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FUNCTIONAL SERVICING REPORT

Proposed High Rise Residential Development

10 Aspen Springs Drive
Community of Bowmanville
Municipality of Clarington
Region of Durham

May 2022

Prepared For: **Sunray Group**

File: **21164**

VALDOR WATER RESOURCES

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1.0 INTRODUCTION

Valdor Engineering Inc. has been retained by Sunray Group to provide consulting engineering services for the proposed development of their site located at the corner of Bowmanville Avenue and Aspen Springs Drive in the Community of Bowmanville, Municipality of Clarington as indicated in **Figure 1**.

1.1 Existing Conditions

The site is approximately 0.952 hectares in size and is known municipally as 10 Aspen Springs Drive. The site is currently covered by gravel and landscape surfaces. The site is bound to the north and west by undeveloped lots, to the east by Bowmanville Avenue and to the south by Aspen Springs Drive. There are no watercourses or other natural features within or adjacent to the site.

1.2 Proposed Development

The proposed 0.952 hectare development will be in the form of a mix-used development consisting of two 25 storey residential buildings with a 4 storey shared podium and a nine storey building all of which are above a 3 level underground parking garage.

A copy of the architectural site plans are included in **Appendix "A"** together with a calculation of the equivalent population contained in **Table A1**. The development statistics and the equivalent population data are summarized in **Table 1**. It is worth noting that one bedroom and one den units are classified as two bedroom units for conservative estimation.

Table 1. Development Statistics

Land Use	No of Units	Commercial Floor Area (sq.m)	Equivalent Population
One Bedroom Apartment	377		556
Two Bedroom Apartment	220		550
Townhome Units	10		35
Commercial		624.8	6
Total:	607	624.8	1,157

1.3 Purpose of Report

This Functional Servicing Report has been prepared to demonstrate the servicing feasibility of the development in conjunction with the zoning by-law amendment and site plan application. It has been prepared based on a review of the topographic survey and information from servicing plans obtained from the municipal archives.

This report outlines the engineering design elements for the proposed development, including water supply, sanitary sewers, storm sewers and stormwater management as well as grading and driveway access all of which are presented in the following sections.

2.0 WATER SUPPLY

The Region of Durham owns and operates twelve drinking water systems using three supply sources including Lake Ontario, Lake Simcoe and groundwater wells. The Region is responsible for operating and maintaining every component of the water supply system including treatment, storage and distribution of potable water to consumers throughout the Region. In this regard, the Region operates and maintains 6 surface water supply plants, 22 water storage facilities, 18 pumping stations, 23 groundwater wells and approximately 2,400 km of watermains.

The drinking water system for the Bowmanville community is provided by the Bowmanville Water Supply Plant which is located on Port Darlington Road. The source water for the treatment process is drawn from Lake Ontario. A plan of the various drinking water systems in the Region is included in **Appendix "B"**.

The following is a summary of the waster servicing requirements for the development.

2.1 Domestic Demand

The domestic demand is to be calculated using the Region of Durham engineering design standards which include the following parameters:

Residential Average Day Demand: 364 L/person/day
Maximum Day Factor: 2.0
Peak Hour Factor 3.0

Based on the above, it is anticipated that the development will have a water demand as summarized in **Table 2**. A detailed tabulation of the domestic water demand calculation is detailed in **Table B1** of **Appendix "B"**.

Table 2. Domestic Water & Fire Flow Demand

Land Use	**Equivalent Population** (Persons)	**Average Day Demand** (L/min)	**Maximum Day Demand** (L/min)	**Peak Hour Demand** (L/min)	**Fire Flow** (L/min)	**Maximum Day Plus Fire Flow** (L/min)	**Maximum Day Plus Fire Flow** (L/s)
Residential	1151	290.9	581.9	872.8	4,000	4,581.9	76.4
Commercial	6	1.5	1.5	2.3	4,000	4,001.5	66.7
Total:	1157	292.5	583.4	875.1	4,000	4,583.4	76.4

2.2 Watermains & Service Connections

An existing 300mm diameter watermain is located in the north boulevard of Aspen Spring Drive, and an existing 300mm diameter watermain in the east boulevard of Bowmanville Avenue as indicated in **Figure 2**.

The subject site will be serviced by an existing 200mm diameter fire line and an existing 150mm diameter domestic water service connecting to the existing 300mm diameter watermain on Aspen Springs Drive. These water services will have valves at the street line and will extend into the mechanical room located in the P1 underground parking garage level.

The configuration of the existing and proposed water services is illustrated in **Figure 2.**

2.3 Water Meters

In accordance with Region of Durham criteria, the proposed development will have a bulk water meter which will be located within the mechanical room located on the P1 underground parking garage level. A backflow prevention device is to also be installed in accordance with Region standards. The backflow prevention device will ensure that quality of the Region’s potable water system is protected against the potential for the reversal of the normal flow of water which can occur as a result of back siphonage or back pressure when the municipal watermain pressure drops during such events as watermain break or a firefighting operation.

Water meters are to be purchased from the Region of Durham. The location of the meter room is located on the P1 level and is illustrated in **Figure 2**. A copy of the Region of Durham’s standard water meter details is included in **Appendix “B”**.

2.4 Fire Protection

The fire flow required for the proposed buildings was calculated using the criteria indicated in the *Water Supply for Public Fire Protection Manual*, 1999, by the Fire Underwriters Survey (FUS). The calculation incorporates various parameters such as coefficient for fire-resistant construction, an area reduction accounting for a fire-resistant (one hour rating) protection, a reduction for low-hazard occupancies, an adjustment for sprinkler protection system, and a factor for neighbouring building proximity.

In accordance with the FUS, the required fire flow for the condominium development was calculated based on the area of the largest floor plate plus 25% of the floor area of the floor above and 25% of the floor area of the floor below. The high rise building with the shared podium is the governing building which requires a minimum fire suppression flow of 4,000 L/min.

The detailed fire flow calculation for the condominium development is provided in **Table B2-1** and **Table B2-2** contained in **Appendix “B”**. This fire flow plus the maximum day demand must be available at the nearest hydrant with a minimum pressure of 140 KPa.

A flow test was completed by the Region of Durham Works Department on May 10, 2022. Based on the results of the flow test, the required fire flow plus maximum day demand is available at a pressure of 511.7 kPa (74.2 psi). The calculations for the available pressure are provided in **Table B3** which can be found in **Appendix “B”**.

A fire hydrant is to be located within 90m of the principal entrances to the building and within 45m of the siamese connection in accordance with the Ontario Building Code (OBC 2012). Based on the foregoing, the existing street fire hydrants will provide sufficient coverage for the condominium development and therefore private site fire hydrant is not required. The location of the existing fire hydrants are indicated in **Figure 2**.

3.0 WASTEWATER SERVICING

The Region of Durham is responsible for wastewater servicing provided to the residents and businesses within the Region including the Municipality of Clarington. The Region operates and maintains 11 sewage treatment plants, 48 sewage pumping stations and approximately 1,400 km of sanitary sewers. The sanitary sewer system for the Bowmanville community discharges to the Port Darlington Water Pollution Control Plant located on Port Darlington Road.

The following is a summary of the wastewater servicing analysis for the subject site.

3.1 Wastewater Loading

The wastewater loading has been calculated using the Region of Durham engineering design standards which include the following parameters:

Domestic Flow: Q = 364 L/person/day

Extraneous Flow: I = 0.26 L/s/Ha (Infiltration)

Peaking Factor: $K_H = 1 + \frac{14}{4 + \sqrt{P}}$ (K_H =1.5 min., 3.8 max.)

Where: K_H = Harmon Peaking Factor
P = Population in thousands

Design Flow, Q = Q x K_H + I

Design Flow Rate (Commercial): 2.08 L/s/day

Based on the above criteria the sewage flow calculations are provided in **Table C1** contained in **Appendix "C"** and the total flow is summarized in **Table 3**.

Table 3. Wastewater Loading Summary

Land Use	Area (Ha)	Equivalent Population (Persons)	Average Daily Flow (L/s)	Harmon Peaking Factor	Peak Daily Flow (L/s)	Infiltration Rate (L/s)	Total Flow (L/s)
Residential	0.952	1151	4.828	3.76	18.15	0.248	18.41
Commercial	0.062	6	0.130	Incl.	Incl.	Incl.	0.13
Total:	1.014	1157					18.54

3.2 Sanitary Sewers & Service Connections

The subject site will be serviced by a 200mm diameter sanitary service connection which discharges to the existing 200mm diameter sanitary sewer in the easement south of the subject site that drains westerly along Aspen springs Drive. The proposed 200mm diameter sanitary service will connect to the P1 underground parking garage level. The location of the existing sanitary sewer and the sanitary service connection is illustrated in **Figure 3**.

3.3 Downstream Sanitary Sewer Capacity

In order to confirm that there is sufficient capacity in the downstream sanitary sewers for the proposed development, an analysis was completed based on the 1157 people from the proposed development being added to the sanitary catchment. The analysis has been completed for the existing local sanitary sewer from the subject site to the existing 600mm diameter sanitary trunk sewer located southeast of 90 Aspen Springs Drive.

The catchment area for the downstream sanitary sewers was delineated based on a review of plan and profile drawings obtained from the Region of Durham. The sewage flow rate for each section of the local sewer was calculated based on the various existing land uses which included low density to high density residential uses. The land uses were confirmed based on air photograph interpretation. The capacity of the sewer lines was calculated with the use of as-constructed invert elevations that were derived from the plan & profile drawings obtained from the municipal archives.

The pre-development and post-development catchment areas and land uses are delineated on **Figure C1** which is contained in **Appendix "C"**.

The sewer and catchment data were compiled in the form of sanitary sewer design sheets and analyzed to determine the available capacity in the sewer using the following the Region of Durham criteria:

Dry Weather Flow, $Q_D = Q \times K_H + I_D$

Where:

Q = Design Flow

K_H = Harmon Peaking Factor

I_D = Infiltration Flow = 0.26 L/s/Ha

Based on the analysis it was determined that there are some sections of the downstream sanitary sewer which will surcharge under post-development conditions. The pre-development and post-development sanitary sewer design sheets are presented in **Table C3** to **Table C5** in **Appendix "C"**.

In order to determine the degree of surcharging, a hydraulic grade line (HGL) analysis was conducted. There are several industries accepted sanitary hydraulic model software programs available and for this analysis, PCSWMM was selected. PCSWMM, supplied by Computational Hydraulics International, is dynamic unsteady flow modelling software which is ideal for the analysis of collection systems. A schematic of the PCSWMM model has been provided in **Figure C1** in **Appendix "C"**.

Based on the PCSWMM modelling, a minor surcharging at the very last length of sewer before the trunk connection is observed under both the pre-development and post-development wet weather flow conditions. The surcharge is illustrated in **PCSWMM HGL Profiles** which are included in **Appendix "C"**. These figures indicate that the level of surcharging before the truck connection will be at least 2.59m below the ground surface as indicated in the HGL summary table which is included in **Appendix "C"**. Given that the level of surcharging is more than 1.8m below the ground surface, it is considered to be an acceptable level of surcharging and therefore there is sufficient capacity in the downstream sanitary sewer.

Based on the above, the existing wastewater infrastructure has sufficient capacity to accommodate the proposed development without the need for external upgrades or retrofits.

4.0 STORM DRAINAGE

The subject site is located in the jurisdiction of the Central Lake Ontario Conservation Authority (CLOCA) which consists of 727 square kilometers and is defined as the areas drain by fifteen watersheds which covers all, or parts of, the Cities of Oshawa and Pickering, Towns of Ajax and Whitby, Municipality of Clarington, Townships of Scugog and Uxbridge.

The subject site is located within the Bowmanville Creek watershed which is situated entirely within the Regional Municipality of Durham and covers an area of approximately 170 km^2. The watershed drains southerly from its headwaters in the Oak Ridges Moraine outletting to Lake Ontario at Port Darlington. Bowmanville Creek watershed is comprised of five subwatersheds. The subject site is located within the subwatershed of the main branch of Bowmanville Creek. A map illustrating the limits of the CLOCA jurisdiction as well as the watershed map of the Bowmanville is contained in **Appendix "D"**.

In accordance with City standards, a major / minor system storm conveyance concept has been incorporated into the functional servicing design for the subject development. The following sections provide a brief summary of the storm drainage components:

4.1 Minor System Design

As per the municipality engineering design criteria, the proposed development is to be serviced with a minor storm sewer system that is designed to convey runoff from the 5 year storm event. The rainfall intensity values, *I*, are calculated in accordance with the Municipality standards as follows:

$$I_5 = \frac{2464}{(Tc + 16)} \qquad I_{100} = \frac{1770}{(Tc + 4)^{0.820}}$$

The peak flows are calculated using the following formula:

$Q = R \times A \times I \times 2.778$

where: Q = peak flow (L/s)
A = area in hectares (Ha)
I = rainfall intensity (mm/hr)
R = composite runoff coefficient
t = time of concentration (min)

Based on the topographic survey, the subject site currently drains to westerly throughout the site. The existing drainage is illustrated in **Figure 4**.

The proposed condominium development will be serviced by a site storm sewer which will discharge to the existing 375mm diameter storm sewer in the easement southwest of the site along Aspen Spring Drive.

Runoff from the paved and landscaped ground surfaces located over the underground parking garage will be captured by a series of area drains which will connect to the storm service connection via an internal private storm drain. This storm drain will be located along the ceiling of the underground parking garage and will be designed by the mechanical engineer at the building permit stage.

The location of the storm service connection and site storm sewer is illustrated in **Figure 6**. Municipality of Clarington rainfall intensity duration frequency (IDF) curve data is included in **Appendix "D"**.

4.2 Major System Design

The major system will generally be comprised of an overland flow route through the proposed ground level parking which will direct drainage to a safe outlet at the southwest corner of the site towards Aspen Springs Drive. This major system will convey flows which are in excess of the 100 year storm event. The major system flow route is illustrated in **Figure 5**.

4.3 Foundation Drainage

The condominium development will have an underground parking garage that will have a foundation drainage system and a sump pump to discharge accumulated groundwater to the stormwater tank located at the P1 level. Based on the Hydrogeological report completed by Palmer dated April 29, 2022 indicates that the long-term dewatering rate will be 43,444 L/day (0.50 L/s). The stormwater tank has been sized to incorporate the long-term groundwater discharge. The sump pump will be designed by the mechanical engineer at the building permit stage. The excerpts of the supplementary hydrogeological report is included in **Appendix "G"** of the report.

4.4 Roof Drainage

The roof drainage will discharge via an internal storm drain system which will discharge to the storm service connection. The roof drains will be designed by the mechanical engineer at the building permit stage

5.0 STORMWATER MANAGEMENT

In accordance with the requirements of the Region of Durham the following storm water management criteria will be implemented:

- Quantity Control is to be provided such that the post-development peak flows will be controlled to the pre-development rates for rainfall events up to and including the 100 year storm.
- Level 1 (Enhanced) stormwater quality treatment is to be provided to achieve 80% TSS removal.

Based on the foregoing, the following is a summary of the stormwater mitigation measures that are to be incorporated into the design of the subject site.

5.1 Quantity Control

Stormwater quantity control is typically implemented to minimize the potential for downstream flooding, stream bank erosion and overflows of infrastructure. The impact of the proposed development has been analyzed as follows:

5.1.1 Pre-Development Flow

Pre-development surfaces consist primarily of pervious area with an existing gravel pathway. The composite 5 year runoff coefficient was found to be 0.47. The pre-development surface conditions are illustrated in **Figure 4.**

Pre-development peak flow calculations were generated using the City's rainfall IDF data in accordance to the municipal standards. The calculation of the pre-development 5 year and 100 year peak flows are provided on **Table E1** contained in **Appendix "E"** and summarized in the first and second row of **Table 4.**

Table 4: Storm Drainage Peak Flows

Condition	Runoff Coefficient		Peak Flows (L/s)	
	5 Year	100 Year	5 Year	100 Year
Pre-Development	0.47	0.47	98.2	195.5
Post-Development - Unmitigated	0.79	0.79	165.2	329.0
Post-Development - Mitigated	0.79	0.79	63.7	97.5

5.1.2 Post-Development Flow: Unmitigated

Based on a review of the architect's site plan, the post-development surface conditions for this site are illustrated in **Figure 5.** The surfaces consist mainly of the paved private roads, surface parking area, amenity areas, buildings and landscaped areas. Based on these surfaces, the proposed development is more impervious than the existing site condition and the composite runoff coefficient increases to 0.79.

Based on this post-development runoff coefficient the unmitigated 5 and 100 year post-development peak flow rates are calculated on **Table E2** and are summarized in the third row of **Table 4**.

5.1.3 Post-Development Flow: Mitigated

Given that the site storm sewer will discharge to the municipal storm sewer, the 100 year post development peak flows are to be controlled to the 5 year pre-development rates with 0.47 runoff coefficient. Based on the foregoing, on-site stormwater detention measures will be necessary.

The stormwater quantity control was modelled using the modified rational method. This method calculates the storage volume using the composite runoff coefficient and the target rate. Through an iterative assessment of various orifice sizes, underground storage configurations and high water levels, a detention system was developed.

Based on the modelling, the post-development mitigated peak flows are summarized in the fourth row of **Table 4**. A comparison of the flows in the third and fourth rows of **Table 4** indicates that the mitigated post-development 100 year peak flow has been reduced from 333.1 L/s to 97.5 L/s by using a 192mm orifice plate, within the allowable release rate. Based on the above, storage of 209.5 m^3 is required which will be provided in a stormwater detention tank within the underground parking garage level. No ground surface or rooftop detention is proposed.

The location of the orifice and detention system is illustrated in **Figure 6**. The orifice calculation, detention calculation and storage volume summary are presented in **Table E3 to Table E7** which are all contained in **Appendix "E"** together with a storage and discharge summary presented in **Table E**.

5.2 Quality Control

Based on the Ministry of Environment (MOE) criteria, storm water quality control for the subject site is to be designed to achieve "Enhanced" protection level (Level 1 treatment) which entails 80% total suspended solids (TSS) removal.

In order to achieve the Municipality's criteria, a treatment unit has been selected from a list of products which provide 80% TSS removal and are supported by field performance data verified under TARP (Technology Acceptance and Reciprocity Partnership) Tier 2 Testing Protocols used in the NJDEP (New Jersey Department of Environmental Protection) assessment and certification program which is recognized by the City of Toronto. In this regard, Stormceptor model EFO6 by Imbrium Systems Corporation has been selected and based on the sizing will provide a TSS removal rate of 80%.
The selected Storm unit is an OGS system contained in a 1,800mm diameter pre-cast concrete maintenance hole. The unit will be located downstream of the orifice such that

flows through the unit will be controlled thereby enhancing the efficiency of the unit. The location of the control manhole, is aligned along the property line such that they are all easily accessible for inspection and maintenance purposes.

The sizing calculation of the treatment unit is included in **Appendix "F"** together with the product information. The location of the treatment unit is indicated in **Figure 6**.

5.3 Water Balance

The objective of 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. The target of this policy is to retain the 5mm rainfall depth on site.

The runoff volume is calculated based on the site area with an adjustment for initial abstraction. The initial abstraction has been established based on the various site surface types and was calculated to be 1.7mm. The runoff volume required to be retained on site is calculated as follows:

$$V = A \times (D - Ia)$$

where: V = runoff volume (m^3)
A = area (m^2)
D = rainfall depth (0.005m)
I = Initial Abstraction

$$V = 9520\ m^2 \times (0.005m - 0.0017m)$$
$$V = 31.40\ m^3$$

The calculation of the water balance requirement is provided in **Table G1** contained in **Appendix "G"**.

A review of the architect's site plan indicates that the underground parking structure covers almost the entire site, and therefore infiltration methods cannot be utilized. For this project the necessary retention volume will be retained in the stormwater tank on the P1 underground parking level between the bottom of the tank and the tank outlet. The retained water will then be re-used for purposes such as irrigation.

6.0 VEHICULAR & PEDESTRIAN ACCESS

The site plan has been developed with consideration for efficient and safe access and circulation of both vehicular and pedestrian traffic.

6.1 Driveways & Parking

The subject site has frontage on Aspen Springs Drive which is under the jurisdiction of the Municipality of Clarington as well as frontage on Bowmanville Avenue (Regional Road 57) which is under the jurisdiction of the Region of Durham. Access to the proposed development will be provided from both Aspen Springs Drive and Bowmanville Avenue. No new municipal roads are required to accommodate the subject development.

6.2 Sidewalks & Walkways

Internal pedestrian access will be provided by walkways to safely guide residents through the site to the existing municipal sidewalks on Bowmanville Avenue and Aspen Springs Drive.

7.0 GRADING

Based on a topographic survey of the site completed on October 15, 2014, the property slopes from the northeast at an elevation of approximately 125.50m, down to the southwest corner of the site, at an elevation of approximately 121.30m at the southwest corner. This fall of approximately 4.20m equates to an overall average slope of approximately 3.0% which is considered to be relatively flat. A copy of the topographic survey prepared by JD Barnes Ltd. is included in **Appendix "H"**.

As is typical with condominium buildings, the grading design for the site must accommodate the existing elevations along the neighbouring properties and adjacent road allowances and the ground floor level must be established to provide an accessible route from the driveways and walkways to the lobby of the various buildings and to the retail spaces. In many cases the floor levels can be stepped with internal stairs and ramps to better accommodate the site topography.

The subject site is to be graded in accordance with the municipal grading criteria which dictates that driveways, parking lots and walkway grades are to range from 0.5% to 5.0% and that sodded yard areas are to range from 2.0% to 5.0%. For large grade differentials, a maximum slope 3H : 1V can be used for sodded embankments. In areas where space is limited, retaining walls can be utilized to accommodate grade differentials.

Given that the subject site is relatively flat, no major difficulties are anticipated in achieving the municipal grading design criteria.

8.0 EROSION & SEDIMENT CONTROL DURING CONSTRUCTION

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 into receiving watercourses, measures for erosion and sediment control (ESC) are required for construction sites.

The impact of construction on the environment is recognized by the Greater Golden Horseshoe Area Conservation Authorities. In December 2006 they released their document titled "Erosion & Sediment Control Guidelines for Urban Construction". This document provides guidance for the preparation of effective erosion and sediment control plans.

Control measures must be selected that are appropriate for the erosion potential of the site and it is important that they be implemented and modified on a staged basis to reflect the site activities. Furthermore, their effectiveness decreases with sediment loading and therefore inspection and maintenance is required. The selection, implementation, inspection and maintenance of the control features are summarized as follows:

8.1 Control Measures

On moderately sized sites, measures for erosion and sediment control typically include the use of silt fencing, a mud mat and sediment traps. The following is a description of the sediment controls to be implemented on the subject site:

- **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.

8.2 Construction Sequencing

The following is the scheduling of construction activities with respect to sediment controls:

1. Install the silt fences prior to any other activities on the site.
2. Construct temporary mud mat for construction access.
3. Install the sediment traps.
4. Install the shoring, excavate for the underground parking garage and dispose earth material off site.
5. Construct the foundation and underground parking garage.
6. Construct the superstructure of the building and complete the cladding, rough-ins and finishes.
7. Install the service connections.
8. Construct the driveways, surface parking areas and walkways
9. Restore all disturbed areas with final landscape plantings and paving materials.
10. Upon stabilization of all disturbed areas, remove sediment controls.

8.3 ESC Inspection & Maintenance

In order to ensure that the erosion and sediment control measures operate effectively, they are to be regularly monitored and they will require periodic cleaning (e.g., removal of accumulated silt), maintenance and/or re-construction.

Inspections of all of the erosion and sediment controls on the construction site should be undertaken with the following frequency:

- On a weekly basis
- After every rainfall event
- After significant snow melt events
- Prior to forecasted rainfall events

If damaged control measures are found they should be repaired and/or replaced within 48 hours. Site inspection staff and construction managers should refer to the Erosion and Sediment Control Inspection Guide (2008) prepared by the Greater Golden Horseshoe Area Conservation Authorities. This Inspection Guide provides information related to the inspection reporting, problem response and proper installation techniques.

9.0 SUMMARY

Based on the discussions contained herein, the proposed mixed-use development can be adequately serviced with full municipal services (watermain, sanitary and storm) in accordance with the standards of the Municipality of Clarington and the Region of Durham as follows:

Water

- The existing 200mm diameter fire line and 150 mm diameter domestic water service will continue to provide service to the condominium development from the existing 300mm diameter watermain located on the north side of Aspen Springs Drive.
- The existing street fire hydrants does provide sufficient coverage for the condominium development. It will be available within 90m of the principle entrance of the buildings and within 45m of the Siamese connections.
- The subject development will require a maximum day plus fire flow of 76.4 L/s.
- A flow test was completed by the Region of Durham Works Department on May 10, 2022. Based on the results of the flow test, the required fire flow plus maximum day demand is available at a pressure of 511.7 kPa (74.2 psi).
- In accordance with Region of Durham criteria, the proposed development will have a bulk water meter which will be located within the mechanical room located on the P1 underground parking garage level. A backflow prevention device is to also be installed in accordance with Region standards.

Waste Water

- The condominium site will be serviced by a 200mm diameter sanitary service connection that connects to the existing 200mm diameter sanitary sewer in the easement which drains westerly along Aspen Springs Drive. The proposed 200mm diameter sanitary service will connect to the P1 underground parking garage level.
- The subject development will generate a peak wastewater flow of 18.54 L/s.
- An analysis of the downstream sanitary sewer has determined that surcharging is observed under post development condition. An additional HGL analysis is conducted to show that the HGL are at least 1.8m deep which is acceptable. Therefore, existing sanitary sewer system has sufficient capacity to accommodate the subject development.

Storm Drainage

- In accordance with Municipality of Clarington criteria, the subject site will be serviced by a minor system discharging to the municipal storm sewer. The proposed condominium development will be serviced by a site storm sewer which will discharge to the existing 375mm diameter storm sewer in the easement that flows westerly along Aspen Springs Drive.
- The major system will be comprised of an overland flow route which will convey runoff from rainfall events in excess of the capacity of the municipal storm sewer to a safe outlet.

Stormwater Management

- Based on the Municipality of Clarington requirements the following stormwater management measures are to be implemented:
    - The development quantity control will be provided by a detention system. The site runoff will be controlled by a 192 mm diameter orifice plate which will restrict discharge during the 100 year storm event to 97.5 L/s, which is within the allowable release rate. A storage of volume 209.5 m^3 is required which will be provided within a stormwater detention tank on the P1 underground parking level. No ground surface or rooftop detention is proposed.
    - Quality control will be provided the Stormceptor model EFO-6 by Imbrium Systems Corporation which has been sized to provide "Enhanced" protection (Level 1 treatment) quality control. In this regard, EFO-6 model has been selected which will provide a Total Suspended Solids (TSS) removal rate of 80%.
    - The site will retain the 5mm rainfall depth by providing at least 31.40m^3 of required retention volume located at the bottom of the tank to achieve the water balance criteria in the WWFM Policy. The retained water will be re-used for irrigation on site.

Vehicular & Pedestrian Access

- Vehicular access to the subject site will be provided by one driveway off Aspen Springs Drive which is under the jurisdiction of the Region of Durham.
- The existing driveway entrances are to be removed and the curb and boulevard are to be restored.

Grading

- The subject site is relatively flat and based on the proposed development form no major difficulty is anticipated in achieving the municipal grading design criteria.

