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FUNCTIONAL SERVICING / STORMWATER MANAGEMENT REPORT

Proposed Condominium Apartments

Ida Street, Dundalk
Township of Southgate

January 2025

Prepared For: **Briarwood (Dundalk) Ltd.**

File: **23142**

VALDOR WATER RESOURCES

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1.0 INTRODUCTION

Valdor Engineering Inc. has been retained by Briarwood (Dundalk) Ltd. to provide consulting engineering services related to the construction of a condominium apartment development at a 27.06-hectare property located on the north side of Ida Street, East of Hanburry Street, and west of Eco Parkway in Dundalk, in the Township of Southgate as shown in **Figure 1**.

1.1 Existing Conditions

The subject site is currently vacant and is bounded to the north by vacant lands, to the east and west by detached dwellings, and to the south by the road allowance of Ida Street. There are existing watercourses that traverse the subject site that are within Grand River Conservation Authority (GRCA) regulated area. Additionally, there is also a sanitary sewer easement that acrosses the subject site.

1.2 Proposed Development

The proposed development involves the construction of four condominium apartment buildings containing 376 apartment units with one level of underground parking garage. The area of the development site is approximately 3.548 Ha. The development includes two driveways from Ida Street which will provide access to underground parking garage and loading areas.

A copy of the Site Plan and Parking Garage Plan for the development is included in **Appendix "A"**. The development statistics are summarized in **Table 1**.

Table 1. Development Statistics / Equivalent Population

Condo Apartments	Population Density (persons / unit)	No. of Units	Equiv. Population (persons)
Building A	2.7	94	253.8
Building B	2.7	94	253.8
Building C	2.7	94	253.8
Building D	2.7	94	253.8
Total		**376**	**1,015**

1.3 Purpose of Report

This Functional Servicing and Stormwater Management Report outline the engineering design elements for the proposed development, including water supply, sanitary sewers and storm sewers including stormwater. It has been prepared to address the design criteria of the Township of Southgate in support of a Zoning By-law Amendment application for the subject site. This report was prepared based on a review of the architectural building designs for the proposed development and a review of the detailed topographic survey.

2.0 WATER SERVICING

The existing watermain in the site vicinity includes a 200mm diameter watermain on Ida Street.as indicated on **Figure 2**. The following is a summary of the proposed water servicing for the site:

2.1 Domestic Demand

The average domestic water demand for the proposed development was calculated using the Township of Southgate engineering design standards which include the following parameters:

Residential Average Day Demand:	450 L/person/day
Maximum Day Factor:	1.3
Peak Hour Factor:	2.5
Min Hour Factor	0.84

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

Table 2. Water Demand

	Equivalent Population (Persons)	**Average Day Demand** (L/min)	**Max Day Demand** (L/min)	**Peak Hour** (L/min)	**Min Hour** (L/min)	**Fire Flow** (L/min)	**Max Day Demand + Fire Flow** (L/min)
Building A	253.8	79.3	103.1	198.3	66.6	18,000	**18,103.1**
Building B	253.8	79.3	103.1	198.3	66.6	18,000	**18,103.1**
Building C	253.8	79.3	103.1	198.3	66.6	18,000	**18,103.1**
Building D	253.8	79.3	103.1	198.3	66.6	18,000	**18,103.1**
Total	**1,016**	**317.3**	**412.4**	**793.1**	**266.5**	**18,000**	**18,412.4**

2.2 Water Service Connections

The development will be serviced by two connections to the existing 250mm diameter Ida Street watermain and will consist of two 200mm diameter fire lines with a 100mm diameter branch from each fire line for domestic water service complete with valves at the property line.

Given the condominium apartment form of tenure, and the proposed development has an underground parking garage, the water meters and backflow prevention devices will be located in the meter room in the underground parking garage. The locations of the water service connections are illustrated in **Figure 2**.

2.3 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*, 2020, by the Fire Underwriters Survey (FUS). Appropriate reductions and increases have been applied to the equation such as coefficient for wood frame construction, a reduction for low-hazard occupancies, an adjustment for sprinkler protection system, and an increase due to neighbouring building proximity.

Based on the calculation, each building of the proposed development requires 18,000 L/min. The detailed fire flow calculations are provided in **Table B2-1** to **Table B-4,** which are included in **Appendix "B"**. In accordance with the Town standards, this flow must be available at the nearest hydrant with a minimum pressure of 140 KPa.

In accordance with the OBC the principal entrance of each building must be within 90m of a fire hydrant. Based on a review of the existing municipal fire hydrant in the vicinity, four private site fire hydrants will be required in the vicinity of the proposed buildings to provide sufficient coverage.

The fire department connection for each building will be located within 45m of the proposed private site fire hydrant as required by the OBC. The internal private water network will be routed within the parking garage and will be designed by the mechanical engineer at the building permit stage. The locations of the existing and proposed fire hydrants are illustrated in **Figure 2**.

3.0 WASTEWATER SERVICING

There are no municipal sanitary sewers in the vicinity of the subject site along Ida Street. However, there is a 600mm diameter sanitary sewer located within an easement that traverses the site northeast of the development area as indicated on **Figure 3**.

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 Township of Southgate engineering design standards which include the following parameters:

Domestic Flow: Q = 450 L/person/day

Extraneous Flow: *I* = 0.15 L/s/Ha (Infiltration)

Peaking Factor: $K_H = 1 + \frac{14}{4 + \sqrt{P}}$

Where: K_H = Harmon Peaking Factor (Min 2.0, Max 4.0)
P = Population in thousands

Design Flow, Q = $Q \times K_H + I$

The wastewater loading is summarized in **Table 3**. The detailed calculation for the wastewater loading is included in **Table C1** which is contained in **Appendix “”C”**.

Table 3. Wastewater Loading Summary

	Area (Ha)	**Population** (Persons)	**Average Daily Flow** (L/s)	**Harmon Peaking Factor**	**Peak Daily Flow** (L/s)	**Infiltration Rate** (L/s)	**Total Flow** (L/s)
Proposed Development	3.548	1,015	5.29	3.80	20.07	0.52	20.60
Total	**1.640**	**1,015**			**20.07**		**20.60**

3.2 Sanitary Service Connection

Given the distance between the development site and the existing 600mm diameter sanitary sewer in the easement to northeast is approximately 286.8m, and the existing sanitary sewer in the easement is only approximately 1.4m deep, draining the wastewater from the site by gravity is not feasible. Therefore, a 150mm diameter sanitary force main is proposed from the pump station located at the southeast corner of the development site to the existing 600mm diameter sanitary sewer in the easement.

The sanitary services within the development limit will enter the underground parking garage and be routed to each of the four apartment buildings. Sanitary drains within the parking garage and will be designed by the mechanical engineer at the building permit stage. The sanitary service connection location is illustrated in **Figure 3**.

4.0 STORM DRAINAGE & STORMWATER MANAGEMENT

The subject site is located within the tributary of the Grand River Watershed. The Grand River starts in the Dufferin Highlands and flows south about 310 km to Lake Erie. The main watershed along Grand River has a drainage area of 5,263 km^2. The subject site is located within the regulated area of the Grand River Conservation Authority. A plan of the watershed as well as the regulation mapping is included in **Appendix “D”**.

In accordance with the municipal standards, the storm drainage and stormwater management system for the subject site is to include the following:

- Stormwater quantity control is to be provided to restrict post-development flows to pre-development rates for the 2- to 100-year storm events
- Stormwater quality control is to be provided for “Enhanced” protection (Level 1 treatment).

The following is a summary of the storm drainage and stormwater management system for the site:

4.1 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:

4.1.1 Pre-Development Flow

The pre-development surfaces consist primarily of a vegetated field, which indicates that the existing site condition is relatively pervious having a 0.25 runoff coefficient. The pre-development surface condition is illustrated in **Figure 4.**

In accordance with the Township standards, the drainage system has been designed using the rational method based on the Environment Canada intensity duration frequency (IDF) data for the subject site included in **Appendix "D"**. In this regard, the rainfall intensity values, *I*, are calculated as follows:

$$I_2 = \frac{404.147}{(t+0)^{0.699}} \quad I_5 = \frac{535.364}{(t+0)^{0.699}} \quad I_{10} = \frac{622.842}{(t+0)^{0.699}}$$

$$I_{25} = \frac{731.314}{(t+0)^{0.699}} \quad I_{50} = \frac{811.794}{(t+0)^{0.699}} \quad I_{100} = \frac{892.273}{(t+0)^{0.699}}$$

The pre-development 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 (minutes)

Based on our calculations, the 2- to 100-year pre-development peak flows are summarized in the first row of **Table 4** (detailed results are provided in **Table E1**, contained in **Appendix "E"**).

Table 4: Storm Drainage Peak Flows

Condition	Area (Ha)	Runoff Coefficient	Peak Flows (L/s)					
			2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Pre-Development	3.548	0.25	199.2	263.8	306.9	360.4	400.0	439.7
Post-Development Uncontrolled	0.694	0.30	47.0	62.2	72.4	85.0	94.4	103.7
Allowable	**-**	**-**	**152.2**	**201.6**	**234.5**	**275.4**	**305.7**	**336.0**
Post-Development Unmitigated	2.854	0.77	491.8	651.5	757.9	889.9	987.8	1,085.8
Post-Development Mitigated	**2.854**	**0.77**	**143.5**	**177.0**	**201.4**	**240.5**	**259.8**	**282.6**

4.1.2 Post-Development Flow: Uncontrolled

Based on a review of the architect's site plan, the post-development drainage areas are illustrated in **Figure 5**. A lower area with landscape features is proposed along the north, east and west limits of the development site. The stormwater runoff from this area will be captured but it will not be directed to the on-site orifices given the grading constraints. Therefore, the allowable release rate for each return period was determined by excluding the uncontrolled flow from the lower area.

The allowable release rates for the 2- to 100-year storm events are summarized in the third row of **Table 4**. The uncontrolled flow calculations are provided in **Table E2-B** in **Appendix "E"**.

4.1.3 Post-Development Flow: Unmitigated

The surfaces under the post-development condition are comprised of landscaped areas, roof area as well as driveway parking lot and walkway pavements. Based on these surfaces, the proposed development is more impervious than the existing site condition. The runoff coefficient of the controlled area increases from 0.25 to 0.77 which translates to an increase in peak flows.

Based on area of the proposed surfaces, the post-development hydrological condition was calculated assuming no mitigation measures will be implemented. The unmitigated 2- to 100-year peak pre-development flow rates are summarized in the fourth row of **Table 4** (detailed results are provided in **Table E2-A**, contained in **Appendix "E"**). A comparison of the rates in the third and fourth rows of **Table**

1 indicates that the un-mitigated post-development flows will be greater than the allowable release rates. Based on the above, mitigation measures are necessary.

4.1.4 Post-Development Flow: Mitigated

A review of the architect's site plan indicates that there is an opportunity to incorporate on-site detention located below grade in the courtyard area to mitigate post-development runoff rates. The SWM detention tank will be controlled by an orifice and weir combination which will be installed in a manhole downstream of the detention tank.

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.

As indicated in **Section 4.1.3** of this report, the lower area along the north, east and west limits of the site will drain uncontrolled. Adequate overcontrol is provided for the rest of the site such that the overall flow targets are not being exceeded.

Based on the modelling, the post-development mitigated peak flows are summarized in the fifth row of **Table 4**. A comparison of the flows in the third and fifth rows of **Table 4** indicates that the mitigated post-development peak flows have been reduced to less than the corresponding pre-development rates. Based on the above, and using an orifice diameter of 200 mm in combination with a 0.10 m wide weir, a total 100-year storage volume of 480.2 m^3 is required, which will be provided underground within the underground SWM detention tank. The SWM detention tank will be in the form of modular storage system comprised of polypropylene top, bottom and side panels and PVC columns, all of which are assembled on site to create the storage chamber. These modular units, which have a 97% void ratio, are marketed as StormTank™ and are manufactured by Brentwood Industries Inc. The individual StormTank™ units have a modular size of 0.914m long x 0.457m wide with a height of 0.914m.

As indicated in **Section 4.4.4** of this report, the SWM tank has been oversized to accommodate 2.8 L/s (246,150 L/day) of long-term groundwater discharge rate from subject phase as indicated in the hydrogeological report. The excerpts of the hydrogeological report are included in **Appendix "G"**.

The orifice, weir and storage calculations are provided in **Table E3** to **Table E5**, which are included in **Appendix "E"**. The location of the detention tank is provided in **Figure 6**. No surface or rooftop detention is proposed for the subject site.

4.2 Quality Control

Based on the Stormwater Management Planning & Design Manual prepared by the Ministry of the Environment (March 2003), various levels of treatment are defined with the goal to maintain or enhance existing aquatic habitat based on the total suspended solids (TSS) removal efficiency.

Based on the municipal criteria for the area, storm water quality control for the subject site is to be designed to achieve “Enhanced” protection level (Level 1 treatment) which provides 80% TSS removal. An industrial setting parking lots can generate motor vehicle related contaminants such as spills of oil, fuel and lubricants and sediment accumulation. In order to provide stormwater quality control for the subject site, a Stormceptor EFO8 oil/grit separator (OGS) will achieve a TSS removal of 80%. The sizing report and a typical detail form the manufacture are included in **Appendix “F”**. The location of the proposed OGS is indicated in **Figure 6**.

4.3 Low-Impact Development

The subject is located within an area designated as a Significant Groundwater Recharge Area, as such, Low-Impact Development (LID) will be required to enhance the stormwater quality control in addition to the proposed OGS.

Low Impact Development (LID) measures such as infiltration trenches, bio-retention swales, and permeable pavers are implemented as source and conveyance stormwater management controls to promote infiltration and pollutant removal on a local site by site basis. These measures rely on eliminating the direct connection between impervious surfaces such as roofs, roads, parking areas, and the storm drainage system, as well as the promotion of infiltration on each development or redevelopment site.

The benefits from LID stormwater management practices are generally focused on the more frequent storm events (5 mm rainfall events) of lower volumes as opposed to the less frequent storm events (e.g. 100 year storm) with higher volumes. It is also recognized that the forms of LID which promote infiltration or filtration through a granular medium also provide thermal mitigation for storm runoff. LID measures can be implemented to varying degrees based upon the available area, the proposed land use, the development form and the soil infiltration capacity.

Based on a review of the hydrogeological assessment completed by Soil Engineers Ltd. dated March 2024, the groundwater level is high across the subject site. Therefore, LID in the form of infiltration trench is not feasible given a minimum clearance of 1.0m needs to be maintained from the groundwater level to the bottom of the infiltration trench.

As the lower area along the north, east and west limits of the development site is composed mainly of landscape area, LID features such as enhanced grass swale can be incorporated to enhance the stormwater quality control in addition to the OGS. The design of the enhanced grass swale will be further assessed at the detailed design stage.

4.4 Storm Drainage

The main features of the storm drainage system include surface drainage, roof drainage and foundation drainage as follows:

4.4.1 Minor System

In accordance with the municipal standards, the development will be serviced with a minor storm sewer system that has been designed to convey runoff from the 5-year storm event. In this regard the on-site storm sewer will convey the flows to the detention tank after which it will discharge to the re-aligned watercourse to the east of the development site via an outfall headwall with erosion protection. A channel will extend from the headwall, down to the base of the valley slope in the form of a sinuous natural channel with embedded stone cascades and erosion protection at the toe of the slope. The storm drainage system is illustrated in **Figure 6**.

4.4.2 Major System

The major system will generally be comprised of an overland flow route along the private road which will convey rainfall events up to and including the 100 year storm to the on-site detention system. In the event of rainfall in excess of the 100 year storm, the overland flow route will convey flow towards the re-aligned watercourse on the east side of the development site. The private road that provides access to the underground parking garage on the west side will direct the overland flow route to Ida Street.

4.4.3 Roof Drainage

The proposed building will have a peaked roof design with eavestroughs and roof downspouts. The proposed roof drains will be collected by the building's internal storm drain system within the underground parking garage which will discharge to the on-site detention system. Roof top detention is not proposed.

4.4.4 Foundation Drainage

Given the building will have an underground parking garage and it will be constructed under the high groundwater table, the foundations will have a weeping tile system. In order to drain the weeping tile, a sump pump will be required which will pump up to the storm connections of the proposed buildings. The sump pump is to be fitted with a backflow preventer. The foundation drain sump pump is to be designed by the mechanical engineer and indicated on the mechanical plans at the building permit design stage.

The groundwater discharge will be directed to the stormwater detention tank on the subject site so that the groundwater and stormwater together will be controlled to the allowable stormwater discharge rate thereby avoiding impact to the municipal storm sewer. Based on the Hydrogeological Assessment completed by Soil Engineers Ltd. Dated January 21, 2025, the long-term groundwater discharge rate for the subject phase is estimated to be 2.8 L/s (246,150 L/day). The SWM tank has been oversized to accommodate this groundwater discharge rate. The excerpts of the hydrogeological report are included in **Appendix "G"**.

4.4.5 Flood Plain

A Flood Plain Analysis Report was prepared by Valdor Engineering Inc. to delineate the existing flood plain associated with the watercourse that drains in a southerly direction through the property. The analysis also determined the impact on the existing flood plain based on the proposed filling to accommodate the subject development. Based on the analysis it was determined that the proposed filling will have to be offset by a corresponding cut elsewhere on the property in order to maintain flood storage. The existing and proposed floodlines are indicated on the Functional Servicing & Grading Plan (Dwg FSGP-1).

4.5 SWM Inspection & Maintenance

The proposed stormwater management system requires regular inspection and maintenance to ensure the infrastructure function as designed. The suggested inspection and maintenance procedures are as follows:

Swales:	Keep the grass swales maintained by cutting grass and removing any accumulated garbage and debris so that flow is not impeded.
Orifices:	Inspect orifices periodically. Ensure orifice devices clear of blockage and keep the area around the head walls clear.
Detention Tank:	Inspect the tank regularly to ensure that there is no debris in the tank and to ensure that the access ports are unobstructed.
Oil/Grit Separator:	Inspect and maintain the unit in accordance with the manufacturer's recommendations.

Maintenance should be performed immediately if an abnormality is observed such as slow drain down time for the detention area.

5.0 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:

5.1 Control Measures

On relatively small sites, measures for erosion and sediment control typically include the use of silt fencing 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.

5.2 Construction Sequencing

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

1. Install all silt fences prior to any other activities on the site.
2. Construct mud mat.
3. Strip topsoil and dispose of off site.
4. Cut / fill to the pre-grade elevations including stormwater detention area.
5. Install the site services.
6. Upon completion of the site services, the outlet for the storm detention area is to be protected with a rock check dam.
7. Construct the building and parking lot.
8. Restore / re-vegetate all disturbed areas final landscape and paving materials.
9. Once the surfaces are stabilized the stormwater detention area is to be cleaned of any silt and debris.
10. Upon stabilization of all disturbed areas, remove sediment controls.

5.3 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.

6.0 CONCLUSIONS

Based on the discussions contained herein, the proposed building additions can be adequately serviced with full municipal services (watermain, sanitary and storm) in accordance with the standards of the Township of Southgate as follows:

Water Servicing

- The proposed development will be serviced by the existing 200mm diameter watermain on Ida Street. The proposed water service connections will consist of two 200mm diameter fire lines with a 100mm diameter branch from each fire line for domestic water service complete with valves at the property line.
- Given the condominium apartment form of tenure, and the proposed development has an underground parking garage, the water meters and backflow prevention devices will be located in the meter room in the underground parking garage.
- Fire protection will be provided by the existing municipal fire hydrants along Ida Street and four proposed private site fire hydrants.
- The total water requirement including fire flow and the max hour demand for the proposed development is 18,412.4 L/min.

Wastewater Servicing

- The subject site Given there is no sanitary sewer along Ida Street in the vicinity of the subject site, the wastewater from the proposed building will discharge to the existing 600mm diameter sanitary sewer in the easement across the subject property to the east of the development limit via a 150mm diameter force main with a sanitary pump station located at the southeast end corner of the development limit. The wastewater flow from the subject development was calculated to be 20.60 L/s.

Storm Drainage

- The subject site will be serviced by a minor storm sewer system that will discharge the controlled stormwater runoff to the re-aligned watercourse to the east of the development site via an outfall headwall with erosion protection.
- An overland flow route will be provided within the subject site to direct runoff, in excess of the 100 year storm event. In this regard, the proposed site grades have been designed to ensure that flows in excess of the 100 year storm will be directed towards the re-aligned watercourse on the east side of the development site. The private road that provides access to the underground parking garage on the west side will direct the overland flow route to Ida Street.
- A weeping tile system will be required at the foundation of the underground parking garage. Given the depth of this system, it cannot drain by gravity to the storm sewer and therefore a sump pump will be required.
- A Flood Plain Analysis Report was prepared by Valdor Engineering Inc. to delineate the existing flood plain associated with the watercourse that drains in a southerly direction through the property. The analysis also determined the impact on the existing flood plain based on the proposed filling to accommodate the subject development. Based on the analysis it was determined that the proposed filling will have to be offset by a corresponding cut elsewhere on the property in order to maintain flood storage.

Stormwater Management

- The subject site will have an on-site stormwater detention system to control the post-development peak flows to pre-development rates. Stormwater storage is provided below grade in the courtyard. Roof top detention is not required and not proposed, the roof drainage will be directed to the on-site SWM detention tank. With an orifice diameter of 200 mm in combination with a 0.10 m wide weir, a total 100-year storage required volume of 480.2 m^3 will be achieved.
- "Enhanced" Level 1 treatment of stormwater achieving at least 80% TSS removal rate will be achieved by the OGS. The LID measure such as enhanced grass swale will be studied at the detailed design stage to enhance the stormwater quality control of the subject site.
- The proposed on-site stormwater management facilities are to be inspected and maintained in accordance with the recommendations contained in this report.

Erosion & Sediment Controls

- Erosion and sediment control measures are to be implemented during construction to prevent silt laden runoff downstream in accordance with the Erosion & Sediment Control Guidelines for Urban Construction (December 2006).

7.0 REFERENCES & BIBLIOGRAPHY

- Township of Southgate, **Municipal Servicing Standards**, June 2016.
- Ministry of Environment, **Stormwater Management Planning & Design Manual**, March 2003.
- TRCA & CVC, **Low Impact Development Stormwater Management Planning & Design Guide**, Version 1.0, 2010
- Greater Golden Horseshoe Area Conservation Authorities, **Erosion & Sediment Control Guidelines for Urban Construction**, December 2006.
- Hydrogeological Assessment, **Soil Engineers Ltd.**, January 21, 2025.

