runoff coefficient
A = the drainage area (ha)
i = rainfall intensity (mm/hr)

Time	Rainfall Intensity	Storm Runoff	Runoff Volume	Released Volume	Storage Volume	
(min)	(mm/hr)	(m^3/s)	(m^3)	(m^3)	(m^3)	
10	198	1.03	620	210	410	
15	169	0.88	792	315	477	
20	147	0.77	920	420	500	********
25	131	0.68	1020	525	495	
30	117	0.61	1100	630	470	
35	107	0.56	1166	735	431	
40	98	0.51	1221	840	381	
45	90	0.47	1268	945	323	
50	84	0.44	1309	1050	259	
55	78	0.41	1345	1155	190	
60	73	0.38	1376	1260	116	
65	69	0.36	1404	1365	39	
70	65	0.34	1429	1470	0	
75	62	0.32	1452	1575	0	
80	59	0.31	1473	1680	0	
85	56	0.29	1492	1785	0	
90	54	0.28	1509	1890	0	
95	51	0.27	1525	1995	0	
100	49	0.26	1540	2100	0	
105	47	0.25	1553	2205	0	
110	46	0.24	1566	2310	0	
115	44	0.23	1578	2415	0	
120	42	0.22	1590	2520	0	

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SWM DESIGN CALCULATIONS
Required Storage Calculations - Area 203/204
1:100 year storm event

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 24-Jan-24

Prepared by: PM
Checked by: LC
Last Revised: 14-Mar-24

Rainfall Data

Location:	City of Waterloo	a		4692
Event	100-year	b		17.347
		c		0.956

Site Data

Area (ha)	1.96
Runoff Coefficient	0.90
AC	1.76
Tc (min)	15
Time Increment (min)	5
Upstream Controlled Flows	350
Release Rate (l/s)	1,002
Storage Required (m^3)	**159**

The Rational Equation:

$$Q = \frac{(C)(i)(A)}{360}$$

where,

Q = the design flow (m^3/s)
C = the site specific runoff coefficient
A = the drainage area (ha)
i = rainfall intensity (mm/hr)

Time	Rainfall Intensity	Storm Runoff	Controlled Inflows	Runoff Volume	Released Volume	Storage Volume	
(min)	(mm/hr)	(m^3/s)	(m^3/s)	(m^3)	(m^3)	(m^3)	
15	169	0.83	0.35	1061	902	159	********
20	147	0.72	0.35	1287	1203	84	
25	131	0.64	0.35	1486	1504	0	
30	117	0.58	0.35	1667	1804	0	
35	107	0.52	0.35	1834	2105	0	
40	98	0.48	0.35	1991	2406	0	
45	90	0.44	0.35	2140	2706	0	
50	84	0.41	0.35	2284	3007	0	
55	78	0.38	0.35	2422	3308	0	
60	73	0.36	0.35	2557	3609	0	
65	69	0.34	0.35	2688	3909	0	
70	65	0.32	0.35	2817	4210	0	
75	62	0.30	0.35	2943	4511	0	
80	59	0.29	0.35	3068	4811	0	
85	56	0.28	0.35	3191	5112	0	
90	54	0.26	0.35	3312	5413	0	
95	51	0.25	0.35	3432	5714	0	
100	49	0.24	0.35	3551	6014	0	
105	47	0.23	0.35	3669	6315	0	

SWM DESIGN CALCULATIONS
Required Storage Calculations- Area 203 204

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 20-Dec-23

Prepared by: PM
Checked by: PM
Last Revised: 14-Mar-24

Orifice Location	=	**MH103**		**[Parkside Dr. Ext. private road]**
Orifice Coefficient (C)	=	0.80		**[TUBE]**
Acceleration due to gravity (g)	=	9.81	m/s/s	
High Water Level	=	**343.90**	m	**[100-year storm event]**
Orifice Invert Elevation	=	341.930	m	
Orifice Diameter	=	**525**	**mm**	
Orifice Springline Elevation		342.19	m	
Cross section area of orifice (A)	=	0.2165	sq.m.	
Head (H)	=	**1.71**	m	
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**1,002.4**	L/s	**[1:100 year storm event]**

SWM DESIGN CALCULATIONS
Available Storage Calculations (Downstream Orifice - Area 203/204)