Erosion & Sediment Control During Construction

- Erosion and sediment controls are to be implemented during construction to prevent silt laden runoff from leaving the site in accordance with the "Erosion & Sediment Control Guidelines for Urban Construction" (December 2006)

10.0 REFERENCES & BIBLIOGRAPHY

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Respectfully Submitted,

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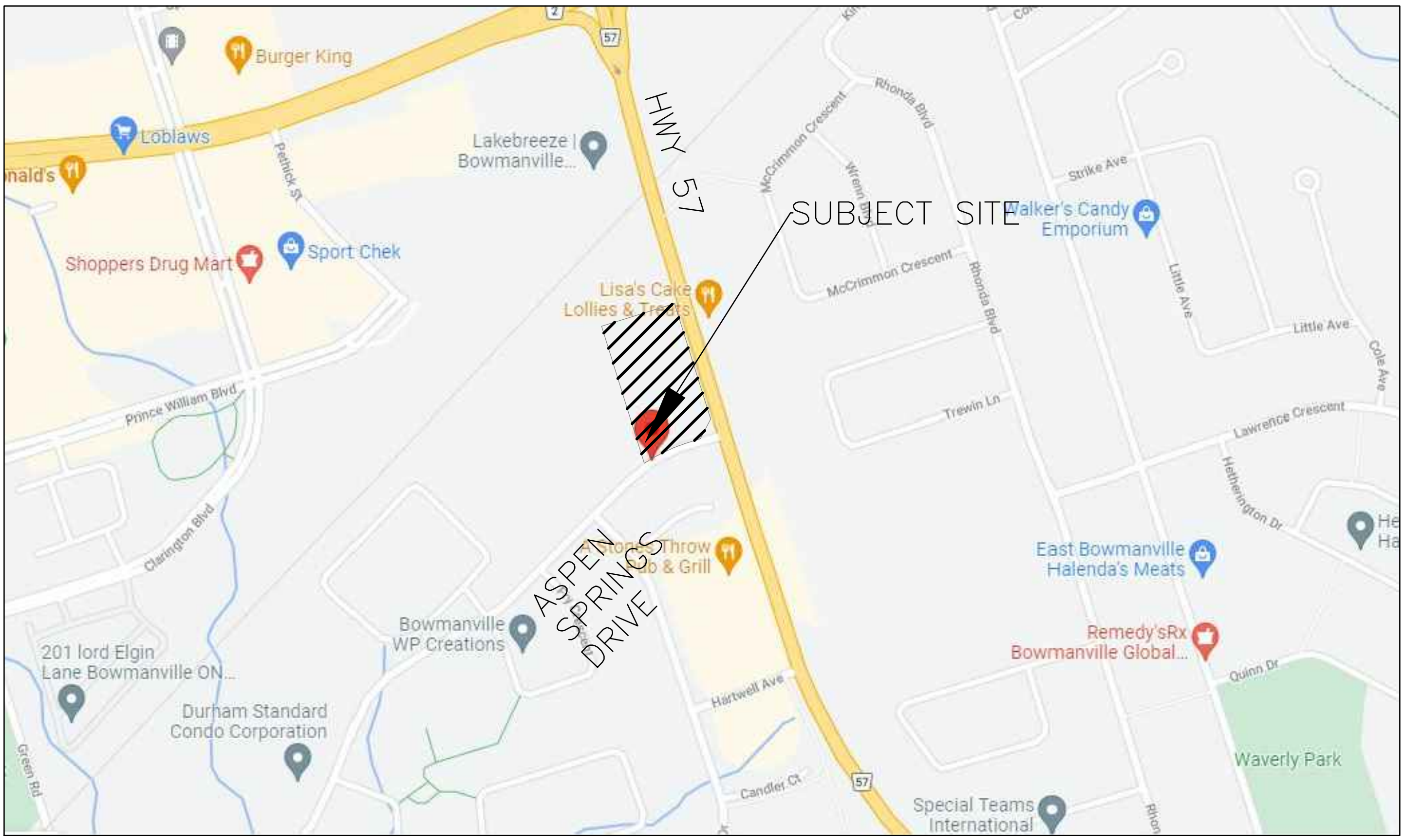

PROPOSED RESIDENTIAL DEVELOPMENT
10 ASPEN SPRINGS
COMMUNITY OF BOWMANVILLE
MUNICIPALITY OF CLARINGTON
REGION OF DURHAM

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 CHRISLEA ROAD, UNIT 4, 2nd FLOOR WOODBRIDGE ONTARIO, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
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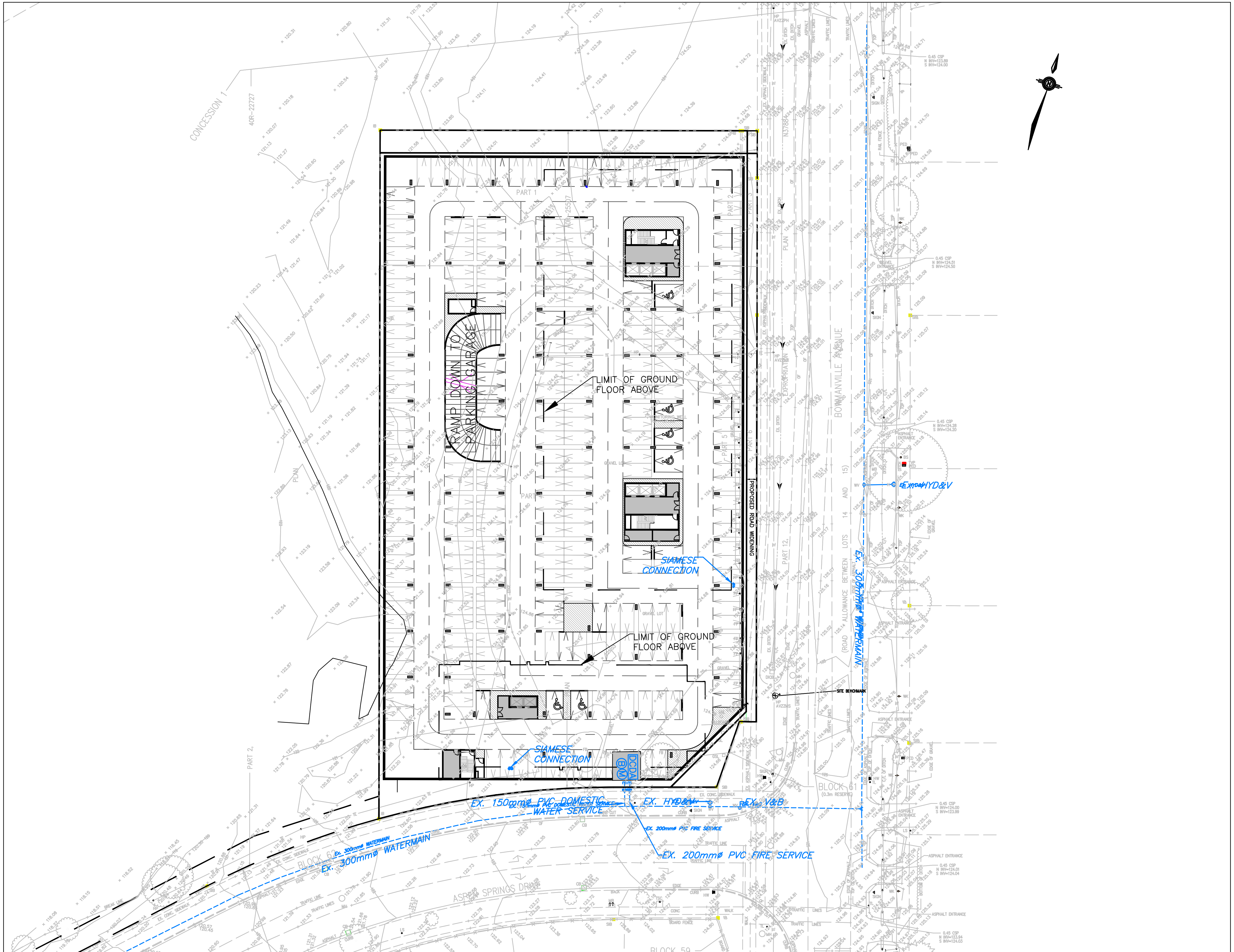
LOCATION PLAN

SCALE	N.T.S	CKD. BY	D.G.	DWG.	FIGURE 1
DATE	MAY 2022	DRAWN BY	T.Z.	PROJECT	21164



LEGEND:

- EXISTING WATERMAIN
- PROPOSED WATERMAIN
- HYDRANT
- VALVE

PROJECT

PROPOSED RESIDENTIAL DEVELOPMENT

10 ASPEN SPRINGS
COMMUNITY OF BOWMANVILLE
MUNICIPALITY OF CLARINGTON
REGION OF DURHAM

WATER SERVICING PLAN

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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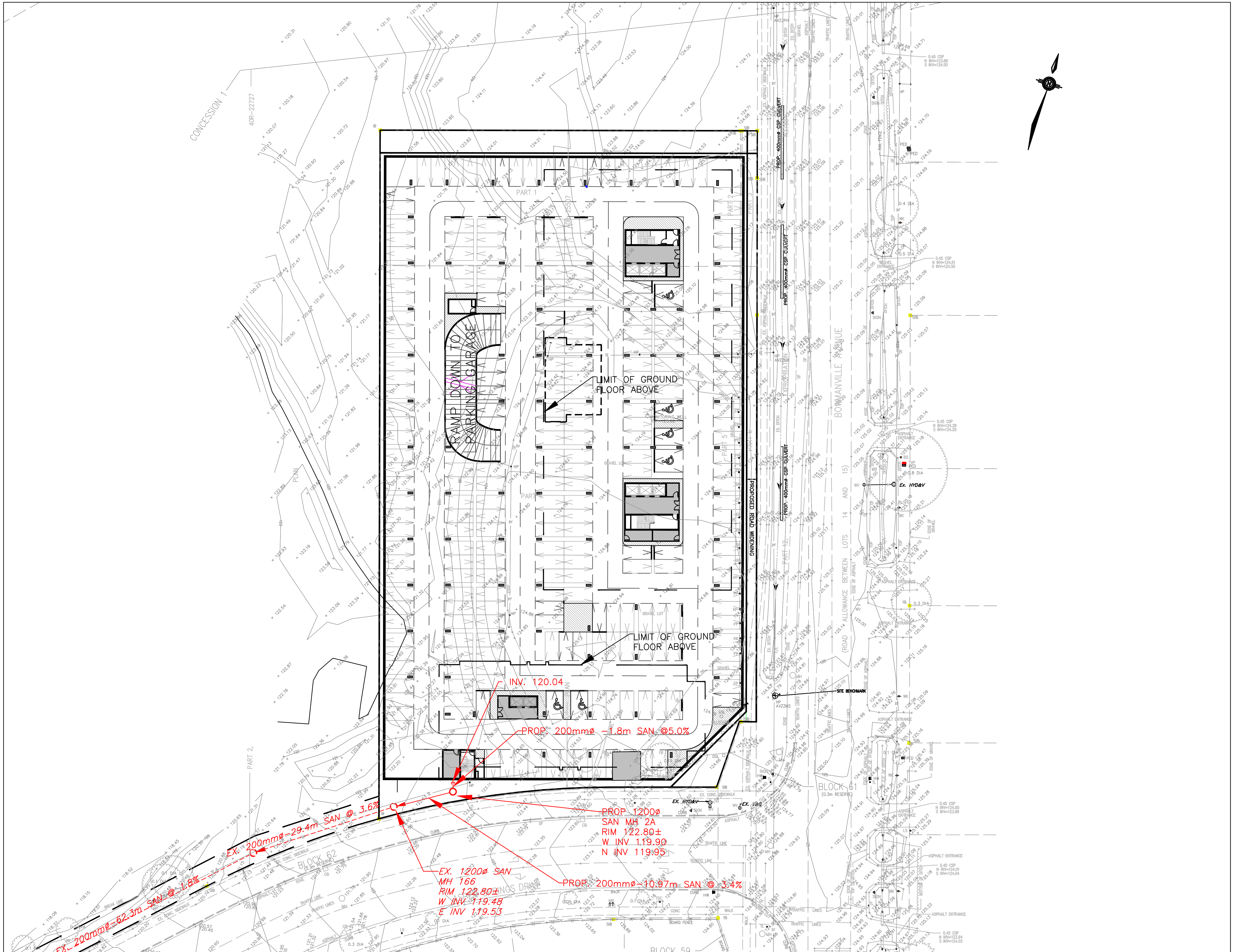
PREPARED BY T.Z.	CKD. BY D.G.
SCALE 1:750	DATE MAY 2022
PROJECT 21164	DWG. FIGURE 2



LEGEND:

- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER
- SANITARY SERVICE
- SANITARY MANHOLE

PROJECT

PROPOSED RESIDENTIAL DEVELOPMENT

10 ASPEN SPRINGS
COMMUNITY OF BOWMANVILLE
MUNICIPALITY OF CLARINGTON
REGION OF DURHAM

SANITARY SERVICING PLAN

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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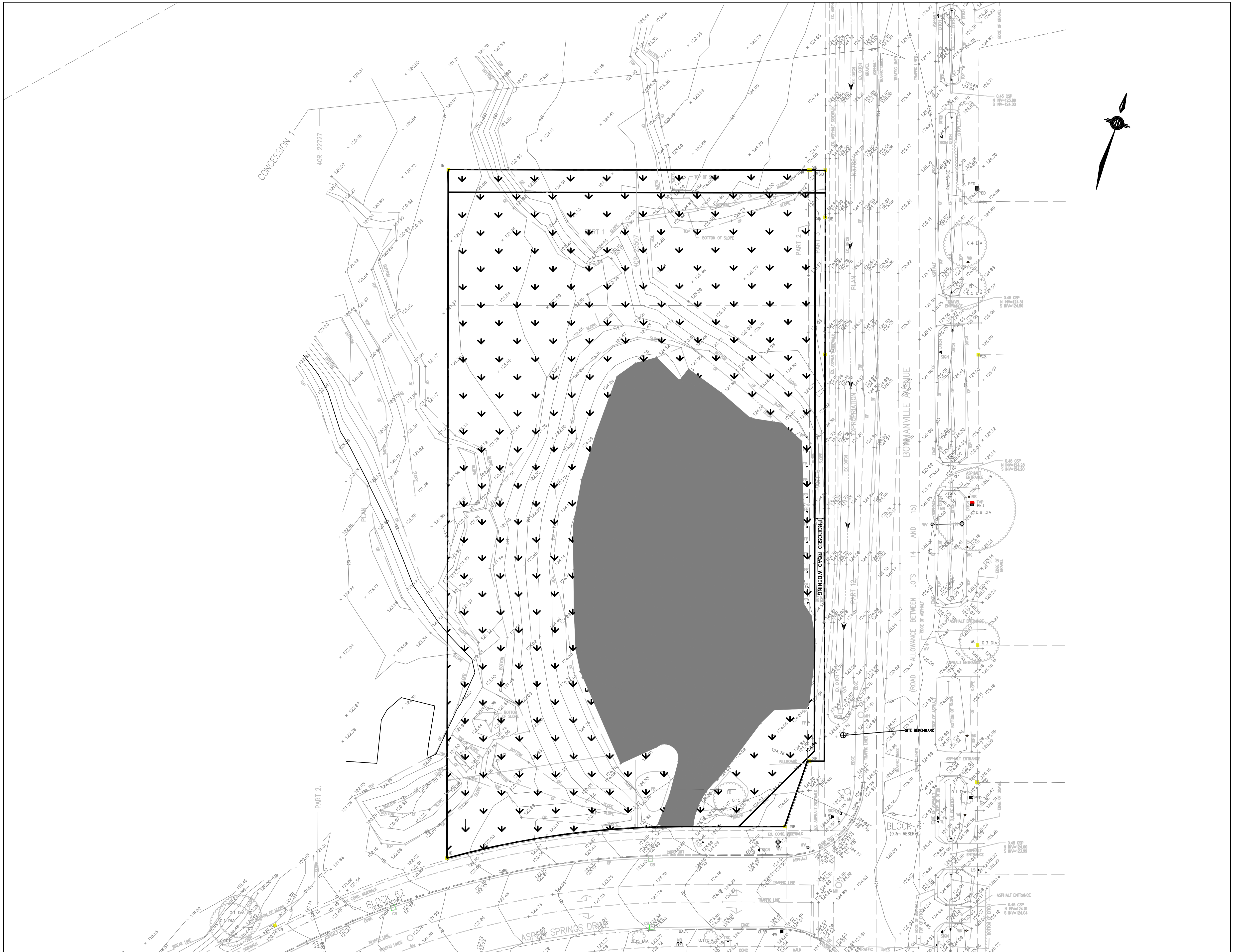
PREPARED BY T.Z.	CKD. BY D.G.
SCALE 1:750	DATE MAY 2022
PROJECT 21164	DWG. FIGURE 3



LEGEND:

IMPERVIOUS

PERVIOUS

PRE-DEVELOPMENT AREA SUMMARY

LAND USE	AREA (Ha.)	RC	COMPOSITE RC
PERVIOUS	0.634	0.25	0.467
IMPERVIOUS	0.318	0.90	
TOTAL	0.952		

PROJECT

PROPOSED RESIDENTIAL DEVELOPMENT
10 ASPEN SPRINGS
COMMUNITY OF BOWMANVILLE
MUNICIPALITY OF CLARINGTON
REGION OF DURHAM

PRE-DEVELOPMENT STORM DRAINAGE CONDITION

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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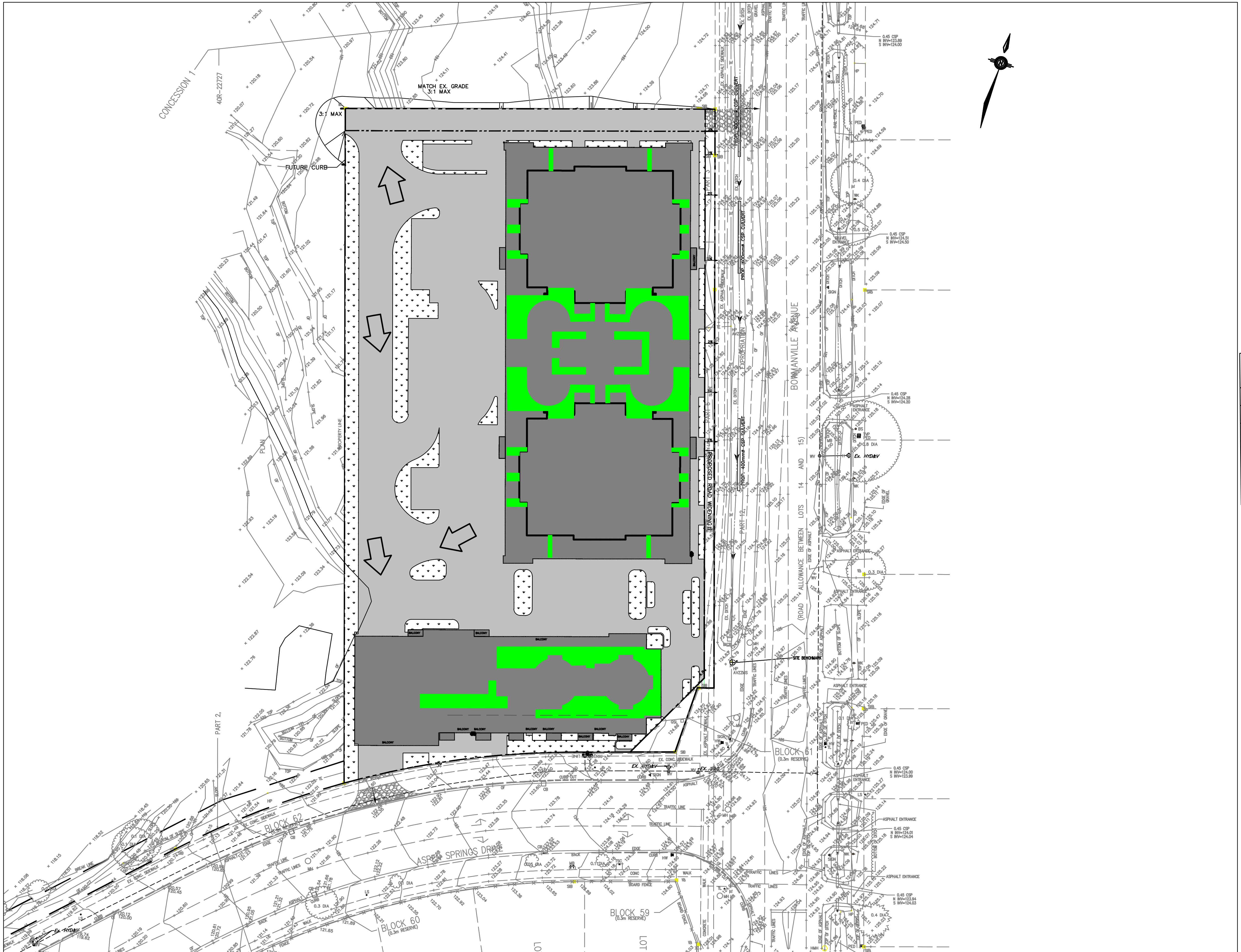
PREPARED BY T.Z.	CKD. BY D.G.
SCALE 1:750	DATE MAY 2022
PROJECT 21164	DWG. FIGURE 4



LEGEND:

ROOF

IMPERVIOUS

PERVIOUS

LANDSCAPE ROOF

EMERGENCY OVERLAND FLOW DIRECTION

DRAINAGE BOUNDARY

POST–DEVELOPMENT AREA SUMMARY

LAND USE	AREA (Ha.)	RC	COMPOSITE RC
PERVIOUS	0.104	0.25	0.79
ROOF	0.384	0.90	
IMPERVIOUS	0.401	0.90	
LANDSCAPE ROOF AREAS	0.063	0.25	
TOTAL	0.952		

PROJECT

PROPOSED RESIDENTIAL DEVELOPMENT
10 ASPEN SPRINGS
COMMUNITY OF BOWMANVILLE
MUNICIPALITY OF CLARINGTON
REGION OF DURHAM

POST–DEVELOPMENT STORM DRAINAGE CONDITION

VALDOR ENGINEERING INC.
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PREPARED BY: T.Z.	CKD. BY: D.G.
SCALE: 1:750	DATE: MAY 2022
PROJECT: 21164	DWG.: FIGURE 5

LEGEND:

- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER
- SANITARY SERVICE
- SANITARY MANHOLE

PROJECT

PROPOSED RESIDENTIAL DEVELOPMENT

10 ASPEN SPRINGS
COMMUNITY OF BOWMANVILLE
MUNICIPALITY OF CLARINGTON
REGION OF DURHAM

SANITARY SERVICING PLAN

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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PREPARED BY T.Z.	CKD. BY D.G.
SCALE 1:750	DATE MAY 2022
PROJECT 21164	DWG. FIGURE 6

APPENDIX "A"

Preliminary Site Plan & Building Elevations

SITE STATISTICS

PROJECT INFORMATION	
PROJECT ADDRESS	10 ASPEN SPRINGS DR, BOWMANVILLE, ON L1C 4W7
EXISTING ZONING REFERENCE	COMMERCIAL EXCEPTION (C6-12) (ZONING BY-LAW 84-63)
PROPERTY LEGAL DESCRIPTION:	PART OF LOT 15 CONCESSION 1
BUILDING 1 - 25 STOREY RESIDENTIAL	485 UNITS
BUILDING 2 - 9 STOREY RESIDENTIAL	122 UNITS
TOTAL RESIDENTIAL	607 UNITS
TOTAL COMMERCIAL	624.8 SQM

DEVELOPMENT STATISTICS		
AREA	**SM**	**SF**
LOT AREA	9,819.4	105,695.5
LOT AREA (Excluding 2m road widening and daylight triangle)	9,518.6	102,457.6
BUILDING AREA AT GRADE LEVEL		
BUILDING 1	2,948.0	31,732.0
BUILDING 2	1,062.5	11,436.6
LANDSCAPE SOFT AREA (Excluding 2m road widening and daylight triangle)	1,246.4	13,416.4
LANDSCAPE HARD AREA (DRIVEWAY, SIDEWALK, AMENITY, CURB, RAMP ETC.) (Excluding 2m road widening and daylight triangle)	4,261.7	45,872.5
LOT COVERAGE		
BUILDING 1		31.0%
BUILDING 2		13.5%
TOTAL LOT COVERAGE		**44.4%**

SETBACKS AND BUFFERS		
	M	**F**
LOT FRONTAGE (ASPEN SPRINGS DR.)	75.00	246.1
FRONT YARD SETBACK (ASPEN SPRINGS DR.)	3.38	11.1
INTERIOR SIDE YARD SETBACK	2.07	6.8
EXTERIOR SIDE YARD SETBACK (BOWMANVILLE AVE.)	2.54	8.3
REAR YARD SETBACK	6.88	22.6
BUILDING 1 HEIGHT (Measured to the top of roof deck)	74.22	243.5
BUILDING 2 HEIGHT (Measured to the top of roof deck)	26.97	88.5

FSI (Gross)	
BUILDING 1	3.91
BUILDING 2	0.99
TOTAL FSI (Gross)	**4.90**

PARKING	
PARKING BREAKDOWN BY LEVEL	**SPACES**
Parking (Visitors)	15
Parking (Visitors Acc.- Single)	3
Total Parking at ground level	**18**
P1-Parking	155
P1-Parking (Visitors)	87
P1-Parking (Visitors Acc.)	4
TOTAL UNDERGROUND P1	**246**
P2-Parking	248
P2 - ACC. (Shared)	4
P2 - ACC. (Single)	1
TOTAL UNDERGROUND PARKING LEVEL P2	**253**
P3-Parking	253
P3 - ACC. (Shared)	4
P3 - ACC. (Single)	1
TOTAL UNDERGROUND PARKING LEVEL P3	**258**
TOTAL PARKING (Including Accessible Parking)	**775**
ACCESSIBLE PARKING	**17**

PARKING REQUIREMENTS AND SUPPLY (MU-3 ZONE)

Land use		NOS	Minimum requirement		Proposed Supply
			Rate	Spaces	
Dwelling units	1-Bedroom	385	1 parking/unit	385	665
	2-Bedroom	212	1 parking/unit	212	
	3-Bedroom	10	1 parking/unit	10	
	Visitors	607	NA	NA	89
Ratail GFA		624.8 m2	1 parking/ 30 m2 of GFA	20.8	21
Acc. Parking: 2% of the total space required				12.6	17
Total (including acc. Parking)				628	775
Loading			2 space for 91 or more units		3
Bicycle			NA		234 Indoor
					18 Outdoor

GFA CALCULATIONS

BUILDING 1 - 25 STOREY RESIDENTIAL

BUILDING 1 PODIUM

	USE	RESIDENTIAL		COMMERCIAL		TOTAL GFA	
	AREA	SM	SF	SM	SF	SM	SF
	GROUND FLOOR	1,073.1	11,550.7	433.4	4,466.0	1,506.5	16,215.8
	2ND FLOOR	2,864.5	10,786.0	0.0	0.0	2,864.5	30,833.2
	3rd FLOOR	2,671.4	18,180.0	0.0	0.0	2,671.4	28,754.7
	4th FLOOR	2,671.4	18,180.0	0.0	0.0	2,671.4	28,754.7
	PODIUM TOTAL	**9,280.4**	**58,696.7**	**433.4**	**4,466.0**	**9,713.8**	**104,558.4**

BUILDING 1 TOWER A

	USE	RESIDENTIAL		COMMERCIAL		TOTAL GFA	
	AREA	SM	SF	SM	SF	SM	SF
	5th FLOOR	684.5	7,367.9	0.0	0.0	684.5	7,367.9
TYPICAL	6th FLOOR - 23rd FLOOR (Residential=685.10 SM x 18)	12,331.8	132,738.3	0.0	0.0	12,331.8	132,738.3
	24th FLOOR - 25th FLOOR (Residential=668.40 SM x 2)	1,336.80	14,389.2	0.0	0.0	1,336.8	14,389.2
	TOWER A TOTAL	**14,353.1**	**154,495.3**	**0.0**	**0.0**	**14,353.1**	**154,495.3**