Respectfully submitted,

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This report was prepared by Valdor Engineering Inc. for the account of the Briarwood (Dundalk) Ltd. The comments, recommendations and material in this report reflect Valdor Engineering Inc.'s best judgment in light of the information available to it at the time of preparation. Any use of which a third party makes of this report, or any reliance on, or decisions made based on it, are the responsibility of such third parties. Valdor Engineering Inc. accepts no responsibility whatsoever for any damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

LEGEND

DEVELOPMENT SITE

SUBJECT SITE

PROPOSED CONDOMINIUM APARTMENTS

IDA STREET, DUNDALK, TOWNSHIP OF SOUTHGATE

PROPOSED SITE LOCATION

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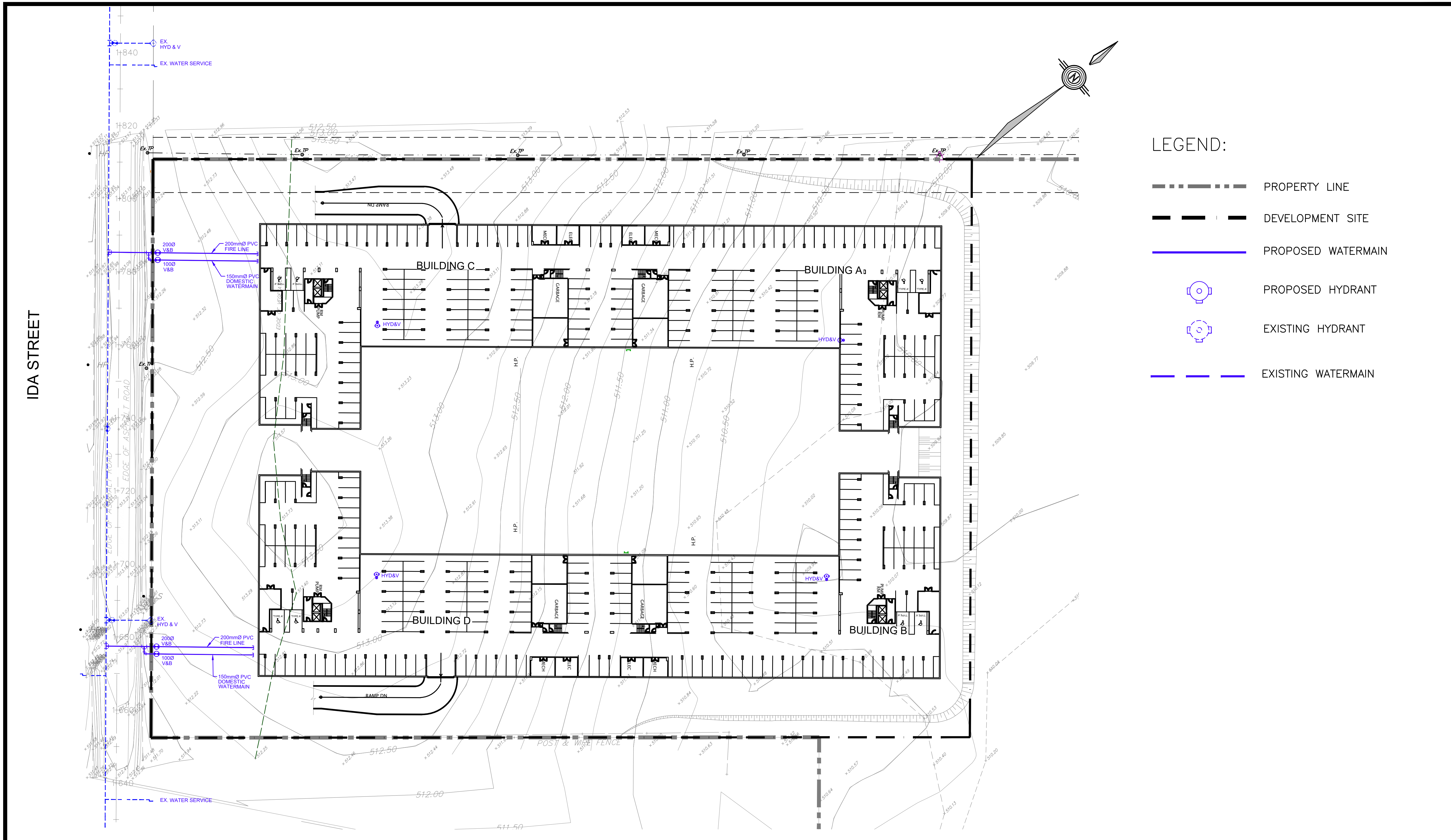
SCALE	N.T.S.	CKD. BY	D.G	DWG.	FIGURE 1
DATE	JANUARY 2025	DRAWN BY	D.Z.	PROJECT	23142



PROPOSED CONDOMINIUM APARTMENTS
IDA STREET, DUNDALK, TOWNSHIP OF SOUTHGATE

WATERMAIN SERVICING

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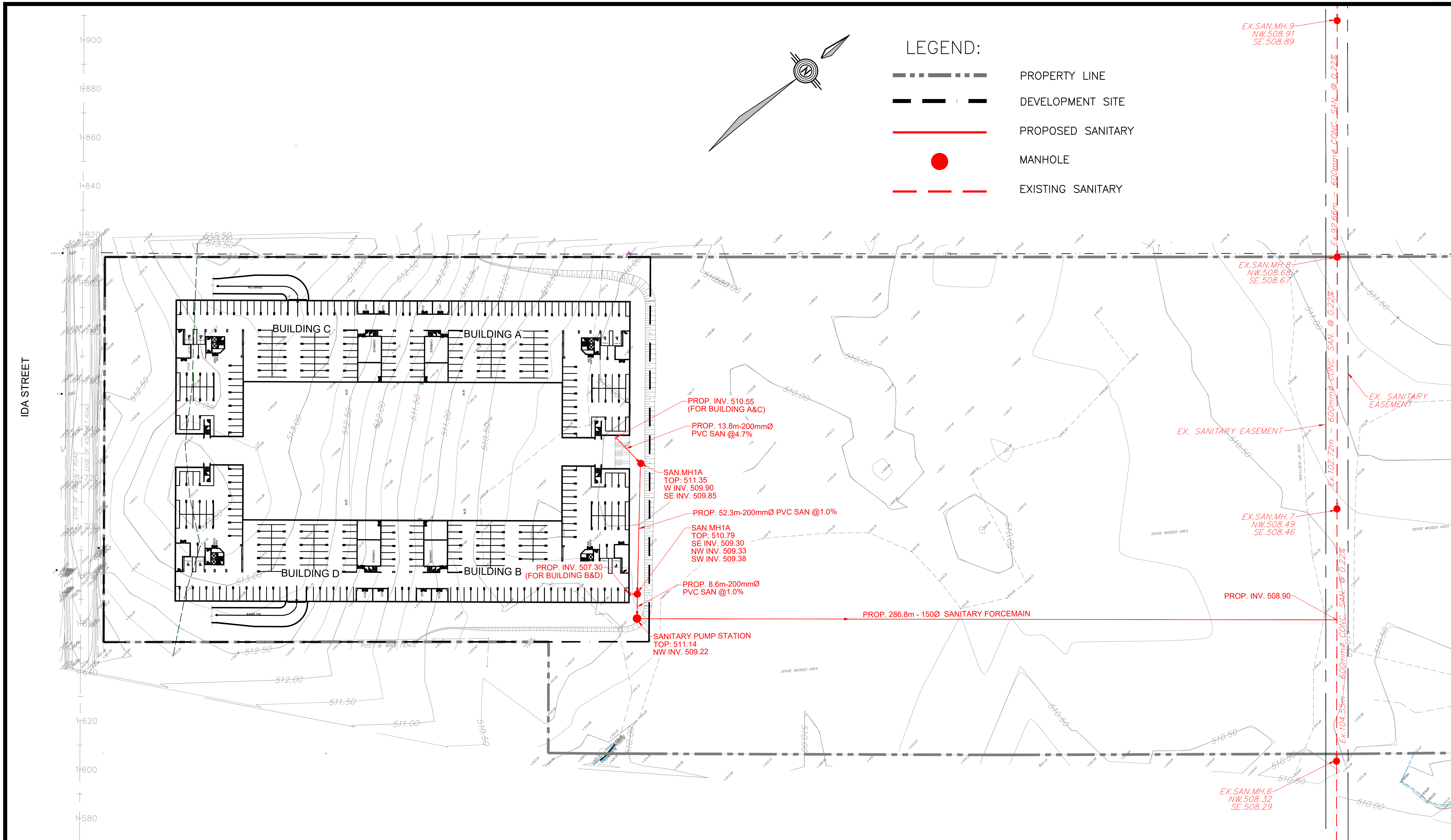
DATE:	JANUARY 2025	DRAWN BY:	R.P.	PROJECT:	23142
SCALE:	N.T.S.	CKD. BT:	D.G.	DWG.:	FIGURE 2



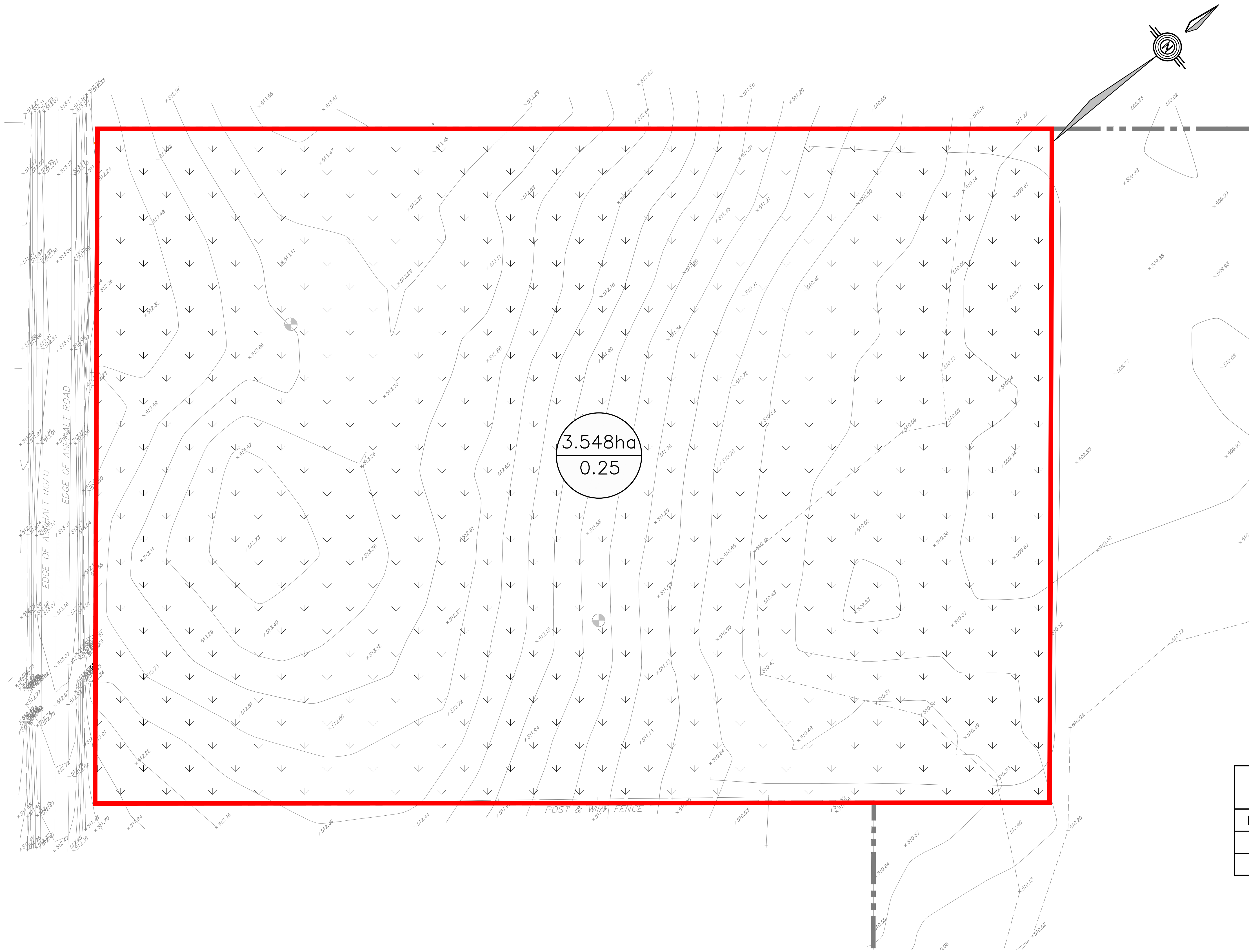
PROPOSED CONDOMINIUM APARTMENTS

IDA STREET, DUNDALK, TOWNSHIP OF SOUTHGATE

SANITARY SERVICING

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

DATE:	JANUARY 2025	DRAWN BY:	R.P.	PROJECT:	23142
SCALE:	N.T.S.	CKD. BT:	D.G.	DWG.:	FIGURE 3



LEGEND:

PROPERTY LINE

DRAINAGE BOUNDARY

PERVIOUS AREA

PRE–DEVELOPMENT AREA SUMMARY (TO WATERCOURSE)			
LAND USE	AREA (Ha.)	RC	COMPOSITE RC
PERVIOUS	3.548	0.25	0.25
TOTAL	3.548		

PROPOSED CONDOMINIUM APARTMENTS
IDA STREET, DUNDALK, TOWNSHIP OF SOUTHGATE

PRE - DEVELOPMENT STORM DRAINAGE CONDITION

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
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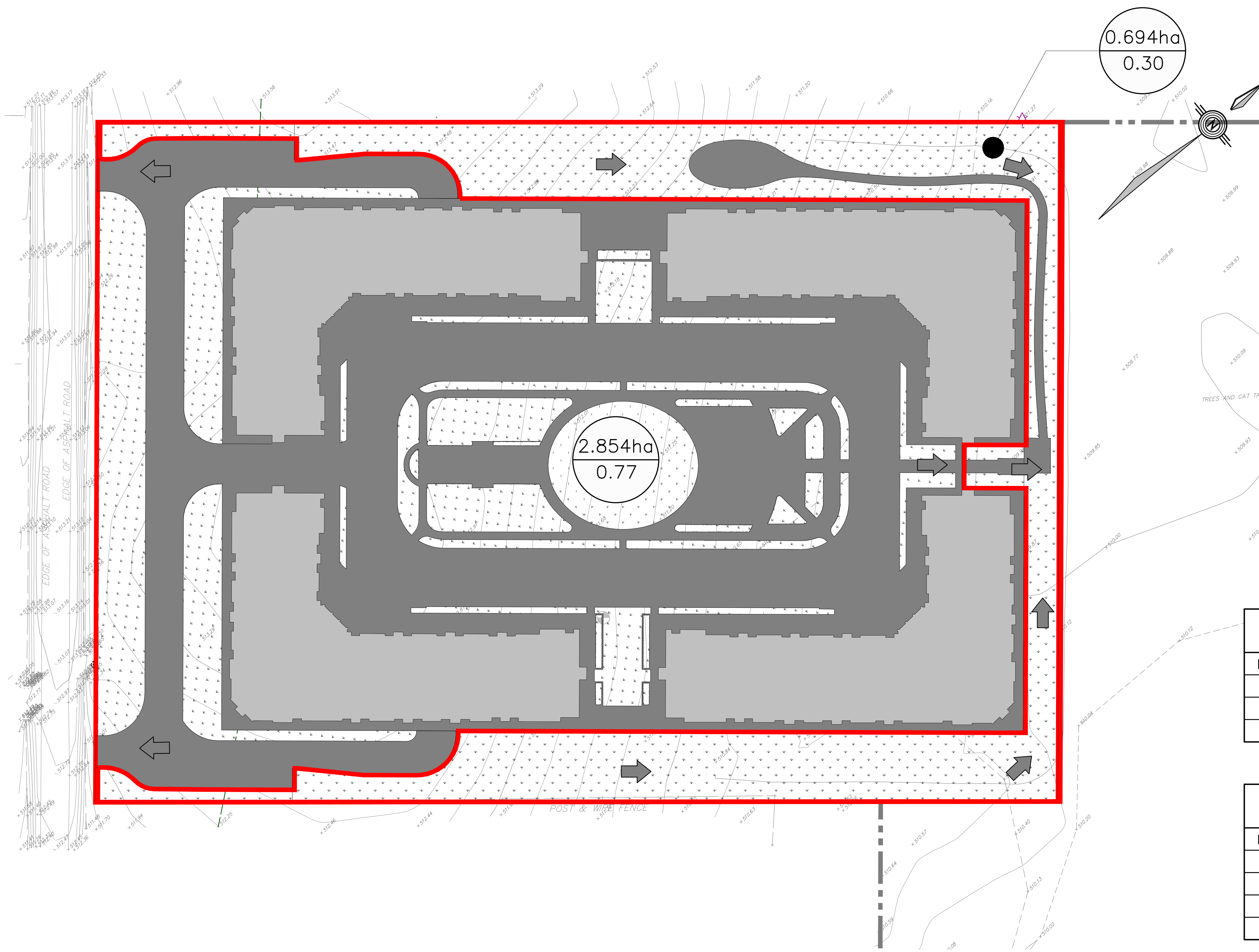
DATE:	JANUARY 2025	DRAWN BY:	R.P.	PROJECT:	23142
SCALE:	N.T.S.	CKD. BT:	D.G.	DWG.:	FIGURE 4



LEGEND:

PROPERTY LINE

DRAINAGE BOUNDARY

ROOF

PERVIOUS

IMPERVIOUS

DRAINAGE DIRECTION

POST–DEVELOPMENT AREA SUMMARY
SUBJECT SITE (UNCONTROLLED)

LAND USE	AREA (Ha.)	RC	COMPOSITE RC
PERVIOUS	0.639	0.25	0.30
IMPERVIOUS	0.055	0.90	
TOTAL	0.694		

POST–DEVELOPMENT AREA SUMMARY
SUBJECT SITE (CONTROLLED)

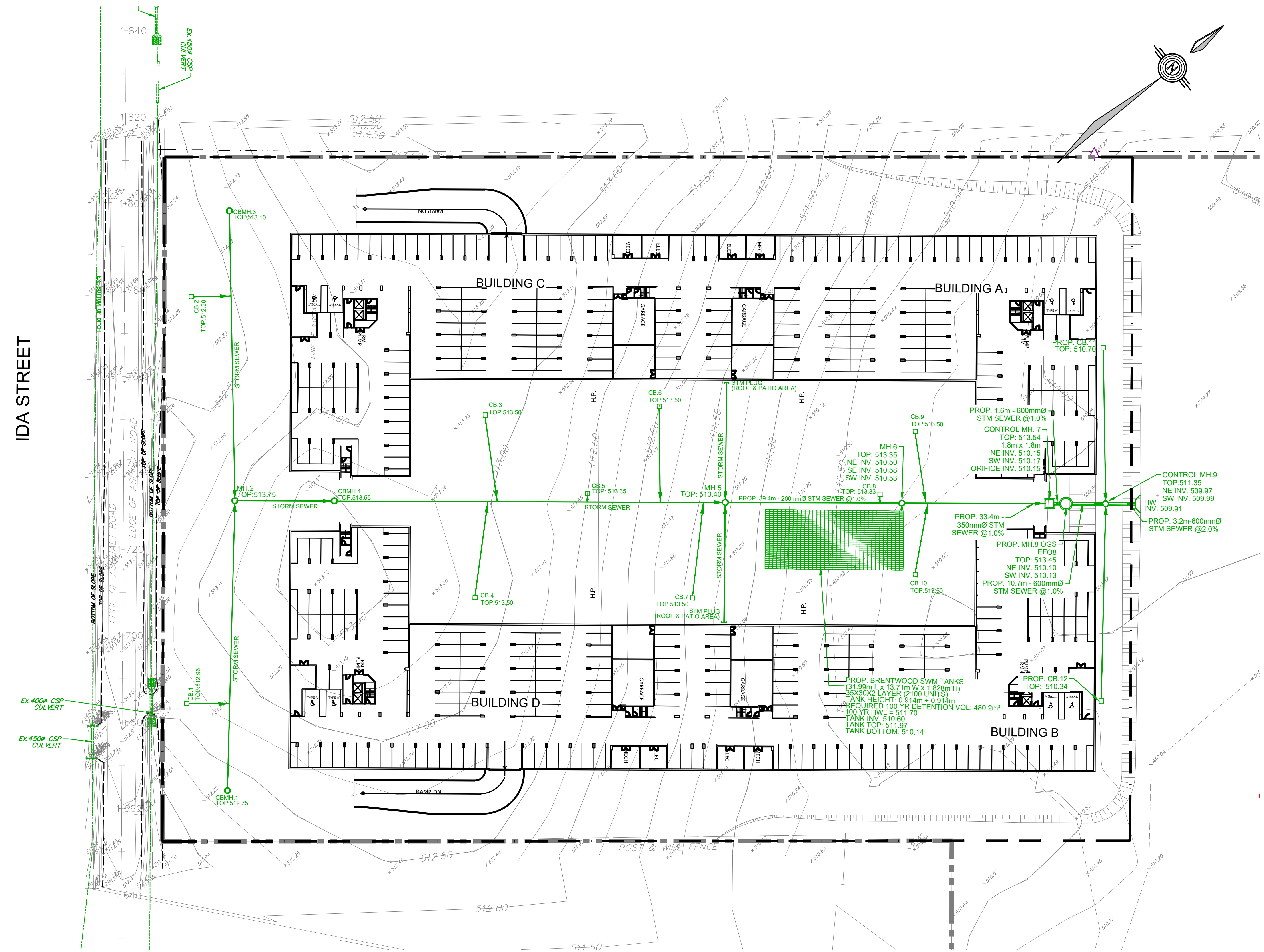
LAND USE	AREA (Ha.)	RC	COMPOSITE RC
PERVIOUS	0.582	0.25	0.77
ROOF AREA	0.937	0.90	
IMPERVIOUS	1.335	0.90	
TOTAL	2.854		

PROPOSED CONDOMINIUM APARTMENTS
IDA STREET, DUNDALK, TOWNSHIP OF SOUTHGATE

POST - DEVELOPMENT STORM DRAINAGE CONDITION

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

DATE:	JANUARY 2025	DRAWN BY:	R.P.	PROJECT:	23142
SCALE:	N.T.S.	CKD. BT:	D.G.	DWG.:	FIGURE 5



LEGEND:

PROPERTY LINE

DEVELOPMENT SITE

PROPOSED STORM

EXISTING STORM

PROPOSED MANHOLE

EXISTING MANHOLE

PROPOSED CONDOMINIUM APARTMENTS

IDA STREET, DUNDALK, TOWNSHIP OF SOUTHGATE

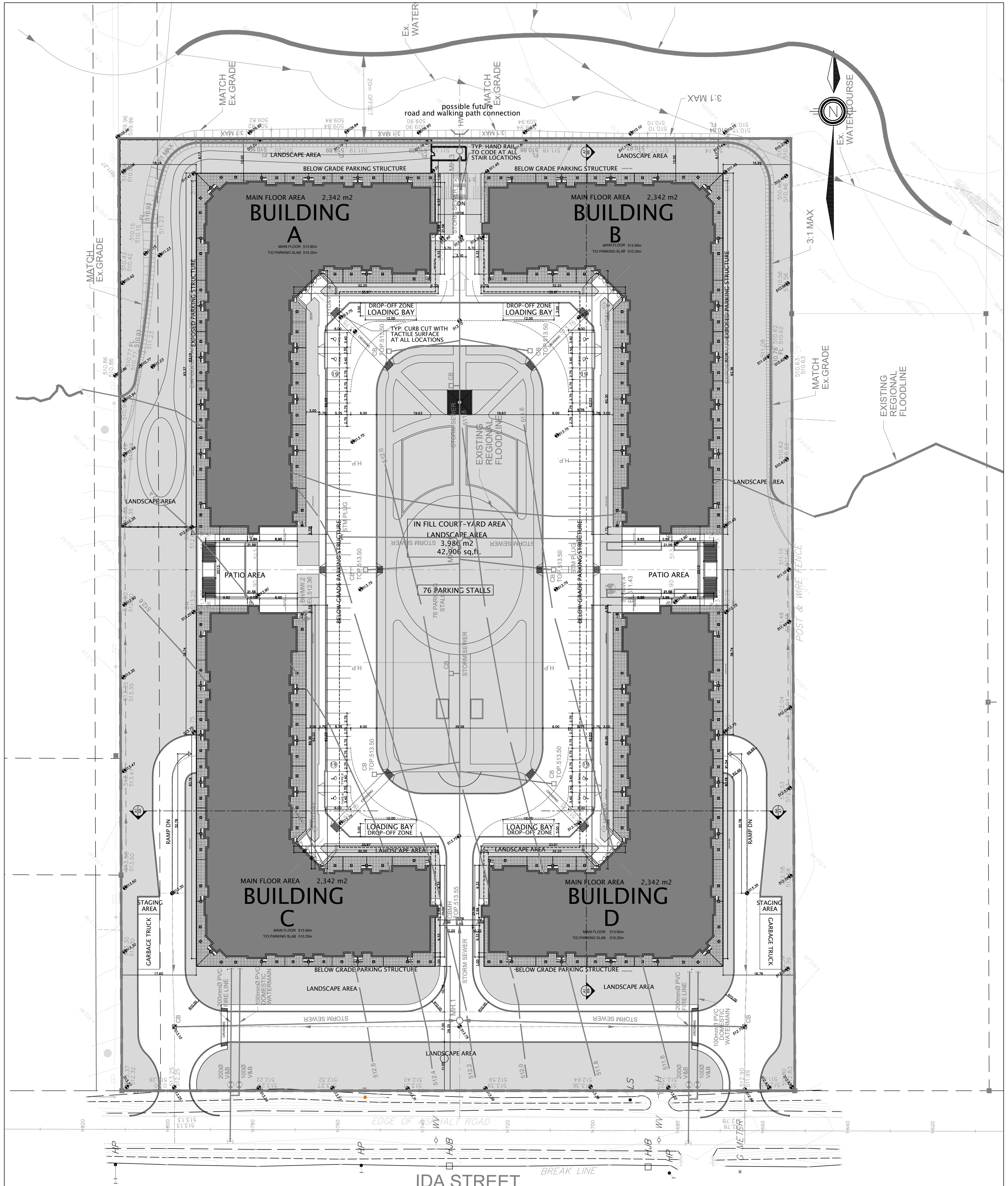
STORM SERVICING

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

DATE:	JANUARY 2025	DRAWN BY:	R.P.	PROJECT:	23142
SCALE:	N.T.S.	CKD. BT:	D.G.	DWG.:	FIGURE 6

APPENDIX “A”

Architectural Site Plan



OBC: 3.2.245 group C, up to 4 storeys, Sprinklered
(iii) 2400 m2 if 3 storeys in building height.

SITE AREA	35,481.69 m2 381,921.7 sq,ft.
LOT COVERAGE	26%
OPEN AREA	74%
FRONT YARD SET BACK(SOUTH SIDE)	29.25m
SIDE YARD SET BACK (EAST SIDE)	15.99m
SIDE YARD SET BACK (WEST SIDE)	17.60m
REAR YARD SET BACK (NORTH SIDE)	10.00m
EACH STRUCTURE AREA	7,535.86 m2
TOTAL PARKING STRUCTURE	15,071.72 m2 162,230.6 sq,ft.
PARKING STALLS 1.0 PER UNIT	376
PARKING STALLS VISITOR 0.2 PER UNITS	75
PARKING STALLS REQUIRED	451
1 BED accessible unit 15% of total	56 Units
PARKING STALLS BELOW GRADE 1.0 PER UNIT	378
PARKING STALLS AT GRADE COURT YARD 0.2 PER UNITS	76
PARKING STALLS PROVIDED	454

BUILDING -A-

MAIN FLOOR AREA	2,342 m2
2ND FLOOR AREA	2,309 m2
3RD FLOOR AREA	2,309 m2
GFA-TOTAL AREA PER BUILDING	6,960 m2

BUILDING -B-

MAIN FLOOR AREA	2,342 m2
2ND FLOOR AREA	2,309 m2
3RD FLOOR AREA	2,309 m2
GFA-TOTAL AREA PER BUILDING	6,960 m2

BUILDING -C-

MAIN FLOOR AREA	2,342 m2
2ND FLOOR AREA	2,309 m2
3RD FLOOR AREA	2,309 m2
GFA-TOTAL AREA PER BUILDING	6,960 m2

BUILDING -D-

MAIN FLOOR AREA	2,342 m2
2ND FLOOR AREA	2,309 m2
3RD FLOOR AREA	2,309 m2
GFA-TOTAL AREA PER BUILDING	6,960 m2

GFA-GRAND TOTAL AREA X 4 27,840 m2
299,667.3 sq,ft.

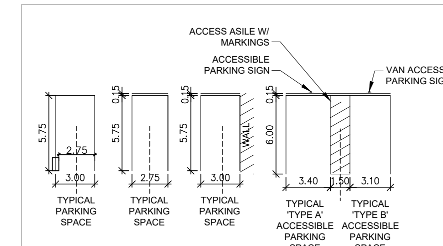
(A) BUILDING 193 MAPLEVIEW DRIVE EAST

Item	OntarioBuildingCodeDataMatrixPart3	OBCReference
1	Project Description ■ New	■ Part3
2	MajorOccupancy(s) GROUP C - RESIDENTIAL / GROUP E MERCANTILE	3.1.2.1.(1)
3	BuildingArea(m2) New 1640.00 Total 1640.00	1.1.3.2
4	GrossArea(m2) New 8184.00 Total 8184.00	1.1.3.2
5	NumberOfStoreys Abovegrade 5 Below grade 1	3.2.1.1.(1)&1.1.3.2
6	Height of Building 5 STOREY	
7	NumberofStreetsAccessRoutes 2	3.2.2.10&3.2.5.5
8	BuildingClassification GROUP C, 5 STOREYS, SPRINKLERED	3.2.2.43A.
9	SprinklerSystemProposed ■ entire building ☐ inlieu of roof rating ☐ not required	3.2.2.43A.
10	Stand pipe required ■ Yes ☐ No	3.2.9
11	Fire Alarm required ■ Yes ☐ No	3.2.4
12	Water Service Supply is Adequate ■ Yes ☐ No	
13	High Building ☐ Yes ■ No	3.2.6
14	Permitted Construction ■ Combustible ■ Non-combustible Actual Construction ■ Combustible ☐ Non-combustible	3.2.2.45.
15	Mezzanine(s)Aream2 NA	3.2.1.1.(3)-(8)
16	Occupant load based on ☐ m2person ■ design of building 1stFloor Occupancy GROUPC Load 30 persons 2ndFloor Occupancy GROUPC Load 62 persons 3rdFloor Occupancy GROUPC Load 62 persons 4thFloor Occupancy GROUPC Load 62 persons 5thFloor Occupancy GROUPC Load 62 persons	3.1.17 OCCUPANT LOADAS PEROBC3.1.17.1.(1)(b)
17	Barrie-free Design ■ Yes ☐ No(Explain)	3.8
18	Hazardous Substances ☐ Yes ■ No	3.3.1.2.(1)&3.3.1.19(1)
19	Required Fire Resistance Rating (FRR) Horizontal Assemblies FRR(Hours) / Listed Design No. or Description(SB-2) Floors 1 / OBC SB-2 / ULC Floors 1 / OBC SB-2 / ULC Roof 1 / OBC SB-2 / ULC FRR of Supporting Members(Hours) / Listed Design No. or Description(SB-2) Floors 1 / OBC SB-2 / ULC Floors 1 / OBC SB-2 / ULC Roof 1 / OBC SB-2 / ULC	3.3.5.6.(1),3.2.2.43A 3.2.2.20-.83&3.2.1.4
20	Spatial Separation-Construction Of Exterior Walls	3.2.3
21	Storage Garage Considered as a Separate Building, Group F Division 3.	3.2.1.2. 3.2.2.76

Wall	L.D. (m)	Areaof EBF (m2)	LH or HL	Permitted Max.of Openings	Proposed of Openings	FRR (Hours)	Listed Designor Description	Comb Const	Comb.Constr. Nonc. Cladding	Non-Comb. Const.
North	5.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
South	38.98	NA	NA	NA	NA	NA	NA	NA	NA	NA
East	5.31	NA	NA	NA	NA	NA	NA	NA	NA	NA
West	7.50	NA	NA	NA	NA	NA	NA	NA	NA	NA

SHEETS

NOTE:
ALL LANDSCAPING IMAGES ARE FOR REFERENCE ONLY, SEE LANDSCAPE ARCHITECTS DWGS.
ALL SITE GRADES PROPOSED ON THIS AND FOLLOWINGS DWGS ARE SUBJECT TO CIVIL DWGS



Barrier Free And Parking Standards

No.	Description	Date	Rev.
3	ISSUED FOR CLIENT AND CONSULTANT REVIEW (sidewalk connection)	Dec 09, 2024	
2	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Oct 22, 2024	
1	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Sept 30, 2024	

CLIENT:

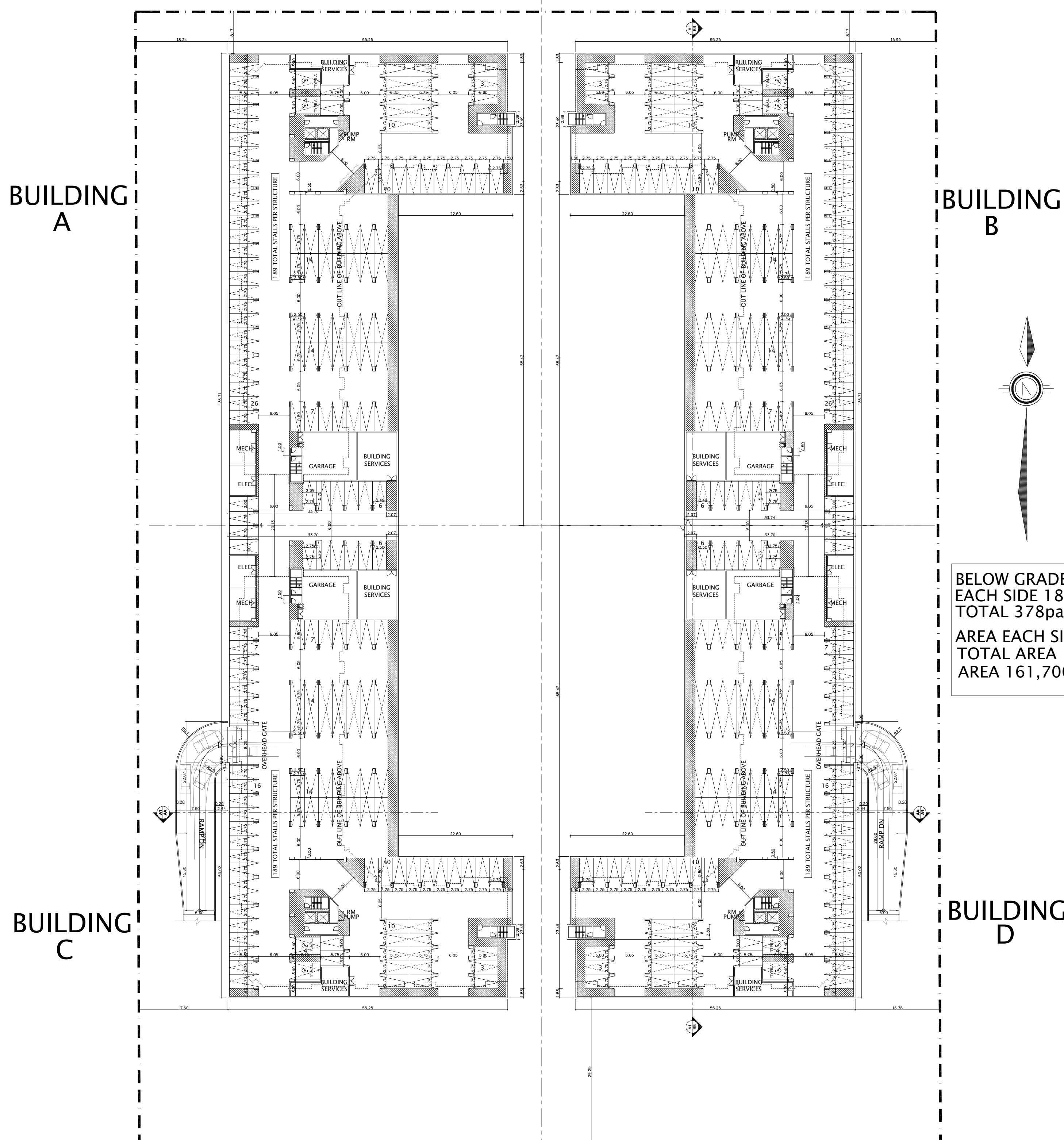
DUNDALK CONCEPT — ELEVATION: — Drawing No. A-101

FLOOD PLAIN SITE PLAN — DATE ISSUED: JUNE 27,2024

PROJECT #: 2024-25 — MARKETING NAME: -

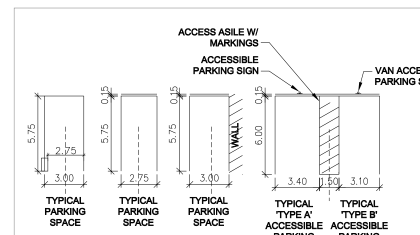
SCALE: 1:500 — MUNICIPALITY:

S&C ARCHITECTS INC.
T:(416)848-0991 F:(416)860-6101
INFO@SCARCHITECTS.CA
60 RANDALL DRIVE SUITE 10
AJAX, ONTARIO L1S 6L3



BELOW GRADE PARKING
EACH SIDE 189 parking stall
TOTAL 378parking stall

AREA EACH SIDE 7,540m2
TOTAL AREA 15,022.46 m2
AREA 161,700.4 sq,ft.



Barrier Free And Parking Standards

No.	Description	Date	Rev.
6	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Oct 22, 2024	
5	ISSUED FOR CLIENT AND CONSULTANT REVIEW	AUG 08, 2024	
4	ISSUED FOR CLIENT AND CONSULTANT REVIEW	July 16, 2024	
3	ISSUED FOR CLIENT AND CONSULTANT REVIEW	July 11, 2024	
2	ISSUED FOR CLIENT AND CONSULTANT REVIEW	june 27, 2024	SA
1	ISSUED FOR CLIENT AND CONSULTANT REVIEW	june 02, 2024	SA

CLIENT:

DUNDALK CONCEPT

ELEVATION:

Drawing No. A-102

PARKING PLAN

DATE ISSUED: JUNE 27,2024

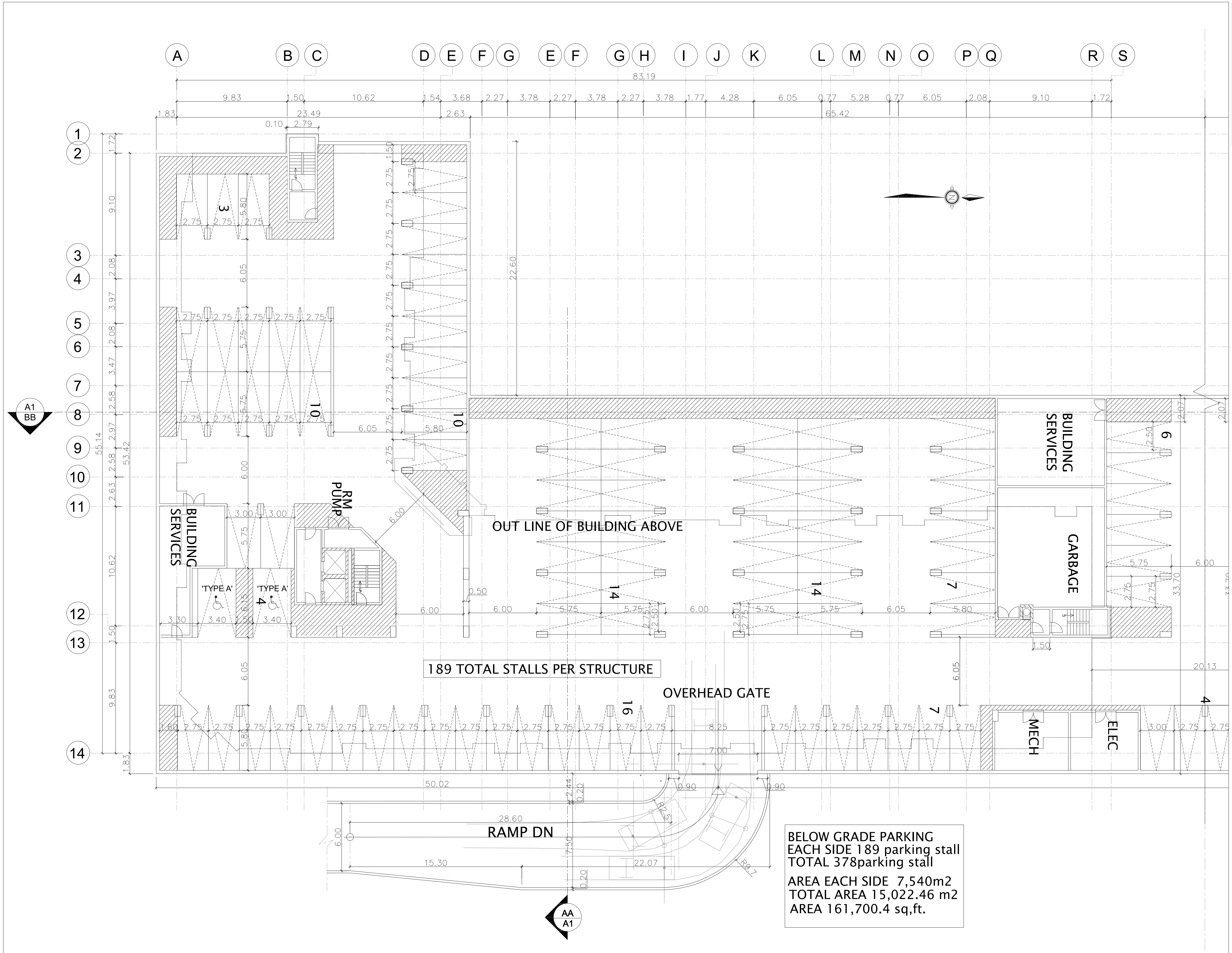
PROJECT #: 2024-25

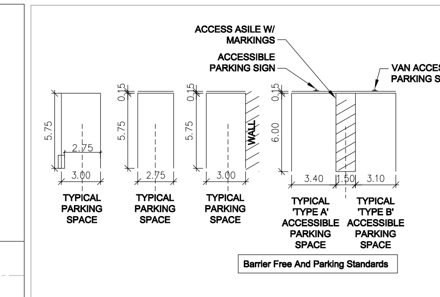
MARKETING NAME: -

SCALE: 1:500

MUNICIPALITY:

S&C ARCHITECTS INC.
T:(416)848-0991 F:(416)860-6101
INFO@SCARCHITECTS.CA
60 RANDALL DRIVE SUITE 10
AJAX, ONTARIO L1S 6L3





No.	Description	Date	Rev.
6	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Oct 22, 2024	
5	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Aug 08, 2024	
4	ISSUED FOR CLIENT AND CONSULTANT REVIEW	July 16, 2024	
3	ISSUED FOR CLIENT AND CONSULTANT REVIEW	July 11, 2024	
2	ISSUED FOR CLIENT AND CONSULTANT REVIEW	june 27, 2024	SA
1	ISSUED FOR CLIENT AND CONSULTANT REVIEW	june 02, 2024	SA

CLIENT:

DUNDALK CONCEPT

ELEVATION:

Drawing No. A-103

PARKING PLAN

DATE ISSUED: JUNE 27,2024

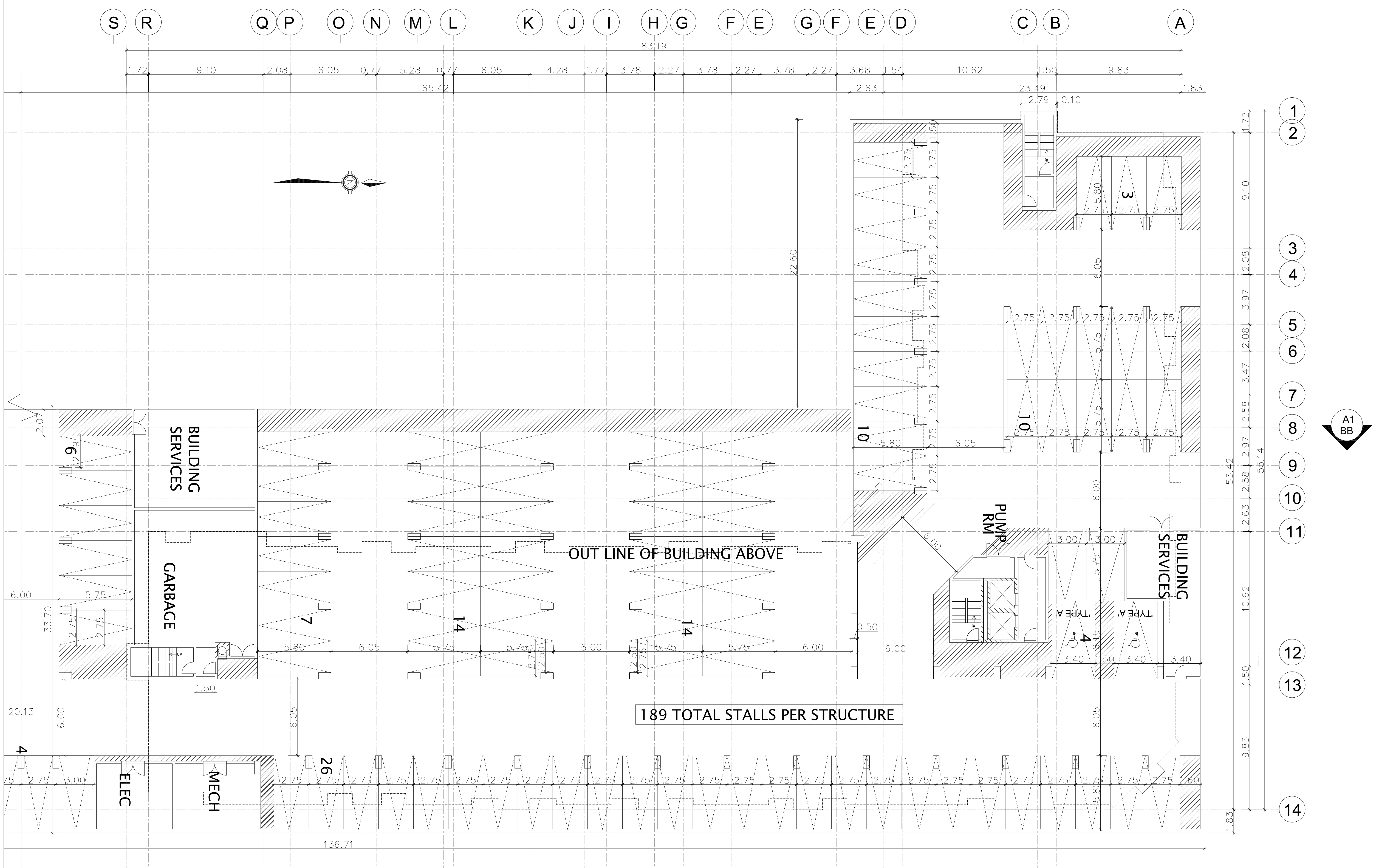
PROJECT #: 2024-25

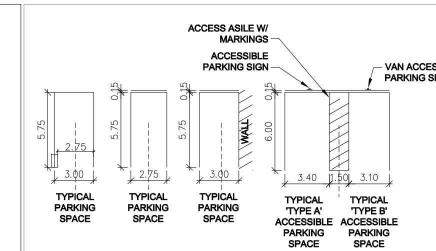
MARKETING NAME: -

SCALE: 1:150

MUNICIPALITY:

S&C ARCHITECTS INC.
T:(416)848-0991 F:(416)860-6101
INFO@SCARCHITECTS.CA
60 RANDALL DRIVE SUITE 10
AJAX, ONTARIO L1S 6L3





Barrier Free And Parking Standards

BELOW GRADE PARKING
EACH SIDE 189 parking stall
TOTAL 378parking stall

AREA EACH SIDE 7,540m2
TOTAL AREA 15,022.46 m2
AREA 161,700.4 sq,ft.