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 20-Dec-23

Prepared by: PM
Checked by: PW
Last Revised: 14-Mar-24

Available Storage Underground in Sewer

UPSTREAM OF THE ORIFICE CONTROL AT MH103 (BELOW HWL of 343.90m) :

From	To	Length Below HWL (m)	Diameter (mm)	Volume (m^3)
MH103	MH104	51.9	1200	58.70
MH104	DCBMH117	18.9	1200	21.38
DCBMH117	MH118	55.3	825	29.56
MH118	MH111	39.7	675	14.21
MH111	MH120	38.4	600	10.86
MH104	CBBMH109	24.9	600	7.04
Total Storage Underground in Sewers (m^3):				**141.7**

Available Storage Underground in Sewer Catchbasins & Manholes

UPSTREAM OF THE ORIFICE CONTROL AT MH103 (BELOW HWL of 343.90m) :

MH	Manhole/CB Top Elevation or HWL (m)	Low Invert Elevation (m)	Diameter/Dimension (m)	Volume (m^3)
MH103	343.90	341.93	2.40	8.91
MH104	343.90	342.21	3.60	17.20
DCBMH117	343.90	342.38	2.40	6.88
MH119	343.90	343.02	1.50	1.56
MH111	343.90	343.36	1.50	0.95
CBMH109	343.90	342.35	1.50	2.74
Total Storage Underground in CB's & MH's (m^3):				**38.2**

Total Available Stormwater Storage (m^3): 180.0

SWM DESIGN CALCULATIONS
Required Storage Calculations- Downstream Orifice Area 201/202

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 20-Dec-23

Prepared by: PM
Checked by: PW
Last Revised: 14-Mar-24

Rainfall Data

Location:	City of Waterloo	a		4692
Event	100-year	b		17.347
		c		0.956

Site Data

Area (ha)	4.22
Runoff Coefficient	0.90
AC	3.80
Tc (min)	15
Time Increment (min)	5
Controlled Roof Flows	240
Release Rate (l/s)	1,279
Storage Required (m^3)	**671**

The Rational Equation:

$$Q = \frac{(C)(i)(A)}{360}$$

where,

Q = the design flow (m^3/s)
C = the site specific runoff coefficient
A = the drainage area (ha)
i = rainfall intensity (mm/hr)

Time	Rainfall Intensity	Storm Runoff	Controlled Inflows	Runoff Volume	Released Volume	Storage Volume	
(min)	(mm/hr)	(m^3/s)	(m^3/s)	(m^3)	(m^3)	(m^3)	
15	169	1.78	0.24	1822	1151	671	********
20	147	1.56	0.24	2155	1535	620	
25	131	1.38	0.24	2429	1919	510	
30	117	1.24	0.24	2664	2302	361	
35	107	1.13	0.24	2869	2686	183	
40	98	1.03	0.24	3054	3070	0	
45	90	0.95	0.24	3221	3454	0	
50	84	0.89	0.24	3376	3837	0	
55	78	0.83	0.24	3520	4221	0	
60	73	0.78	0.24	3656	4605	0	
65	69	0.73	0.24	3785	4989	0	
70	65	0.69	0.24	3908	5372	0	
75	62	0.65	0.24	4026	5756	0	
80	59	0.62	0.24	4140	6140	0	
85	56	0.59	0.24	4250	6524	0	
90	54	0.57	0.24	4357	6907	0	
95	51	0.54	0.24	4462	7291	0	

SWM DESIGN CALCULATIONS
Orifice Calculation- Downstream Orifice Area 201/202

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 20-Dec-23

Prepared by: PM
Checked by: PM
Last Revised: 14-Mar-24

Orifice Location	=	**DCBMH201**		**Building L**
Orifice Coefficient (C)	=	0.80		**[TUBE]**
Acceleration due to gravity (g)	=	9.81	m/s/s	
High Water Level	=	**342.75**	m	**[100-year storm event]**
Orifice Invert Elevation	=	340.820	m	
Orifice Diameter	=	**600**	**mm**	
Orifice Springline Elevation		341.12	m	
Cross section area of orifice (A)	=	0.2827	sq.m.	
Head (H)	=	**1.63**	m	
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**1,279.2**	L/s	**[1:100 year storm event]**

SWM DESIGN CALCULATIONS
Available Storage Calculations - Area 201, 202 (Underground)

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 6-Mar-24

Prepared by: PM
Checked By: PW
Last Revised: 14-Mar-24

Available Storage Underground in Sewer

UPSTREAM OF THE WEIR/ORIFICE CONTROL AT MH204 (BELOW HWL of 342.75m) :