BUILDING 1 TOWER B

	USE	RESIDENTIAL		COMMERCIAL		TOTAL GFA	
	AREA	SM	SF	SM	SF	SM	SF
	5th FLOOR	684.5	7,367.9	0.0	0.0	684.5	7,367.9
TYPICAL	6th FLOOR - 23rd FLOOR (Residential=685.10 SM x 18)	12,331.8	132,738.3	0.0	0.0	12,331.8	132,738.3
	24th FLOOR - 25th FLOOR (Residential=668.40 SM x 2)	1,336.80	14,389.2	0.0	0.0	1,336.8	14,389.2
	TOWER B TOTAL	**14,353.1**	**154,495.3**	**0.0**	**0.0**	**14,353.1**	**154,495.3**
	BUILDING 1 GFA TOTAL (INCLUDING THE INDOOR AMENITY AREA)					**38,420.0**	**413,549.0**

BUILDING 2 - 9 STOREY RESIDENTIAL

	USE	RESIDENTIAL		COMMERCIAL		TOTAL	
	AREA	SM	SF	SM	SF	SM	SF
	GROUND FLOOR	537.7	5,787.7	191.4	2,060.2	729.1	7,848.0
	2ND FLOOR	851.4	9,164.4	0.0	0.0	851.4	9,164.4
	3RD FLOOR	1,161.2	12,499.0	0.0	0.0	1,161.2	12,499.0
	4TH FLOOR	1,158.9	12,474.3	0.0	0.0	1,158.9	12,474.3
	5TH FLOOR	1,159.10	12,476.4	0.0	0.0	1,159.1	12,476.4
	6TH FLOOR	1,159.10	12,476.4	0.0	0.0	1,159.1	12,476.4
	7TH FLOOR	1,159.50	12,480.7	0.0	0.0	1,159.5	12,480.7
	8TH FLOOR	1,159.70	12,482.9	0.0	0.0	1,159.7	12,482.9
	9TH FLOOR	1,222.20	13,155.6	0.0	0.0	1,222.2	13,155.6
	BUILDING 2 GFA TOTAL (INCLUDING THE INDOOR AMENITY AREA)	**9,568.8**	**102,997.6**	**191.4**	**2,060.2**	**9,760.2**	**105,057.8**

	TOTAL GFA OF ALL BUILDINGS	**47,555.4**	**470,685.0**	**624.8**	**6,526.2**	**48,180.2**	**518,606.9**

NOTE: GFA EXCLUSIONS INCLUDE UNDERGROUND PARKING AREAS, BICYCLE PARKING AREAS, SERVICE AND MECH. AREAS, LOADING + GARBAGE AREAS, STAIR AND ELEVATOR SHAFTS

AMENITY AREA

GROUND LEVEL OUTDOOR AMENITY AREA "A"	93.0	1,001.0
GROUND LEVEL OUTDOOR AMENITY AREA "B"	499.0	5,371.2
BUILDING 1 5TH FLOOR OUTDOOR AMENITY AREA	916.3	9,863.0
BUILDING 2 ROOFTOP OUTDOOR AMENITY AREA	536.1	5,770.5
BUILDING 1 INDOOR AMENITY AREA (excluding private unit balconies)	1,606.0	17,286.8
BUILDING 2 INDOOR AMENITY AREA (excluding private unit balconies)	255.8	2,753.4

RESIDENTIAL UNIT MIX

BUILDING 1

UNIT TYPE	STUDIO	1-BED	1-BED + DEN	2-BED	3-BED	TOTAL
UNIT AREA (SM)- TYPICAL	43	57	71	66	116	-
UNIT AREA (SF)- TYPICAL	465	614	766	715	1,250	-
PODIUM						
GROUND FLOOR	0	0	0	0	0	0
2ND FLOOR	8	0	1	4	2	15
3RD - 4TH FLOOR (2 FLOORS)	8	12	0	2	4	26
PODIUM MIX (%)	36%	36%	1%	12%	15%	100%
PODIUM TOTAL UNITS	**24**	**24**	**1**	**8**	**10**	**67**
TOWER A						
5TH FLOOR	4	2	0	3	0	9
6TH - 25TH FLOOR (20 FLOORS)	4	2	0	4	0	10
TOWER A MIX (%)	40%	20%	0%	40%	0%	100%
TOWER A TOTAL UNITS	**84**	**42**	**0**	**83**	**0**	**209**
TOWER B						
5TH FLOOR	4	2	0	3	0	9
6TH - 25TH FLOOR (20 FLOORS)	4	2	0	4	0	10
TOWER B MIX (%)	40%	20%	0%	40%	0%	100%
TOWER B TOTAL UNITS	**84**	**42**	**0**	**83**	**0**	**209**
BUILDING 1 TOTAL						
BUILDING 1 TOTAL MIX (%)	40%	22%	0%	36%	2%	100%
BUILDING 1 TOTAL UNITS	**192**	**108**	**1**	**174**	**10**	**485**

BUILDING 2

UNIT TYPE	STUDIO	1-BED	1-BED + DEN	2-BED	3-BED	TOTAL
UNIT AREA (SM) - TYPICAL	42	57	73	84	-	-
UNIT AREA (SF) - TYPICAL	450	610	790	905	-	-
GROUND FLOOR	0	0	0	0	-	0
2ND FLOOR	0	7	0	3	-	10
3RD - 9TH FLOOR (7 FLOORS)	2	8	1	5	-	16
MIX (%)	11%	52%	6%	31%	-	100%
BUILDING 2 TOTAL UNITS	**14**	**63**	**7**	**38**	**-**	**122**

Project North:	True North:

Key Plan:

No.	Date:	Issue/Revision	By:
1	YY/MM/DD	Issued for	XX

Drawing Issues/Revisions:

Note:
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WORK IN PROGRESS

MATAJ ARCHITECTS INC

Architect's Stamp

MATAJ ARCHITECTS INCORPORATED
206-418 Iroquois Shore Rd
Oakville Ontario
L6H 0X7
T.905.281.4444

Project:
BOWMANVILLE

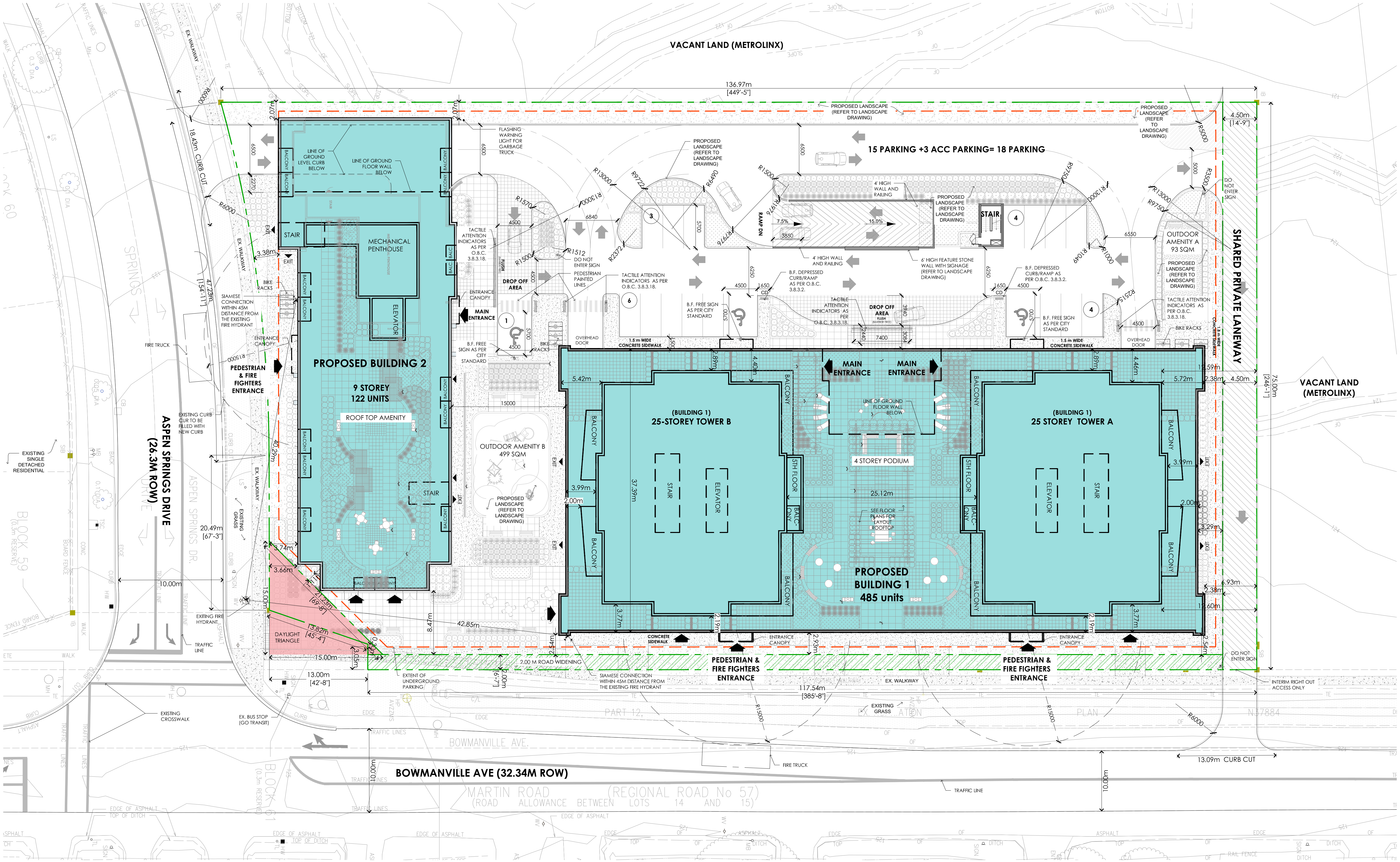
10 ASPEN SPRINGS DR, BOWMANVILLE, ON L1C 4W7

Sheet Title:
SITE STATISTICS

Design By:	Drawn By:	Approved By:
M.A	X.Z	EM
Scale:	**Date:**	**Project No.:**
N.T.S.	22.03.15	21-019

Drawing No: **ASP-1** Of:

Drawing Series:



	PROPERTY LINE		OTHER ACCESS POINTS		HOSE BIB (REFER TO MECHANICAL DWGS)		WALL MOUNTED LIGHT FIXTURE -REFER TO ELECTRICAL DWGS
	EXTENT OF UNDERGROUND PARKING		EXISTING TOWN HYDRANT		PAD MOUNTED HYDRO TRANSFORMER W/ STEEL BOLLARDS		LANDSCAPED AREA
	CURB RAMP AS PER OBC 3.8.3.2		PROPOSED LOCATION OF NEW FIRE HYDRANT W/ STEEL BOLLARDS (REFER TO CIVIL DWGS)		SINGLE HEADED LIGHT FIXTURE ON CONCRETE BASE -REFER TO ELECTRICAL		DAYLIGHT TRIANGLE
	PRINCIPLE ENTRANCE		FIRE DEPARTMENT CONNECTION		DOUBLE HEADED LIGHT FIXTURE ON CONCRETE BASE -REFER TO ELECTRICAL DWGS		

Project North: True North:

Key Plan:

No.	Date:	Issue/Revision	By:
1	YY/MM/DD	Issued for	XX

Drawing Issues/Revisions:

Note:

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Architect's Stamp

MATAJ ARCHITECTS INCORPORATED

Project:

BOWMANVILLE

10 ASPEN SPRINGS DR, BOWMANVILLE, ON L1C 4W7

Sheet Title:

SITE PLAN

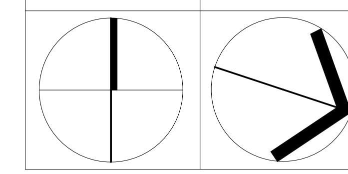
Design By:	Drawn By:	Approved By:
M.A	X.Z	EM
Scale: 1:250	Date: 22.03.10	Project No.: 21-019

Drawing No:

ASP-3 Of:

Drawing Series:

Project North:	True North:

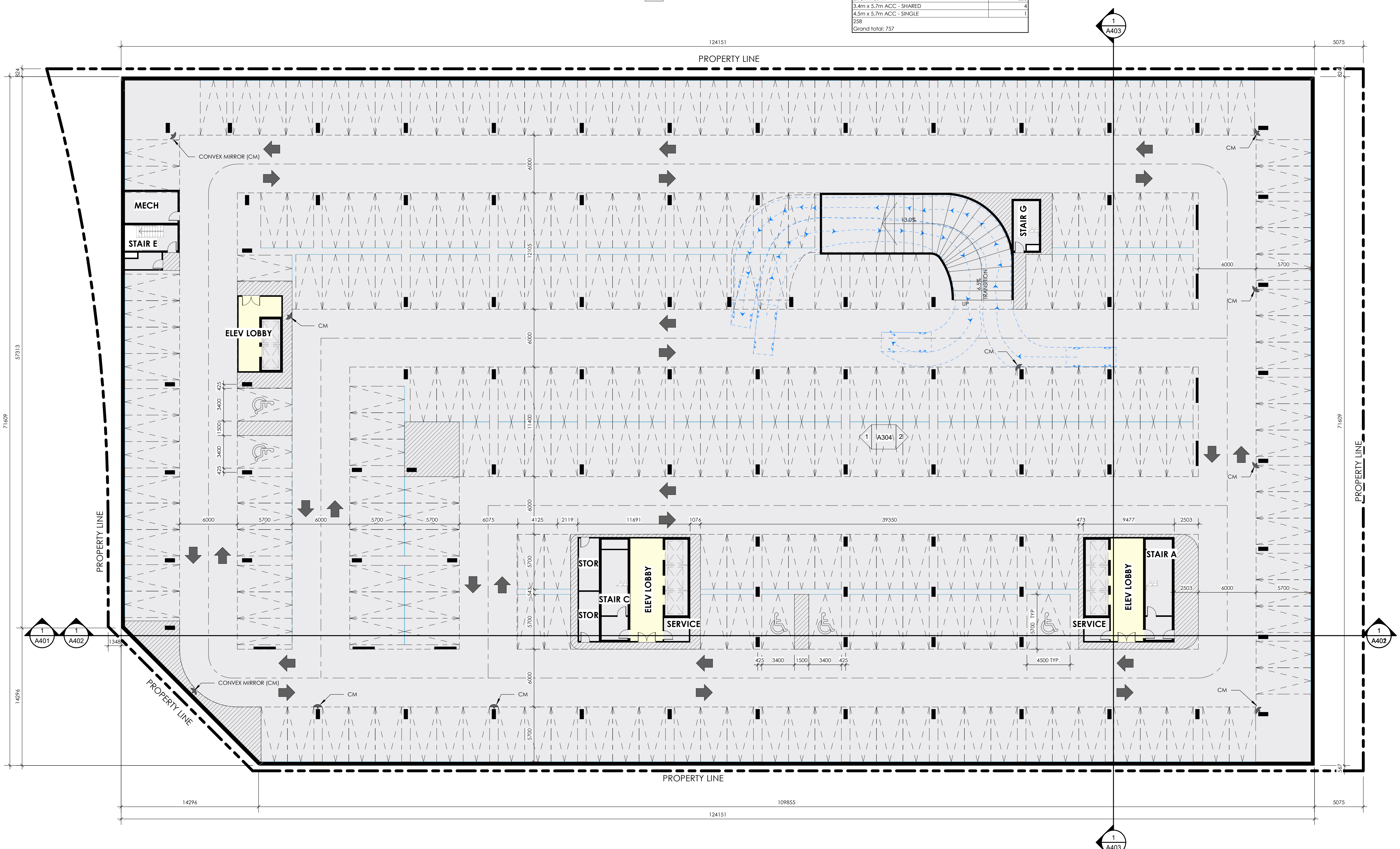


PARKING SCHEDULE - UNDERGROUND

Type	Count
T/O P1	
2.75m x 5.7m	155
2.75m X 5.7m - VISITOR	87
3.4m x 5.7m ACC - VISITOR	4
246	
T/O P2	
2.75m x 5.7m	248
3.4m x 5.7m ACC - SHARED	4
4.5m x 5.7m ACC - SINGLE	1
253	
T/O P3	
2.75m x 5.7m	253
3.4m x 5.7m ACC - SHARED	4
4.5m x 5.7m ACC - SINGLE	1
258	
Grand total: 757	

GFA COLOR LEGEND

- COMMON SPACES
- DEDUCTION



SPA FILE NO. -

REV	DESCRIPTION	REV. DATE

Drawing Issues/Revisions:

Note:

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WORK IN PROGRESS

MATAJ ARCHITECTS INC

Architect's Stamp

MATAJ ARCHITECTS INCORPORATED
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Project:

BOWMANVILLE

10 ASPEN SPRINGS DR.,
BOWMANVILLE, ON L1C 4W7

Sheet Title:

PARKING LEVEL P3

Design By:	Drawn By:	Approved By:
Designer	Author	Approver
Scale:	**Date:**	**Project No.:**
1 : 200	Issue Date	20-034

Drawing No:

A201 Of:

Drawing Series:

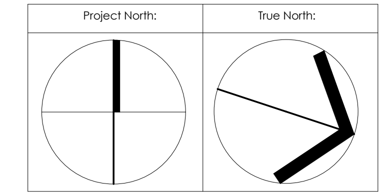
--

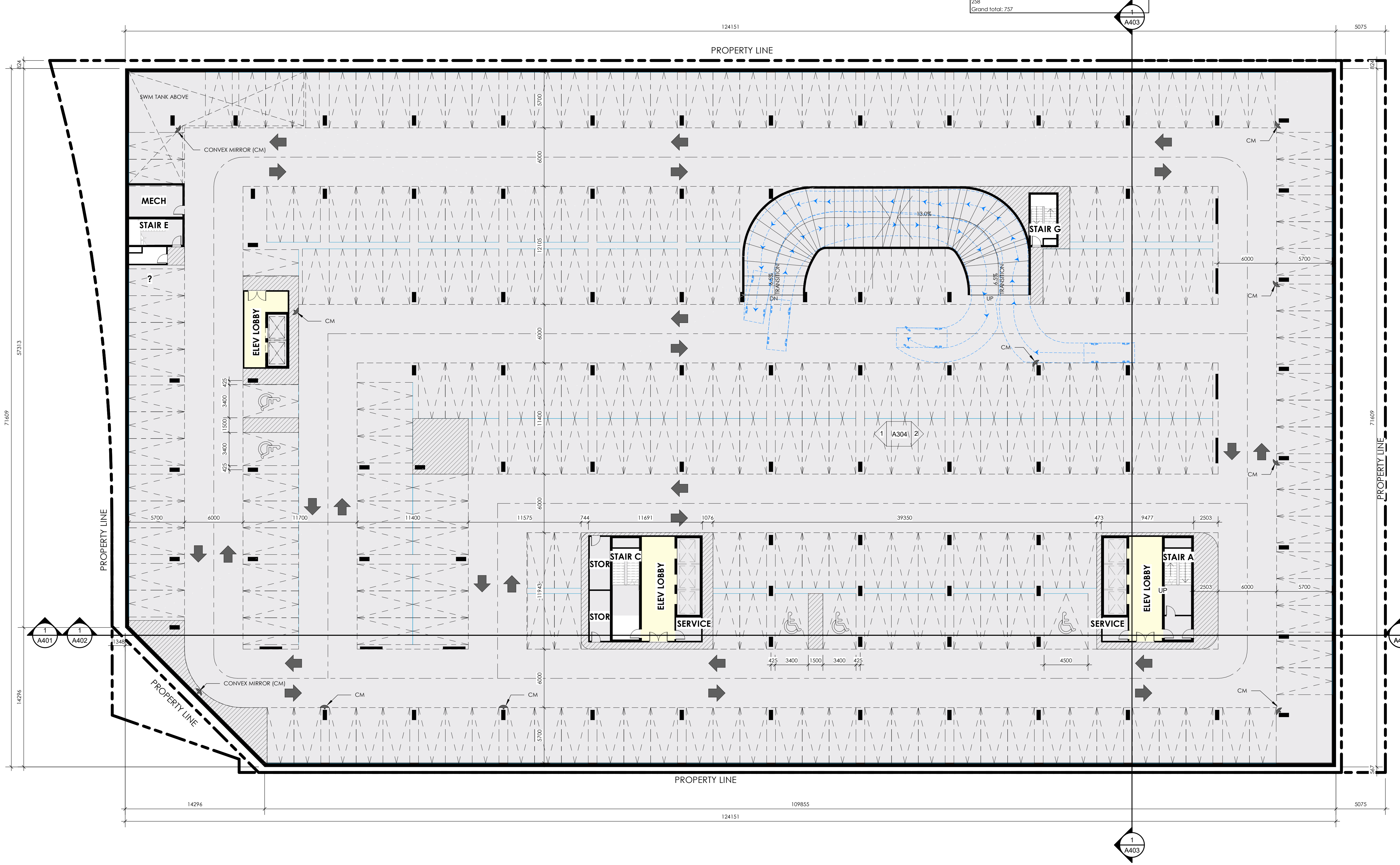
GFA COLOR LEGEND

- COMMON SPACES
- DEDUCTION

PARKING SCHEDULE - UNDERGROUND

Type	Count
T/O P1	
2.75m x 5.7m	155
2.75m X 5.7m - VISITOR	87
3.4m x 5.7m ACC - VISITOR	4
246	
T/O P2	
2.75m x 5.7m	248
3.4m x 5.7m ACC - SHARED	4
4.5m x 5.7m ACC - SINGLE	1
253	
T/O P3	
2.75m x 5.7m	253
3.4m x 5.7m ACC - SHARED	4
4.5m x 5.7m ACC - SINGLE	1
258	
Grand total: 757	





SPA FILE NO. -

REV	DESCRIPTION	REV. DATE

Drawing Issues/Revisions:

Note:

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WORK IN PROGRESS

MATAJ ARCHITECTS INC

Architect's Stamp

MATAJ ARCHITECTS
INCORPORATED
418 Iroquois Shore Road, Unit 206.
Oakville Ontario
L6H 0X7
T.905.281.4444

Project:

BOWMANVILLE

10 ASPEN SPRINGS DR.,
BOWMANVILLE, ON L1C 4W7

Sheet Title:

PARKING LEVEL P2

Design By:	Drawn By:	Approved By:
EM	BL	EM
Scale:	Date:	Project No.:
1 : 200	Issue Date	20-034

Drawing No:

A202 Of:

Drawing Series:

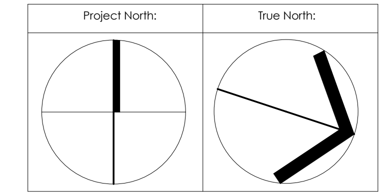
--

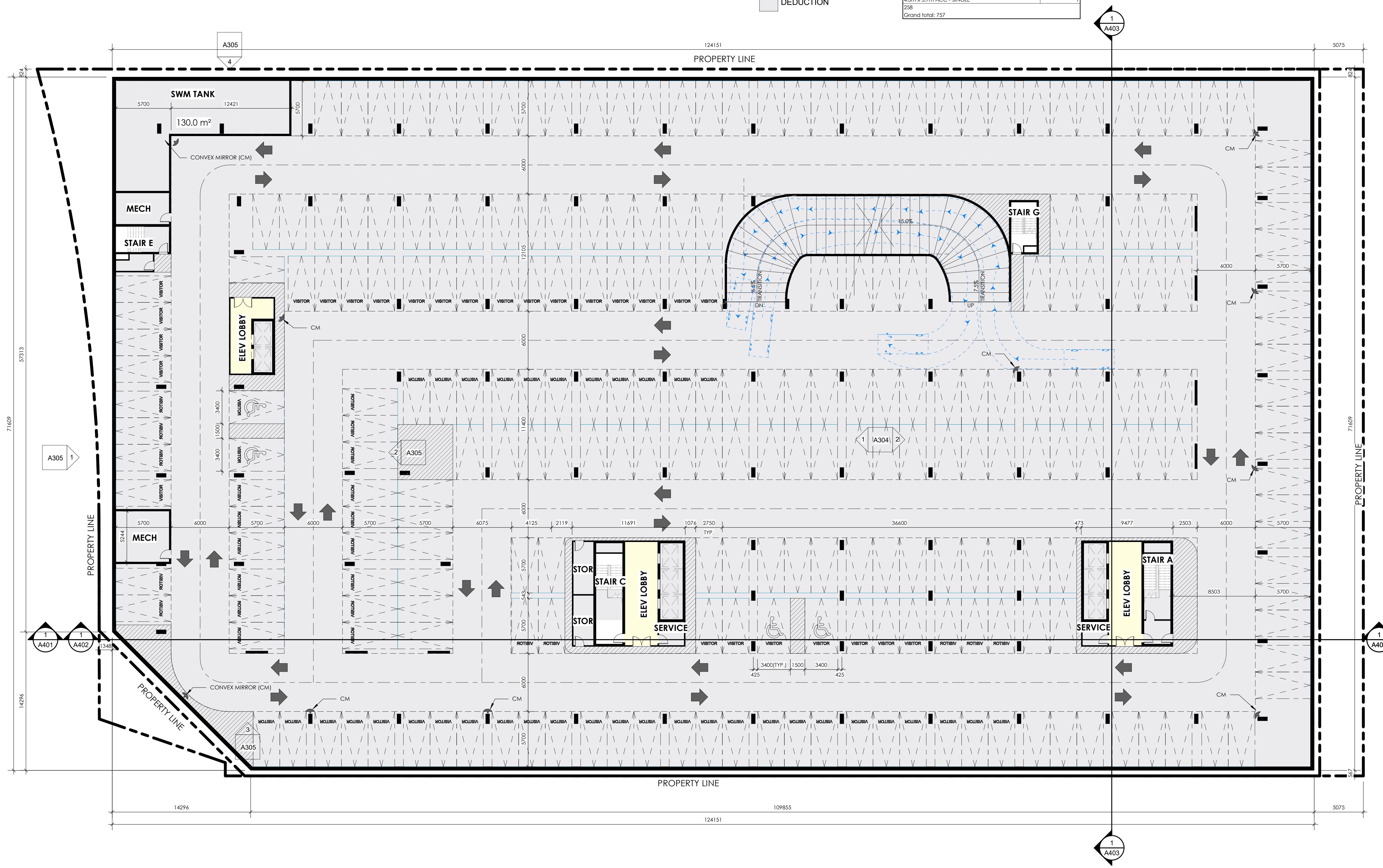
PARKING SCHEDULE - UNDERGROUND

Type	Count
T/O P1	
2.75m x 5.7m	155
2.75m X 5.7m - VISITOR	87
3.4m x 5.7m ACC - VISITOR	4
246	
T/O P2	
2.75m x 5.7m	248
3.4m x 5.7m ACC - SHARED	4
4.5m x 5.7m ACC - SINGLE	1
253	
T/O P3	
2.75m x 5.7m	253
3.4m x 5.7m ACC - SHARED	4
4.5m x 5.7m ACC - SINGLE	1
258	
Grand total: 757	

GFA COLOR LEGEND

- COMMON SPACES
- DEDUCTION





REV	DESCRIPTION	REV. DATE

SPA FILE NO. -

Drawing Issues/Revisions:

Note:

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MATAJ ARCHITECTS INCORPORATED
418 Iroquois Shore Road, Unit 206.
Oakville Ontario
L6H 0X7
T.905.281.4444

Project:
BOWMANVILLE

10 ASPEN SPRINGS DR.,
BOWMANVILLE, ON L1C 4W7

Sheet Title:
PARKING LEVEL P1

Design By:	Drawn By:	Approved By:
EM	BL	EM
Scale: 1 : 200	Date: Issue Date	Project No.: 20-034

Drawing No:
A203 Of:

Drawing Series:
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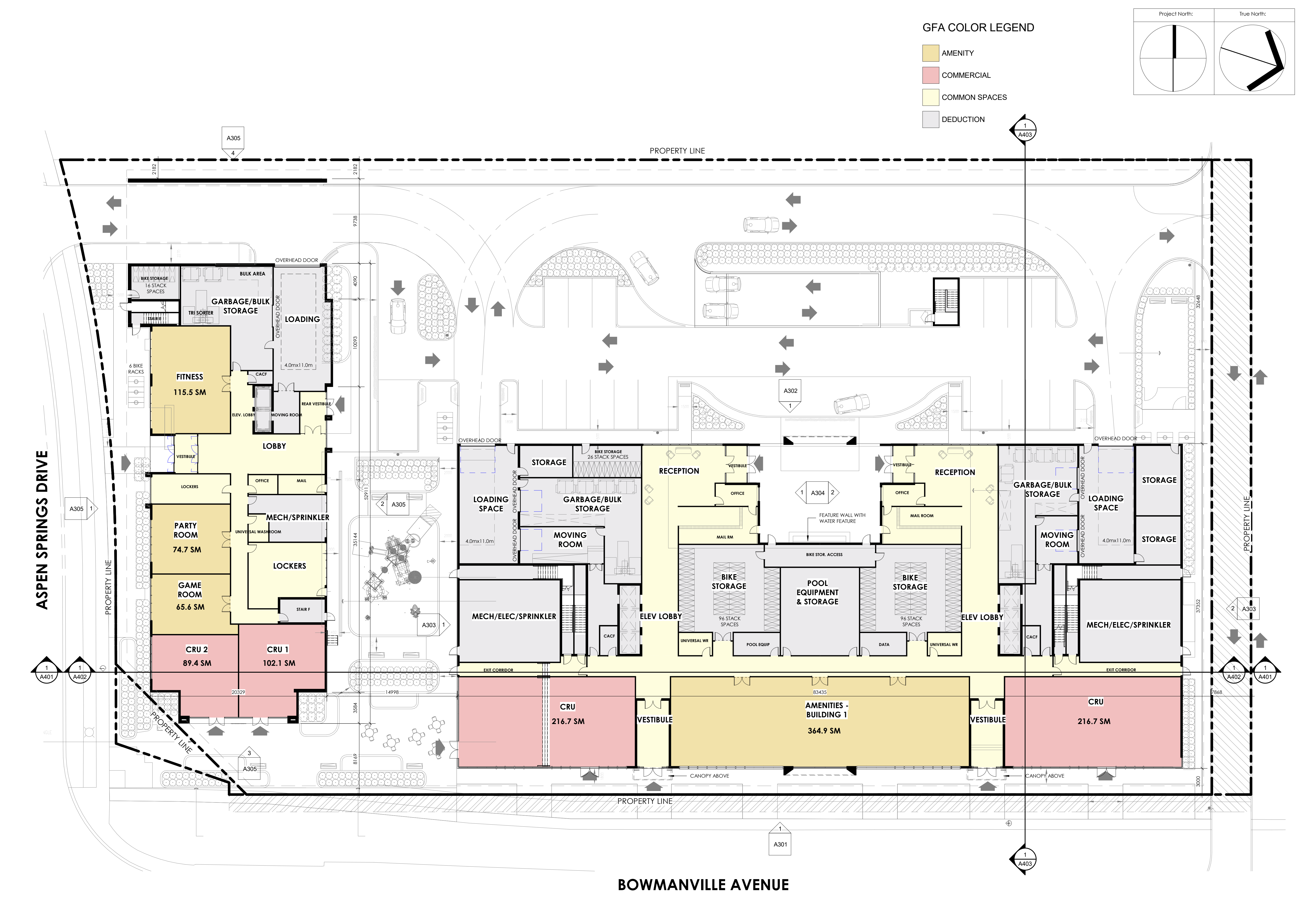

SPA FILE NO. -

REV	DESCRIPTION	REV. DATE
1	PROGRESS SET	Date 2

Drawing Issues/Revisions:

Note:

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418 Iroquois Shore Road, Unit 206,
Oakville Ontario
L6H 0X7
T.905.281.4444

Project:

BOWMANVILLE

10 ASPEN SPRINGS DR.,
BOWMANVILLE, ON L1C 4W7

Sheet Title:

OVERALL GROUND FLOOR PLAN

Design By:	Drawn By:	Approved By:
EM	BL	EM
Scale:	Date:	Project No.:
1 : 200	Issue Date	20-034

Drawing No:

A204

Of:

Drawing Series:

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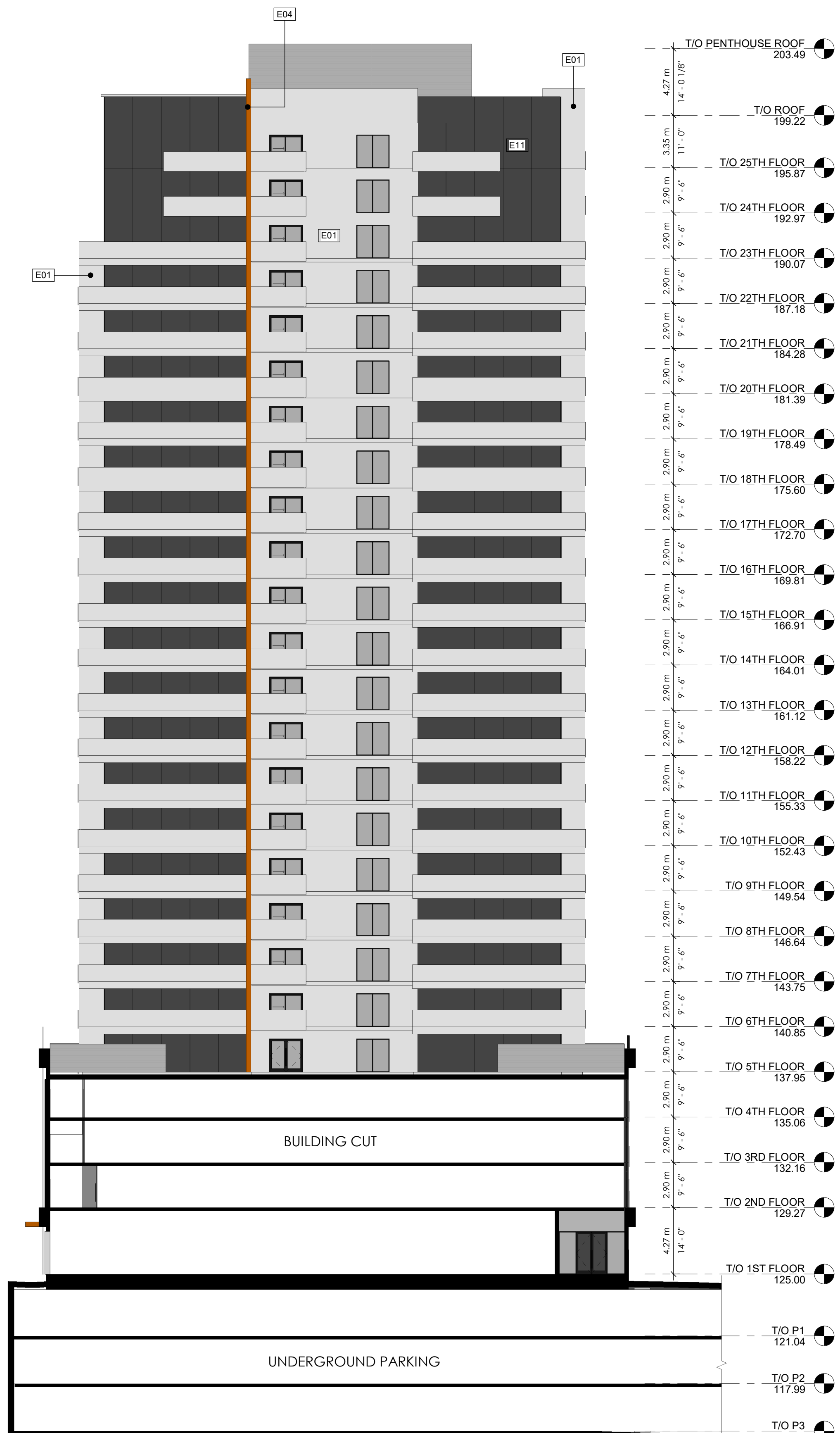
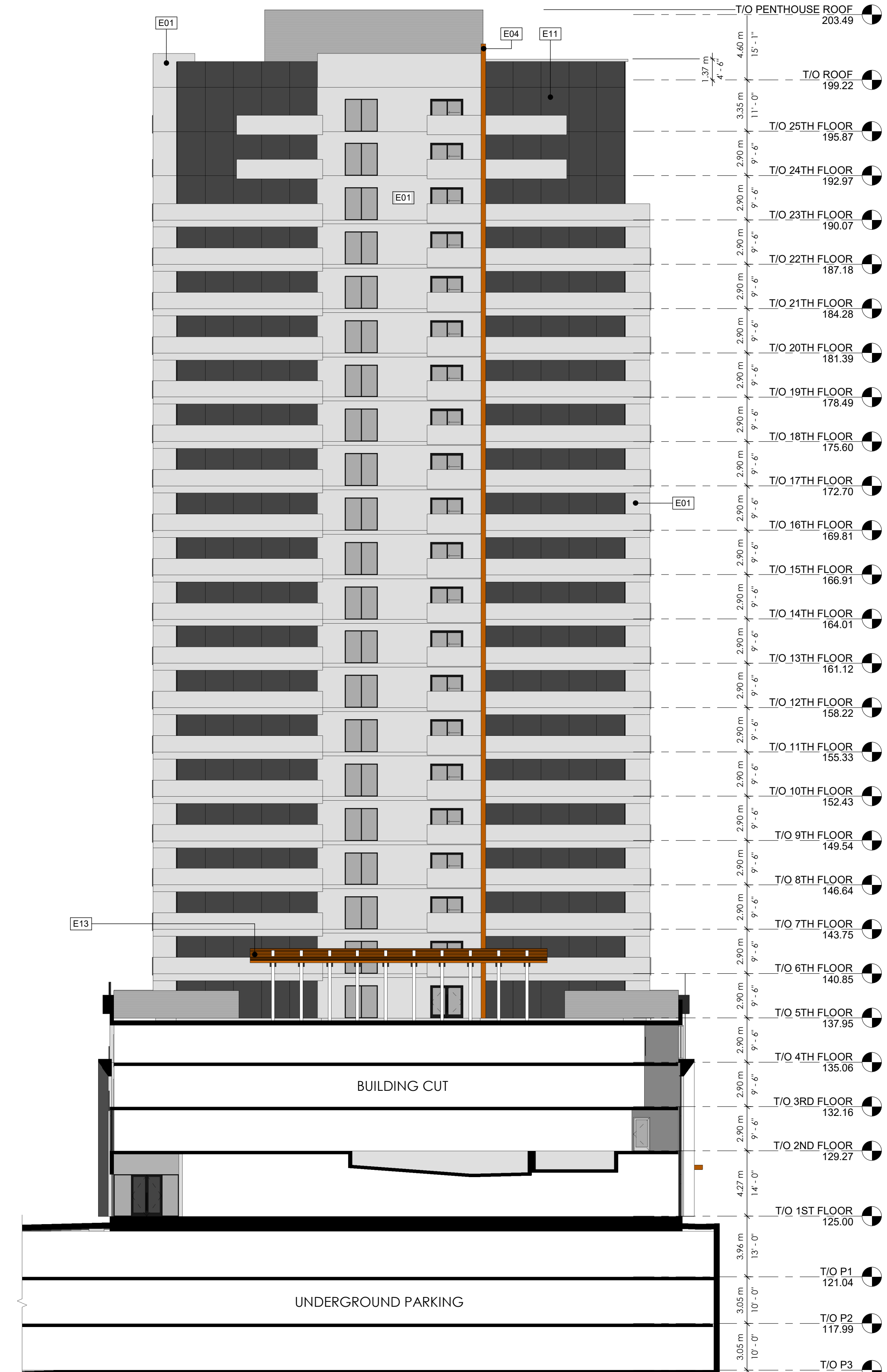


1 A304 NORTH ELEVATION - TOWER A
1 : 200



2 A304 SOUTH ELEVATION - TOWER B
1 : 200

SPA FILE NO. -

REV	DESCRIPTION	REV. DATE

Drawing Issues/Revisions:

Note:

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Oakville Ontario
L6H 0X7
T.905.281.4444

Project:
BOWMANVILLE

10 ASPEN SPRINGS DR.,
BOWMANVILLE, ON L1C 4W7

Sheet Title:
TOWER ELEVATIONS - BUILDING 1

Design By:	Drawn By:	Approved By:
Designer	Author	Approver
Scale: 1 : 200	Date: Issue Date	Project No.: 20-034

Drawing No:
A304 Of:

Drawing Series:
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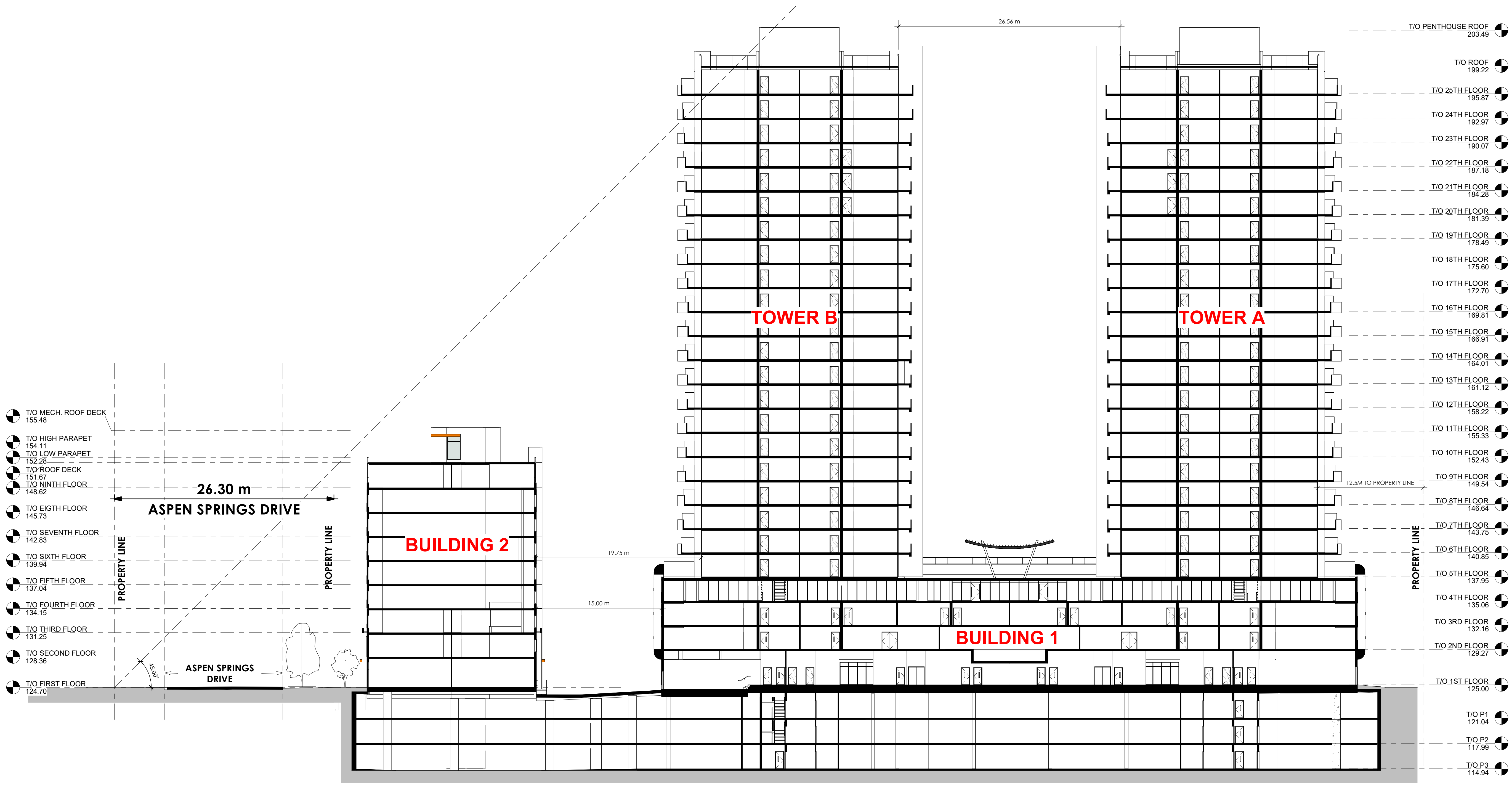

SPA FILE NO. -

1	PROGRESS SET	Date 2
REV	DESCRIPTION	REV. DATE

Drawing Issues/Revisions:

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Architect's Stamp

MATAJ ARCHITECTS
INCORPORATED
418 Iroquois Shore Road, Unit 206.
Oakville Ontario
L6H 0X7
T.905.281.4444

Project:

BOWMANVILLE

10 ASPEN SPRINGS DR.,
BOWMANVILLE, ON L1C 4W7

Sheet Title:

SITE SECTION

Design By:	Drawn By:	Approved By:
EM	BL	EM
Scale: 1 : 250	Date: Issue Date	Project No.: 20-034

Drawing No:

A401

Of:

Drawing Series:

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VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Vaughan, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: A1

EQUIVALENT POPULATION

Project Name: **10 Aspen Springs Drive**
File: 21164
Date: May 2022

Unit Type	Population Density		Residential Units	Other Floor Area (sq.m)	Commercial Floor Area (sq.m)	Equivalent Population
1 Bedroom	1.5	persons per unit	377			566
2 Bedroom	2.5	persons per unit	220			550
3 Bedroom	3.5	persons per unit	10			35
Commercial	86	persons/ha			624.8	6
Total:	2704		**607**	**0**	**625**	**1157**

APPENDIX "B"

Water System Calculations & Details

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Vaughan, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: B1

WATER DEMAND CALCULATION

Project Name: **10 Aspen Springs Drive**
File: 21164
Date: May 2022

Critera:

	Eqv. Population	Base Demand		Peaking Factors	
Residential	1151	364	L/capita/day	Max Day	2.00
				Peak Hour	3.00
Commercial (Retail)	6	364	L/capita/day	Max Day	1.00
				Peak Hour	1.50

Demand:

	Average Day (L/day)	Average Day (L/min)	Max Day (L/min)	Peak Hour (L/min)	
Residential	418,964	290.9	581.9	872.8	
Commercial	2,184	1.5	1.5	2.3	
Total	**421,148**	**292.5**	**583.4**	**875.1**	

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Table B2-1

REQUIRED FIRE FLOW CALCULATION

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 1999

Project Name: **10 Aspen Springs Drive, Bowmanville**
File: 21164
Date: May 2022

Notes: **Residential Tower A & B**
(25 Storey)

Type of Construction - Fire Resistive
C = 0.6

For fire-resistive buildings with 1-hour fire rating, the area shall be the total area of the largest floor plus 25% of each of the two immediately adjoining floors (assuming vertical openings and exterior vertical communications are properly protected):

Floor	Area (sq.m)	%	
Largest Floor Area	2,864.5	100%	(2nd Floor)
Adjacent Upper Adjoining Floor Area	2,671.4	25%	(3rd Floor)
Adjacent Lower Adjoining Floor Area	1,506.5	25%	(1st Floor)
A =	3,909	sq.m	

$F = 220\, C\, \sqrt{A}$
F = 8,253 L/min
F = 8,000 (to nearest 1,000 Lmin)

Occupancy Factor

Type:	Charge
Non-Combustible	-25%
f_1 =	-25%

$F' = F \times (1+f_1)$
F' = 6,000 L/min

Sprinkler Credit

		Charge
NFPA 13 Sprinkler Standard:	YES	-30%
Standard Water Supply:	YES	-10%
Fully Supervised System:	YES	-10%
Total Charge to Fire Flow:	f_2 =	-50%

Exposure Factor		Charge
North Side - Distance to Building (m):	> 45m	0%
East Side - Distance to Building (m):	30 to 45m	5%
South Side - Distance to Building (m):	10 to 20m	15%
West Side - Distance to Building (m):	> 45m	0%
	f_3 =	20% (maximum of 75%)

$F'' = F' + F' \times f_2 + F' \times f_3$
F'' = 4,200 L/min

REQUIRED FIRE FLOW
F'' = **4,000** **L/min** (to nearest 1,000 L/min)

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www.valdor-engineering.com

Table B2-2

REQUIRED FIRE FLOW CALCULATION

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 1999

Project Name: **10 Aspen Springs Drive, Bowmanville**
File: 21164
Date: May 2022

Notes: **Mid-Rise Condominium**
(9 Storey)

Type of Construction - Fire Resistive
C = 0.6

For fire-resistive buildings with 1-hour fire rating, the area shall be the total area of the largest floor plus 25% of each of the two immediately adjoining floors (assuming vertical openings and exterior vertical communications are properly protected):

Floor	Area (sq.m)	%	
Largest Floor Area	1,159.7	100%	(8th Floor)
Adjacent Upper Adjoining Floor Area	1,222.2	25%	(9th Floor)
Adjacent Lower Adjoining Floor Area	1,159.5	25%	(7th Floor)
A =	1,755	sq.m	

$F = 220\, C \sqrt{A}$
F = 5,530 L/min
F = 6,000 (to nearest 1,000 Lmin)

Occupancy Factor

		Charge
Type:	Non-Combustible	-25%
	f_1 =	-25%

$F' = F \times (1+f_1)$
F' = 4,500 L/min

Sprinkler Credit

		Charge
NFPA 13 Sprinkler Standard:	YES	-30%
Standard Water Supply:	YES	-10%
Fully Supervised System:	YES	-10%
Total Charge to Fire Flow:	f_2 =	-50%

Exposure Factor		Charge
North Side - Distance to Building (m):	10 to 20m	15%
East Side - Distance to Building (m):	30 to 45m	5%
South Side - Distance to Building (m):	30 to 45m	5%
West Side - Distance to Building (m):	> 45m	0%
	f_3 =	25% (maximum of 75%)

$F'' = F' + F' \times f_2 + F' \times f_3$
F'' = 3,375 L/min

REQUIRED FIRE FLOW
F'' = **3,000** **L/min** (to nearest 1,000 L/min)

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www.valdor-engineering.com

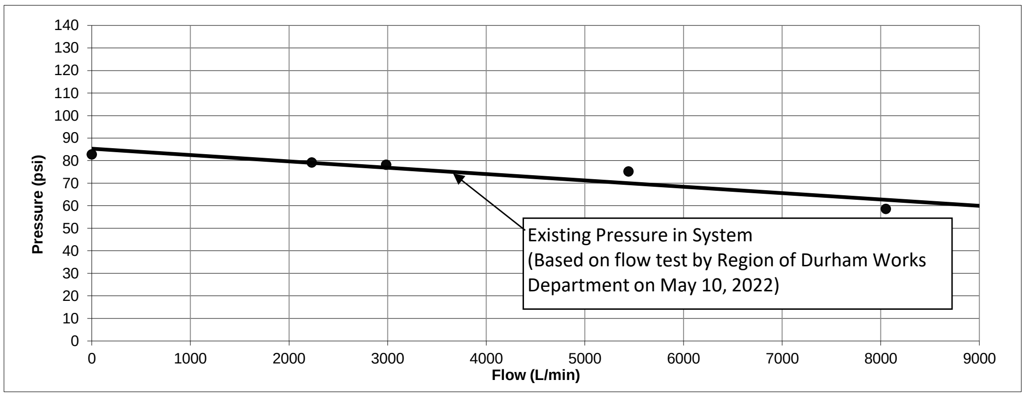
TABLE B3

Water Supply Calculation

Project Name: **10 Aspen Springs Drive, Bowmanville**
File: 21164
Date: May 2022

Hydrant Flow Test Results
Residual Location: 10 Aspen Springs Drive, Bowmanville

Number of Outlets & Orifice Size	Flow (IGPM)	Flow (L/min)	Residual Pressure (psi)
0	0	0	82.7
1 x 1 1/2	490.5	2230	79.2
1 x 1 3/4	656.4	2984	78.2
1 x 2 1/2	1197.0	5442	75.2
2 x 2 1/2	1770.9	8051	58.6



$$Q_r = Q_t \times \left(\frac{P_s - Pr}{P_s - Pt}\right)^{0.54}$$

Re-aranged to: $P_r = P_s - (Ps - Pt)\sqrt[0.54]{Q_r/Q_t}$

Where,
Q_r= Projected Flow Rate at the Desired Pressure
Q_t= Flow Rate from Flow Test
P_s= Static Pressure
P_r= Desired Residual Pressure
P_t= Residual Pressure inTest

Q_t= 8051 L/min
P_t= 58.6 psi
P_s= 82.7 psi

Maximum Day Domestic Demand =	583.4	L/min	(from Domestic Demand Calculation)
Domestic Peak Hour Flow to Satisfy (Q_{r2})=	875.1	L/min	(from Domestic Demand Calculation)
Fire Flow Requirement =	4,000	L/min	(from Fire Flow Calculation)
Fire Flow + Max Day (Q_{r1})=	4,583	L/min	
Minimum Req. Pressure for Fire-Flow =	140	kPa	
=	20.3		
System Provided Pressure at min. firelow + max. day (P_{r1})=	74.2	psi	
	511.7	kPa	
System Provided Pressure at Peak Hour Flow (P_{r2})=	82.3	psi	
	567.5	kPa	

THE REGIONAL MUNICIPALITY OF DURHAM

WORKS DEPARTMENT

FLOW TEST SUMMARY AND RESULTS

Requested by: David Giugovaz	Account No.:
Company: Valdor Engineering Inc.	
Address: 571 Chrislea Road, Unit 4	Telephone: 416-518-0431
Woodbridge, Ontario	Email: dgiugovaz@valdor-engineering.com
L4L 8A2	

Test Location: 10 Aspen Springs Dr

Municipality: Town of Bowmanville

Date: 10-May-22 Time: 10:30AM Conducted by: K.J

Flow Hydrant: A532

Monitoring Hydrant: A531

Nozzle Size (in.)	Residual Pressure (p.s.i.)		Pitot Guage	
	Field Reading @ Monitoring Hydrant	Actual @ Flow Hydrant (adjusted)*	Pressure (p.s.i.)	Flow (i.g.p.m.)
STATIC	75.6	82.7		0.0
1-1/2	72.1	79.2	77.9	490.5
1-3/4	71.1	78.2	75.3	656.4
2-1/2	68.1	75.2	73.1	1197.0
2 x 2-1/2	51.5	58.6	40.0	1770.9

* Calculation based on gain/loss in pressure due to elevation difference between flow & monitoring hydrants

Hydrant Elevations (ft.)	
Flow Hydrant:	390.4
Static Hydrant:	406.8
Difference:	-16.4
Pressure Diff. (p.s.i.):	-7.1

Comments:

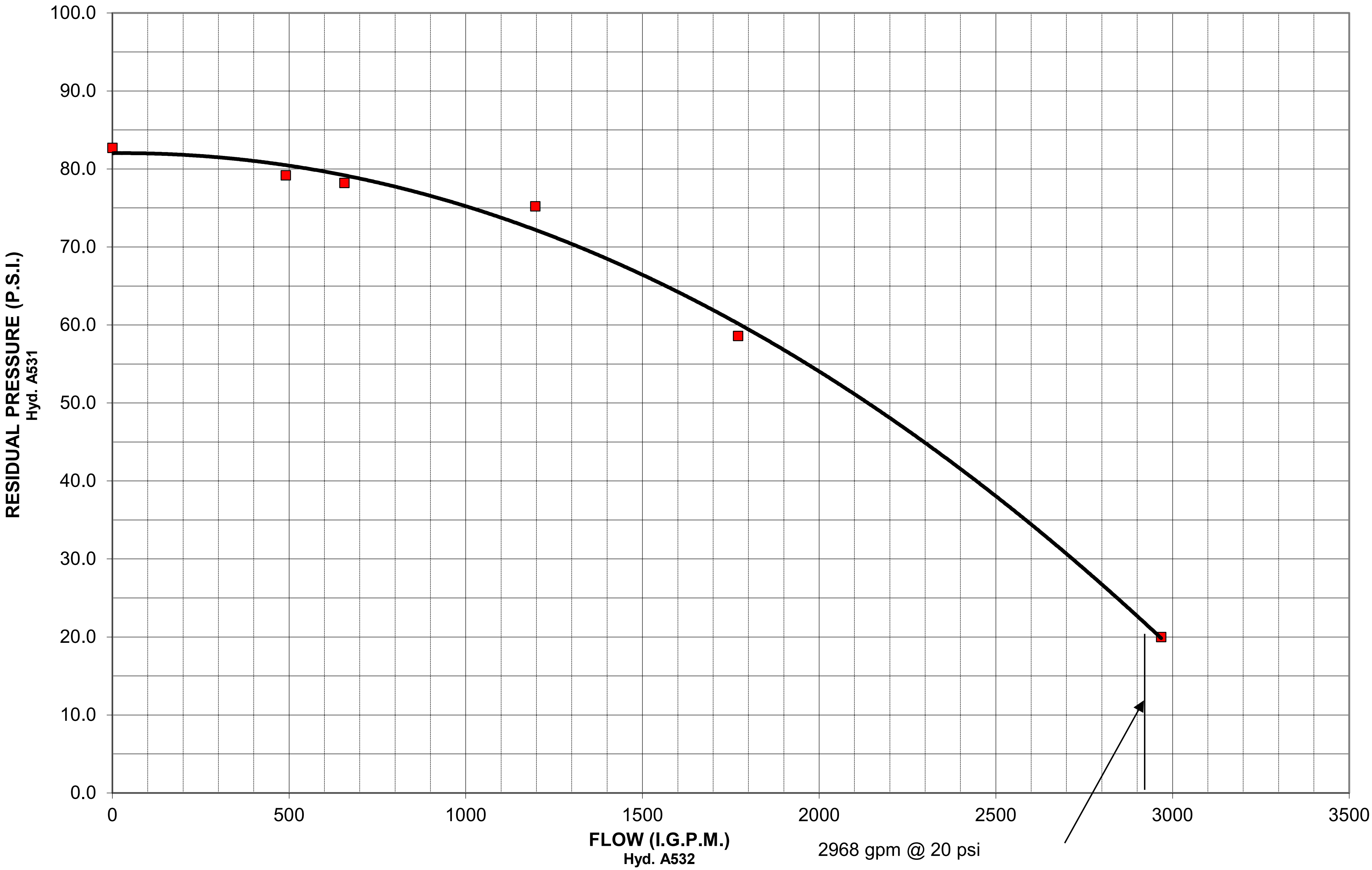
Flow for 1-1/2 & 1-3/4 nozzle calculated using Discharge of smooth nozzles

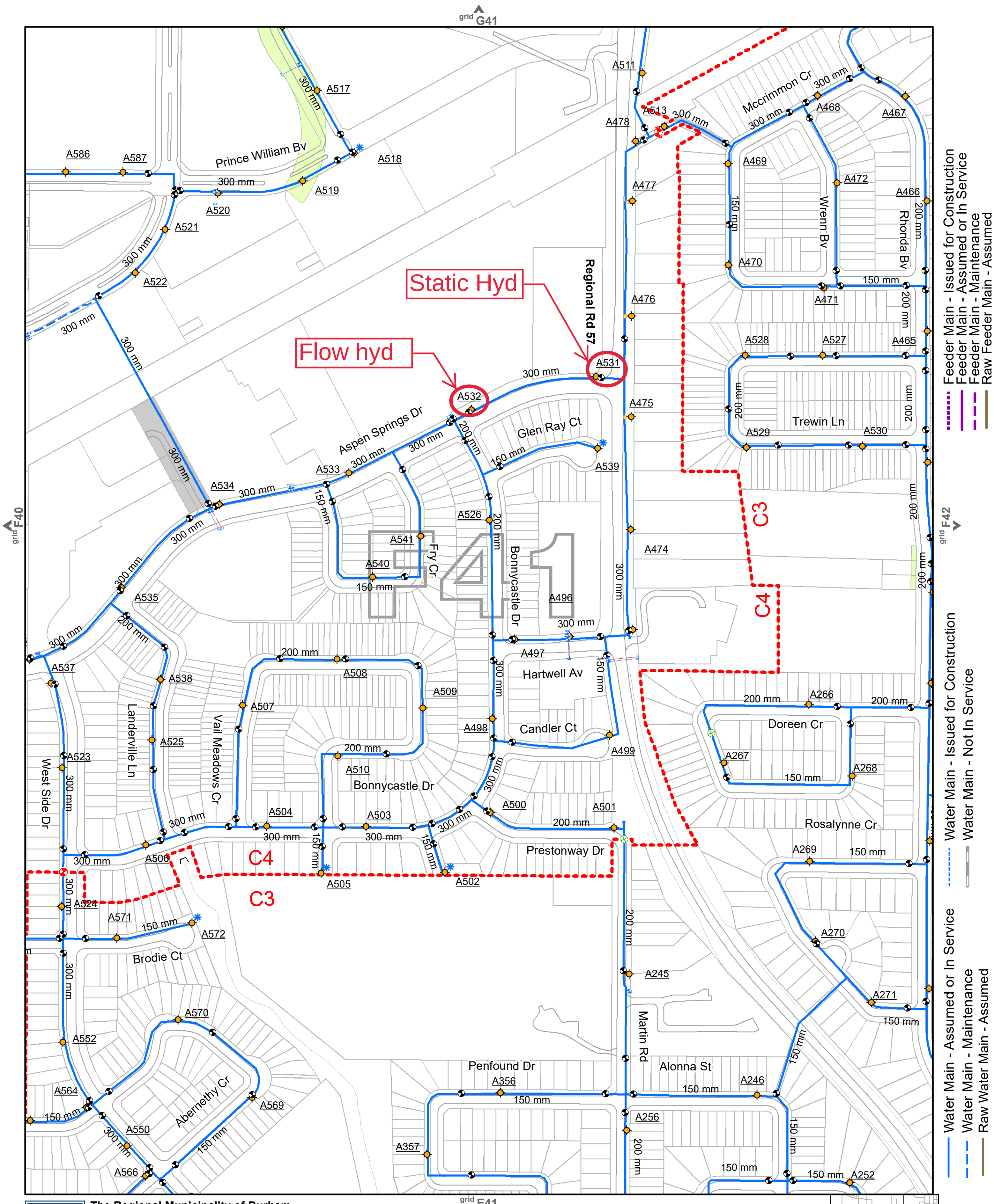
Flow for 2-1/2 nozzle calculated using Discharge for circular outlets

Results	
Static Pressure	82.7
Flow at 20 p.s.i. (I.g.p.m.):	2968 (approx.)
Checked by:	

FIRE FLOW TEST
(Graph of Residual Pressure vs. Hydrant Flow)

Location: 10 Aspen Springs Dr
Municipality: Bowmanville
Date: May 10, 2022





The Regional Municipality of Durham
Works Department
Water Supply System

DURHAM REGION

CLARINGTON (Bowmanville)

1:5,000

0 25 50 100 150 200 Meters

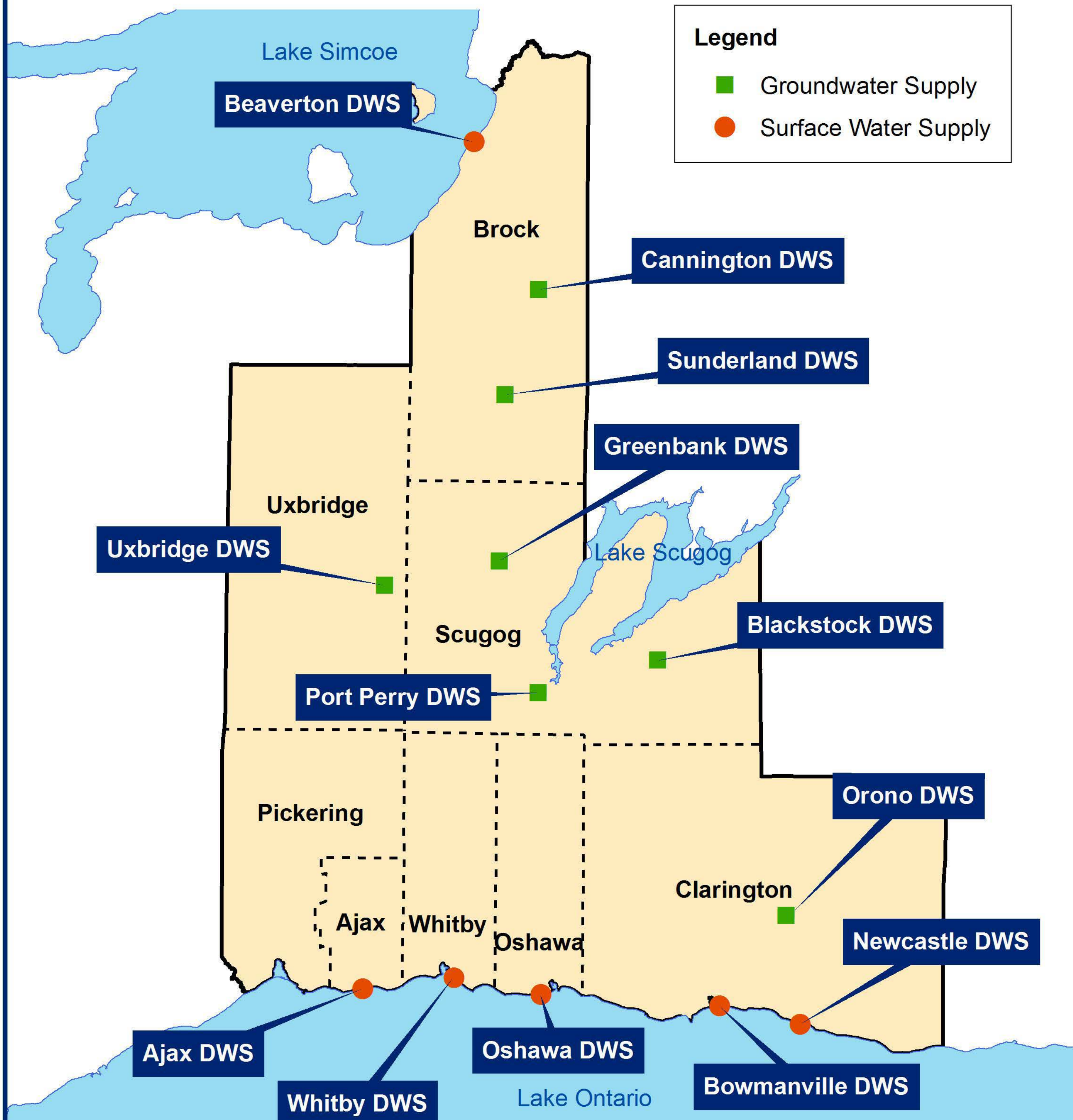
All dimensions are in mm unless otherwise noted.

March 25, 2022

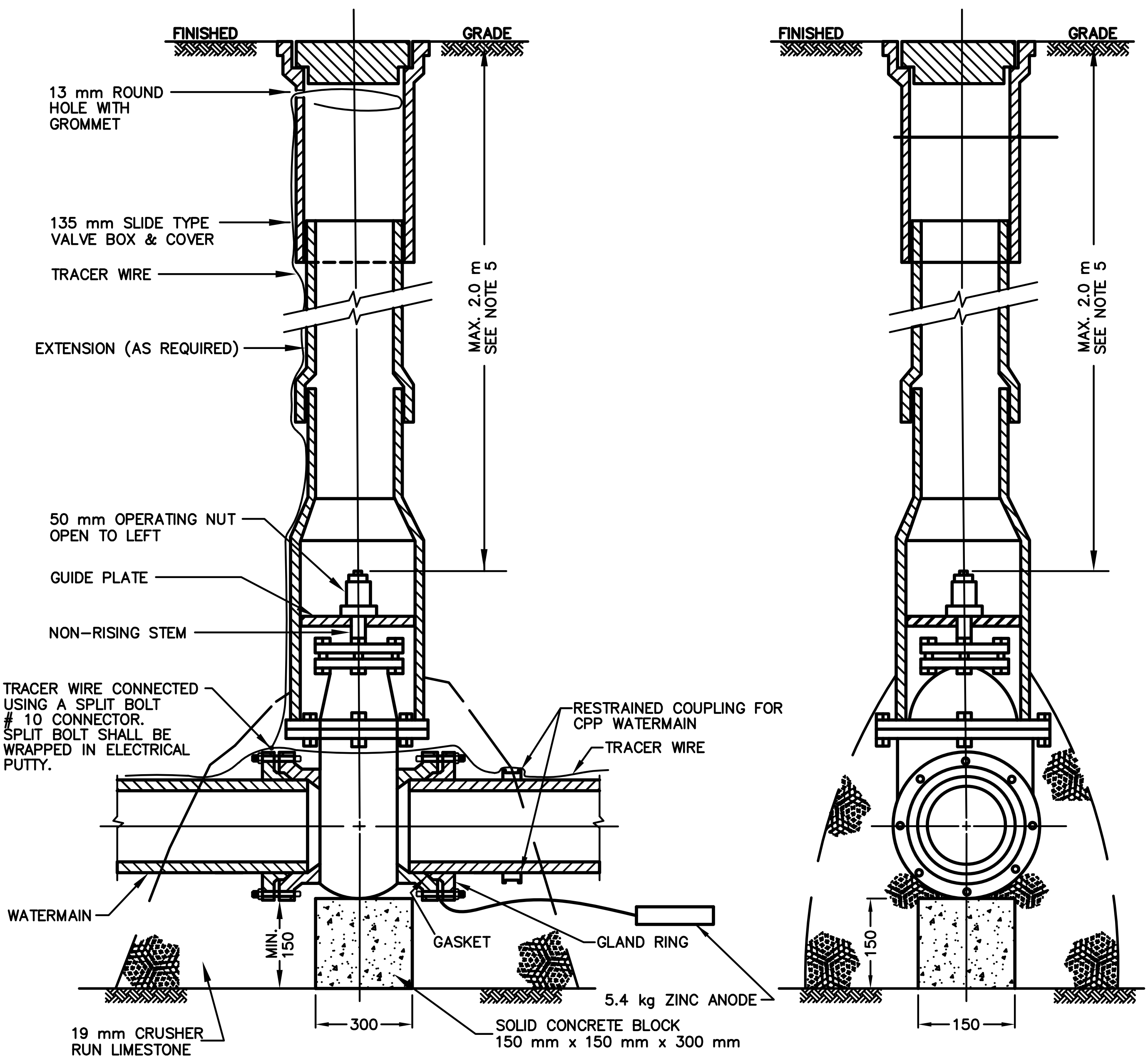
Servicing Note:
THIS MAP DEPICTS LOCAL PROXIMITY OF SERVICES ONLY. IT IS NOT TO BE USED TO DETERMINE INDIVIDUAL SITE SERVICING AVAILABILITY OR AVAILABILITY OF CAPACITY WITHIN THE SYSTEM. FOR DETAILED SITE SERVICING INFORMATION PLEASE CONTACT THE DEVELOPMENT APPROVALS SECTION OF THE WORKS DEPARTMENT.

G40	G41	G42
F40	F41	F42
E40	E41	E42

Regional Municipality of Durham Works Department Municipal Drinking Water Supply System (DWS)



SLIDE TYPE



NOTES

1. VALVE BOX SHALL BE ADEQUATELY BRACED WHILE BACKFILLING AND MUST REMAIN PLUMB.
2. VALVE BOX EXTENSION SHALL BE USED ONLY IF REQUIRED.
3. REFER TO "STANDARD SPECIFICATIONS FOR THE CONSTRUCTION OF WATERMAINS" FOR PLACEMENT OF MARKER STAKES.
4. VALVE SHALL BE COMPLETELY BACKFILLED WITH 19 mm CRUSHER RUN LIMESTONE..
5. ALL INLINE VALVES INSTALLED ON PVC WATERMAIN SHALL BE RESTRAINED AS PER S-200.060, UNLESS OTHERWISE NOTED.
6. IF VALVE BOX IS LOCATED IN A GRAVEL AREA, A 1.0 m x 1.0 m x 50 mm ASPHALT COLLAR SHALL BE INSTALLED.
7. TRACER WIRE COATED, 7 STRAND, 12 GAUGE TW75, TWU75 OR RW90 XLPE WIRE RATED AT MINUS 40° C.
8. TRACER WIRE SHALL BE INSTALLED OUTSIDE VALVE BOX AND BROUGHT INTO UPPER SECTION THROUGH 13 mm ROUND HOLE. LENGTH OF TRACER WIRE INSIDE VALVE BOX TO BE 450 mm MIN.
9. TRACER WIRE SHALL BE INSTALLED IN ALL P.V.C. AND C.P.P. MAIN LINE VALVE BOXES.
10. CATHODIC PROTECTION, BONDING CABLE AND TRACER WIRE SHALL BE AS PER S-201.030, S-201.031.
11. BUTTERFLY VALVES ARE NOT PERMITTED.

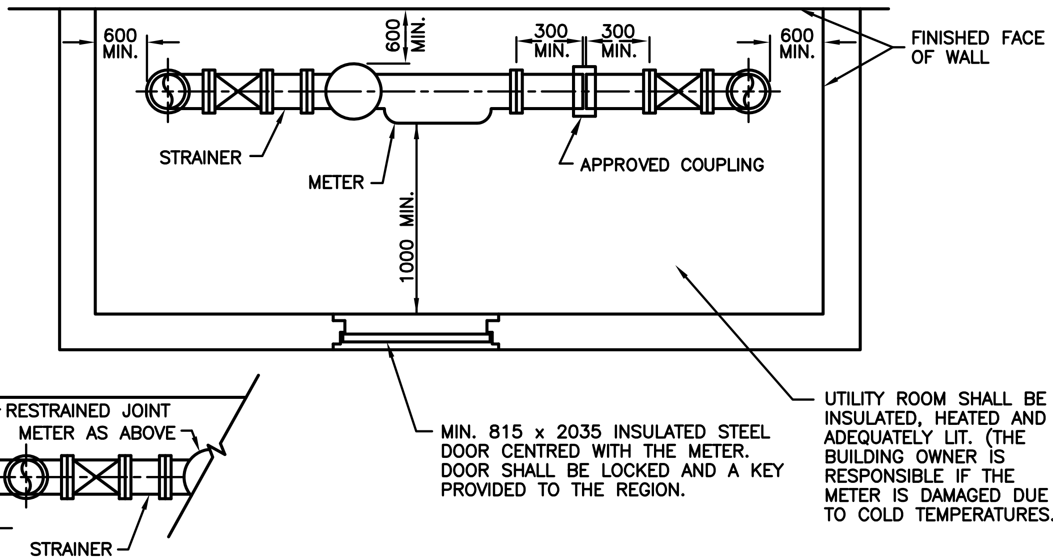
ALL DIMENSIONS IN MILLIMETRES EXCEPT WHERE NOTED.

DURHAM REGION
WORKS DEPARTMENT

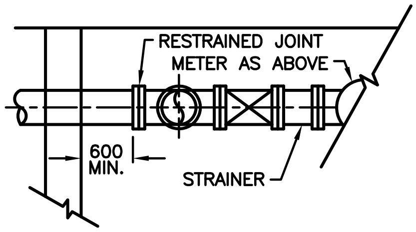
100 mm TO 400 mm GATE VALVE, VALVE BOX AND TRACER WIRE ARRANGEMENT FOR PVC OR CPP WATERMAIN

DWG. DATE: 1991 11
REVISION NO.: 22
REV. DATE: 2020 04
SCALE: N.T.S.

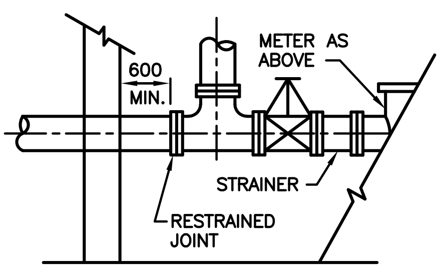
S-220.010



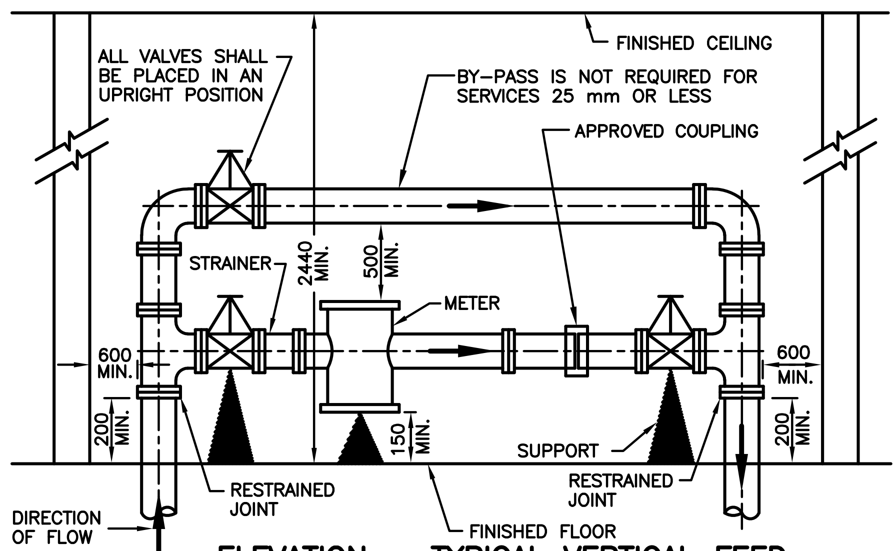
PLAN – TYPICAL VERTICAL FEED



PLAN – TYPICAL HORIZONTAL FEED



ELEVATION – TYPICAL HORIZONTAL FEED



ELEVATION – TYPICAL VERTICAL FEED

NOTES

1. BY-PASS PIPE SHALL BE :
   (A) THE SAME SIZE AS THE INCOMING PIPE.
   (B) REQUIRED ON ALL SERVICES FOR MULTI-RESIDENTIAL, COMMERCIAL, INSTITUTIONAL AND INDUSTRIAL BUILDINGS.
   (C) REQUIRED ON RESIDENTIAL SERVICES LARGER THAN 25 mm.
2. MINIMUM CLEARANCES SHOWN FOR WALL MOUNTED BY-PASS SHALL BE APPLIED TO FLOOR MOUNTED BY-PASS.
3. STRAINERS SHALL BE REQUIRED FOR METERS 75 mm AND LARGER.
4. ALL JOINTS SHALL BE MECHANICALLY RESTRAINED.
5. METER AND VALVES SHALL BE SUPPORTED AS DIRECTED BY THE REGION OF DURHAM.
6. ALL METER ROOMS ARE PRIVATELY OWNED, HOWEVER, ALL METER ROOMS SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH REGION OF DURHAM WORKS DEPARTMENT DESIGN CRITERIA.
7. WHEN BACKFLOW PREVENTION IS REQUIRED, REFER TO S-240.040, S-240.041, S-240.050 AND S-240.051.
8. WHEN MORE THAN ONE WATER SUPPLY IS GOING THROUGH THE BUILDING, THERE SHALL BE A MINIMUM DISTANCE OF 600 mm BETWEEN PIPES.
9. PROVISION IS TO BE MADE FOR THE DISPOSAL OF WATER USED FOR IN PLACE TESTING EITHER THROUGH FLOOR DRAIN OR THE 125mm FERRULE.
10. IF HOT WATER TANK IS WITHIN 3.0m OF METER, THEN A CHECK VALVE IS REQUIRED BETWEEN THE METER AND HOT WATER TANKS.
11. WHERE METER ROOM IS NOT ADJACENT TO AN OUTSIDE WALL OR IS BELOW EXTERIOR FINISHED GRADE, THE CONTRACTOR/APPLICANT SHALL PROVIDE A CONTINUOUS 12mm E.M.T. CONDUIT COMPLETE WITH NYLON FISH LINE FROM METER ROOM TO 1000mm ABOVE EXTERIOR FINISHED GRADE.
12. METER SHALL BE ACCESSIBLE AT ALL TIMES.
13. RESTRAIN FITTINGS AND PIPE MATERIAL SHALL BE AS PER THE ONTARIO BUILDING CODE.
14. ALL VALVES SHALL BE PLACED IN AN UPRIGHT POSITION.
15. BY-PASS VALVE SHALL BE CHAINED OR SUPERVISED IN THE CLOSED POSITION.
16. REFER TO S-240.030 FOR BUILDING CONTROL VALVE LOCATION.

ALL DIMENSIONS IN MILLIMETRES EXCEPT WHERE NOTED.