No.	Description	Date	Rev.
6	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Oct 22, 2024	
5	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Aug 08, 2024	
4	ISSUED FOR CLIENT AND CONSULTANT REVIEW	July 16, 2024	
3	ISSUED FOR CLIENT AND CONSULTANT REVIEW	July 11, 2024	
2	ISSUED FOR CLIENT AND CONSULTANT REVIEW	june 27, 2024	SA
1	ISSUED FOR CLIENT AND CONSULTANT REVIEW	june 02, 2024	SA

CLIENT:

DUNDALK CONCEPT

ELEVATION:

Drawing No. A-104

PARKING PLAN

DATE ISSUED: JUNE 27,2024

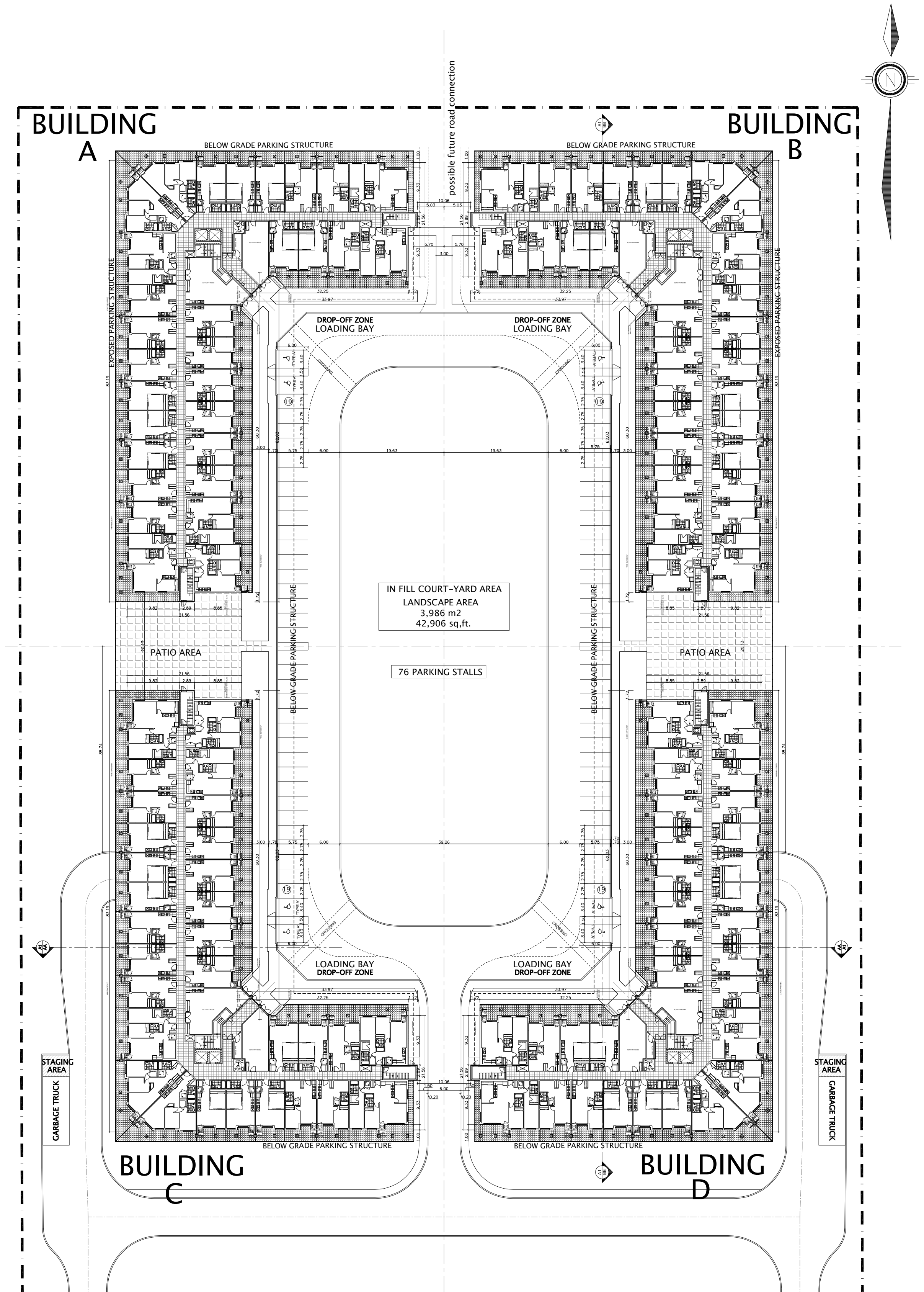
PROJECT #: 2024-25

MARKETING NAME: -

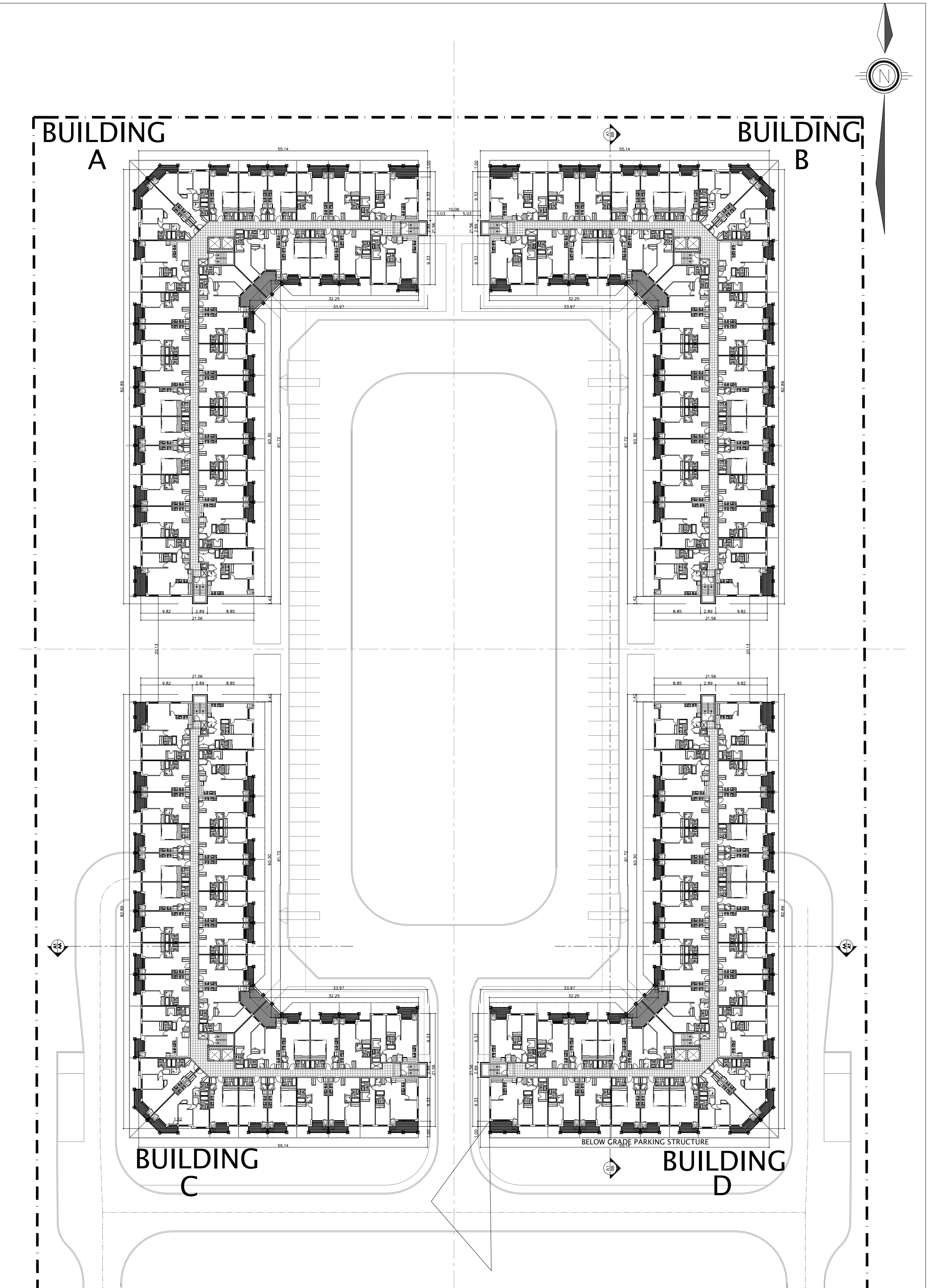
SCALE: 1:150

MUNICIPALITY:

S&C ARCHITECTS INC.
T:(416)848-0991 F:(416)860-6101
INFO@SCARCHITECTS.CA
60 RANDALL DRIVE SUITE 10
AJAX, ONTARIO L1S 6L3



MAIN FLOOR PLAN



2ND FLOOR PLAN

No.	Description	Date	Rev.
6	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Oct 22, 2024	
5	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Aug 08, 2024	
4	ISSUED FOR CLIENT AND CONSULTANT REVIEW	July 16, 2024	
3	ISSUED FOR CLIENT AND CONSULTANT REVIEW	July 11, 2024	
2	ISSUED FOR CLIENT AND CONSULTANT REVIEW	june 27, 2024	SA
1	ISSUED FOR CLIENT AND CONSULTANT REVIEW	june 02, 2024	SA

CLIENT:

DUNDALK CONCEPT

ELEVATION:

Drawing No. A-105

MAIN-2ND-3RD FLOOR PLANS

DATE ISSUED: JUNE 27,2024

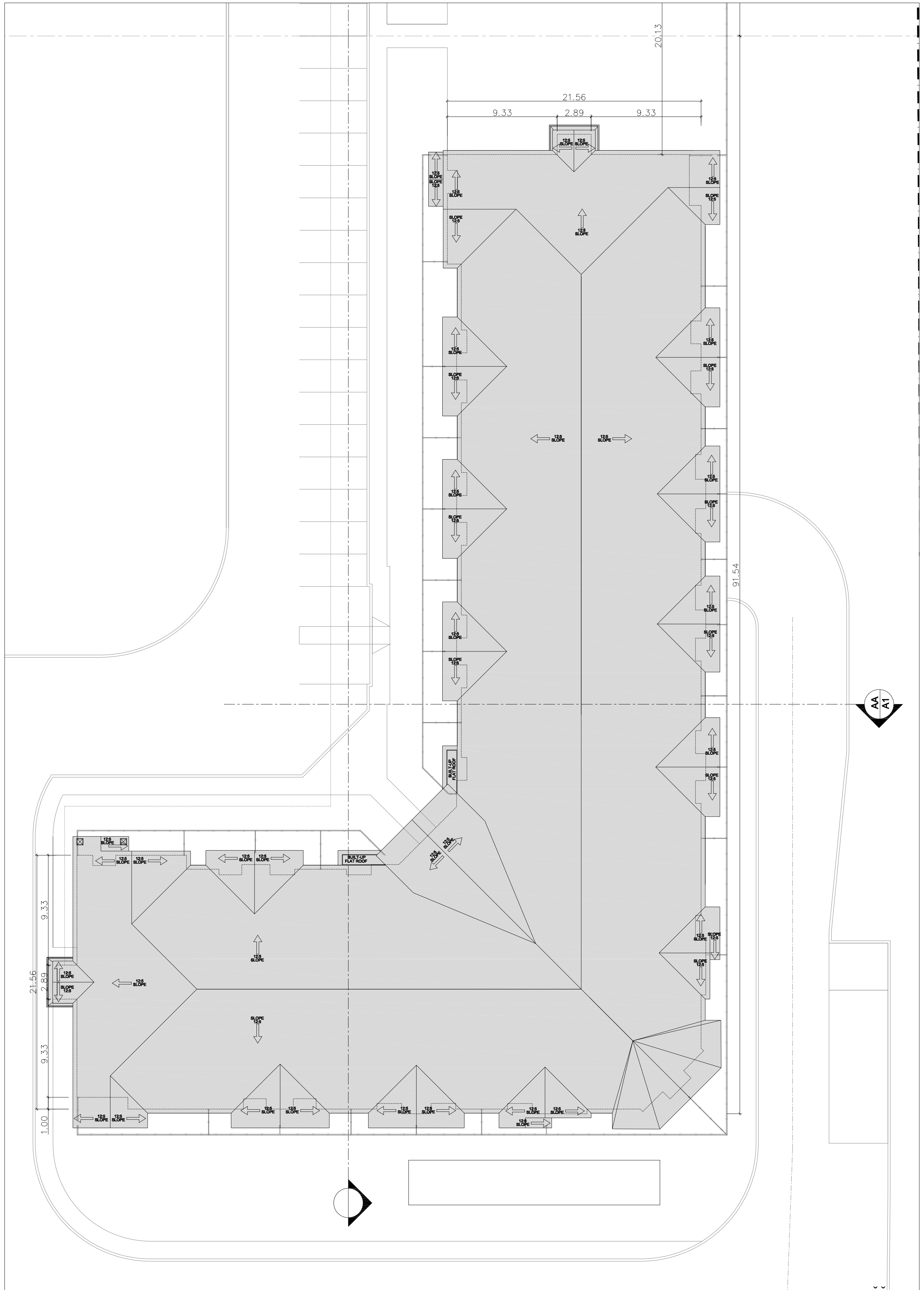
PROJECT #: 2024-25

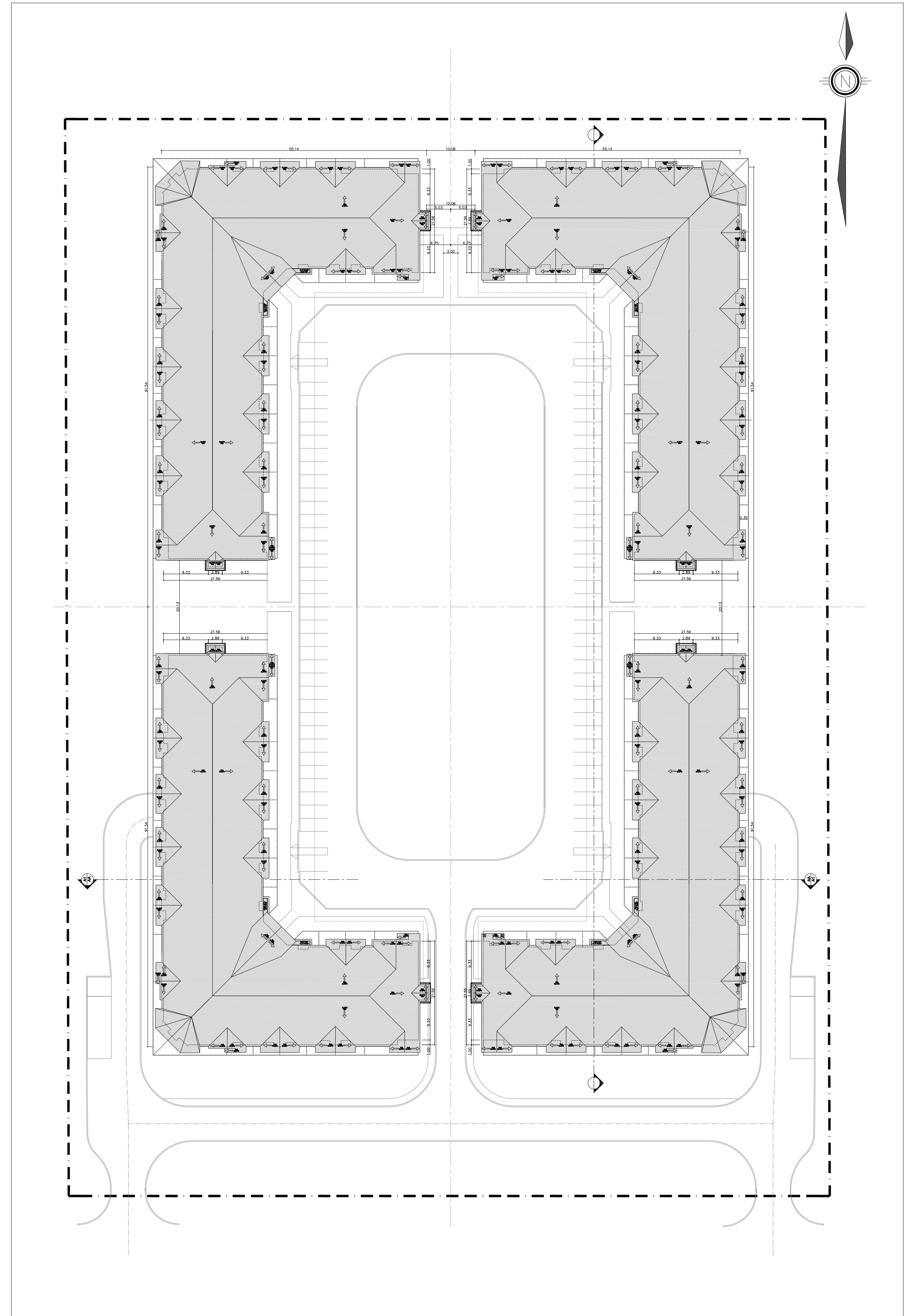
MARKETING NAME: -

SCALE: 1:500

MUNICIPALITY:

S&C ARCHITECTS INC.
T:(416)848-0991 F:(416)860-6101
INFO@SCARCHITECTS.CA
60 RANDALL DRIVE SUITE 10
AJAX, ONTARIO L1S 6L3



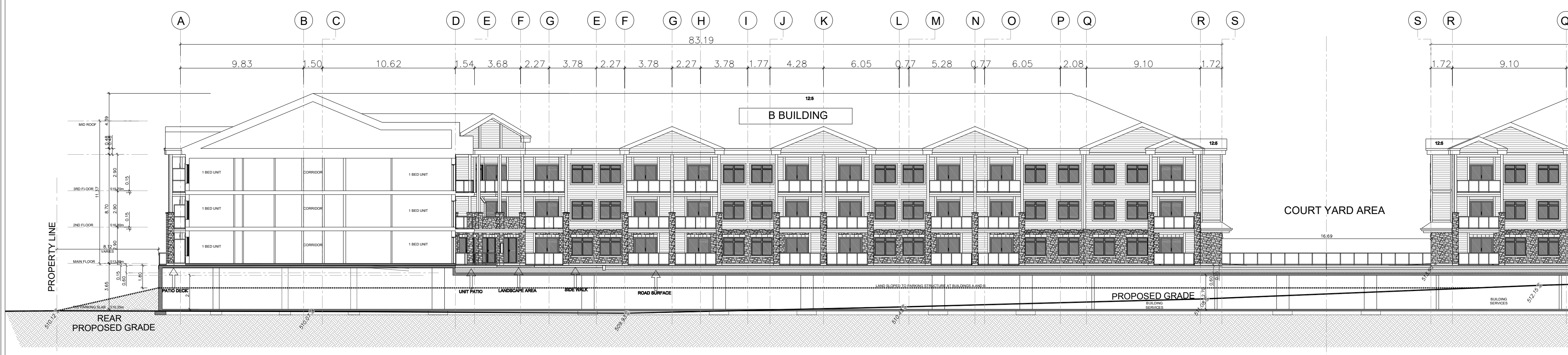


No.	Description	Date	Rev.
6	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Oct 22, 2024	
5	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Aug 08, 2024	
4	ISSUED FOR CLIENT AND CONSULTANT REVIEW	July 16, 2024	
3	ISSUED FOR CLIENT AND CONSULTANT REVIEW	July 11, 2024	
2	ISSUED FOR CLIENT AND CONSULTANT REVIEW	june 27, 2024	SA
1	ISSUED FOR CLIENT AND CONSULTANT REVIEW	june 02, 2024	SA

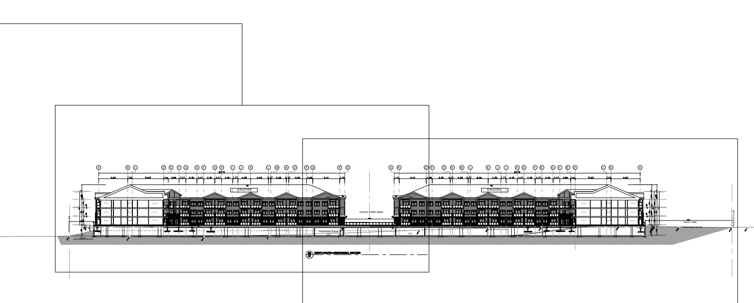
Drawing No.