From	To	Length Below HWL (m)	Diameter (mm)	Volume (m^3)
DCBMH206	CBMH205	54.7	750	24.17
CBMH205	CBMH204	66.7	750	29.47
CBMH204	CBMH203	56.7	750	25.05
CBMH203	CBMH202	51.9	750	22.93
CBMH202	CBMH201	50.5	750	22.31
MH305	CBMH304	40.8	675	14.60
CBMH304	CBMH302	71.8	675	25.69
CBMH302	DCBMH301	66.4	975	49.58
DCBMH301	CBMH201	15.2	1050	13.16
DCBMH404	DCBMH403	14.4	600	4.07
DCBMH403	DCBMH402	37.7	600	10.66
DCBMH402	DCBMH401	15.1	600	4.27
DCBMH401	DCBMH301	12.6	600	3.56
CULTEC	CBMH401	11.9	375	1.31
CULTEC	CBMH410	23.5	375	2.60
CBMH410	CBMH302	13.1	375	1.45
Total Storage Underground in Sewers (m^3):				**254.9**

Available Storage Underground in Sewer Catchbasins & Manholes

UPSTREAM OF THE WEIR/ORIFICE CONTROL AT MH204 (BELOW HWL of 342.75m) :

MH	Manhole/CB Top Elevation or HWL (m)	Low Invert Elevation (m)	Diameter/Dimension (m)	Volume (m^3)
DCBMH206	342.50	342.46	1.50	0.07
CBMH205	342.50	342.14	1.50	0.64
CBMH204	342.50	341.78	1.50	1.27
CBMH203	342.50	341.46	1.50	1.84
CBMH202	342.50	341.15	1.50	2.39
DCBMH201	342.50	340.95	2.40	7.01
MH305	342.50	342.04	1.50	0.81
CBMH304	342.50	341.77	1.50	1.29
CBMH411	342.50	342.07	1.50	0.76
CBMH302	342.50	341.38	2.40	5.07
CBMH410	342.50	341.05	1.50	2.56
DCBMH301	342.50	341.01	2.40	6.74
CBMH401	342.50	341.37	1.50	2.00
CBMH402	342.50	341.51	1.80	2.52
MH403	342.50	341.76	1.50	1.31
CBMH404	342.50	341.92	1.50	1.03
CBMH405	342.50	342.24	1.50	0.46
Total Storage Underground in CB's & MH's (m^3):				**37.3**

Cultec System Storage (m^3) **400.0**

Total Available Stormwater Storage (m^3): **690**

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SWM DESIGN CALCULATIONS
Required Roof Storage Calculations (Buildings J, K & L)

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 6-Mar-24

Prepared by: LC
Checked by: PM
Last Revised:

Rainfall Data

Location:	Waterloo, On	a	4692
Event	100-year	b	17.347
		c	0.956

Site Data

Area (ha)	1.92
Runoff Coefficient	0.90
AC	1.73
Tc (min)	10
Time Increment (min)	5
Release Rate (l/s)	240
Storage Required (m^3)	**583**

The Rational Equation:

$$Q = \frac{(C)(i)(A)}{360}$$

where,

Q = the design flow (m^3/s)
C = the site specific runoff coefficient
A = the drainage area (ha)
i = rainfall intensity (mm/hr)

Time	Rainfall Intensity	Storm Runoff	Runoff Volume	Released Volume	Storage Volume	
(min)	(mm/hr)	(m^3/s)	(m^3)	(m^3)	(m^3)	
10	198	0.95	572	144	428	
15	169	0.81	731	216	515	
20	147	0.71	849	288	561	
25	131	0.63	941	360	581	
30	117	0.56	1015	432	583	********
35	107	0.51	1076	504	572	
40	98	0.47	1127	576	551	
45	90	0.43	1171	648	523	
50	84	0.40	1208	720	488	
55	78	0.38	1241	792	449	
60	73	0.35	1270	864	406	
65	69	0.33	1296	936	360	
70	65	0.31	1319	1008	311	
75	62	0.30	1340	1080	260	
80	59	0.28	1359	1152	207	
85	56	0.27	1377	1224	153	
90	54	0.26	1393	1296	97	
95	51	0.25	1408	1368	40	
100	49	0.24	1421	1440	0	
105	47	0.23	1434	1512	0	
110	46	0.22	1446	1584	0	
115	44	0.21	1457	1656	0	
120	42	0.20	1467	1728	0	