DURHAM REGION WORKS DEPARTMENT	WATER METER ROOM LAYOUT	DWG. DATE: 1988 09 REVISION NO.: 10 REV. DATE: 2017 04 SCALE: N.T.S. S-240.020

APPENDIX "C"

Wastewater Calculations & Details

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Vaughan, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: C1

Wastewater Loading Calculation

Project Name: **10 Aspen Springs Drive**
File: 21164
Date: May 2022

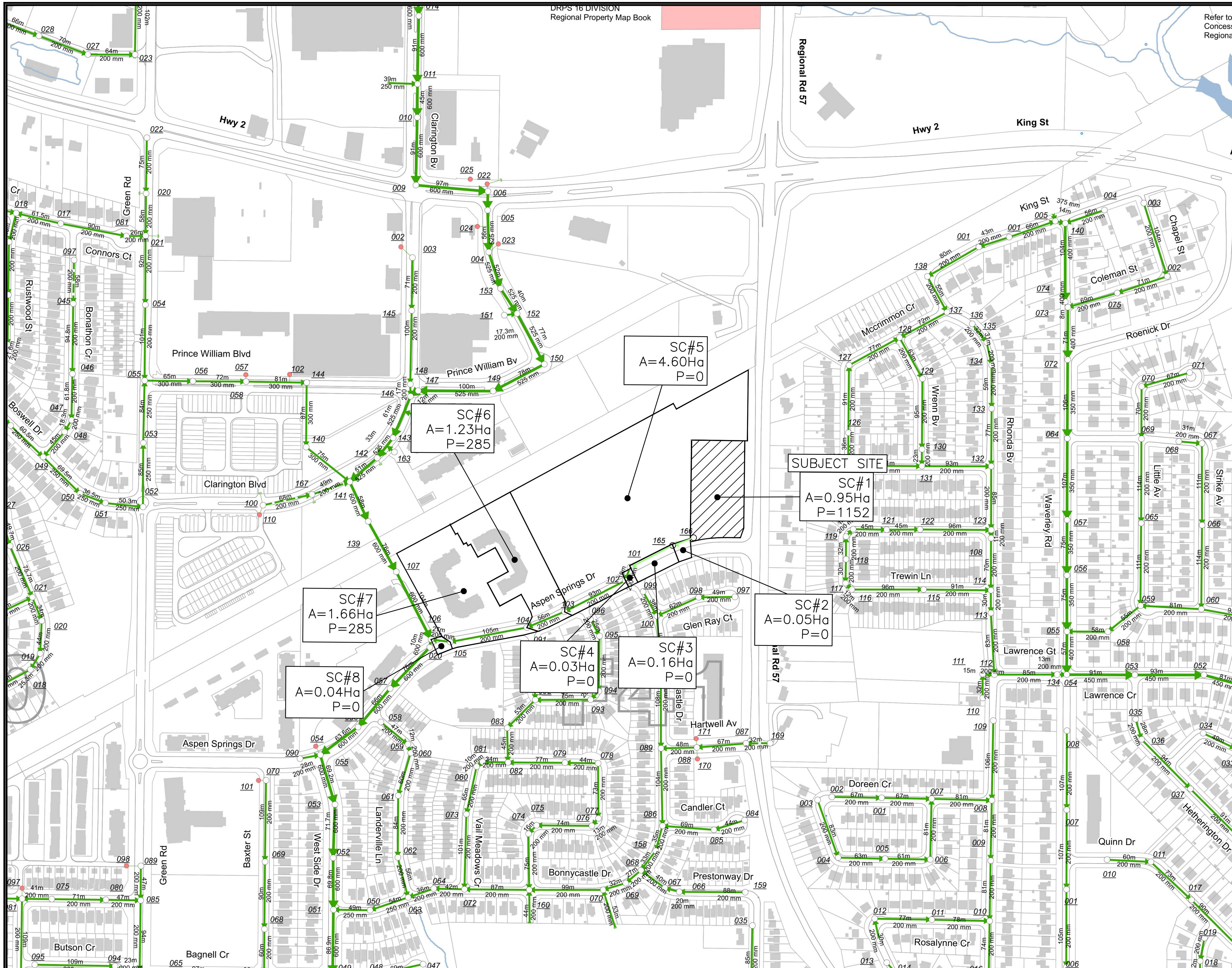
Criteria:

Peak flow design parameters

Avg. Flow Rate (Residential): 364 L/person/day
Design Flow Rate (Commercial) 2.08 L/s/ha

Infiltration Rate: 0.26 L/s/ha
Residential Peaking Factor: 1 + (14 / (4+(P/1000)^0.5)) where P is population in thousands
Peaking Factor to be Min 2.0, Max 4.0

	Site Area (ha.)	Residential Equivalent Population	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Infiltration (L/s)	Total Peak Flow (L/s)
Condominium/Townhome	0.9520	1151.0	4.828	3.76	18.15	0.248	18.41
	Floor Area (ha)	**Commercial**					
Retail	0.0620	6.0	0.130	Incl.	Incl.	Incl.	0.13
TOTAL	**1.0140**	**1157.0**					**18.54**



PROJECT

PROPOSED RESIDENTIAL DEVELOPMENT

10 ASPEN SPRINGS
COMMUNITY OF BOWMANVILLE
MUNICIPALITY OF CLARINGTON
REGION OF DURHAM

SANITARY ANALYSIS

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 CHRISLEA ROAD, UNIT 4, 2nd FLOOR WOODBRIDGE ONTARIO, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PREPARED BY	T.Z.	CKD. BY	D.G.
SCALE	N.T.S.	DATE	MAY 2022
PROJECT	21164	DWG.	FIGURE C1

TABLE C-2

Existing Sanitary Sewer Capacity Calculation

CRITERIA:		
Office	3.3	persons/100 sq.m
Retail, Commercial =	1.1	persons/100 sq.m
School, Church, Commercialk =	86	persons/ha Lot
Industrial =	136	persons/ha Lot
Hospital =	1	person/30 sq.m
Single Family =	3.5	persons/unit
Semi-Detached =	3.5	persons/unit
Townhouse =	3.0	persons/unit
Duplex =	3.0	persons/unit
Triplex =	3.7	persons/unit
Apartments or Condo:		
Existing Apartment=	2.7	persons/unit
Bachelor =	1.5	persons/unit
1 Bedroom =	1.5	persons/unit
2 Bedroom =	2.5	persons/unit
3 Bedroom =	3.5	persons/unit
4 Bedroom or greater =	4.5	persons/unit

Subject Site Area (ha)	0.95
Existing Retail Area (sq.m)	0
Existing Site Population	0

Ex.MH.166 to Ex.MH.165	**Commercial** (sq.m GFA)	**Single Family** (units)	**Semi Detached** (units)	**Townhouse** (units)	**Existing Apartment** (units)	**Retail** (sq.m)	**Hospital** (sq.m)	**Industrial** (ha)	**School** (ha)	**Church** (ha)	**Bachelor** (units)	**1 Bed** (units)	**2 Bed** (units)	**3 Bed** (units)	**Res.Equiv. Population** (persons)	**ICI Equiv. Population** (persons)	**Area** (ha.)
SC#1 - Subject Site	625											377	220	10	1151	6	0.95
SC#2																	0.05
Total															**1151**	**6**	**0.95**

Ex.MH.165 to Ex.MH.101	**Office** (sq.m GFA)	**Single Family** (units)	**Semi Detached** (units)	**Townhouse** (units)	**Existing Apartment** (units)	**Retail** (sq.m)	**Hospital** (sq.m)	**Industrial** (ha)	**School** (ha)	**Church** (ha)	**Bachelor** (units)	**1 Bed** (units)	**2 Bed** (units)	**3 Bed** (units)	**Res.Equiv. Population** (persons)	**ICI Equiv. Population** (persons)	**Area** (ha.)
SC#3															0	0	0.16
Total															**0**	**0**	**0.16**

Ex.MH.101 to EX.MH.102	**Office** (sq.m GFA)	**Single Family** (units)	**Semi Detached** (units)	**Townhouse** (units)	**Existing Apartment** (units)	**Retail** (sq.m)	**Hospital** (sq.m)	**Industrial** (ha)	**School** (ha)	**Church** (ha)	**Bachelor** (units)	**1 Bed** (units)	**2 Bed** (units)	**3 Bed** (units)	**Res.Equiv. Population** (persons)	**ICI Equiv. Population** (persons)	**Area** (ha.)
SC#4															0	0	0.03
Total															**0**	**0**	**0.03**

Ex.MH.102 to EX.MH.103	**Office** (sq.m GFA)	**Single Family** (units)	**Semi Detached** (units)	**Townhouse** (units)	**Existing Apartment** (units)	**Retail** (sq.m)	**Hospital** (sq.m)	**Industrial** (ha)	**School** (ha)	**Church** (ha)	**Bachelor** (units)	**1 Bed** (units)	**2 Bed** (units)	**3 Bed** (units)	**Res.Equiv. Population** (persons)	**ICI Equiv. Population** (persons)	**Area** (ha.)
SC#5															0	0	4.60
Total															**0**	**0**	**4.60**

Ex.MH.103 to EX.MH.104	**Office** (sq.m GFA)	**Single Family** (units)	**Semi Detached** (units)	**Townhouse** (units)	**Existing Apartment** (units)	**Retail** (sq.m)	**Hospital** (sq.m)	**Industrial** (ha)	**School** (ha)	**Church** (ha)	**Bachelor** (units)	**1 Bed** (units)	**2 Bed** (units)	**3 Bed** (units)	**Res.Equiv. Population** (persons)	**ICI Equiv. Population** (persons)	**Area** (ha.)
SC#6													114		285	0	1.23
Total															**285**	**0**	**1.23**

Ex.MH.104 to EX.MH.105	**Office** (sq.m GFA)	**Single Family** (units)	**Semi Detached** (units)	**Townhouse** (units)	**Existing Apartment** (units)	**Retail** (sq.m)	**Hospital** (sq.m)	**Industrial** (ha)	**School** (ha)	**Church** (ha)	**Bachelor** (units)	**1 Bed** (units)	**2 Bed** (units)	**3 Bed** (units)	**Res.Equiv. Population** (persons)	**ICI Equiv. Population** (persons)	**Area** (ha.)
SC#7													114		285	0	1.66
Total															**285**	**0**	**1.66**

Ex.MH.105 to EX.MH.106	**Office** (sq.m GFA)	**Single Family** (units)	**Semi Detached** (units)	**Townhouse** (units)	**Existing Apartment** (units)	**Retail** (sq.m)	**Hospital** (sq.m)	**Industrial** (ha)	**School** (ha)	**Church** (ha)	**Bachelor** (units)	**1 Bed** (units)	**2 Bed** (units)	**3 Bed** (units)	**Res.Equiv. Population** (persons)	**ICI Equiv. Population** (persons)	**Area** (ha.)
SC#8															0	0	0.04
Total															**0**	**0**	**0.04**

Regional Municipality of Durham

TABLE C-3

PRE-DEVELOPMENT SANITARY DESIGN SHEET

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Vaughan, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069

Prepared By: Joo Ho Kim, B.Eng
Checked: David Giaugovaz, P.Eng
File No.: 21164, 10 Aspen Springs Drive
Date Revised: May 2022

$$K = 1 + \frac{14}{4+\sqrt{P}} \quad \text{where } P \text{ in 1000's}$$

$$Q(p) = \frac{P \times q \times K}{86.4} \quad \text{in } (l/s) \text{ where } q = 0.0042\ L/s/capita$$

$$Q(i) = i \times A \quad \text{in } (l/s)$$

Single Family, Semi-Detached, & Links - Density:	3.5	people/unit
Townhouse & Duplexes - Density:	3.0	people/unit
Apartment Density:		
One Bedroom or Smaller (Bachelor):	1.5	people/unit (average)
Two Bedrooms:	2.5	people/unit (average)
Three Bedrooms:	3.5	people/unit (average)
Four Bedrooms or Larger:	4.5	people/unit (average)
Minimum Velocity:	0.6	m/s (actual Flow)
Maximum Velocity:	3.65	m/s
Average Residential Flow, q:	364	l/day/capita
Residential Infiltration, i:	0.26	l/s/ha
Retail, Office, Commercial Flow, q:	2.08	l/s/ha
Industrial (Local Sanitary Sewers), q:	2.08	l/s/ha
Industrial (Trunk Sanitary Sewers), q:	1.04	l/s/ha
Schools, Institutions, Church, q:	1.29	l/s/ha

Street	from M.H.	to M.H.	RESIDENTIAL Pop'n P	Accum. Pop'n P	Peaking Factor K	Peak Flow Q(p) (l/s)	INFILTRATION Area (ha)	Accum. Area (ha)	Peak Flow Q(i) (l/s)	COMMERCIAL Area (ha)	Accum. Area (ha)	Peak Flow Q(inst) (l/s)	INDUSTRIAL Area (ha)	Accum. Area (ha)	Peak Flow Q(inst) (l/s)	SCHOOL/CHURCH Area (ha)	Accum. Area (ha)	Peak Flow Q(inst) (l/s)	FLOW Total Design Flow Q_d (l/s)	SEWER DESIGN & ANALYSIS Pipe Length L (m)	Nominal Diameter d (mm)	Pipe Slope S (%)	Nominal Full Flow Capacity Q_f (l/s)	Nominal Full Flow Velocity V_f (m/s)	Fraction of Full Flow Qd/Qf	Actual Flow Velocity V (m/s)	Remarks
Aspen Springs Drive	Site	EX.MH.166	0.0	0.0	3.800	0.00	0.952	0.952	0.25	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000	0.00	0.25	-	-	-	-	-	-	-	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.166	EX.MH.165	0	0	3.800	0.00	0.050	1.002	0.26	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000	0.00	0.26	29.4	200	3.60%	62.2	1.98	0.00	0.48	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.165	EX.MH.101	0	0	3.800	0.00	0.160	1.162	0.30	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000	0.00	0.30	62.3	200	1.80%	44.0	1.40	0.01	0.40	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.101	EX.MH.102	0	0	3.800	0.00	0.030	1.192	0.31	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000	0.00	0.31	19.0	200	1.31%	37.5	1.19	0.01	0.36	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.102	EX.MH.103	0	0	3.800	0.00	4.600	5.792	1.51	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000	0.00	1.51	93.2	200	3.00%	56.8	1.81	0.03	0.78	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.103	EX.MH.104	285	285	3.800	4.56	1.230	7.022	1.83	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000	0.00	6.39	55.6	200	1.50%	40.2	1.28	0.16	0.93	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.104	EX.MH.105	285	570	3.800	9.13	1.660	8.682	2.26	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000	0.00	11.38	105.4	200	1.50%	40.2	1.28	0.28	1.10	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.105	EX.MH.106		570	3.800	9.13	0.040	8.722	2.27	0.000	0.000	0.00	0.000	0.000	0.00	0.000	0.000	0.00	11.39	26.6	200	0.50%	23.2	0.74	0.49	0.73	**See Detailed Calc for Population**

Regional Municipality of Durham

Table C-4

PRE-DEVELOPMENT SANITARY DESIGN SHEET

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Vaughan, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069

Prepared By: Joo Ho Kim, B.Eng
Checked: David Giaugovaz, P.Eng
File No.: 21164, 10 Aspen Springs Drive
Date Revised: May 2022

$$K = 1 + \frac{14}{4+\sqrt{P}} \quad where\ P\ in\ 1000's$$

$$Q(p) = \frac{P \times q \times K}{86.4} \quad in\ (l/s)\ where\ q = 0.0042\ L/s/capita$$

$$Q(i) = i \times A \quad in\ (l/s)$$

Single Family, Semi-Detached, & Links - Density:	3.5	people/unit
Townhouse & Duplexes - Density:	3.0	people/unit
Apartment Density:		
One Bedroom or Smaller (Bachelor):	1.5	people/unit (average)
Two Bedrooms:	2.5	people/unit (average)
Three Bedrooms:	3.5	people/unit (average)
Four Bedrooms or Larger:	4.5	people/unit (average)
Minimum Velocity:	0.6	m/s (actual Flow)
Maximum Velocity:	3.65	m/s
Average Residential Flow, q:	364	l/day/capita
Residential Infiltration, i:	0.26	l/s/ha
Retail, Office, Commercial Flow, q:	2.08	l/s/ha
Industrial (Local Sanitary Sewers), q:	2.08	l/s/ha
Industrial (Trunk Sanitary Sewers), q:	1.04	l/s/ha
Schools, Institutions, Church, q:	1.29	l/s/ha

Street	from M.H.	to M.H.	RESIDENTIAL Pop'n P	RESIDENTIAL Accum. Pop'n P	RESIDENTIAL Peaking Factor K	RESIDENTIAL Peak Flow Q(p) (l/s)	INFILTRATION Area (ha)	INFILTRATION Accum. Area (ha)	INFILTRATION Peak Flow Q(i) (l/s)	COMMERCIAL Area (ha)	COMMERCIAL Accum. Area (ha)	COMMERCIAL Peak Flow Q(inst) (l/s)	INDUSTRIAL Area (ha)	INDUSTRIAL Accum. Area (ha)	INDUSTRIAL Peak Flow Q(inst) (l/s)	SCHOOL/CHURCH Area (ha)	SCHOOL/CHURCH Accum. Area (ha)	SCHOOL/CHURCH Peak Flow Q(inst) (l/s)	FLOW Total Design Flow Q_d (l/s)	Pipe Length L (m)	Nominal Diameter d (mm)	Pipe Slope S (%)	Nominal Full Flow Capacity Q_f (l/s)	Nominal Full Flow Velocity V_f (m/s)	Fraction of Full Flow Qd/Qf	Actual Flow Velocity V (m/s)	Remarks
Aspen Springs Drive	SUBJECT SITE	PROP.MH.2A	1151	1151	3.760	18.23	0.952	0.952	0.25	0.062	0.062	0.13	0.000	0.000	0.00	0.000	0.000	0.00	18.61		-	-	-	-	-	-	**See Detailed Calc for Population**
Aspen Springs Drive	PROP.MH.2A	EX.MH.166	0	1151	3.760	18.23	0.000	0.952	0.25	0.000	0.062	0.13	0.000	0.000	0.00	0.000	0.000	0.00	18.61	11.0	200	3.40%	60.5	1.93	0.31	1.69	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.166	EX.MH.165	0	1151	3.760	18.23	0.050	1.002	0.26	0.000	0.062	0.13	0.000	0.000	0.00	0.000	0.000	0.00	18.62	29.4	200	3.60%	62.2	1.98	0.30	1.73	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.165	EX.MH.101	0	1151	3.760	18.23	0.160	1.162	0.30	0.000	0.062	0.13	0.000	0.000	0.00	0.000	0.000	0.00	18.66	62.3	200	1.80%	44.0	1.40	0.42	1.34	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.101	EX.MH.102	0	1151	3.760	18.23	0.030	1.192	0.31	0.000	0.062	0.13	0.000	0.000	0.00	0.000	0.000	0.00	18.67	19.0	200	1.31%	37.5	1.19	0.50	1.19	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.102	EX.MH.103	0	1151	3.760	18.23	4.600	5.792	1.51	0.000	0.062	0.13	0.000	0.000	0.00	0.000	0.000	0.00	19.87	93.2	200	2.98%	56.6	1.80	0.35	1.64	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.103	EX.MH.104	285	1436	3.693	22.34	1.230	7.022	1.83	0.000	0.062	0.13	0.000	0.000	0.00	0.000	0.000	0.00	24.30	55.6	200	1.48%	39.9	1.27	0.61	1.33	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.104	EX.MH.105	285	1721	3.636	26.36	1.660	8.682	2.26	0.000	0.062	0.13	0.000	0.000	0.00	0.000	0.000	0.00	28.75	105.4	200	1.49%	40.0	1.27	0.72	1.39	**See Detailed Calc for Population**
Aspen Springs Drive	EX.MH.105	EX.MH.106	0	1721	3.636	26.36	0.040	8.722	2.27	0.000	0.062	0.13	0.000	0.000	0.00	0.000	0.000	0.00	28.76	26.6	200	0.51%	23.4	0.75	1.23	0.76	**See Detailed Calc for Population**

VALDOR ENGINEERING INC.

Project: 10 Aspen Springs Dr, Bowmanville

File:21164

Date: May 2022

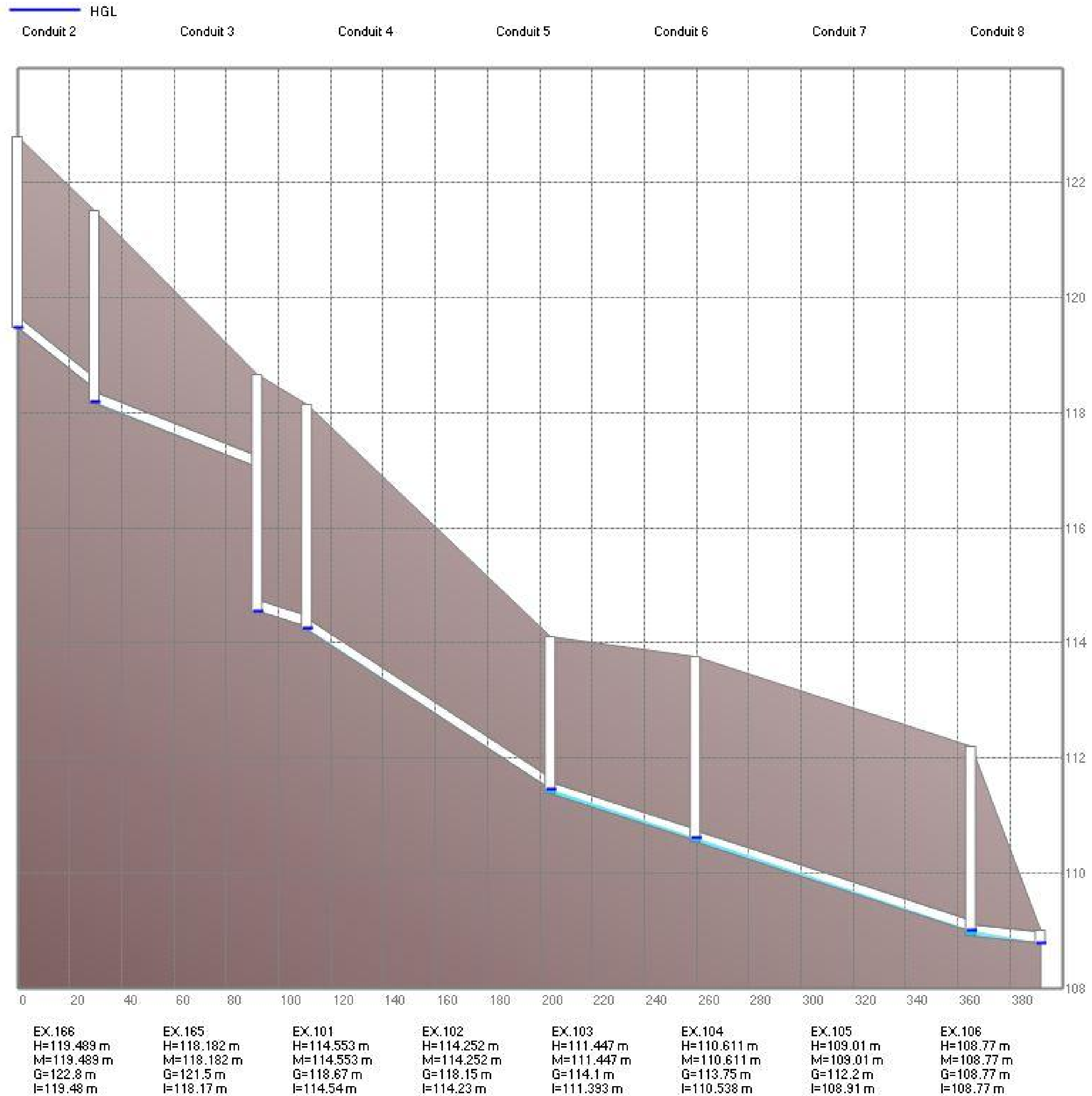
Table C-5

Sanitary HGL Summary Table

Node ID	Invert Elevation (m)	Ground Elevation (m)	Hydraulic Grade Line			Depth (m)	Notes
			Existing (m)	Proposed (m)	Difference (m)		
PROP.MH2A	119.90	122.80	119.49	119.99	0.50	2.81	
EX.166	119.48	122.80	118.18	119.56	1.38	3.24	
EX. 165	118.17	121.50	109.01	118.26	9.25	3.24	
EX.101	114.23	118.67	114.55	114.64	0.09	4.03	
EX.102	111.39	118.15	114.25	114.31	0.06	3.84	
EX.103	110.54	114.10	111.45	111.51	0.06	2.59	
EX.104	108.91	113.75	110.61	110.67	0.06	3.08	
EX.105	77.99	112.20	109.01	109.16	0.15	3.04	
EX. 106	-	-	-	-	-	-	Trunk Connection