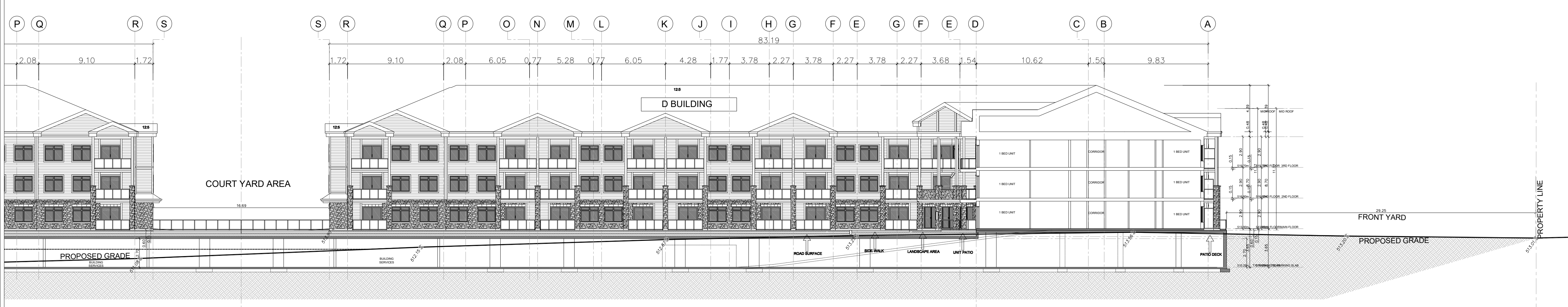
S&C ARCHITECTS INC.
T:(416)848-0991 F:(416)860-6101
INFO@SCARCHITECTS.CA
60 RANDALL DRIVE SUITE 10
AJAX, ONTARIO L1S 6L3

AA A1 EAST WEST CROSS SECTION



BB A1 NORTH SOUTH LONGITUDINAL SECTION





BB A1 NORTH SOUTH LONGITUDINAL SECTION

NOTE:
SEE SPEC FOR EACH BUILDINGS ASSIGNED
COLOURS AND STONE WORK.
LOCATIONS OF MATERIALS WILL REMAIN CONSTANT WITH EACH BUILDING.
ALL GLAZING TO BE CLEAR AT RAILINGS.

ALL GRADES ARE TO CONFORM TO CIVIL ENG DWGS.

No.	Description	Date	Rev.
2	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Oct 22, 2024	
1	ISSUED FOR CLIENT AND CONSULTANT REVIEW	Sept 25, 2024	SA

CLIENT:

DUNDALK CONCEPT

ELEVATION:

Drawing No. A-115

BUILDING SITE SECTIONS

DATE ISSUED: JUNE 27,2024

PROJECT #: 2024-25

MARKETING NAME: -

SCALE: 1:200

MUNICIPALITY:

S&C ARCHITECTS INC.
T:(416)848-0991 F:(416)860-6101
INFO@SCARCHITECTS.CA
60 RANDALL DRIVE SUITE 10
AJAX, ONTARIO L1S 6L3

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

TABLE: A1

EQUIVALENT POPULATION

In accordance with The Township of Southgate's Municipal Servicing Standards (2016).

Project Name: **Ida Street, Dundalk, Township of Southgate**
File: 23142
Date: January 2025

Condo Apartments	Criteria	Residential Units	Equivalent Population
Building 'A'	2.7 persons per unit	94	253.8
Building 'B'	2.7 persons per unit	94	253.8
Building 'C'	2.7 persons per unit	94	253.8
Building 'D'	2.7 persons per unit	94	253.8
Total:		**376**	**1,015**

APPENDIX "B"

Water Servicing

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

Table B1

WATER DEMAND CALCULATION

In accordance with The Township of Southgate's Municipal Servicing Standards (2016).

Project Name: **Ida Street, Dundalk, Township of Southgate**

File: 23142

Date: January 2025

Demand Critera:

	Base Demand		Peaking Factors	
Domestic Flows	450	L/capita/day	Max Day	1.3
			Peak Hour	2.5
			Min Hour	0.84

	Equivalent Population	Average Day (L/day)	Average Day (L/min)	Max Day (L/min)	Peak Hour (L/min)	Min Hour (L/min)
Building 'A'	253.8	114,210.0	79.3	103.1	198.3	66.6
Building 'B'	253.8	114,210.0	79.3	103.1	198.3	66.6
Building 'C'	253.8	114,210.0	79.3	103.1	198.3	66.6
Building 'D'	253.8	114,210.0	79.3	103.1	198.3	66.6
Total	**1,016**	**456,840.0**	**317.3**	**412.4**	**793.1**	**266.5**

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

Table B2-1

REQUIRED FIRE FLOW CALCULATION

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 2020

Project Name: **Ida Street, Dundalk, Township of Southgate**
File: 23142
Date: December 2024

Notes: Building 'A' - 3 Storeys

Type of Construction - Wood Frame Construction
$C =$ 1.5

For a building classified with a Construction Coefficient from 1.0 to 1.5, the total effective area shall be the total area of all floor areas (assuming vertical openings and exterior vertical communications are properly protected):

Floor	Area (sq.m)	%	
Largest Floor Area	2,342	100%	(Main Floor)
Upper Adjoining Floor Area	2,309	100%	(2nd Floor)
Upper Adjoining Floor Area	2,309	100%	(3rd Floor)
$A =$	6,960	sq.m	

$F = 220\ C\ \sqrt{A}$
$F =$ 27,531 L/min
$F =$ 28,000 (to nearest 1,000 Lmin)

Occupancy Factor

		Charge
Type:	Residential	-15%
	$f_1 =$	-15%

$F' = F \times (1+f_1)$
$F' =$ 23,800 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):	>30m	0%	
East Side - Distance to Building (m):	10.1 to 20m	13%	
South Side - Distance to Building (m):	10.1 to 20m	13%	
West Side - Distance to Building (m):	>30m	0%	
	$f_3 =$	26%	(maximum of 75%)

$F'' = F' + F' \times f_2 + F' \times f_3$
$F'' =$ 18,088 L/min

REQUIRED FIRE FLOW
$F'' =$ **18,000** **L/min** (to nearest 1,000 L/min)

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

Table B2-2

REQUIRED FIRE FLOW CALCULATION

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 2020

Project Name: **Ida Street, Dundalk, Township of Southgate**
File: 23142
Date: December 2024

Notes: Building 'B' - 3 Storeys

Type of Construction - Wood Frame Construction
$C =$ 1.5

For a building classified with a Construction Coefficient from 1.0 to 1.5, the total effective area shall be the total area of all floor areas (assuming vertical openings and exterior vertical communications are properly protected):

Floor	Area (sq.m)	%	
Largest Floor Area	2,342	100%	(Main Floor)
Upper Adjoining Floor Area	2,309	100%	(2nd Floor)
Upper Adjoining Floor Area	2,309	100%	(3rd Floor)
$A =$	6,960	sq.m	

$F = 220\,C\sqrt{A}$
$F =$ 27,531 L/min
$F =$ 28,000 (to nearest 1,000 Lmin)

Occupancy Factor

		Charge
Type:	Residential	-15%
	$f_1 =$	-15%

$F' = F \times (1+f_1)$
$F' =$ 23,800 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):	>30m	0%	
East Side - Distance to Building (m):	>30m	0%	
South Side - Distance to Building (m):	10.1 to 20m	13%	
West Side - Distance to Building (m):	10.1 to 20m	13%	
	$f_3 =$	26%	(maximum of 75%)

$F'' = F' + F' \times f_2 + F' \times f_3$
$F'' =$ 18,088 L/min

REQUIRED FIRE FLOW
$F'' =$ **18,000** **L/min** (to nearest 1,000 L/min)

VALDOR ENGINEERING INC.
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www.valdor-engineering.com

Table B2-3

REQUIRED FIRE FLOW CALCULATION

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 2020

Project Name: **Ida Street, Dundalk, Township of Southgate**
File: 23142
Date: December 2024

Notes: Building 'C' - 3 Storeys

Type of Construction - Wood Frame Construction

$C =$ 1.5

For a building classified with a Construction Coefficient from 1.0 to 1.5, the total effective area shall be the total area of all floor areas (assuming vertical openings and exterior vertical communications are properly protected):

Floor	Area (sq.m)	%	
Largest Floor Area	2,342	100%	(Main Floor)
Upper Adjoining Floor Area	2,309	100%	(2nd Floor)
Upper Adjoining Floor Area	2,309	100%	(3rd Floor)
$A =$	6,960	sq.m	

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

$F =$ 27,531 L/min

$F =$ 28,000 (to nearest 1,000 Lmin)

Occupancy Factor

		Charge
Type:	Residential	-15%
	$f_1 =$	-15%

$F' = F \text{ x } (1+f_1)$

$F' =$ 23,800 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):	10.1 to 20m	13%	
East Side - Distance to Building (m):	10.1 to 20m	13%	
South Side - Distance to Building (m):	>30m	0%	
West Side - Distance to Building (m):	>30m	0%	
	$f_3 =$	26%	(maximum of 75%)

$F'' = F' + F' \text{ x } f_2 + F' \text{ x } f_3$

$F'' =$ 18,088 L/min

REQUIRED FIRE FLOW

$F'' =$ **18,000** **L/min** (to nearest 1,000 L/min)

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

Table B2-4

REQUIRED FIRE FLOW CALCULATION

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 2020

Project Name: **Ida Street, Dundalk, Township of Southgate**
File: 23142
Date: January 2025

Notes: Building 'D' - 3 Storeys

Type of Construction - Wood Frame Construction

$C =$ 1.5

For a building classified with a Construction Coefficient from 1.0 to 1.5, the total effective area shall be the total area of all floor areas (assuming vertical openings and exterior vertical communications are properly protected):

Floor	Area (sq.m)	%	
Largest Floor Area	2,342	100%	(Main Floor)
Upper Adjoining Floor Area	2,309	100%	(2nd Floor)
Upper Adjoining Floor Area	2,309	100%	(3rd Floor)
$A =$	6,960	sq.m	

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

$F =$ 27,531 L/min

$F =$ 28,000 (to nearest 1,000 Lmin)

Occupancy Factor

		Charge
Type:	Residential	-15%
	$f_1 =$	-15%

$F' = F \text{ x } (1+f_1)$

$F' =$ 23,800 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):	10.1 to 20m	13%	
East Side - Distance to Building (m):	>30m	0%	
South Side - Distance to Building (m):	>30m	0%	
West Side - Distance to Building (m):	10.1 to 20m	13%	
	$f_3 =$	26%	(maximum of 75%)

$F'' = F' + F' \text{ x } f_2 + F' \text{ x } f_3$

$F'' =$ 18,088 L/min

REQUIRED FIRE FLOW

$F'' =$ **18,000** **L/min** (to nearest 1,000 L/min)

APPENDIX "C"

Wastewater Servicing

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: Ida Street, Dundalk, Twonship of Southgate
File: 23142
Date: January 2025

Criteria:

Design Parameters

Avg. Flow Rate (Residential): 450 L/person/day

Infiltration Rate: 0.15 L/s/ha

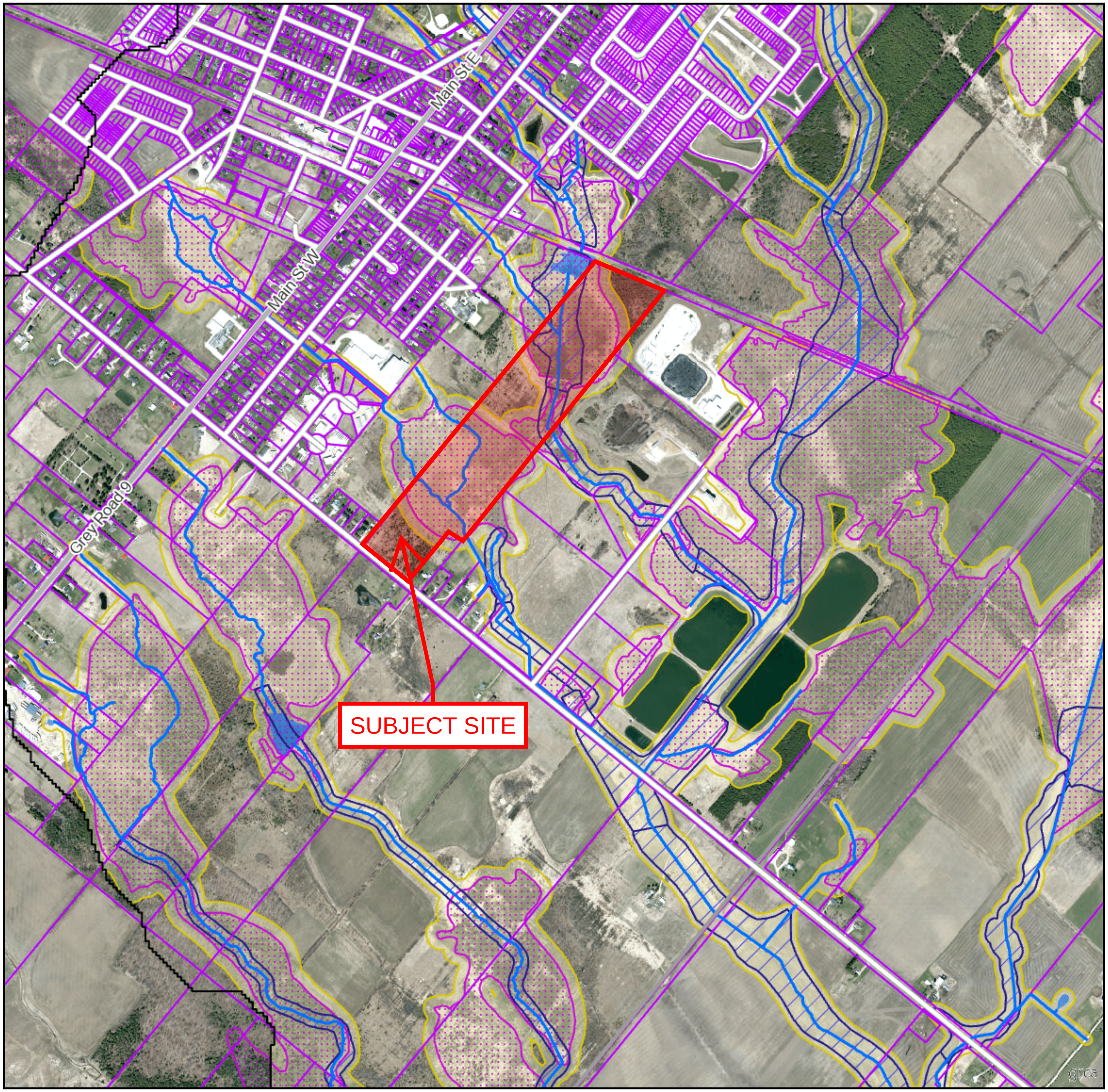
Residential Peaking Factor: 1 + (14 / (4+(P/1000)^0.5)) where P is population in thousands
Peaking Factor to be Min 2.0, Max 4.0

Commercial 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

Proposed Residential Development	Site Area (ha.)	Equivalent Population	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Infiltration (L/s)	Total Peak Flow (L/s)
Proposed Development	3.548	1,015	5.29	3.80	20.07	0.53	20.60
TOTAL	**3.548**	**1,015**			**20.07**		**20.60**

APPENDIX "D"

Watershed Map & Regulation Mapping



Grand River Conservation Authority

Date: Dec 11, 2024

GRCA Web-GIS

Legend

- Regulation Limit (GRCA)
- Floodplain (GRCA)
  - Engineered
  - Estimated
  - Approximate
- Floodplain - Special Policy Area (GRCA)
- Slope Erosion (GRCA)
  - Steep
  - Oversteep
  - Toe
- Slope Valley (GRCA)
  - Steep
  - Oversteep
- Regulated Watercourse (GRCA)
- Regulated Waterbody (GRCA)
- Wetland (GRCA)
- Lake Erie Flood (GRCA)
- Lake Erie Shoreline Reach (GRCA)
- Lake Erie Dynamic Beach (GRCA)
- Lake Erie Erosion (GRCA)
- Parcel - Assessment (MPAC/MNRF)

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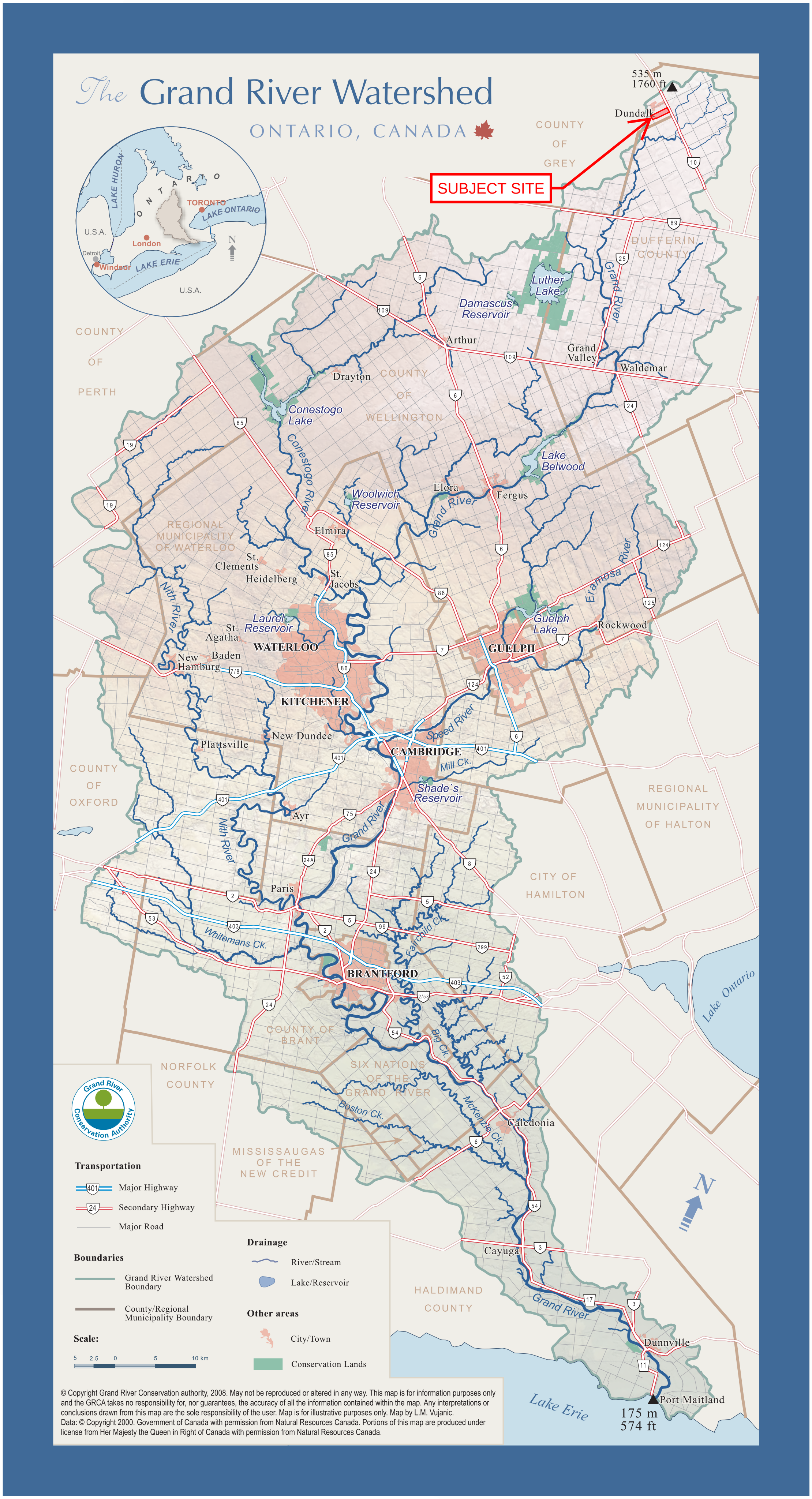
Disclaimer: This map is for illustrative purposes only. Information contained herein is not a substitute for professional review or a site survey and is subject to change without notice. The Grand River Conservation Authority takes no responsibility for, nor guarantees, the accuracy of the information contained on this map. Any interpretations or conclusions drawn from this map are the sole responsibility of the user.
The source for each data layer is shown in parentheses in the map legend. See Sources and Citations for details.