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

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SWM DESIGN CALCULATIONS
Water Balance Calculation

Project Name: 170-200 Northfield Drive West
Municipality: City of Waterloo
Project No.: 22051
Date: 24-Jan-24

Prepared by: PM
Checked by: LC
Last Revised: 14-Mar-24

1. VOLUME TO BE RETAINED

Total Area of Site (A) =	11.08	Ha.
Target Retention Depth (D) =	0.0125	(m)
*site area excluding road widening+ CNR buffer		
Storage Volume Required = V = A x D =	**1,385.0**	(cu.m.)

2. STORAGE VOLUME PROVIDED

Landscape Areas (Park Blocks)

Area (A) =	1.25	Ha.
Initial Abstraction (d) =	0.005	(m)
Storage Volume Provided = V = A x d =	**62.5**	(cu.m.)

Infiltration Galleries (Buildings J, K & L)

Area =	1.92	Ha.
Initial Abstraction =	0.04	m
Storage Volume Provided =	**800.0**	(cu.m.)

Retention Volume for Onsite Reuse (Buildings A-D)

Area =	1.92	Ha.
Initial Abstraction =	0.03	m
Storage Volume Provided =	**574.6**	(cu.m.)

Total

Storage Volume Provided =	**1437.1**	(cu.m.)

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Hydrodynamic Separation Product Calculator

170-200 Northfield Drive- Waterloo

Area 110 - Northfield Drive Storm sewer outlet

CDS CDS-8-C

Project Information					
Project Name	170-200 Northfield Drive- Waterloo			**Option #**	A
Country	Metric	**State**	N/A	**City**	Waterloo

Contact Information			
First Name	Pula	**Last Name**	Mathumo
Company	Counterpoint Engineering Inc.	**Phone #**	
Email			

Design Criteria					
Site Designation	Area 110 - Northfield Drive Storm sewer outlet			**Sizing Method**	Treatment Flow Rate
Screening Required?	No	**Treatment Flow Rate**	1002.40	**Peak Flow (cfs)**	1002.40
Groundwater Depth (ft)	>15	**Pipe Invert Depth (ft)**	>15	**Bedrock Depth (ft)**	5 - 10
Multiple Inlets?	No	**Grate Inlet Required?**	No	**Pipe Size (in)**	750.00
Required Particle Size Distribution?	No	**90° between two inlets?**	N/A		

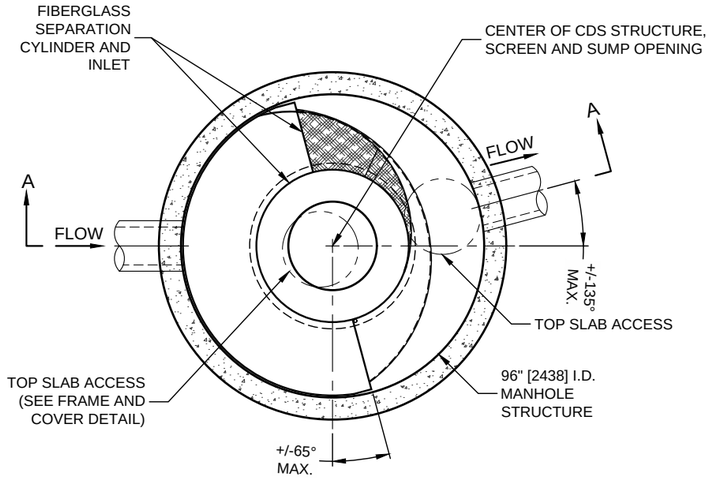
Treatment Selection				
Treatment Unit	CDS	**System Model**	CDS-8-C	
Target Removal	80%	**Particle Size Distribution (PSD)**	ETV Canada	

4.4 The contractor shall removal all loose material and pooling water from the SWTD prior to the transfer of operational responsibility to the Owner.