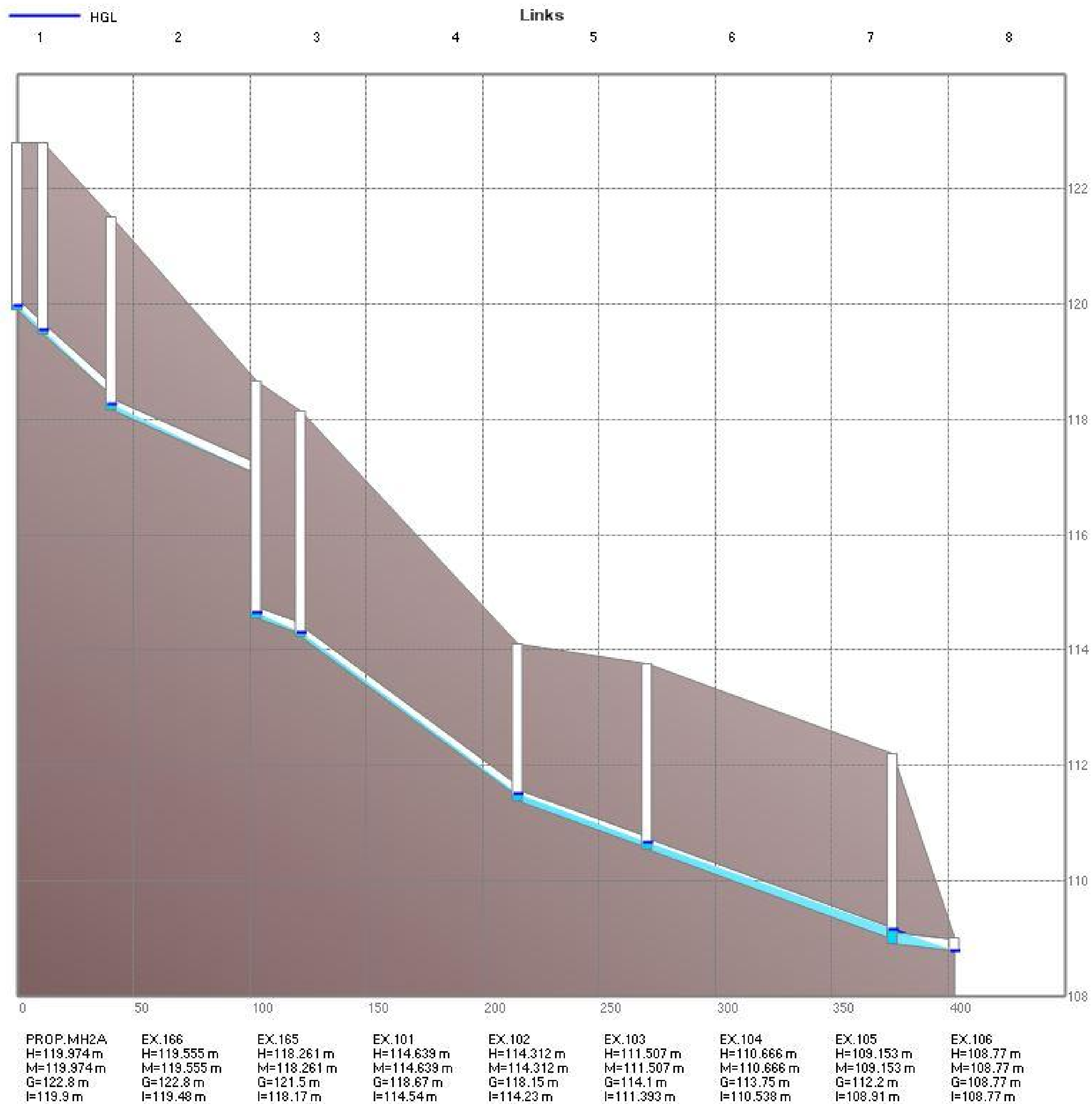
PRE DEVELOPMENT PCSWMM HGL PROFILE

FIG C-2



POST DEVELOPMENT PCSWMM HGL PROFILE

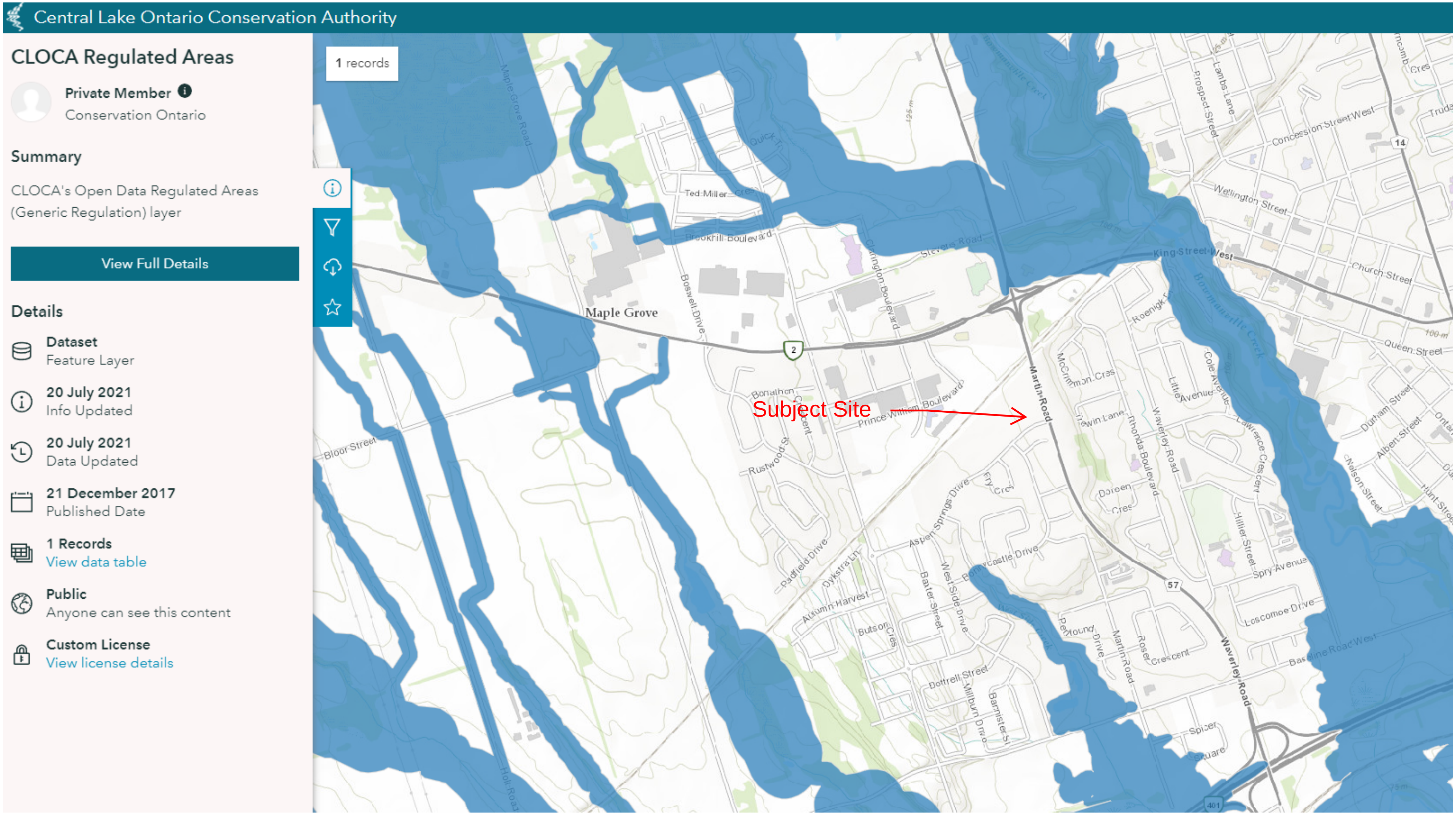
FIG C-3



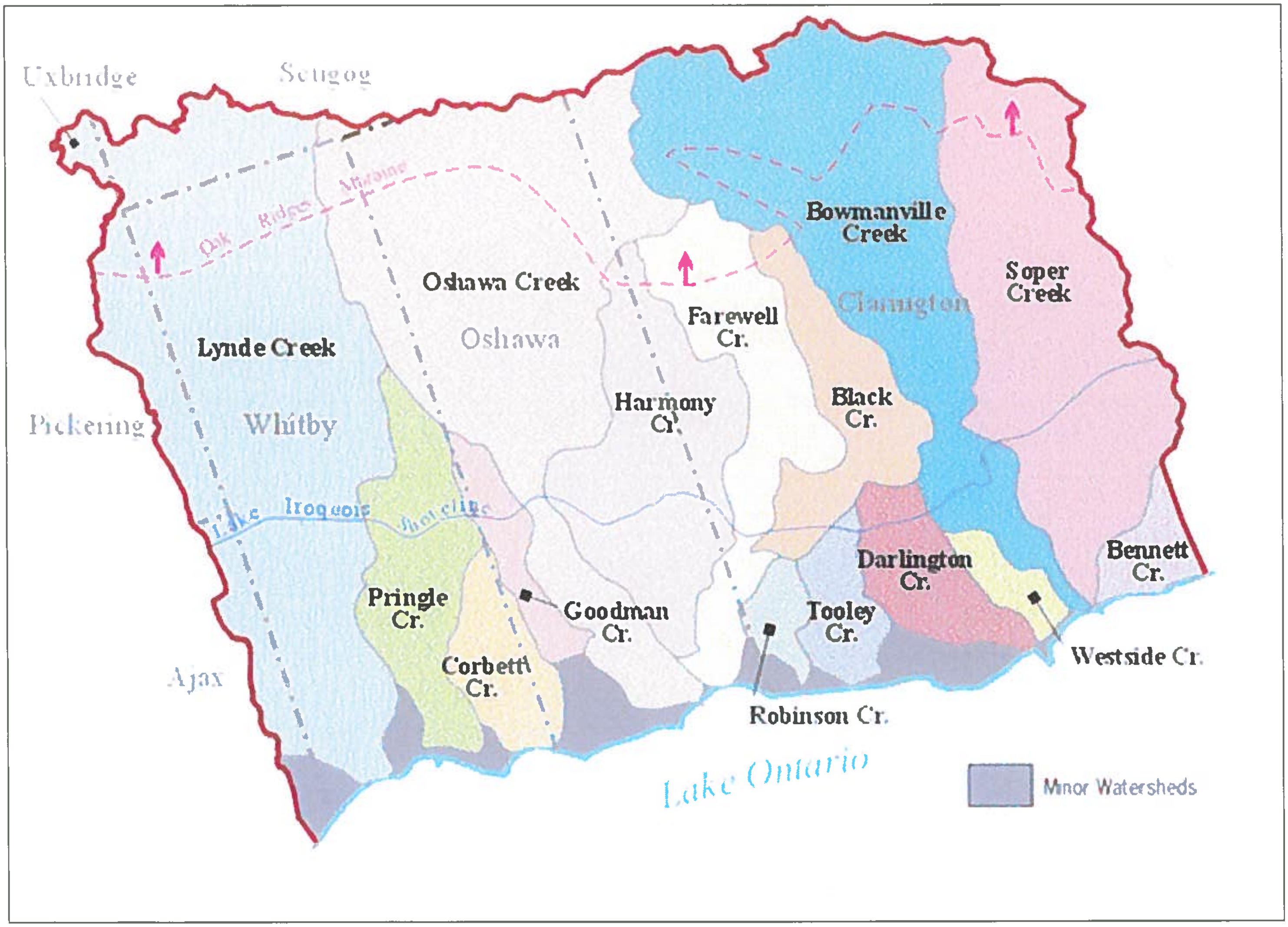
APPENDIX "D"

Watershed Map & IDF Data

CLOCA Regulation Mapping



Central Lake Ontario Conservation Authority Watersheds



with a minimum 0.5m freeboard against surcharging for major storm events.

2.04 Provide calculations showing that major storm flooding does not encroach onto private property and depth of water at centreline of collector roads will not exceed 0.15m.

2.05 The minimum depth of cover on all storm sewers and connections shall be 1.2 metres, although 1.8m is preferred. Storm sewer connections (laterals) shall be of suitable depth to accommodate house foundation drains.

2.06 Except where approved otherwise, storm sewers shall maintain a 3 metre horizontal separation from sanitary sewers and shall generally be located at a 1.5m offset from the roadway centreline.

2.07 Sewers shall extend to the subdivision limits to provide for future connection.

2.08 Radius pipe must be specifically approved by the Municipality and will not be permitted for pipe diameters of 750mm or less. Elbows will not be permitted for sewer mains nor are manhole 'tees' generally permitted.

2.09 In no case shall a downstream pipe be smaller than the upstream pipe, regardless of the increase in grade.

2.10 All house connections shall extend 1.5 metres into the lot. No "Y" connections are permitted. Pre-manufactured tees are required for sewer mains 450mm and smaller. All larger mains require coring using approved equipment.

3.0 PIPE CAPACITY DESIGN

3.01 All storm sewer design calculations must be submitted to the Municipality for review on standard design sheets.

3.02 Yarnell's rainfall intensity/duration curves shall be used for the minor storm sewer design.

Design Storm	Yarnell Rainfall Intensity Formulas (Metric)
1:2 Year	I = 1778/Tc + 13
1:5 Year	I = 2464/Tc + 16
1:10 Year	I = 2819/Tc + 16
1:25 Year	I = 4318/Tc + 27
1:50 Year	I = 4750/Tc + 24
1:100 Year	I = 5588/Tc + 28

Note: For 1:100 year storm event, the Chicago Storm formula should be used to be more conservative. i.e. I = 1770 / (Tc + 4) ^0.820

APPENDIX "E"

Stormwater Quantity Control Calculations

VALDOR ENGINEERING INC. **TABLE: E**
File: 21164
May 2022

Project: 10 Aspen Springs Drive, Region of Durham, Municipality of Clarington, Town of Bowmanville

STORAGE AND DISCHARGE SUMMARY

AREA No.	DRAINAGE AREA (Ha)	5 YEAR HWL (m)	100 YEAR HWL (m)	ORIFICE					STORAGE REQUIRED		STORAGE PROVIDED	
				LOCATION	INVERT (m)	DIAMETER (mm)	5 YEAR RELEASE (L/s)	100 YEAR RELEASE (L/s)	5 YR (cu.m.)	100 YR (cu.m.)	5 YR (cu.m.)	100 YR (cu.m.)
Subject Site (Orifice Controlled)	0.952	120.91	121.80	SWM Tank	120.15	192	63.7	97.5	94.8	209.5	98.8	214.5

VALDOR ENGINEERING INC. **TABLE: E1**
File: 21164
May 2022

10 Aspen Springs Drive, Region of Durham, Municipality of Clarington,
Town of Bowmanville

PRE-DEVELOPMENT PEAK FLOW CALCULATION

Surface Type	Area (ha.)	Runoff Coefficient
Roof Area	0.000	0.90
Impervious Area	0.318	0.90
Landscape Area	0.634	0.25
TOTAL AREA	0.952	0.47

5 Year Pre-Development Flow

I = 2464 / (Tc+16)

I = Rainfall Rate (mm/hr)

T =	15	minutes
I =	79.5	mm/hr
5 yr R =	0.47	(composite)
N =	2.778	

Q = R x A x I x N

5 year Q =	98.2	L/s
Total 5-Year Q =	**98.2**	**L/s**

100 Year Pre-Development Flow

I = 1770 / (Tc+4)^0.82

I = Rainfall Rate (mm/hr)

T =	15	minutes
I =	158.3	mm/hr
100 yr R =	0.47	(composite)
N =	2.778	

Q = R x A x I x N

100 year Q =	195.5	L/s
Total 100-Year Q =	**195.5**	**L/s**

VALDOR ENGINEERING INC. **TABLE: E2**
File: 21164
May 2022

**10 Aspen Springs Drive, Region of Durham, Municipality of Clarington,
Town of Bowmanville**

POST-DEVELOPMENT PEAK FLOW CALCULATION (Unmitigated)

Surface Type	Area (ha.)	Runoff Coefficient
Roof Area	0.384	0.90
Landscape Roof Area	0.063	0.25
Impervious Area	0.401	0.90
Landscape Area	0.104	0.25
TOTAL AREA	0.952	0.79

5 Year Post-Development Flow

I = 2464 / (Tc+16)

I = Rainfall Rate (mm/hr)

T =	15	minutes
I =	79.5	mm/hr
5 yr R =	0.79	(composite)
N =	2.778	

Q = R x A x I x N

5 year Q =	165.2	L/s
Total 5-Year Q =	**165.2**	**L/s**

100 Year Post-Development Flow

I = 1770 / (Tc+4)^0.82

I = Rainfall Rate (mm/hr)

T =	15	minutes
I =	158.3	mm/hr
100 yr R =	0.79	(composite)
N =	2.778	

Q = R x A x I x N

100 year Q =	329.0	L/s
Total 100-Year Q =	**329.0**	**L/s**

VALDOR ENGINEERING INC. **TABLE: E3**

File: 21164
May 2022

10 Aspen Springs Drive, Region of Durham, Municipality of Clarington, Town of Bowmanville

CONTROL ORIFICE DESIGN (at MH.1)
5 YEAR STORM

Orifice Location	=	SWM Tank	
Orifice Coefficient (C)	=	0.61	(PLATE)
Acceleration due to gravity (g)	=	9.81	m/s/s
5 Year High Water Level	=	120.91	m
Orifice Invert Elevation	=	120.15	m
Orifice Diameter	=	192	mm
Orifice Springline Elevation		120.246	m
Cross section area of orifice (A)	=	0.0290	sq.m.
Head (H)	=	0.66	m
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**63.7**	L/s

VALDOR ENGINEERING INC. **TABLE: E4**

File: 21164
May 2022

10 Aspen Springs Drive, Region of Durham, Municipality of Clarington,
Town of Bowmanville

CONTROL ORIFICE DESIGN (at MH.1)
100 YEAR STORM

Orifice Location	=	SWM Tank	
Orifice Coefficient (C)	=	0.61	(PLATE)
Acceleration due to gravity (g)	=	9.81	m/s/s
100 Year High Water Level	=	121.80	m
Orifice Invert Elevation	=	120.15	m
Orifice Diameter	=	192	mm
Orifice Springline Elevation		120.246	m
Cross section area of orifice (A)	=	0.0290	sq.m.
Head (H)	=	1.55	m
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**97.5**	L/s

VALDOR ENGINEERING INC.
File: 21164
May 2022

TABLE: E5

Storage Volume Calculations - Rational Method

5-year Chicago Storm - Municipality of Clarington

Surface Type	Area	Coefficient
Roof Area	0.384	0.90
Landscape Roof Area	0.063	0.25
Impervious Area	0.401	0.90
Landscape Area	0.104	0.25
Total Area (ha)	0.952	

Composite Runoff Coefficient	0.79
Maximum Discharge Through Orifice (L/s)	63.7
Long-Term Groundwater Discharge Rate (L/day) (from Hydrogeological Report)	43444
Long-Term Groundwater Discharge (L/s)	0.50
Discharged Volume per 5 min Interval (cu.m)	19.1

Time (min)	Intensity (mm/hr)	Groundwater Discharge (cu.m)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.151	0.000	0.151	0.000
5	1.2	0.151	0.773	0.924	0.000
10	1.5	0.151	0.923	1.074	0.000
15	1.8	0.151	1.116	1.267	0.000
20	2.2	0.151	1.384	1.535	0.000
25	2.8	0.151	1.752	1.903	0.000
30	3.7	0.151	2.301	2.452	0.000
35	5.1	0.151	3.155	3.306	0.000
40	7.4	0.151	4.589	4.740	0.000
45	11.7	0.151	7.295	7.446	0.000
50	21.5	0.151	13.375	13.526	0.000
55	52.1	0.151	32.505	19.124	13.532
60	117.3	0.151	73.160	19.124	54.187
65	65.9	0.151	41.079	19.124	22.106
70	38.4	0.151	23.969	19.124	4.996
75	25.2	0.151	15.707	15.858	0.000
80	17.8	0.151	11.087	11.237	0.000
85	13.2	0.151	8.243	8.394	0.000
90	10.2	0.151	6.373	6.523	0.000
95	8.1	0.151	5.069	5.220	0.000
100	6.6	0.151	4.134	4.285	0.000
105	5.5	0.151	3.429	3.580	0.000
110	4.6	0.151	2.893	3.044	0.000
115	4.0	0.151	2.475	2.626	0.000
120	3.4	0.151	2.139	2.290	0.000
125	3.0	0.151	1.871	2.021	0.000
130	2.6	0.151	1.646	1.797	0.000
135	2.4	0.151	1.465	1.616	0.000
140	2.1	0.151	1.309	1.460	0.000
145	1.9	0.151	1.172	1.323	0.000
150	1.7	0.151	1.060	1.211	0.000
155	1.6	0.151	0.966	1.117	0.000
160	1.4	0.151	0.879	1.030	0.000
165	1.3	0.151	0.804	0.955	0.000
170	1.2	0.151	0.742	0.893	0.000
175	1.1	0.151	0.686	0.837	0.000
180	1.0	0.151	0.630	0.781	0.000

Total Storage Volume Required (cu.m) **94.8**

VALDOR ENGINEERING INC.
File: 21164
May 2022

TABLE: E6

Storage Volume Calculations - Rational Method
100-year Chicago Storm - Municipality of Clarington

Surface Type	Area	Coefficient
Roof Area	0.384	0.90
Landscape Roof Area	0.063	0.25
Impervious Area	0.401	0.90
Landscape Area	0.104	0.25
Total Area (ha)	0.952	

Composite Runoff Coefficient	0.79
Maximum Discharge Through Orifice (L/s)	97.5
Long-Term Groundwater Discharge Rate (L/day) (from Hydrogeological Report)	43444
Long-Term Groundwater Discharge (L/s)	0.50
Discharged Volume per 5 min Interval (cu.m)	29.3

Time (min)	Intensity (mm/hr)	Groundwater Discharge (cu.m)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.151	0.000	0.151	0.000
5	5.3	0.151	3.323	3.474	0.000
10	5.8	0.151	3.629	3.780	0.000
15	6.4	0.151	3.997	4.148	0.000
20	7.2	0.151	4.465	4.615	0.000
25	8.1	0.151	5.063	5.214	0.000
30	9.4	0.151	5.880	6.031	0.000
35	11.3	0.151	7.040	7.191	0.000
40	14.2	0.151	8.829	8.980	0.000
45	19.2	0.151	11.991	12.142	0.000
50	30.5	0.151	19.024	19.175	0.000
55	76.8	0.151	47.913	29.256	18.808
60	292.1	0.151	182.124	29.256	153.019
65	101.4	0.151	63.246	29.256	34.140
70	52.4	0.151	32.649	29.256	3.543
75	34.9	0.151	21.774	21.925	0.000
80	26.2	0.151	16.324	16.475	0.000
85	21.0	0.151	13.082	13.233	0.000
90	17.5	0.151	10.931	11.082	0.000
95	15.1	0.151	9.409	9.560	0.000
100	13.3	0.151	8.274	8.425	0.000
105	11.9	0.151	7.395	7.546	0.000
110	10.7	0.151	6.697	6.848	0.000
115	9.8	0.151	6.123	6.274	0.000
120	9.1	0.151	5.649	5.800	0.000
125	8.4	0.151	5.244	5.395	0.000
130	7.9	0.151	4.901	5.052	0.000
135	7.4	0.151	4.602	4.753	0.000
140	7.0	0.151	4.340	4.491	0.000
145	6.6	0.151	4.103	4.254	0.000
150	6.3	0.151	3.897	4.048	0.000
155	6.0	0.151	3.716	3.867	0.000
160	5.7	0.151	3.548	3.699	0.000
165	5.5	0.151	3.398	3.549	0.000
170	5.2	0.151	3.261	3.412	0.000
175	5.0	0.151	3.130	3.281	0.000
180	4.8	0.151	3.018	3.169	0.000

Total Storage Volume Required (cu.m) **209.5**

VALDOR ENGINEERING INC.

TABLE: E7

File: 21164
May 2022

Project: 10 Aspen Springs Drive, Region of Durham, Municipality of Clarington, Town of Bowmanville
AVAILABLE STORAGE - 100 YEAR STORM

Underground SWM Detention Tank

	Orifice Inv. (m)	**HWL** (m)	**Tank Inv.** (m)	**Water Depth** (m)	**Area** (m^2)	**PROVIDED STORAGE** (m^3)	**REQUIRED STORAGE** (m^3)
5YR	120.15	120.91	120.15	0.76	130.0	98.8	94.8
100 YR	120.15	121.80	120.15	1.65	130.0	214.5	209.5

APPENDIX "F"

Stormwater Quality Control Calculations

VALDOR ENGINEERING INC.
File: 21164 **TABLE F1**
May 2022

OIL / GRIT SEPARATOR SIZING

Site Area = A = 0.952 Ha

Surface Type	Runoff Coeff	Area (Ha)
Roof Area	0.90	0.384
Impervious Area	0.90	0.401
Landscape Roof Area	0.25	0.063
Landscaped Area	0.25	0.104
	0.79	**0.952**

Imperviousness

% Impervious = (Runoff Coefficient - 0.20) / 0.7 x 100

% Impervious = 83.7 %

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

01/27/2022

Province:	Ontario
City:	Town of Bowmanville
Nearest Rainfall Station:	TORONTO CITY
Climate Station Id:	6158355
Years of Rainfall Data:	20
Site Name:	
Drainage Area (ha):	0.95
% Imperviousness:	86.50
Runoff Coefficient 'c':	0.81
Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	26.39
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	94.50
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	21164
Project Number:	21164
Designer Name:	Domenic Mazzitti
Designer Company:	Valdor Engineering Inc.
Designer Email:	DMazzitti@valdor-engineering.com
Designer Phone:	905-264-0054
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	69
EFO6	81
EFO8	88
EFO10	92
EFO12	96

Recommended Stormceptor EFO Model:	**EFO6**
Estimated Net Annual Sediment (TSS) Load Reduction (%):	**81**
Water Quality Runoff Volume Capture (%):	**> 90**

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

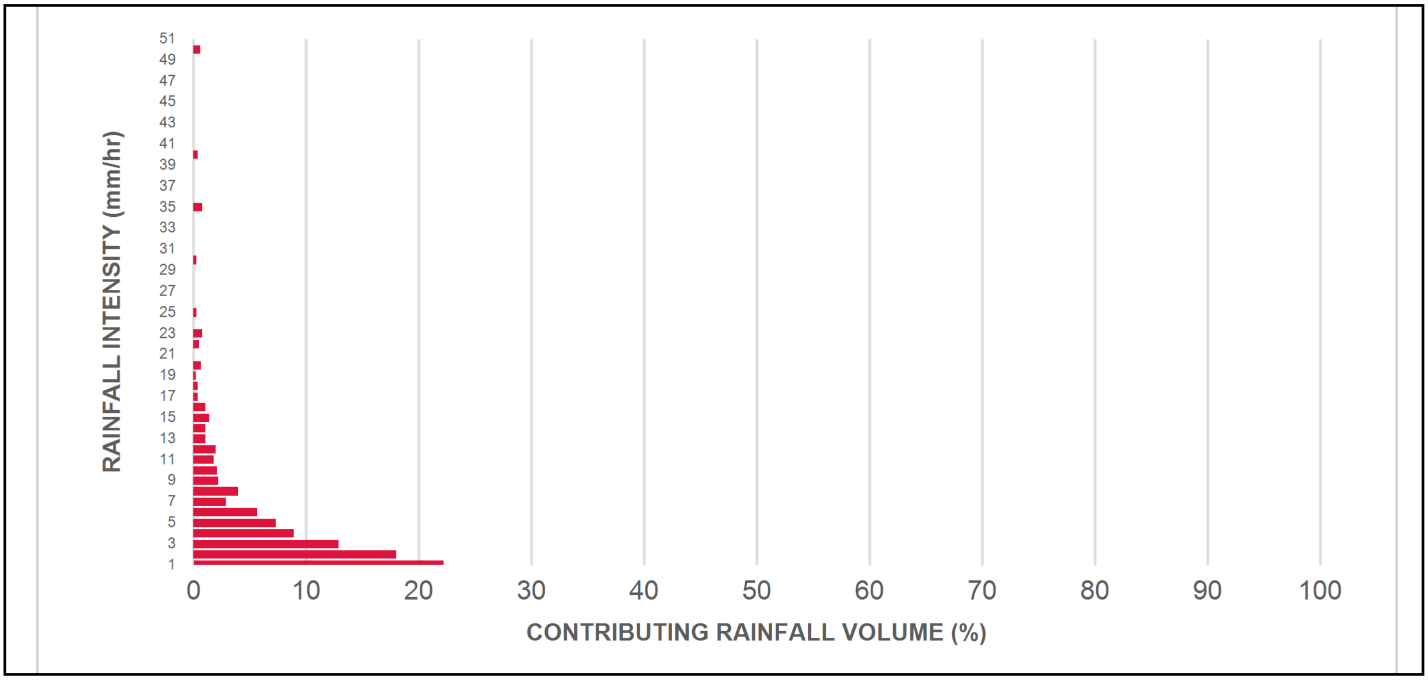
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

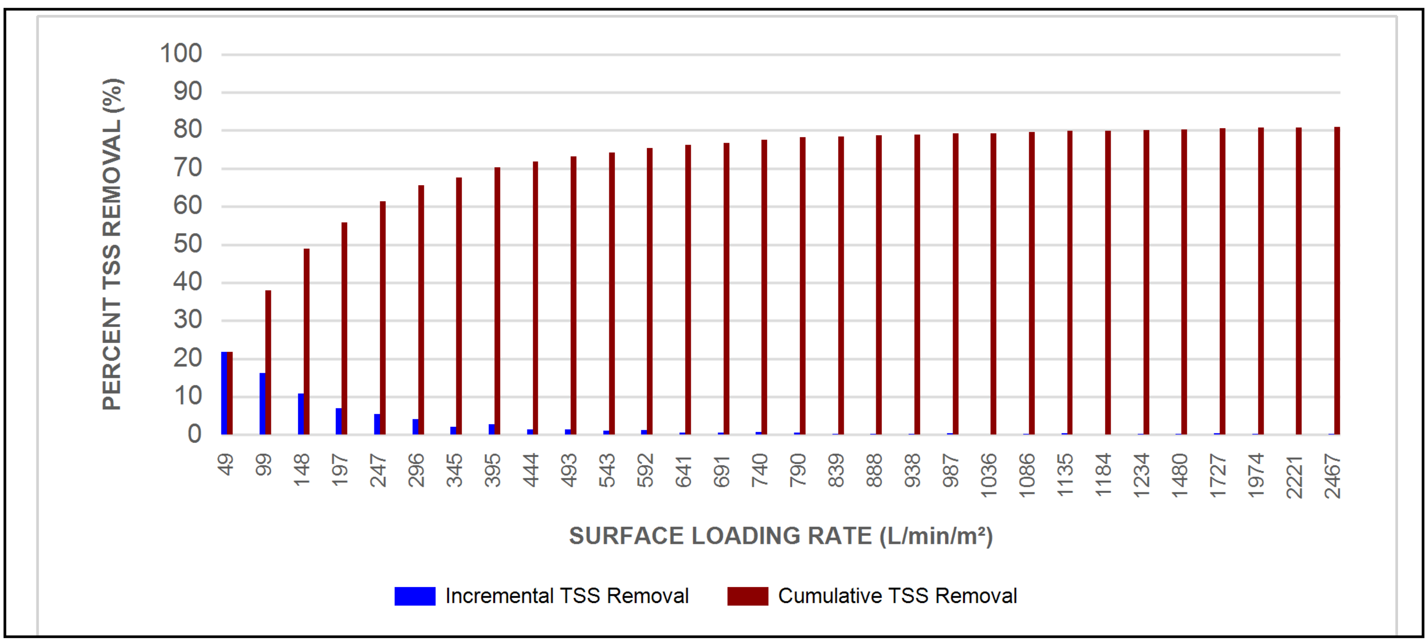
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	22.2	22.2	2.16	130.0	49.0	98	21.8	21.8
2	18.0	40.2	4.33	260.0	99.0	90	16.2	38.0
3	12.9	53.0	6.49	389.0	148.0	84	10.9	48.9
4	8.9	61.9	8.65	519.0	197.0	78	7.0	55.8
5	7.3	69.2	10.81	649.0	247.0	75	5.5	61.3
6	5.7	74.9	12.98	779.0	296.0	73	4.2	65.5
7	2.9	77.8	15.14	908.0	345.0	71	2.1	67.6
8	4.0	81.8	17.30	1038.0	395.0	69	2.7	70.3
9	2.2	84.0	19.47	1168.0	444.0	67	1.5	71.8
10	2.1	86.1	21.63	1298.0	493.0	65	1.4	73.1
11	1.8	87.8	23.79	1428.0	543.0	63	1.1	74.2
12	2.0	89.8	25.96	1557.0	592.0	60	1.2	75.4
13	1.1	90.8	28.12	1687.0	641.0	60	0.6	76.1
14	1.1	92.0	30.28	1817.0	691.0	59	0.7	76.7
15	1.4	93.4	32.44	1947.0	740.0	59	0.8	77.5
16	1.1	94.5	34.61	2076.0	790.0	59	0.7	78.2
17	0.4	94.9	36.77	2206.0	839.0	58	0.2	78.4
18	0.4	95.3	38.93	2336.0	888.0	58	0.2	78.7
19	0.2	95.5	41.10	2466.0	938.0	58	0.1	78.8
20	0.7	96.2	43.26	2596.0	987.0	57	0.4	79.2
21	0.0	96.2	45.42	2725.0	1036.0	57	0.0	79.2
22	0.5	96.7	47.59	2855.0	1086.0	55	0.3	79.5
23	0.8	97.5	49.75	2985.0	1135.0	54	0.4	79.9
24	0.0	97.5	51.91	3115.0	1184.0	53	0.0	79.9
25	0.3	97.8	54.07	3244.0	1234.0	52	0.1	80.1
30	0.3	98.1	64.89	3893.0	1480.0	46	0.2	80.2
35	0.8	99.0	75.70	4542.0	1727.0	40	0.3	80.6
40	1.0	100.0	86.52	5191.0	1974.0	35	0.4	80.9
45	0.0	100.0	94.00	5640.0	2144.0	32	0.0	80.9
50	0.0	100.0	94.00	5640.0	2144.0	32	0.0	80.9
Estimated Net Annual Sediment (TSS) Load Reduction =								81 %