Scale 1:15,558

NAD83 UTM zone 17 (EPSG:26917)

Map Centre (X,Y): 548991.70, 4889664.33 | Map Link

This map is not to be used for navigation | 2020 Ortho (ON)



The Grand River Watershed
ONTARIO, CANADA
SUBJECT SITE
535 m
1760 ft
Dundalk
COUNTY OF GREY
DUFFERIN COUNTY
COUNTY OF PERTH
COUNTY OF WELLINGTON
REGIONAL MUNICIPALITY OF WATERLOO
COUNTY OF OXFORD
REGIONAL MUNICIPALITY OF HALTON
CITY OF HAMILTON
COUNTY OF BRANT
NORFOLK COUNTY
SIX NATIONS OF THE GRAND RIVER
MISSISSAUGAS OF THE NEW CREDIT
HALDIMAND COUNTY
LAKE HURON
ONTARIO
TORONTO
LAKE ONTARIO
U.S.A.
London
Detroit
Windsor
LAKE ERIE
Luther Lake
Damascus Reservoir
Grand River
Arthur
Grand Valley
Waldemar
Drayton
Conestogo Lake
Conestogo River
Lake Belwood
Woolwich Reservoir
Elora
Fergus
Elmira
St. Clements
Heidelberg
St. Jacobs
Eramosa River
Nith River
Laurel Reservoir
St. Agatha
Baden
New Hamburg
WATERLOO
GUELPH
Guelph Lake
Rockwood
KITCHENER
New Dundee
Plattsville
Speed River
CAMBRIDGE
Mill Ck.
Shade`s Reservoir
Ayr
Paris
Whitemans Ck.
Fairchild Ck.
BRANTFORD
Big Ck.
McKenzie Ck.
Boston Ck.
Caledonia
Cayuga
Dunnville
Port Maitland
175 m
574 ft
Lake Ontario
Lake Erie
Grand River Conservation Authority
Transportation
Major Highway
Secondary Highway
Major Road
Boundaries
Grand River Watershed Boundary
County/Regional Municipality Boundary
Drainage
River/Stream
Lake/Reservoir
Other areas
City/Town
Conservation Lands
Scale:
5 2.5 0 5 10 km
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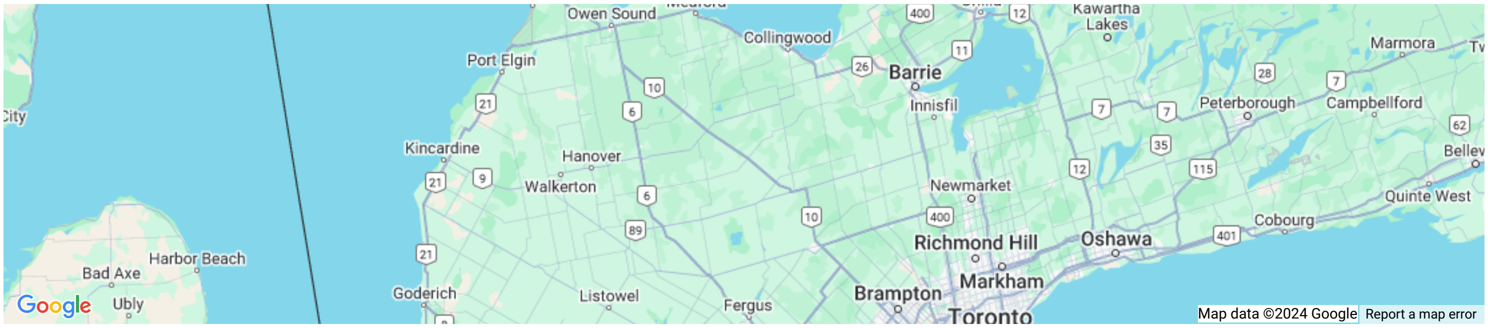
Ontario IDF CURVE LOOKUP

Active coordinate

44° 9' 45" N, 80° 23' 45" W (44.162500,-80.395833)

Retrieved: Mon, 18 Nov 2024 19:36:16 GMT



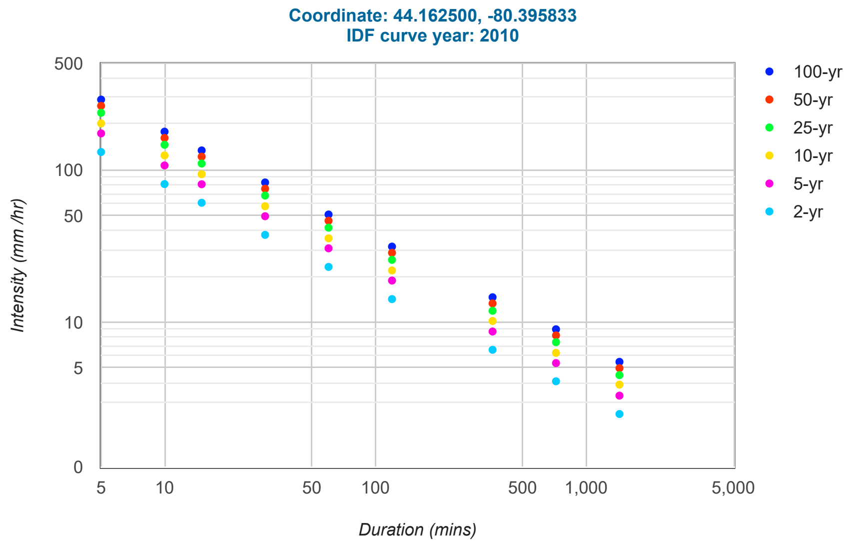
Location summary

These are the locations in the selection.

IDF Curve: 44° 9' 45" N, 80° 23' 45" W (44.162500,-80.395833)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 44° 9' 45" N, 80° 23' 45" W (44.162500,-80.395833)

Retrieved: Mon, 18 Nov 2024 19:36:16 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	23.1	30.6	35.6	41.8	46.4	51.0
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

A: 404.147 B: 0 C: 0.699	A: 535.364 B: 0 C: 0.699	A: 622.842 B: 0 C: 0.699	A: 731.314 B: 0 C: 0.699	A: 811.794 B: 0 C: 0.699	A: 892.273 B: 0 C: 0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	131.2	80.8	60.9	37.5	23.1	14.2	6.6	4.1	2.5
5-yr	173.8	107.1	80.6	49.7	30.6	18.8	8.7	5.4	3.3
10-yr	202.2	124.6	93.8	57.8	35.6	21.9	10.2	6.3	3.9
25-yr	237.4	146.3	110.2	67.9	41.8	25.7	11.9	7.4	4.5
50-yr	263.6	162.3	122.3	75.3	46.4	28.6	13.3	8.2	5.0
100-yr	289.7	178.4	134.4	82.8	51.0	31.4	14.6	9.0	5.5

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.9	13.5	15.2	18.8	23.1	28.5	39.6	48.8	60.1
5-yr	14.5	17.8	20.2	24.8	30.6	37.7	52.5	64.6	79.6
10-yr	16.9	20.8	23.5	28.9	35.6	43.9	61.0	75.2	92.7
25-yr	19.8	24.4	27.5	33.9	41.8	51.5	71.7	88.3	108.8
50-yr	22.0	27.1	30.6	37.7	46.4	57.2	79.6	98.0	120.8
100-yr	24.1	29.7	33.6	41.4	51.0	62.8	87.5	107.7	132.7

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Ontario Ministry of Transportation | Terms and Conditions | About
Last Modified: September 2016

APPENDIX “E”

Stormwater Quantity Control Calculations

VALDOR ENGINEERING INC. **TABLE: E**

File: 23142
January 2025

Project: IDA Street, Dundalk, Township of Southgate

STORAGE AND DISCHARGE SUMMARY

AREA No.	DRAINAGE AREA (Ha)	2 YEAR HWL (m)	5 YEAR HWL (m)	10 YEAR HWL (m)	25 YEAR HWL (m)	50 YEAR HWL (m)	100 YEAR HWL (m)	ORIFICE LOCATION	ORIFICE INVERT (m)	ORIFICE DIAMETER (mm)	WEIR LOCATION	WEIR INVERT (m)	WEIR Length (mm)
Subject Site (Orifice Controlled)	3.548	511.150	511.30	511.40	511.55	511.62	511.70	Concrete MH5	510.15	200	Concrete MH5	510.80	0.10
TOTAL	**3.548**												

RELEASE RATE SUMMARY

	2 YR (L/s)	5 YR (L/s)	10 YR (L/s)	25 YR (L/s)	50 YR (L/s)	100 YR (L/s)
Orifice	108.3	116.9	122.4	130.1	133.6	137.4
Weir	35.2	60.1	79.0	110.4	126.2	145.1
TOTAL ACTUAL RELEASE	143.5	177.0	201.4	240.5	259.8	282.6
ALLOWABLE RELEASE	**152.2**	**201.6**	**234.5**	**275.4**	**305.7**	**336.0**

SWM STORAGE SUMMARY

	2 YR (L/s)	5 YR (L/s)	10 YR (L/s)	25 YR (L/s)	50 YR (L/s)	100 YR (L/s)
Required Storage	205.8	282.4	332.2	386.0	434.7	480.2
Provided Storage	234.0	297.8	340.3	404.2	433.9	582.0

VALDOR ENGINEERING INC. **TABLE: E1**

File: 23142

January 2025

Project: IDA Street, Dundalk, Township of Southgate

PRE-DEVELOPMENT PEAK FLOW CALCULATION

Surface Type	Area (ha.)	Runoff Coefficient
Roof	0.000	0.90
Impervious	0.000	0.90
Landscaped	3.548	0.25
TOTAL	**3.548**	**0.25**

2-Year Post-Development Flow

I = 404.15 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	80.8	mm/hr
R_2 =	0.250	
N =	2.778	

Q = R x A x I x N

2-year Q =	199.2	L/s
Total 2-Year Q =	**199.2**	**L/s**

5-Year Pre-Development Flow

I = 535.36 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	107.1	mm/hr
R_5 =	0.250	
N =	2.778	

Q = R x A x I x N

5-year Q =	263.8	L/s
Total 5-Year Q =	**263.8**	**L/s**

10-Year Post-Development Flow

I = 622.84 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	124.6	mm/hr
R_{10} =	0.250	
N =	2.778	

Q = R x A x I x N

10-year Q =	306.9	L/s
Total 10-Year Q =	**306.9**	**L/s**

25-Year Post-Development Flow

I = 731.31 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	146.3	mm/hr
R_{25} =	0.250	
N =	2.778	

Q = R x A x I x N

25-year Q =	360.4	L/s
Total 25-Year Q =	**360.4**	**L/s**

50-Year Post-Development Flow

I = 811.79 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	162.3	mm/hr
R_{50} =	0.250	
N =	2.778	

Q = R x A x I x N

50-year Q =	400.0	L/s
Total 50-Year Q =	**400.0**	**L/s**

100-Year Pre-Development Flow

I = 892.27 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	178.4	mm/hr
R_{100} =	0.250	
N =	2.778	

Q = R x A x I x N

100-year Q =	439.7	L/s
Total 100-Year Q =	**439.7**	**L/s**

VALDOR ENGINEERING INC. **TABLE: E2-A**

File: 23142

January 2025

Project: IDA Street, Dundalk, Township of Southgate

POST-DEVELOPMENT PEAK FLOW CALCULATION (Unmitigated)

Surface Type	Area (ha.)	Runoff Coefficient
Roof	0.937	0.90
Impervious	1.335	0.90
Landscaped	0.582	0.25
TOTAL	**2.854**	**0.77**

2-Year Post-Development Flow

I = 404.15 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	80.8	mm/hr
R_2 =	0.767	
N =	2.778	

Q = R x A x I x N

2-year Q =	491.8	L/s
Total 2-Year Q =	**491.8**	**L/s**

5-Year Post-Development Flow

I = 535.36 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	107.1	mm/hr
R_5 =	0.767	
N =	2.778	

Q = R x A x I x N

5-year Q =	651.5	L/s
Total 5-Year Q =	**651.5**	**L/s**

10-Year Post-Development Flow

I = 622.84 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	124.6	mm/hr
R_{10} =	0.767	
N =	2.778	

Q = R x A x I x N

10-year Q =	757.9	L/s
Total 10-Year Q =	**757.9**	**L/s**

25-Year Post-Development Flow

I = 731.31 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	146.3	mm/hr
R_{25} =	0.767	
N =	2.778	

Q = R x A x I x N

25-year Q =	889.9	L/s
Total 25-Year Q =	**889.9**	**L/s**

50-Year Post-Development Flow

I = 811.79 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	162.3	mm/hr
R_{50} =	0.767	
N =	2.778	

Q = R x A x I x N

50-year Q =	987.8	L/s
Total 50-Year Q =	**987.8**	**L/s**

100-Year Post-Development Flow

I = 892.27 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	178.4	mm/hr
R_{100} =	0.767	
N =	2.778	

Q = R x A x I x N

100-year Q =	1085.8	L/s
Total 100-Year Q =	**1085.8**	**L/s**

VALDOR ENGINEERING INC. **TABLE: E2-B**

File: 23142

January 2025

Project: IDA Street, Dundalk, Township of Southgate

POST-DEVELOPMENT PEAK FLOW CALCULATION (Uncontrolled)
Lower Area

Surface Type	Area (ha.)	Runoff Coefficient
Roof	0.000	0.90
Impervious	0.055	0.90
Landscaped	0.639	0.25
TOTAL	**0.694**	**0.30**

2-Year Post-Development Flow

I = 404.15 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	80.8	mm/hr
R_2 =	0.302	
N =	2.778	

Q = R x A x I x N

2-year Q =	47.0	L/s
Total 2-Year Q =	**47.0**	**L/s**

5-Year Post-Development Flow

I = 535.36 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	107.1	mm/hr
R_5 =	0.302	
N =	2.778	

Q = R x A x I x N

5-year Q =	62.2	L/s
Total 5-Year Q =	**62.2**	**L/s**

10-Year Post-Development Flow

I = 622.84 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	124.6	mm/hr
R_{10} =	0.302	
N =	2.778	

Q = R x A x I x N

10-year Q =	72.4	L/s
Total 10-Year Q =	**72.4**	**L/s**

25-Year Post-Development Flow

I = 731.31 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	146.3	mm/hr
R_{25} =	0.302	
N =	2.778	

Q = R x A x I x N

25-year Q =	85.0	L/s
Total 25-Year Q =	**85.0**	**L/s**

50-Year Post-Development Flow

I = 811.79 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	162.3	mm/hr
R_{50} =	0.302	
N =	2.778	

Q = R x A x I x N

50-year Q =	94.4	L/s
Total 50-Year Q =	**94.4**	**L/s**

100-Year Post-Development Flow

I = 892.27 x T^(-0.699)

I = Rainfall Rate (mm/hr)

T =	10	minutes
I =	178.4	mm/hr
R_{100} =	0.302	
N =	2.778	

Q = R x A x I x N

100-year Q =	103.7	L/s
Total 100-Year Q =	**103.7**	**L/s**

VALDOR ENGINEERING INC. **TABLE: E3-A**

File: 23142
January 2025

Project: IDA Street, Dundalk, Township of Southgate

CONTROL ORIFICE DESIGN
2-YEAR STORM

Catchment 101			
2-Year High Water Level	=	511.15	m
Orifice			
Orifice Location	=	Concrete MH5	
Orifice Coefficient (C)	=	0.82	(TUBE)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	510.15	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		510.250	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	0.90	m
Actual Discharge (Q)	=	**108.3**	L/s
(C x A x (2 x g x H)^0.5)			
Weir			
Weir Invert Elevation	=	510.80	m
Weir Length (L)	=	0.10	m
Weir Coefficient (C)	=	1.7	(Broad Crested)
Head (H)	=	0.35	m
Actual Discharge (Q)	=	**35.2**	L/s
(C x L x (H^3/2))			
Total Discharge:	=	**143.5**	L/s
Allowable Discharge:	=	**152.2**	L/s

VALDOR ENGINEERING INC.

TABLE: E3-B

File: 23142
January 2025

Project: IDA Street, Dundalk, Township of Southgate

CONTROL ORIFICE DESIGN
5-YEAR STORM

Catchment 101			
5-Year High Water Level	=	511.30	m
Orifice			
Orifice Location	=	Concrete MH5	
Orifice Coefficient (C)	=	0.82	(TUBE)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	510.15	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		510.250	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	1.05	m
Actual Discharge (Q)	=	**116.9**	L/s
(C x A x (2 x g x H)^0.5)			
Weir			
Weir Invert Elevation	=	510.80	m
Weir Length (L)	=	0.10	m
Weir Coefficient (C)	=	1.7	(Broad Crested)
Head (H)	=	0.50	m
Actual Discharge (Q)	=	**60.1**	L/s
(C x L x (H^3/2))			
Total Discharge:	=	**177.0**	L/s
Allowable Discharge:	=	**201.6**	L/s

VALDOR ENGINEERING INC.

TABLE: E3-C

File: 23142
January 2025

Project: IDA Street, Dundalk, Township of Southgate

CONTROL ORIFICE DESIGN
10-YEAR STORM

Catchment 101			
10-Year High Water Level	=	511.40	m
Orifice			
Orifice Location	=	Concrete MH5	
Orifice Coefficient (C)	=	0.82	(TUBE)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	510.15	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		510.250	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	1.15	m
Actual Discharge (Q)	=	**122.4**	L/s
(C x A x (2 x g x H)^0.5)			
Weir			
Weir Invert Elevation	=	510.80	m
Weir Length (L)	=	0.10	m
Weir Coefficient (C)	=	1.7	(Broad Crested)
Head (H)	=	0.60	m
Actual Discharge (Q)	=	**79.0**	L/s
(C x L x (H^3/2))			
Total Discharge:	=	**201.4**	L/s
Allowable Discharge:	=	**234.5**	L/s

VALDOR ENGINEERING INC.

TABLE: E3-D

File: 23142
January 2025

Project: IDA Street, Dundalk, Township of Southgate

CONTROL ORIFICE DESIGN
25-YEAR STORM

Catchment 101			
25-Year High Water Level	=	511.55	m
Orifice			
Orifice Location	=	Concrete MH5	
Orifice Coefficient (C)	=	0.82	(TUBE)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	510.15	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		510.250	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	1.30	m
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**130.1**	L/s
Weir			
Weir Invert Elevation	=	510.80	m
Weir Length (L)	=	0.10	m
Weir Coefficient (C)	=	1.7	(Broad Crested)
Head (H)	=	0.75	m
Actual Discharge (Q) (C x L x (H^3/2))	=	**110.4**	L/s
Total Discharge:	=	**240.5**	L/s
Allowable Discharge:	=	**275.4**	L/s

VALDOR ENGINEERING INC.

TABLE: E3-E

File: 23142
January 2025

Project: IDA Street, Dundalk, Township of Southgate

CONTROL ORIFICE DESIGN
50-YEAR STORM

Catchment 101

50-Year High Water Level	=	511.62	m

Orifice

Orifice Location	=	Concrete MH5	
Orifice Coefficient (C)	=	0.82	(TUBE)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	510.15	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		510.250	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	1.37	m
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**133.6**	L/s

Weir

Weir Invert Elevation	=	510.80	m
Weir Length (L)	=	0.10	m
Weir Coefficient (C)	=	1.7	(Broad Crested)
Head (H)	=	0.82	m
Actual Discharge (Q) (C x L x (H^3/2))	=	**126.2**	L/s

Total Discharge:	=	**259.8**	L/s
Allowable Discharge:	=	**305.7**	L/s

VALDOR ENGINEERING INC.

TABLE: E3-F

File: 23142
January 2025

Project: IDA Street, Dundalk, Township of Southgate

CONTROL ORIFICE DESIGN
100-YEAR STORM

Catchment 101			
100-Year High Water Level	=	511.70	m
Orifice			
Orifice Location	=	Concrete MH5	
Orifice Coefficient (C)	=	0.82	(TUBE)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	510.15	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		510.250	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	1.45	m
Actual Discharge (Q)	=	**137.4**	L/s
(C x A x (2 x g x H)^0.5)			
Weir			
Weir Invert Elevation	=	510.80	m
Weir Length (L)	=	0.10	m
Weir Coefficient (C)	=	1.7	(Broad Crested)
Head (H)	=	0.90	m
Actual Discharge (Q)	=	**145.1**	L/s
(C x L x (H^3/2))			
Total Discharge:	=	**282.6**	L/s
Allowable Discharge:	=	**336.0**	L/s

VALDOR ENGINEERING INC.

File: 23142

January 2025

TABLE: E4-A

Storage Volume Calculations - Rational Method

2-year Storm - City of Vaughan

Project: IDA Street, Dundalk, Township of Southgate

	Area (ha)	Runoff Coefficient
Roof	0.937	0.90
Impervious	1.335	0.90
Pervious	0.582	0.25
Total	**2.854**	**0.77**

Maximum Discharge Through Orifice (L/s)	143.5	
Long Term Groundwater Discharge Rate (L/day)	246150	(As per Hydrogeological Report)
Long Term Groundwater Discharge Rate (L/s)	2.8	
Discharged Volume per 5 min Interval (cu.m)	43.04	

Time (min)	Intensity (mm/hr)	Groundwater Discharge (cu.m)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.85	0.000	0.855	0.000
5	3.5	0.85	6.323	7.178	0.000
10	3.7	0.85	6.767	7.621	0.000
15	4.0	0.85	7.294	8.149	0.000
20	4.3	0.85	7.935	8.789	0.000
25	4.8	0.85	8.732	9.587	0.000
30	5.3	0.85	9.757	10.612	0.000
35	6.1	0.85	11.135	11.990	0.000
40	7.2	0.85	13.110	13.965	0.000
45	8.9	0.85	16.242	17.096	0.000
50	12.2	0.85	22.217	23.071	0.000
55	22.6	0.85	41.323	42.178	0.000
60	131.2	0.85	239.487	43.036	197.306
65	27.8	0.85	50.712	43.036	8.531
70	17.5	0.85	31.976	32.831	0.000
75	13.4	0.85	24.385	25.240	0.000
80	11.0	0.85	20.086	20.941	0.000
85	9.5	0.85	17.265	18.120	0.000
90	8.4	0.85	15.248	16.103	0.000
95	7.5	0.85	13.723	14.578	0.000
100	6.9	0.85	12.523	13.378	0.000
105	6.3	0.85	11.550	12.404	0.000
110	5.9	0.85	10.742	11.597	0.000
115	5.5	0.85	10.060	10.914	0.000
120	5.2	0.85	9.474	10.328	0.000
125	4.9	0.85	8.964	9.819	0.000
130	4.7	0.85	8.517	9.371	0.000
135	4.4	0.85	8.120	8.975	0.000
140	4.3	0.85	7.765	8.620	0.000
145	4.1	0.85	7.446	8.301	0.000
150	3.9	0.85	7.157	8.012	0.000
155	3.8	0.85	6.894	7.749	0.000
160	3.6	0.85	6.653	7.508	0.000
165	3.5	0.85	6.432	7.286	0.000
170	3.4	0.85	6.227	7.082	0.000
175	3.3	0.85	6.038	6.893	0.000
180	3.2	0.85	5.862	6.717	0.000
				Total Storage Volume Required (cu.m)	**205.8**

VALDOR ENGINEERING INC.

File: 23142

January 2025

TABLE: E4-B

Storage Volume Calculations - Rational Method

5-year Storm - City of Vaughan

Project: IDA Street, Dundalk, Township of Southgate

	Area (ha)	Runoff Coefficient
Roof	0.937	0.90
Impervious	1.335	0.90
Pervious	0.582	0.25
Total	**2.854**	**0.77**

Maximum Discharge Through Orifice (L/s)	177.0	
Long Term Groundwater Discharge Rate (L/day)	246150	(As per Hydrogeological Report)
Long Term Groundwater Discharge Rate (L/s)	2.8	
Discharged Volume per 5 min Interval (cu.m)	53.11	

Time (min)	Intensity (mm/hr)	Groundwater Discharge (cu.m)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.85	0.000	0.855	0.000
5	4.6	0.85	8.376	9.231	0.000
10	4.9	0.85	8.964	9.818	0.000
15	5.3	0.85	9.663	10.517	0.000
20	5.8	0.85	10.511	11.366	0.000
25	6.3	0.85	11.567	12.421	0.000
30	7.1	0.85	12.925	13.779	0.000
35	8.1	0.85	14.750	15.605	0.000
40	9.5	0.85	17.367	18.222	0.000
45	11.8	0.85	21.515	22.369	0.000
50	16.1	0.85	29.430	30.285	0.000
55	30.0	0.85	54.740	53.109	2.486
60	173.8	0.85	317.242	53.109	264.988
65	36.8	0.85	67.177	53.109	14.923
70	23.2	0.85	42.358	43.213	0.000
75	17.7	0.85	32.302	33.157	0.000
80	14.6	0.85	26.608	27.463	0.000
85	12.5	0.85	22.871	23.725	0.000
90	11.1	0.85	20.199	21.054	0.000
95	10.0	0.85	18.179	19.033	0.000
100	9.1	0.85	16.589	17.443	0.000
105	8.4	0.85	15.300	16.154	0.000
110	7.8	0.85	14.230	15.085	0.000
115	7.3	0.85	13.326	14.180	0.000
120	6.9	0.85	12.550	13.404	0.000
125	6.5	0.85	11.875	12.729	0.000
130	6.2	0.85	11.282	12.137	0.000
135	5.9	0.85	10.756	11.611	0.000
140	5.6	0.85	10.287	11.141	0.000
145	5.4	0.85	9.864	10.719	0.000
150	5.2	0.85	9.481	10.336	0.000
155	5.0	0.85	9.132	9.987	0.000
160	4.8	0.85	8.813	9.668	0.000
165	4.7	0.85	8.520	9.375	0.000
170	4.5	0.85	8.249	9.104	0.000
175	4.4	0.85	7.999	8.853	0.000
180	4.3	0.85	7.766	8.620	0.000

Total Storage Volume Required (cu.m) **282.4**

VALDOR ENGINEERING INC.