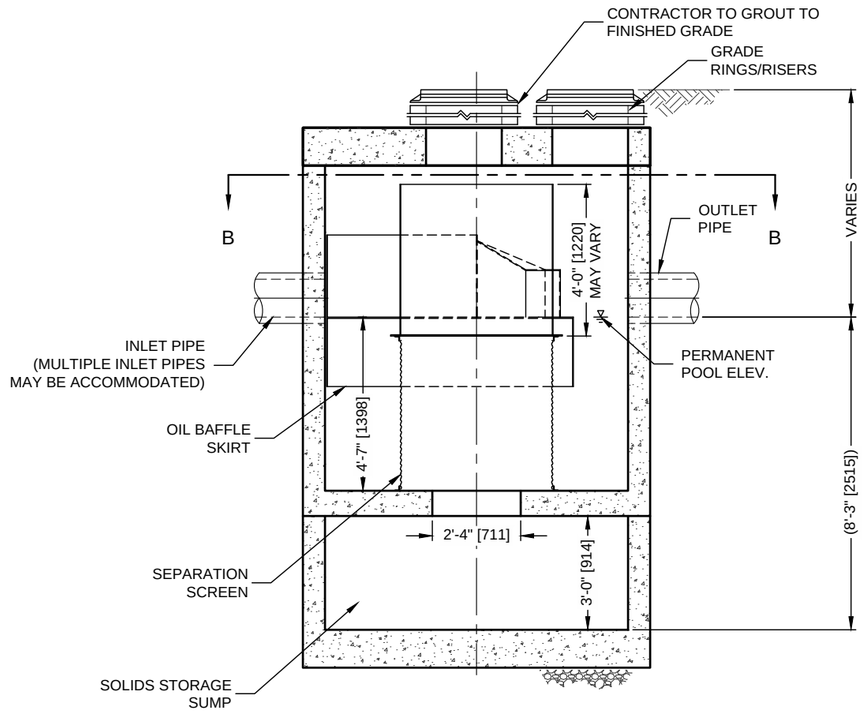
TABLE 1
Storm Water Treatment Device
Storage Capacities

CDS Model	Minimum Sump Storage Capacity $(yd^3)/(m^3)$	Minimum Oil Storage Capacity (gal)/(L)
CDS2015-4	0.9(0.7)	61(232)
CDS2015-5	1.5(1.1)	83(313)
CDS2020-5	1.5(1.1)	99(376)
CDS2025-5	1.5(1.1)	116(439)
CDS3020-6	2.1 (1.6)	184(696)
CDS3025-6	2.1(1.6)	210(795)
CDS3030-6	2.1 (1.6)	236(895)
CDS3035-6	2.1 (1.6)	263(994)
CDS3535-7	2.9(2.2)	377(1426)
CDS4030-8	5.6(4.3)	426(1612)
CDS4040-8	5.6 (4.3)	520(1970)
CDS4045-8	5.6 (4.3)	568(2149)
CDS5640-10	8.7(6.7)	758(2869)
CDS5653-10	8.7(6.7)	965(3652)
CDS5668-10	8.7(6.7)	1172(4435)
CDS5678-10	8.7(6.7)	1309(4956)
CDS7070-DV	3.6(2.8)	914 (3459)
CDS10060-DV	5.0 (3.8)	792 (2997)
CDS10080-DV	5.0 (3.8)	1057 (4000)
CDS100100-DV	5.0 (3.8)	1320 (4996)

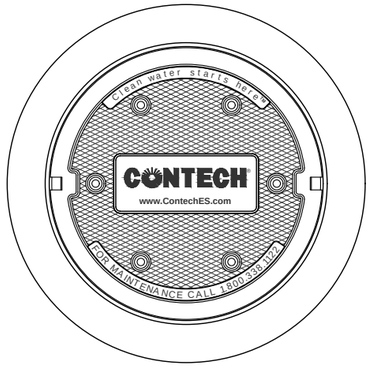
END OF SECTION



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

CDS-8-C (CDS4040) DESIGN NOTES

THE STANDARD CDS-8-C (CDS4040) CONFIGURATION IS SHOWN.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET HS20 (AASHTO M 306) AND BE CAST WITH THE CONTECH LOGO.
6. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS-8-C (CDS4040) ONLINE CDS STANDARD DETAIL

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Hydrodynamic Separation Product Calculator