Climate Station ID: 6158355 *Years of Rainfall Data*: 20

RAINFALL DATA FROM TORONTO CITY RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

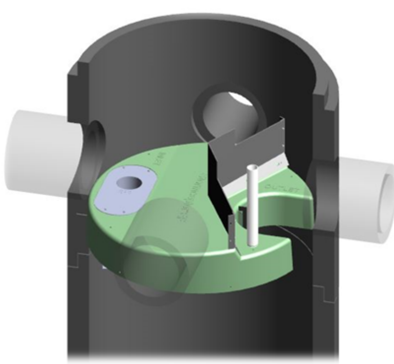
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

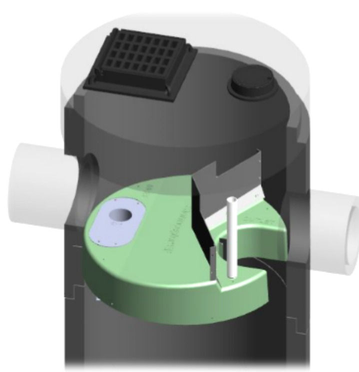
DESIGN FLEXIBILITY

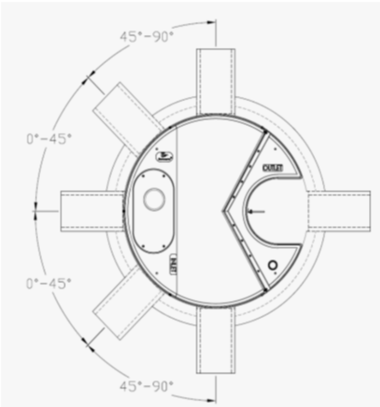
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR
"OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada, and only rainfall intensities greater than 0.5 mm/hr shall be included in sizing calculations. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

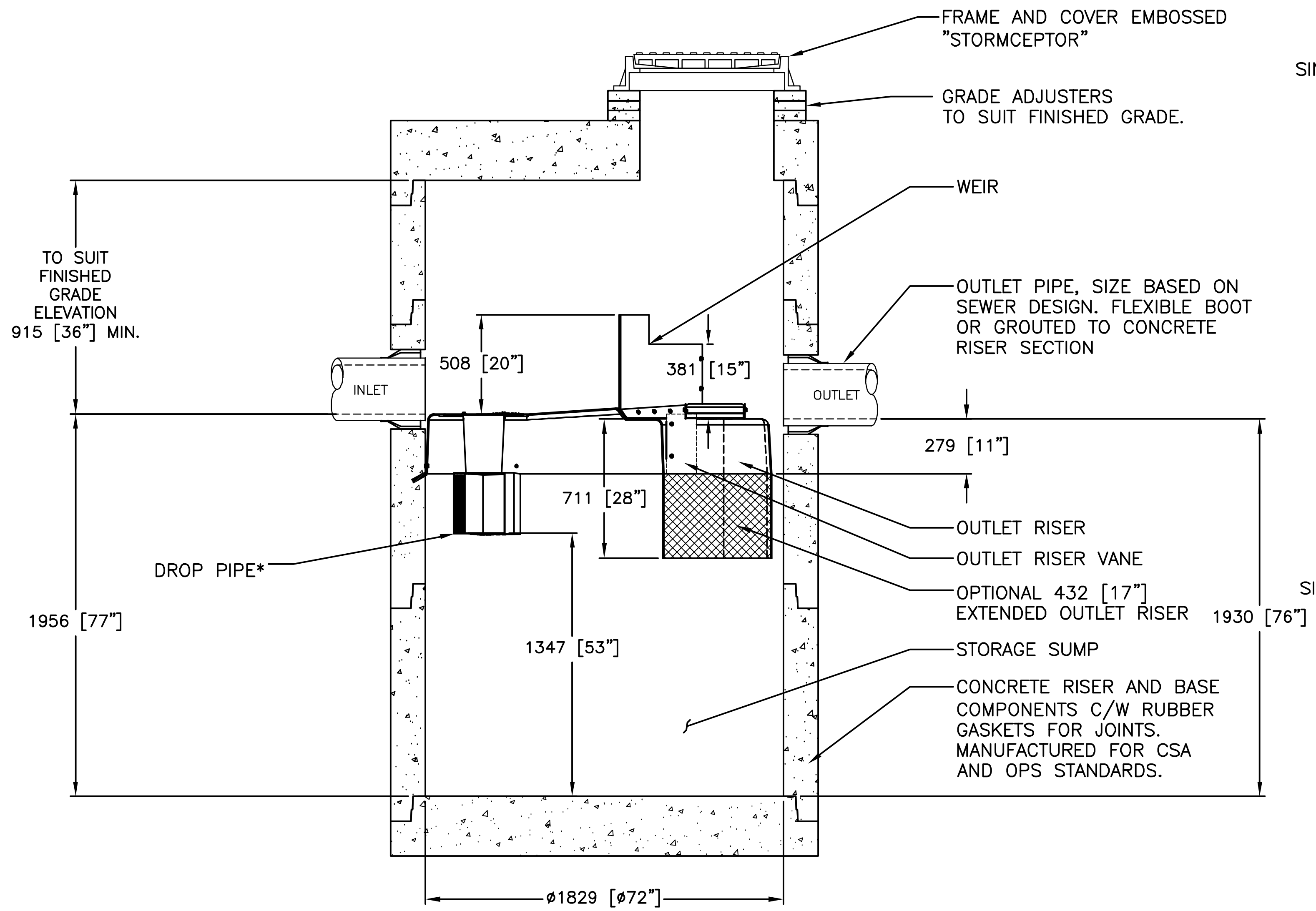
3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

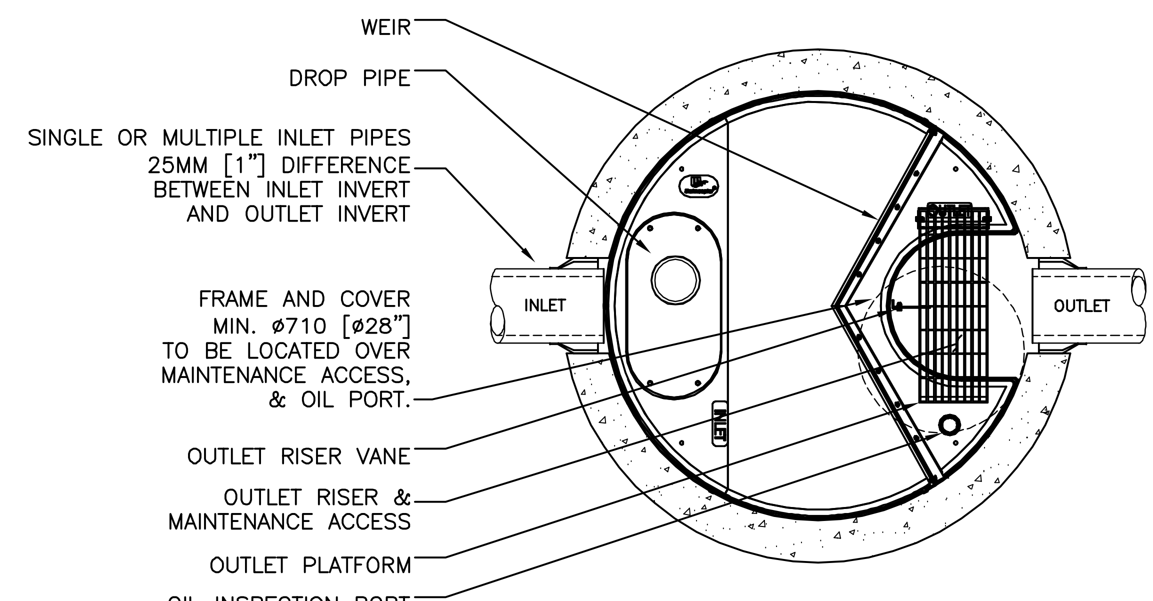
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

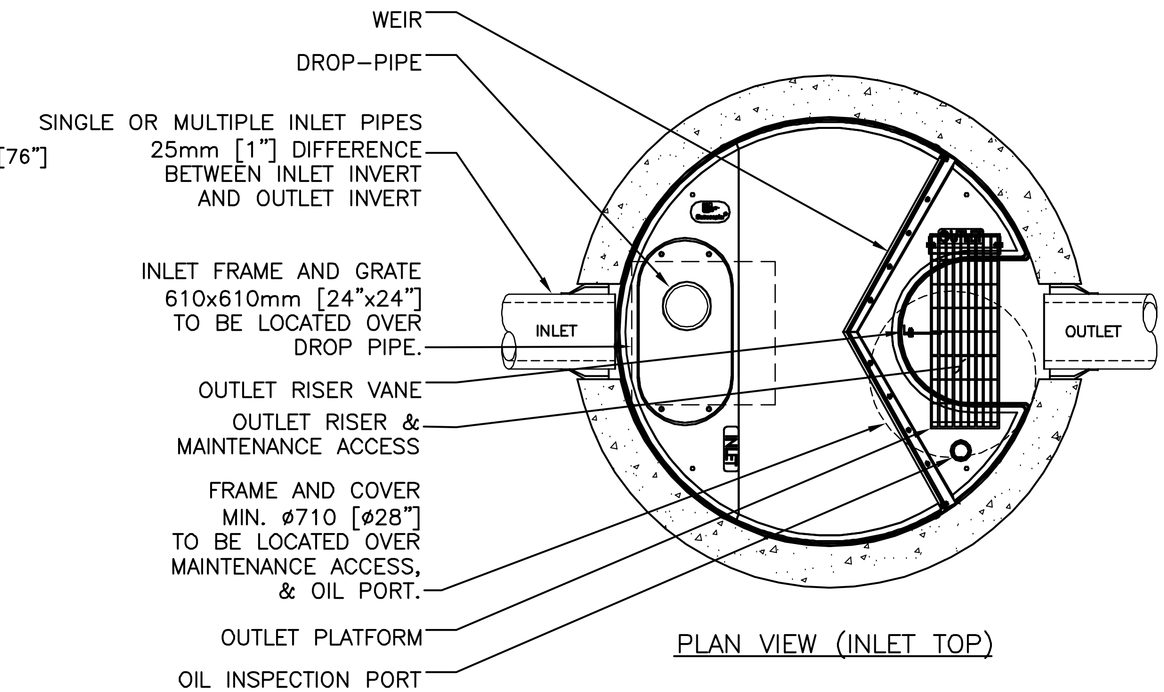
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF6 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO6 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

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 STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO6				
STRUCTURE ID					*
HYDROCARBON STORAGE REQ'D (L)					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
0	05/26/17	INITIAL RELEASE	JSK
1	6/8/18	OUTLET PLATFORM	JSK
####	####	####	####
####	####	####	####
####	####	####	####

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Imbrium Systems ("Imbrium"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Imbrium. Failure to comply is done at the user's own risk and Imbrium expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Imbrium immediately for re-evaluation of the design. Imbrium accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

Stormceptor® EF

SCALE = NTS

imbrium

407 FAIRVIEW DRIVE, WHITBY, ON L1N 3A9

DATE: 10/13/2017	
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: SP
PROJECT No.: EFO6	SEQUENCE No.: *
SHEET: 1 OF 1	

I:\IMBRIUM\PRODUCTS\STORMCEPTOR EF\40 DRAWINGS & DETAILS\STANDARD DETAILS\EFO STANDARD DETAILS\EFO6-DETAIL.DWG 4/12/2019 11:05 AM

APPENDIX "G"

Water Balance Calculations

VALDOR ENGINEERING INC. **TABLE: G1**
File: 21164
May 2022

10 Aspen Springs Drive, Region of Durham, Municipality of Clarington, Town of Bowmanville

WATER BALANCE CALCULATIONS

1. INITIAL ABSTRACTION

Surface Type	Area (Ha)		Init. Abstract. (mm)
Roof Area	0.384		1.000
Landscape Roof Area	0.063		5.000
Impervious Area	0.401		1.000
Landscape Area	0.104		5.000
Total	**0.952**		**1.702**

2. STORAGE VOLUME REQUIRED

Total Area of Site (A) =	9520	sq.m.
Target Retention Depth (D) =	0.005	(m)
Overall Initial Abstractions (I) =	0.0017	(m)
Storage Volume Required = V = A x (D - I) =	**31.40**	(cu.m.)

3. TANK SIZE

Underground storage tank retention volume sizing

Surface Area of Tank (A) =	130.00	sq.m
Height (H) =	0.30	m
Provided Volume = AxH =	**39.00**	cu.m

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

Hydrogeological Investigation

10 Aspen Springs Drive, Bowmanville, Ontario

Palmer Project #
2001518

Prepared For
Watters Environmental Group Inc.

April 29, 2022

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

April 29, 2022

Tanner Leonhardt, B.Eng.
Watters Environmental Group Inc.
9135 Keele St., Unit A1
Concord, ON L4K 0J4

Dear Tanner:

Re: Hydrogeological Investigation – 10 Aspen Springs Drive, Bowmanville, Ontario
Project #: 2001518

Palmer is pleased to submit the attached report describing the results of our Hydrogeological Investigation for the proposed development located at 10 Aspen Springs Drive, Bowmanville, Ontario ("the site"). It is understood that the proposed development will consist of a 9-storey mid-rise and two 25-storey high-rise buildings with a shared 3-level basement. This report provides a characterization of the site hydrogeological conditions based on our records review, field investigations, laboratory testing and data analysis. In addition, dewatering rates from the proposed excavation were estimated and the need for a temporary and/or long-term drainage permit was assessed.

The site is underlain by the deposits of the Newmarket Till Formation over the depth of investigation (28 m). These deposits are heterogeneous, having hydraulic conductivities ranging from 6.1×10^{-9} to 7.3×10^{-6} m/s. A shallow, higher permeability and a deeper, lower permeability till unit were identified. Based on single well response testing, these units have geometric mean hydraulic conductivities of 4.9×10^{-7} and 4.4×10^{-8} m/s, respectively Groundwater levels measured on April 5th and April 7th, 2022 ranged from 0.57 to 3.64 metres below ground surface (mbgs) or ranged in elevation from 120.77 to 122.76 metres above sea level (masl).

We estimate short-term construction dewatering rates to be approximately 381,377 L/day. We therefore expect an EASR registration to be required, but a PTTW not to be required. The groundwater chemistry at the site meets all Durham Region's Storm and Sanitary Sewer Bylaw criteria, except for the Storm Sewer Total Suspended Solids (TSS) guideline. TSS can be managed with typical settling tank methods during construction phase or long-term dewatering.

We estimate that 43,444 L/day could be required for long-term foundation drainage of the proposed development. A PTTW would not be required for this rate of long-term drainage but a permit with Durham Region would be. Groundwater chemistry results demonstrate that the groundwater at the site meets all of the Durham Region Storm and Sanitary Sewer discharge criteria, except for the Total Suspended Solids (TSS) guideline for the storm sewer. TSS is a parameter that can be mitigated through standard settlement procedures and through a properly installed drainage layer.

No adverse impacts on the natural environment, aquifers or private well users are expected to result from the proposed development as the radius of influence from dewatering is expected to be 65 m, and there are no active potable groundwater users or nature features in this radius.

If you have any questions or require further information, please contact our office at your convenience. This report is subject to the Statement of Limitations provided at the end of this report

Yours truly,
Palmer

Jason Cole, M.Sc., P.Geo.
VP, Principal Hydrogeologist

5.2 Private Water Wells

Considering the surface water intake present in Lake Ontario approximately 3.5 km southeast of the site, the Town of Bowmanville has full municipal water servicing. Within a 500 m radius of the site, there are sixteen (16) domestic wells, one (1) public and one (1) municipal well in the MECP Well Records. Of these 18 wells, they range in date of completion from June 4, 1953 to February 16, 1988. Considering that municipal water servicing is available and the date of completion, none of the wells described above are likely to be active. Within the estimated radius of influence of 65 m from each proposed building footprint, there are no domestic wells on record. Impacts from the proposed development on private water wells is therefore considered to be null.

6. Conclusions and Recommendations

Based on the results of this Hydrogeological Investigation, the following conclusions and recommendations are presented:

- The geotechnical drilling program, conducted by Davis Drilling and overseen by the client, consisted of drilling eleven (11) boreholes, seven (7) of which were completed with monitoring wells (i.e., BH101(MW), BH103(MW), BH105(MW), BH106(MW), BH108(MW), BH110(MW) and BH111(MW));

- The site is underlain by the low permeability, heterogeneous deposits of the Newmarket Till over the depth of investigation;

- A shallow, slightly higher permeability till unit was identified and potentially corresponds to the Inter-Newmarket Sediments (INS), and overlies a deeper, lower permeability unit corresponding to the Lower Newmarket Till (LNT);

- The Thorncliffe Aquifer Complex is likely to be found at depths greater than 30 m and the top of bedrock is likely approximately 50 mbgs at the site;

- Groundwater levels as measured on April 5th and 7th, 2022 ranged from 1.84 to 3.64 mbgs. Two additional round of water levels will be collected in April and May 2022 and included with future reporting;

- Groundwater is expected to flow away from Bowmanville Avenue. In the north portion of the site, it is expected to flow northwest and in the south portion of the site groundwater is expected to flow west to southwest;

- Seven (7) single well response tests were conducted in all monitoring wells. Hydraulic conductivities ranged from 6.1×10^{-9} to 7.3×10^{-6} m/s. The shallow INS unit had a geometric mean hydraulic conductivity of 4.9×10^{-7} m/s and the deeper LNT unit had a geometric mean hydraulic conductivity of 4.4×10^{-8} m/s.

- One (1) groundwater chemistry sample was taken from BH106(MW). The results of the laboratory analyses show that the groundwater on site passes all criteria for the Durham Region's Storm and Sanitary Sewer Bylaws, except the Total Suspended Solids (TSS) guideline for the Storm Sewer Bylaw. TSS can be mitigated using typical settling tank methods during dewatering;

- Short-term construction dewatering rates were estimated to be approximately 381,377 L/day. We expect an EASR registration to be required, but a PTTW not to be required;

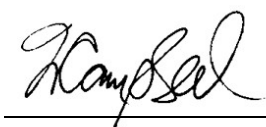
- Long-term foundation drainage rates were estimated to be approximately 43,444 L/day for the proposed development. A PTTW would not be required for long-term discharge at this rate. Discharge waters should be directed into the Durham Region storm sewer system. A permit from Durham Region is expected to be required for this discharge; and

- No adverse impacts on the natural environment, aquifers or private well users are expected to result from the proposed development.

7. Signatures

This report was prepared and reviewed by the undersigned:

Prepared By:



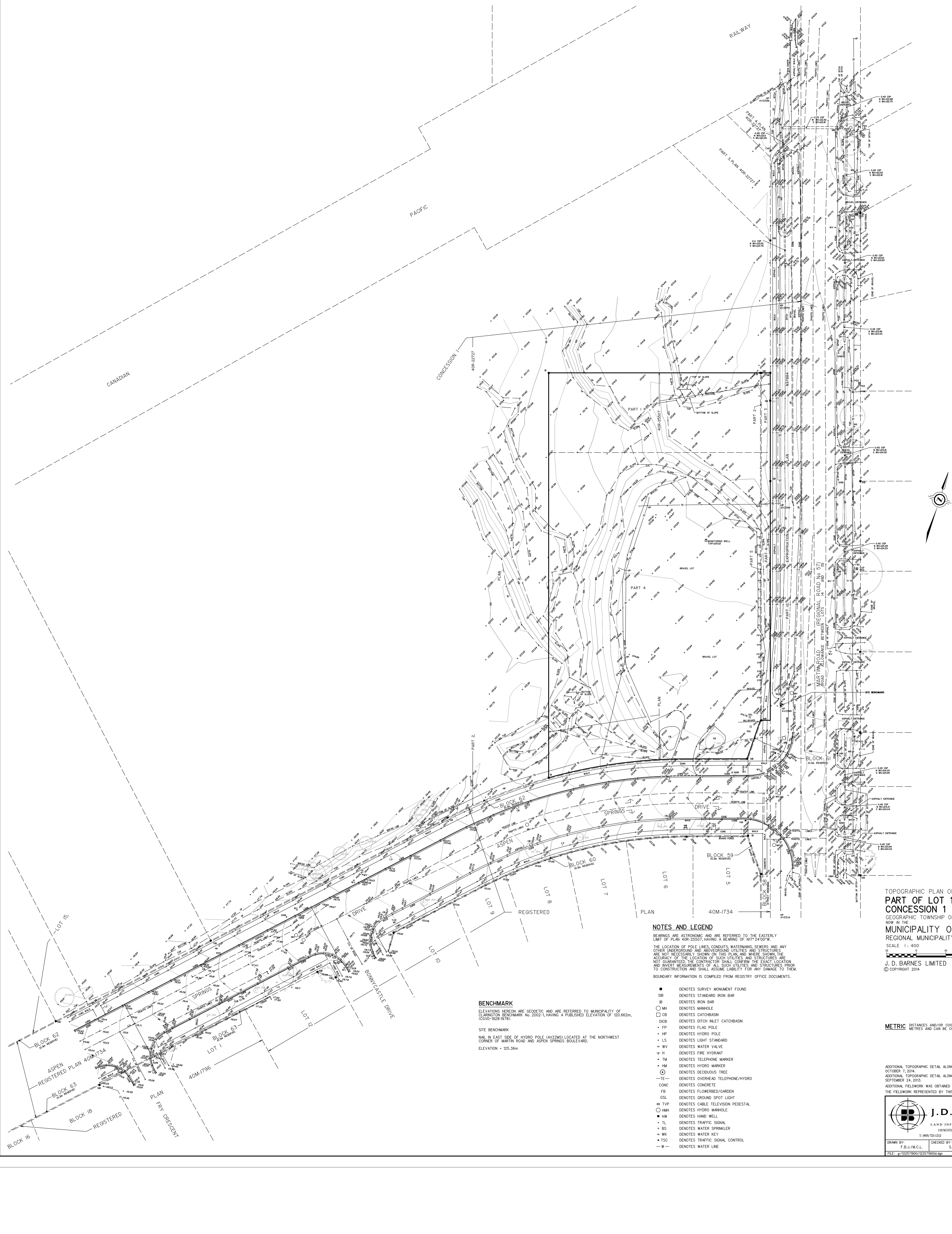
Wesley Campbell, M.A.Sc., G.I.T.
Environmental Scientist

Reviewed By:

Jason Cole, M.Sc., P.Geo.
VP, Principal Hydrogeologist

APPENDIX "H"

Topographic Survey



TOPOGRAPHIC PLAN OF

PART OF LOT 15
CONCESSION 1

GEOGRAPHIC TOWNSHIP OF DARLINGTON
NOW IN THE

MUNICIPALITY OF CLARINGTON

REGIONAL MUNICIPALITY OF DURHAM

SCALE 1 : 400

10 0 10 20 30 metres

J. D. BARNES LIMITED

NOTES AND LEGEND

BEARINGS ARE ASTRONOMIC AND ARE REFERRED TO THE EASTERLY LIMIT OF PLAN 40R-25507, HAVING A BEARING OF N17° 24'00"W.

THE LOCATION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND ANY OTHER UNDERGROUND AND ABOVEGROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THIS PLAN, AND WHERE SHOWN, THE ACCURACY OF THE LOCATION OF SUCH UTILITIES AND STRUCTURES ARE NOT GUARANTEED. THE CONTRACTOR SHALL CONFIRM THE EXACT LOCATION AND INVERT MEASUREMENTS OF ALL SUCH UTILITIES AND STRUCTURES PRIOR TO CONSTRUCTION AND SHALL ASSUME LIABILITY FOR ANY DAMAGE TO THEM.

BOUNDARY INFORMATION IS COMPILED FROM REGISTRY OFFICE DOCUMENTS.

■	DENOTES SURVEY MONUMENT FOUND
SIB	DENOTES STANDARD IRON BAR
IB	DENOTES IRON BAR
◯ MH	DENOTES MANHOLE
□ CB	DENOTES CATCHBASIN
DICB	DENOTES DITCH INLET CATCHBASIN
• FP	DENOTES FLAG POLE
• HP	DENOTES HYDRO POLE
• LS	DENOTES LIGHT STANDARD
WV	DENOTES WATER VALVE
H	DENOTES FIRE HYDRANT
* TM	DENOTES TELEPHONE MARKER
* HM	DENOTES HYDRO MARKER
	DENOTES DECIDUOUS TREE
—TE—	DENOTES OVERHEAD TELEPHONE/HYDRO
CONC	DENOTES CONCRETE
FB	DENOTES FLOWERBED/GARDEN
GSL	DENOTES GROUND SPOT LIGHT
TVP	DENOTES CABLE TELEVISION PEDESTAL
HMH	DENOTES HYDRO MANHOLE
■ HW	DENOTES HAND WELL
• TL	DENOTES TRAFFIC SIGNAL
∘ BS	DENOTES WATER SPRINKLER
WK	DENOTES WATER KEY
▪ TSC	DENOTES TRAFFIC SIGNAL CONTROL
— W —	DENOTES WATER LINE

BENCHMARK

ELEVATIONS HEREON ARE GEODETIC AND ARE REFERRED TO MUNICIPALITY OF CLARINGTON BENCHMARK No. 2002-1, HAVING A PUBLISHED ELEVATION OF 120.662m, (CGVD-1928:1978).

SITE BENCHMARK

NAIL IN EAST SIDE OF HYDRO POLE (AVZZMS) LOCATED AT THE NORTHWEST CORNER OF MARTIN ROAD AND ASPEN SPRINGS BOULEVARD.

ELEVATION = 125.36m

METRIC DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

ADDITIONAL TOPOGRAPHIC DETAIL ALONG ASPEN SPRINGS DRIVE WAS OBTAINED ON OCTOBER 7, 2014.
ADDITIONAL TOPOGRAPHIC DETAIL ALONG MARTIN ROAD WAS OBTAINED ON SEPTEMBER 24, 2013.
ADDITIONAL FIELDWORK WAS OBTAINED ON MAY 10, 2013.
THE FIELDWORK REPRESENTED BY THIS PLAN WAS COMPLETED ON DECEMBER 7, 2012.

J.D.BARNES LIMITED
SURVEYING PLANNING MAPPING GIS
LAND INFORMATION SPECIALISTS
110 SCOTIA COURT, #40 WHITBY, ON L1N 8Y7
T: (905) 723-1212 F: (905) 723-4234 www.jdbarnes.com

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
F.B.J./M.C.L.	S.E.C./G.C.L.	12-25-719-00-D
FILE: g:/122571900/122571900d.dgn		DATED: OCTOBER 15, 2014

PLOTTED: 15 OCT 2014