File: 23142

January 2025

TABLE: E4-C

Storage Volume Calculations - Rational Method

10-year Storm - City of Vaughan

Project: IDA Street, Dundalk, Township of Southgate

	Area (ha)	Runoff Coefficient
Roof	0.937	0.90
Impervious	1.335	0.90
Pervious	0.582	0.25
Total	**2.854**	**0.77**

Maximum Discharge Through Orifice (L/s)	201.4	
Long Term Groundwater Discharge Rate (L/day)	246150	(As per Hydrogeological Report)
Long Term Groundwater Discharge Rate (L/s)	2.8	
Discharged Volume per 5 min Interval (cu.m)	60.41	

Time (min)	Intensity (mm/hr)	Groundwater Discharge (cu.m)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.85	0.000	0.855	0.000
5	5.3	0.85	9.745	10.599	0.000
10	5.7	0.85	10.428	11.283	0.000
15	6.2	0.85	11.241	12.096	0.000
20	6.7	0.85	12.228	13.083	0.000
25	7.4	0.85	13.457	14.312	0.000
30	8.2	0.85	15.037	15.891	0.000
35	9.4	0.85	17.161	18.015	0.000
40	11.1	0.85	20.205	21.059	0.000
45	13.7	0.85	25.030	25.885	0.000
50	18.8	0.85	34.239	35.094	0.000
55	34.9	0.85	63.684	60.413	4.126
60	202.2	0.85	369.080	60.413	309.522
65	42.8	0.85	78.154	60.413	18.596
70	27.0	0.85	49.279	50.134	0.000
75	20.6	0.85	37.580	38.435	0.000
80	17.0	0.85	30.956	31.810	0.000
85	14.6	0.85	26.608	27.462	0.000
90	12.9	0.85	23.499	24.354	0.000
95	11.6	0.85	21.149	22.004	0.000
100	10.6	0.85	19.299	20.154	0.000
105	9.8	0.85	17.800	18.654	0.000
110	9.1	0.85	16.555	17.410	0.000
115	8.5	0.85	15.503	16.358	0.000
120	8.0	0.85	14.600	15.455	0.000
125	7.6	0.85	13.815	14.670	0.000
130	7.2	0.85	13.125	13.980	0.000
135	6.9	0.85	12.514	13.369	0.000
140	6.6	0.85	11.967	12.822	0.000
145	6.3	0.85	11.476	12.330	0.000
150	6.0	0.85	11.030	11.885	0.000
155	5.8	0.85	10.624	11.479	0.000
160	5.6	0.85	10.253	11.108	0.000
165	5.4	0.85	9.912	10.767	0.000
170	5.3	0.85	9.597	10.452	0.000
175	5.1	0.85	9.306	10.160	0.000
180	4.9	0.85	9.035	9.889	0.000
				Total Storage Volume Required (cu.m)	**332.2**

VALDOR ENGINEERING INC.
File: 23142
January 2025

TABLE: E4-D

Storage Volume Calculations - Rational Method

25-year Storm - City of Vaughan

Project: IDA Street, Dundalk, Township of Southgate

	Area (ha)	Runoff Coefficient
Roof	0.937	0.90
Impervious	1.335	0.90
Pervious	0.582	0.25
Total	**2.854**	**0.77**

Maximum Discharge Through Orifice (L/s)	240.5	
Long Term Groundwater Discharge Rate (L/day)	246150	(As per Hydrogeological Report)
Long Term Groundwater Discharge Rate (L/s)	2.8	
Discharged Volume per 5 min Interval (cu.m)	72.16	

Time (min)	Intensity (mm/hr)	Groundwater Discharge (cu.m)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.85	0.000	0.855	0.000
5	6.3	0.85	11.442	12.296	0.000
10	6.7	0.85	12.244	13.099	0.000
15	7.2	0.85	13.199	14.054	0.000
20	7.9	0.85	14.358	15.213	0.000
25	8.7	0.85	15.800	16.655	0.000
30	9.7	0.85	17.655	18.510	0.000
35	11.0	0.85	20.149	21.004	0.000
40	13.0	0.85	23.724	24.578	0.000
45	16.1	0.85	29.389	30.244	0.000
50	22.0	0.85	40.202	41.057	0.000
55	41.0	0.85	74.775	72.156	3.474
60	237.4	0.85	433.357	72.156	362.056
65	50.3	0.85	91.764	72.156	20.463
70	31.7	0.85	57.861	58.716	0.000
75	24.2	0.85	44.125	44.980	0.000
80	19.9	0.85	36.347	37.201	0.000
85	17.1	0.85	31.241	32.096	0.000
90	15.1	0.85	27.592	28.447	0.000
95	13.6	0.85	24.832	25.687	0.000
100	12.4	0.85	22.660	23.515	0.000
105	11.5	0.85	20.899	21.754	0.000
110	10.6	0.85	19.438	20.293	0.000
115	10.0	0.85	18.203	19.058	0.000
120	9.4	0.85	17.143	17.997	0.000
125	8.9	0.85	16.221	17.076	0.000
130	8.4	0.85	15.411	16.266	0.000
135	8.1	0.85	14.693	15.548	0.000
140	7.7	0.85	14.052	14.906	0.000
145	7.4	0.85	13.474	14.329	0.000
150	7.1	0.85	12.951	13.806	0.000
155	6.8	0.85	12.475	13.329	0.000
160	6.6	0.85	12.039	12.893	0.000
165	6.4	0.85	11.638	12.493	0.000
170	6.2	0.85	11.269	12.123	0.000
175	6.0	0.85	10.926	11.781	0.000
180	5.8	0.85	10.608	11.463	0.000
				Total Storage Volume Required (cu.m)	**386.0**

VALDOR ENGINEERING INC.

File: 23142

January 2025

TABLE: E4-E

Storage Volume Calculations - Rational Method

50-year Storm - City of Vaughan

Project: IDA Street, Dundalk, Township of Southgate

	Area (ha)	Runoff Coefficient
Roof	0.937	0.90
Impervious	1.335	0.90
Pervious	0.582	0.25
Total	**2.854**	**0.77**

Maximum Discharge Through Orifice (L/s)	259.8	
Long Term Groundwater Discharge Rate (L/day)	246150	(As per Hydrogeological Report)
Long Term Groundwater Discharge Rate (L/s)	2.8	
Discharged Volume per 5 min Interval (cu.m)	77.94	

Time (min)	Intensity (mm/hr)	Groundwater Discharge (cu.m)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.85	0.000	0.855	0.000
5	7.0	0.85	12.701	13.556	0.000
10	7.4	0.85	13.592	14.447	0.000
15	8.0	0.85	14.652	15.507	0.000
20	8.7	0.85	15.938	16.793	0.000
25	9.6	0.85	17.539	18.394	0.000
30	10.7	0.85	19.598	20.453	0.000
35	12.3	0.85	22.367	23.221	0.000
40	14.4	0.85	26.334	27.189	0.000
45	17.9	0.85	32.624	33.478	0.000
50	24.4	0.85	44.626	45.481	0.000
55	45.5	0.85	83.004	77.937	5.921
60	263.6	0.85	481.048	77.937	403.965
65	55.8	0.85	101.863	77.937	24.780
70	35.2	0.85	64.229	65.084	0.000
75	26.8	0.85	48.981	49.836	0.000
80	22.1	0.85	40.347	41.201	0.000
85	19.0	0.85	34.680	35.534	0.000
90	16.8	0.85	30.628	31.483	0.000
95	15.1	0.85	27.565	28.420	0.000
100	13.8	0.85	25.154	26.009	0.000
105	12.7	0.85	23.199	24.054	0.000
110	11.8	0.85	21.577	22.432	0.000
115	11.1	0.85	20.206	21.061	0.000
120	10.4	0.85	19.029	19.884	0.000
125	9.9	0.85	18.006	18.861	0.000
130	9.4	0.85	17.107	17.962	0.000
135	8.9	0.85	16.310	17.165	0.000
140	8.5	0.85	15.598	16.453	0.000
145	8.2	0.85	14.957	15.812	0.000
150	7.9	0.85	14.376	15.231	0.000
155	7.6	0.85	13.847	14.702	0.000
160	7.3	0.85	13.364	14.218	0.000
165	7.1	0.85	12.919	13.774	0.000
170	6.9	0.85	12.509	13.363	0.000
175	6.6	0.85	12.129	12.983	0.000
180	6.5	0.85	11.776	12.630	0.000
				Total Storage Volume Required (cu.m)	**434.7**

VALDOR ENGINEERING INC.

File: 23142

January 2025

TABLE: E4-F

Storage Volume Calculations - Rational Method

100-year Storm - City of Vaughan

Project: IDA Street, Dundalk, Township of Southgate

	Area (ha)	Runoff Coefficient
Roof	0.937	0.90
Impervious	1.335	0.90
Pervious	0.582	0.25
Total	**2.854**	**0.77**

Maximum Discharge Through Orifice (L/s)	282.6	
Long Term Groundwater Discharge Rate (L/day)	246150	(As per Hydrogeological Report)
Long Term Groundwater Discharge Rate (L/s)	2.85	
Discharged Volume per 5 min Interval (cu.m)	84.77	

Time (min)	Intensity (mm/hr)	Groundwater Discharge (cu.m)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.85	0.000	0.855	0.000
5	7.6	0.85	13.960	14.815	0.000
10	8.2	0.85	14.939	15.794	0.000
15	8.8	0.85	16.104	16.959	0.000
20	9.6	0.85	17.518	18.373	0.000
25	10.6	0.85	19.278	20.133	0.000
30	11.8	0.85	21.541	22.396	0.000
35	13.5	0.85	24.584	25.439	0.000
40	15.9	0.85	28.945	29.800	0.000
45	19.6	0.85	35.858	36.713	0.000
50	26.9	0.85	49.050	49.905	0.000
55	50.0	0.85	91.233	84.766	7.322
60	289.7	0.85	528.738	84.766	444.827
65	61.3	0.85	111.962	84.766	28.051
70	38.7	0.85	70.596	71.451	0.000
75	29.5	0.85	53.837	54.692	0.000
80	24.3	0.85	44.346	45.201	0.000
85	20.9	0.85	38.118	38.972	0.000
90	18.4	0.85	33.665	34.519	0.000
95	16.6	0.85	30.298	31.152	0.000
100	15.1	0.85	27.648	28.502	0.000
105	14.0	0.85	25.499	26.354	0.000
110	13.0	0.85	23.717	24.571	0.000
115	12.2	0.85	22.209	23.064	0.000
120	11.5	0.85	20.916	21.770	0.000
125	10.8	0.85	19.791	20.646	0.000
130	10.3	0.85	18.803	19.658	0.000
135	9.8	0.85	17.927	18.782	0.000
140	9.4	0.85	17.144	17.999	0.000
145	9.0	0.85	16.440	17.294	0.000
150	8.7	0.85	15.801	16.656	0.000
155	8.3	0.85	15.220	16.075	0.000
160	8.0	0.85	14.689	15.543	0.000
165	7.8	0.85	14.200	15.055	0.000
170	7.5	0.85	13.749	14.604	0.000
175	7.3	0.85	13.331	14.186	0.000
180	7.1	0.85	12.943	13.798	0.000
				Total Storage Volume Required (cu.m)	**480.2**

VALDOR ENGINEERING INC.

TABLE: E5-A

File: 23142

January 2025

Project: IDA Street, Dundalk, Township of Southgate

2-YEAR AVAILABLE UNDERGROUND STORAGE

2-year HWL (m):	**511.15**
Tank Inv:	**510.60**
Head:	**0.55**

Brentwood Tank Storage

						Length (m)	Width (m)	Height (m)	AVAILABLE STORAGE (cu.m)
Individual Brentwood Storm Tanks									
	Tank Inv.	510.60	HWL:	511.15					
Layer	L (m)	W (m)	H (m)	Void Ratio	Units:	35	30	1	
1	0.914	0.457	0.914	0.97		31.990	13.710	0.914	234.0
2	0.914	0.457	0.914	0.97		31.990	13.710	0.454	0.0
							(0.46m Height for retention)		
TOTAL									234.0

TOTAL STORAGE PROVIDED :	**234.0**
TOTAL STORAGE REQUIRED :	**205.8**

VALDOR ENGINEERING INC.

File: 23142

January 2025

TABLE: E5-B

Project: IDA Street, Dundalk, Township of Southgate

5-YEAR AVAILABLE UNDERGROUND STORAGE

5-year HWL (m):	**511.30**
Tank Inv:	**510.60**
Head:	**0.70**

Brentwood Tank Storage

						Length (m)	Width (m)	Height (m)	AVAILABLE STORAGE (cu.m)
Individual Brentwood Storm Tanks									
	Tank Inv. 510.60		HWL: 511.30						
Layer	L (m)	W (m)	H (m)	Void Ratio	Units:	35	30	1	
1	0.914	0.457	0.914	0.97		31.990	13.710	0.914	297.8
2	0.914	0.457	0.914	0.97		31.990	13.710	0.454	0.0
							(0.46m Height for retention)		
TOTAL									297.8

TOTAL STORAGE PROVIDED :	**297.8**
TOTAL STORAGE REQUIRED :	**282.4**

VALDOR ENGINEERING INC.

File: 23142

January 2025

TABLE: E5-C

Project: IDA Street, Dundalk, Township of Southgate

10-YEAR AVAILABLE UNDERGROUND STORAGE

10-year HWL (m):	**511.40**
Tank Inv:	**510.60**
Head:	**0.80**

Brentwood Tank Storage

						Length (m)	Width (m)	Height (m)	AVAILABLE STORAGE (cu.m)
Individual Brentwood Storm Tanks									
	Tank Inv.	510.60	HWL:	511.40					
Layer	L (m)	W (m)	H (m)	Void Ratio	Units:	35	30	1	
1	0.914	0.457	0.914	0.97		31.990	13.710	0.914	340.3
2	0.914	0.457	0.914	0.97		31.990	13.710	0.454	0.0
							(0.46m Height for retention)		
TOTAL									340.3

TOTAL STORAGE PROVIDED :	**340.3**
TOTAL STORAGE REQUIRED :	**332.2**

VALDOR ENGINEERING INC.

File: 23142

January 2025

TABLE: E5-D

Project: IDA Street, Dundalk, Township of Southgate

25-YEAR AVAILABLE UNDERGROUND STORAGE

25-year HWL (m):	**511.55**
Tank Inv:	**510.60**
Head:	**0.95**

Brentwood Tank Storage

						Length (m)	Width (m)	Height (m)	AVAILABLE STORAGE (cu.m)
Individual Brentwood Storm Tanks									
	Tank Inv.	510.60	HWL:	511.55					
Layer	L (m)	W (m)	H (m)	Void Ratio	Units:	35	30	1	
1	0.914	0.457	0.914	0.97		31.990	13.710	0.914	388.8
2	0.914	0.457	0.914	0.97		31.990	13.710	0.454	15.3
							(0.46m Height for retention)		
TOTAL									404.2

TOTAL STORAGE PROVIDED :	**404.2**
TOTAL STORAGE REQUIRED :	**386.0**

VALDOR ENGINEERING INC. **TABLE: E5-E**

File: 23142

January 2025

Project: IDA Street, Dundalk, Township of Southgate

5-YEAR AVAILABLE UNDERGROUND STORAGE

50-year HWL (m):	**511.62**
Tank Inv:	**510.60**
Head:	**1.02**

Brentwood Tank Storage

						Length (m)	**Width** (m)	**Height** (m)	**AVAILABLE STORAGE** (cu.m)
Individual Brentwood Storm Tanks									
	Tank Inv. 510.60		HWL: 511.62						
Layer	L (m)	W (m)	H (m)	Void Ratio	Units:	35	30	1	
1	0.914	0.457	0.914	0.97		31.990	13.710	0.914	388.8
2	0.914	0.457	0.914	0.97		31.990	13.710	0.454	45.1
							(0.46m Height for retention)		
TOTAL									433.9

TOTAL STORAGE PROVIDED :	**433.9**
TOTAL STORAGE REQUIRED :	**434.7**

VALDOR ENGINEERING INC.

TABLE: E5-F

File: 23142

January 2025

Project: IDA Street, Dundalk, Township of Southgate

100-YEAR AVAILABLE UNDERGROUND STORAGE

100-year HWL (m):	**511.70**
Tank Inv:	**510.60**
Head:	**1.10**

Brentwood Tank Storage

						Length (m)	**Width** (m)	**Height** (m)	**AVAILABLE STORAGE** (cu.m)
Individual Brentwood Storm Tanks									
	Tank Inv.	510.60		HWL: 511.70					
Layer	L (m)	W (m)	H (m)	Void Ratio	Units:	35	30	1	
1	0.914	0.457	0.914	0.97		31.990	13.710	0.914	388.8
2	0.914	0.457	0.914	0.97		31.990	13.710	0.454	193.1
							(0.46m Height for retention)		
TOTAL									582.0

TOTAL STORAGE PROVIDED :	**582.0**
TOTAL STORAGE REQUIRED :	**480.2**

APPENDIX "F"

Stormwater Quality Control Calculations

VALDOR

VALDOR ENGINEERING INC. **TABLE F1**

File: 23142

Date: January 2025

OIL / GRIT SEPARATOR SIZING

Contributing Area = A = 2.854 Ha

Surface Type	Runoff Coeff	Area (Ha)
Landscape Area	0.25	0.582
Roof Area	0.95	0.937
Impervious Area	0.95	1.335
	0.81	**2.854**

Imperviousness

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

% Impervious = 86.8 %

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

12/13/2024

Province:	Ontario
City:	Southgate
Nearest Rainfall Station:	BARRIE-ORO
Climate Station Id:	6117700
Years of Rainfall Data:	14
Site Name:	
Drainage Area (ha):	2.854
% Imperviousness:	86.80

Runoff Coefficient 'c': 0.82

Project Name:	IDA street, Dundalk
Project Number:	66449
Designer Name:	Ray POON
Designer Company:	Valdor Engineer
Designer Email:	raypoonca1229@gmail.com
Designer Phone:	416-702-3949
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	76.34
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	2533
Estimated Average Annual Sediment Volume (L/yr):	2059

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	55
EFO6	71
EFO8	80
EFO10	86
EFO12	90

Recommended Stormceptor EFO Model: EFO8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 80

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.