170-200 Northfield Drive- Waterloo

Area 205 - CNR corridor outlet

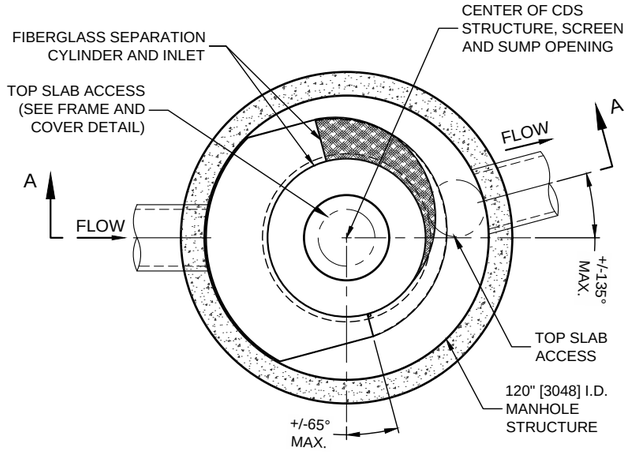
CDS CDS-10-C

Project Information					
Project Name	170-200 Northfield Drive- Waterloo			**Option #**	A
Country	Metric	**State**	N/A	**City**	Waterloo

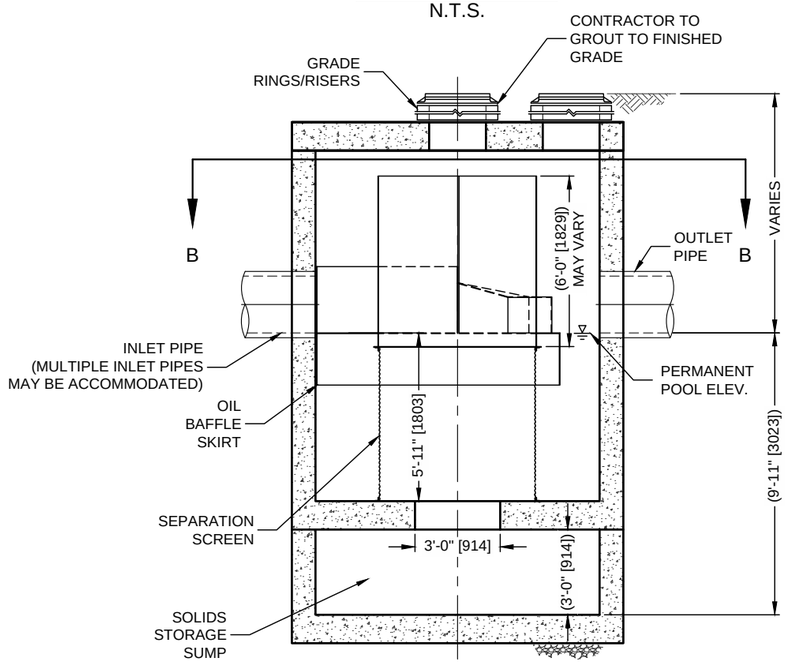
Contact Information			
First Name	Pula	**Last Name**	Mathumo
Company	Counterpoint Engineer Inc.	**Phone #**	
Email			

Design Criteria					
Site Designation	Area 205 - CNR corridor outlet			**Sizing Method**	Treatment Flow Rate
Screening Required?	No	**Treatment Flow Rate**	1280.00	**Peak Flow (cfs)**	1280.00
Groundwater Depth (ft)	>15	**Pipe Invert Depth (ft)**	>15	**Bedrock Depth (ft)**	5 - 10
Multiple Inlets?	No	**Grate Inlet Required?**	No	**Pipe Size (in)**	900.00
Required Particle Size Distribution?	No	**90° between two inlets?**	N/A		

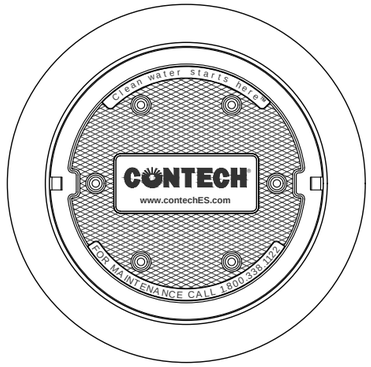
Treatment Selection				
Treatment Unit	CDS	**System Model**	CDS-10-C	
Target Removal	80%	**Particle Size Distribution (PSD)**	ETV Canada	



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

CDS-10-C (CDS5653) DESIGN NOTES

THE STANDARD CDS-10-C (CDS5653) CONFIGURATION IS SHOWN

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

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CDS-10-C (CDS5653)
ONLINE CDS
STANDARD DETAIL

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TABLE 1
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Storage Capacities

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END OF SECTION