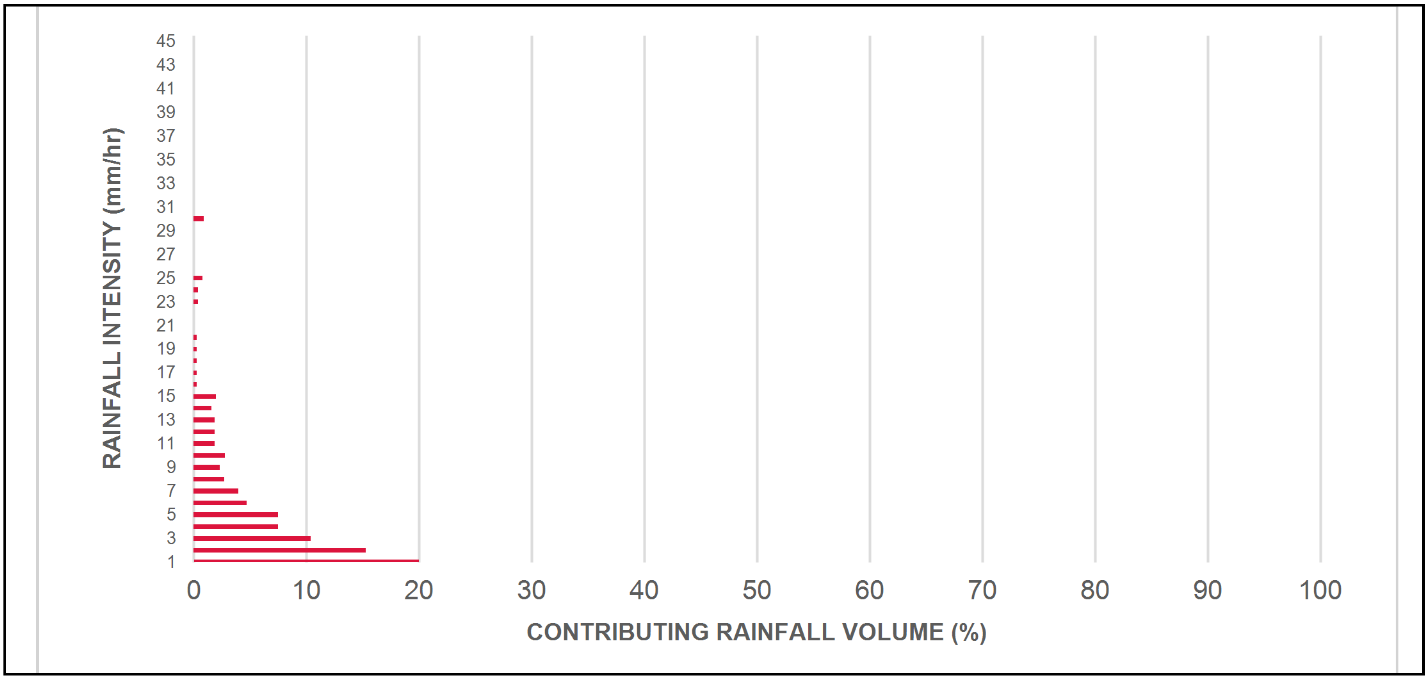
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

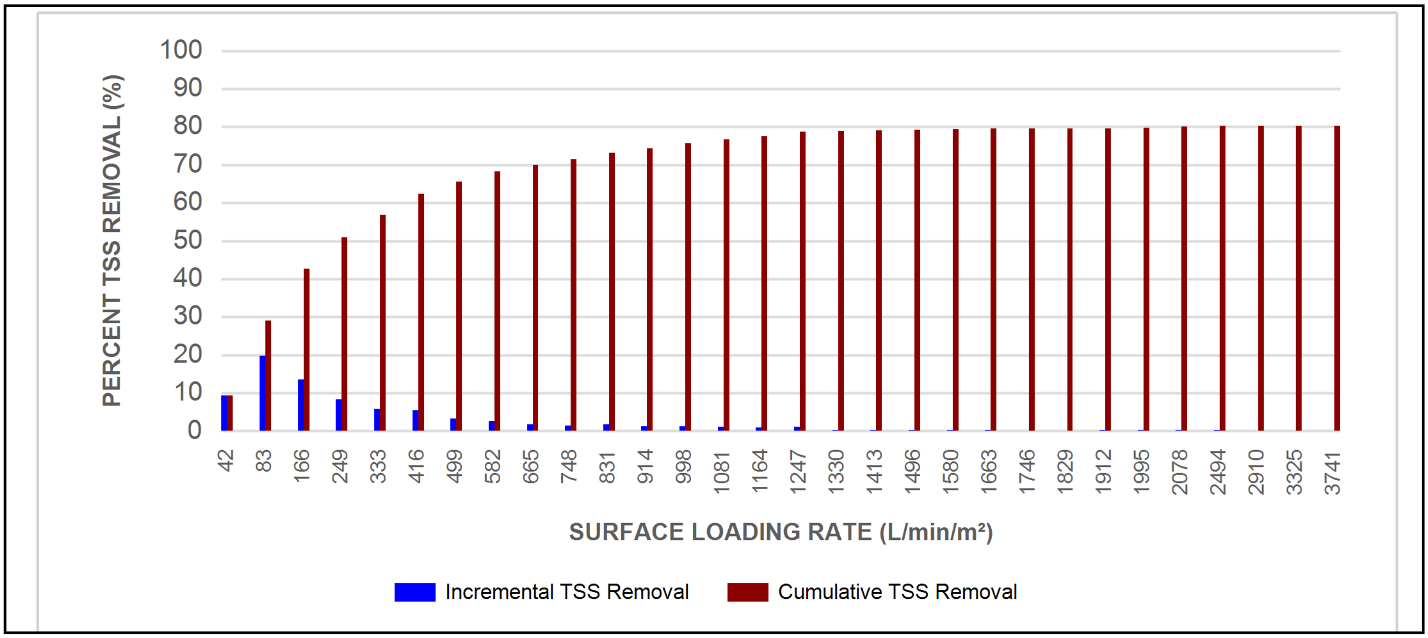
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	9.4	9.4	3.26	195.0	42.0	100	9.4	9.4
1.00	20.0	29.4	6.51	391.0	83.0	98	19.7	29.1
2.00	15.3	44.7	13.02	781.0	166.0	88	13.5	42.6
3.00	10.4	55.1	19.54	1172.0	249.0	81	8.4	51.0
4.00	7.5	62.6	26.05	1563.0	333.0	77	5.8	56.8
5.00	7.5	70.1	32.56	1954.0	416.0	73	5.5	62.3
6.00	4.7	74.9	39.07	2344.0	499.0	70	3.3	65.6
7.00	4.0	78.8	45.59	2735.0	582.0	66	2.6	68.2
8.00	2.7	81.6	52.10	3126.0	665.0	64	1.8	70.0
9.00	2.3	83.9	58.61	3517.0	748.0	64	1.5	71.4
10.00	2.8	86.6	65.12	3907.0	831.0	63	1.7	73.2
11.00	1.9	88.6	71.64	4298.0	914.0	62	1.2	74.4
12.00	1.9	90.5	78.15	4689.0	998.0	62	1.2	75.6
13.00	1.9	92.4	84.66	5080.0	1081.0	60	1.1	76.7
14.00	1.6	94.0	91.17	5470.0	1164.0	58	0.9	77.6
15.00	2.0	96.0	97.68	5861.0	1247.0	56	1.1	78.7
16.00	0.3	96.3	104.20	6252.0	1330.0	54	0.1	78.9
17.00	0.3	96.6	110.71	6643.0	1413.0	52	0.1	79.0
18.00	0.3	96.9	117.22	7033.0	1496.0	49	0.1	79.2
19.00	0.3	97.2	123.73	7424.0	1580.0	46	0.1	79.3
20.00	0.3	97.5	130.25	7815.0	1663.0	44	0.1	79.5
21.00	0.0	97.5	136.76	8206.0	1746.0	42	0.0	79.5
22.00	0.0	97.5	143.27	8596.0	1829.0	40	0.0	79.5
23.00	0.4	97.9	149.78	8987.0	1912.0	38	0.1	79.6
24.00	0.4	98.3	156.30	9378.0	1995.0	37	0.1	79.8
25.00	0.8	99.1	162.81	9768.0	2078.0	35	0.3	80.0
30.00	0.9	100.0	195.37	11722.0	2494.0	29	0.3	80.3
35.00	0.0	100.0	227.93	13676.0	2910.0	25	0.0	80.3
40.00	0.0	100.0	260.49	15630.0	3325.0	22	0.0	80.3
45.00	0.0	100.0	293.05	17583.0	3741.0	20	0.0	80.3
Estimated Net Annual Sediment (TSS) Load Reduction =								**80 %**

Climate Station ID: 6117700 *Years of Rainfall Data*: 14

RAINFALL DATA FROM BARRIE-ORO 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

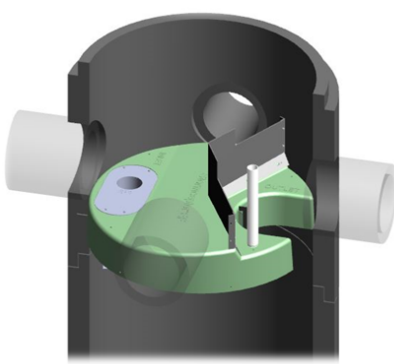
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test 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.

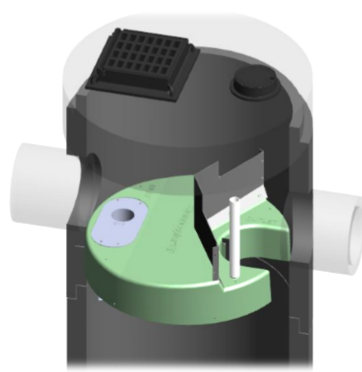
DESIGN FLEXIBILITY

►**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.

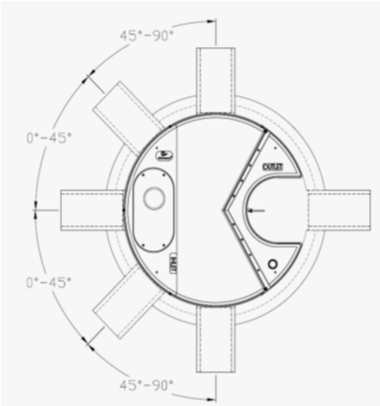
OIL CAPTURE AND RETENTION

►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.





Stormceptor® EF Sizing Report



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)	(ft^3)	(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/ft^3)

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. 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.**

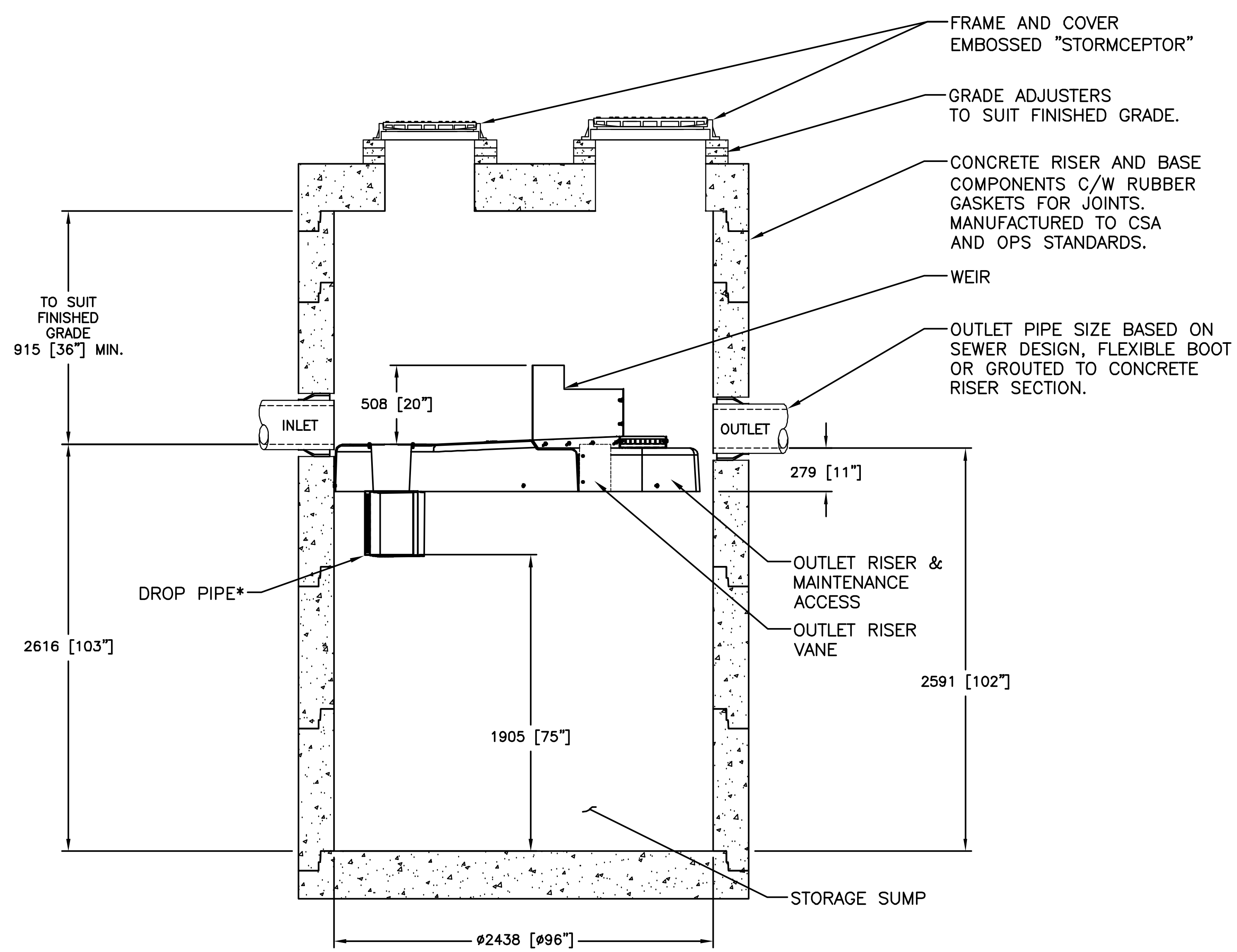
3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

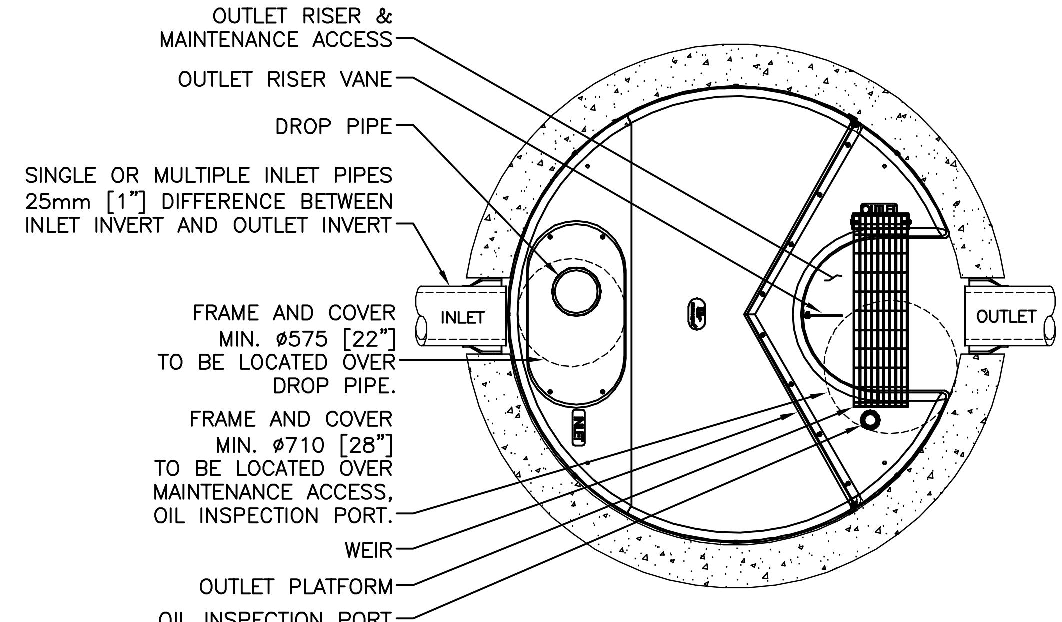
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 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.

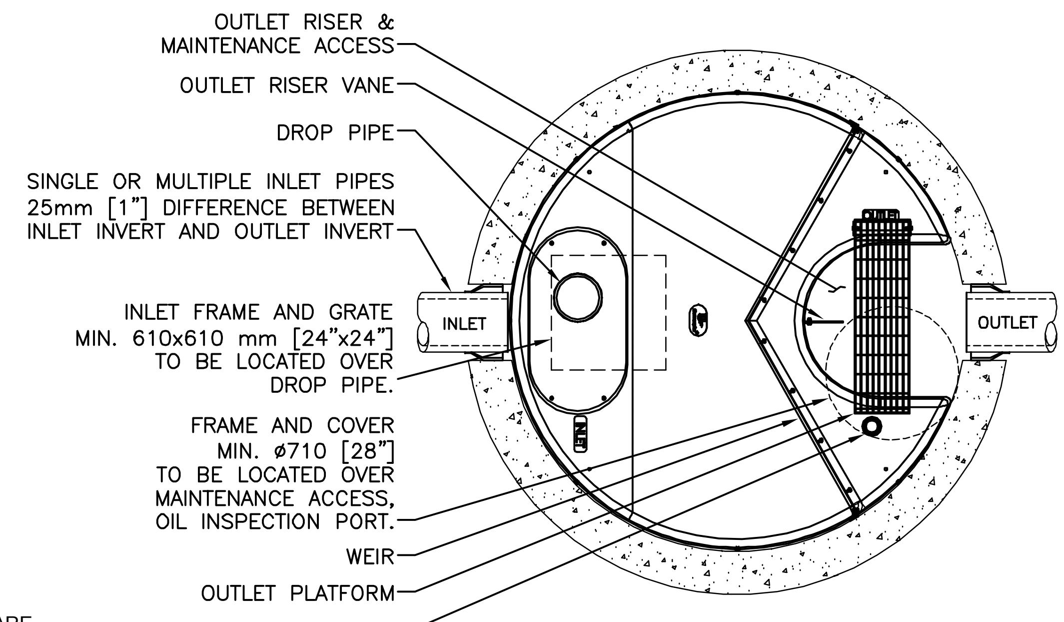
DRAWING NOT TO BE USED FOR CONSTRUCTION



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 EF8 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO8 (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	EF8				
STRUCTURE ID					*
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	5/26/17	INITIAL RELEASE	JSK
1	6/8/18	OUTLET PLATFORM	JSK
####	####	####	####
####	####	####	####
####	####	####	####

Stormceptor® EF

imbrium

SCALE = NTS

DATE: 5/26/2017	
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: *
PROJECT No.: EF8	SEQUENCE No.: *
SHEET: 1 OF 1	

I:\IMBRIUM\PRODUCTS\STORMCEPTOR EF\40 DRAWINGS & DETAILS\STANDARD DETAILS\EF8-DETAIL.DWG 4/12/2019 10:53 AM

◆ Verification Statement ◆ Verification Statement ◆ Verification Statement ◆

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

Stormceptor® EF4 and EFO4 Oil-Grit Separators

Developed by Imbrium Systems, Inc.,
Whitby, Ontario, Canada

In accordance with

ISO 14034:2016

Environmental management —
Environmental technology verification (ETV)

John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

November 10, 2017
Vancouver, BC, Canada

GLOBE PERFORMANCE SOLUTIONS

Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

The Stormceptor® EF4 and EFO4 are treatment devices designed to remove oil, sediment, trash, debris, and pollutants attached to particulates from Stormwater and snowmelt runoff. The device takes the place of a conventional manhole within a storm drain system and offers design flexibility that works with various site constraints. The EFO4 is designed with a shorter bypass weir height, which accepts lower surface loading rate into the sump, thereby reducing re-entrainment of captured free floating light liquids.

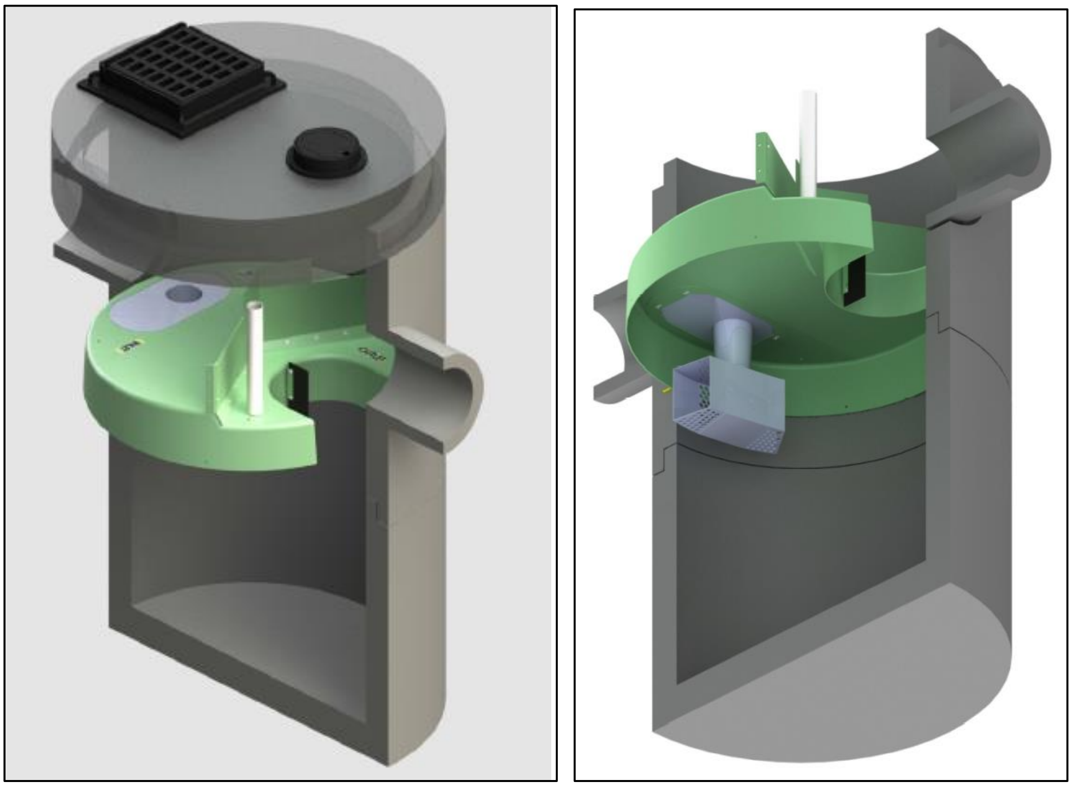


Figure 1. Graphic of typical inline Stormceptor® unit and core components.

Stormwater and snowmelt runoff enters the Stormceptor® EF/EFO's upper chamber through the inlet pipe(s) or a surface inlet grate. An insert divides the unit into lower and upper chambers and incorporates a weir to reduce influent velocity and separate influent (untreated) from effluent (treated) flows. Influent water ponds upstream of the insert's weir providing driving head for the water flowing downwards into the drop pipe where a vortex pulls the water into the lower chamber. The water diffuses at lower velocities in multiple directions through the drop pipe outlet openings. Oil and other floatables rise up and are trapped beneath the insert, while sediments undergo gravitational settling to the sump's bottom. Water from the sump can exit by flowing upward to the outlet riser onto the top side of the insert and downstream of the weir, where it discharges through the outlet pipe.

Maximum flow rate into the lower chamber is a function of weir height and drop pipe orifice diameter. The Stormceptor® EF and EFO are designed to allow a surface loading rate of 1135 L/min/m^2 (27.9 gal/min/ft^2) and 535 L/min/m^2 (13.1 gal/min/ft^2) into the lower chamber, respectively. When prescribed surface loading rates are exceeded, ponding water can overtop the weir height and bypass the lower treatment chamber, exiting directly through the outlet pipe. Hydraulic testing and scour testing demonstrate that the internal bypass effectively prevents scour at all bypass flow rates. Increasing the bypass flow rate does not increase the orifice-controlled flow rate into the lower treatment chamber where sediment is stored. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, treatment continues in the lower chamber at the maximum flow rate. The Stormceptor® EFO's lower design surface loading rate is favorable for minimizing re-entrainment and washout of captured light liquids. Inspection of Stormceptor® EF and EFO devices is performed from grade by inserting a sediment probe through the outlet riser and an oil dipstick through the oil inspection pipe. The unit can be maintained by using a vacuum hose through the outlet riser.

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Imbrium Systems Inc.'s Stormceptor® OGS device, in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014). The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for Environment Canada's Environmental Technology Verification (ETV) Program. A copy of the Procedure may be accessed on the Canadian ETV website at www.etvcanada.ca.

Performance claim(s)

Capture test [a]:

During the capture test, the Stormceptor® EF OGS device, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 46, 44, and 49 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Stormceptor® EFO, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 42, 40, and 34 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Scour test [a]:

During the scour test, the Stormceptor® EF and Stormceptor® EFO OGS devices, with 10.2 cm (4 inches) of test sediment pre-loaded onto a false floor reaching 50% of the manufacturer's recommended maximum sediment storage depth, generate corrected effluent concentrations of 4.6, 0.7, 0, 0.2, and 0.4 mg/L at 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Light liquid re-entrainment test [a]:

During the light liquid re-entrainment test, the Stormceptor® EFO OGS device with surrogate low-density polyethylene beads preloaded within the lower chamber oil collection zone, representing a floating light liquid volume equal to a depth of 50.8 mm over the sedimentation area, retained 100, 99.5, 99.8, 99.8, and 99.9 percent of loaded beads by mass during the 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2.

[a] The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory of Testing of Oil Grit Separators (Version 3.0, June 2014)

Performance results

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure. The *Procedure for Laboratory Testing of Oil Grit Separators* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

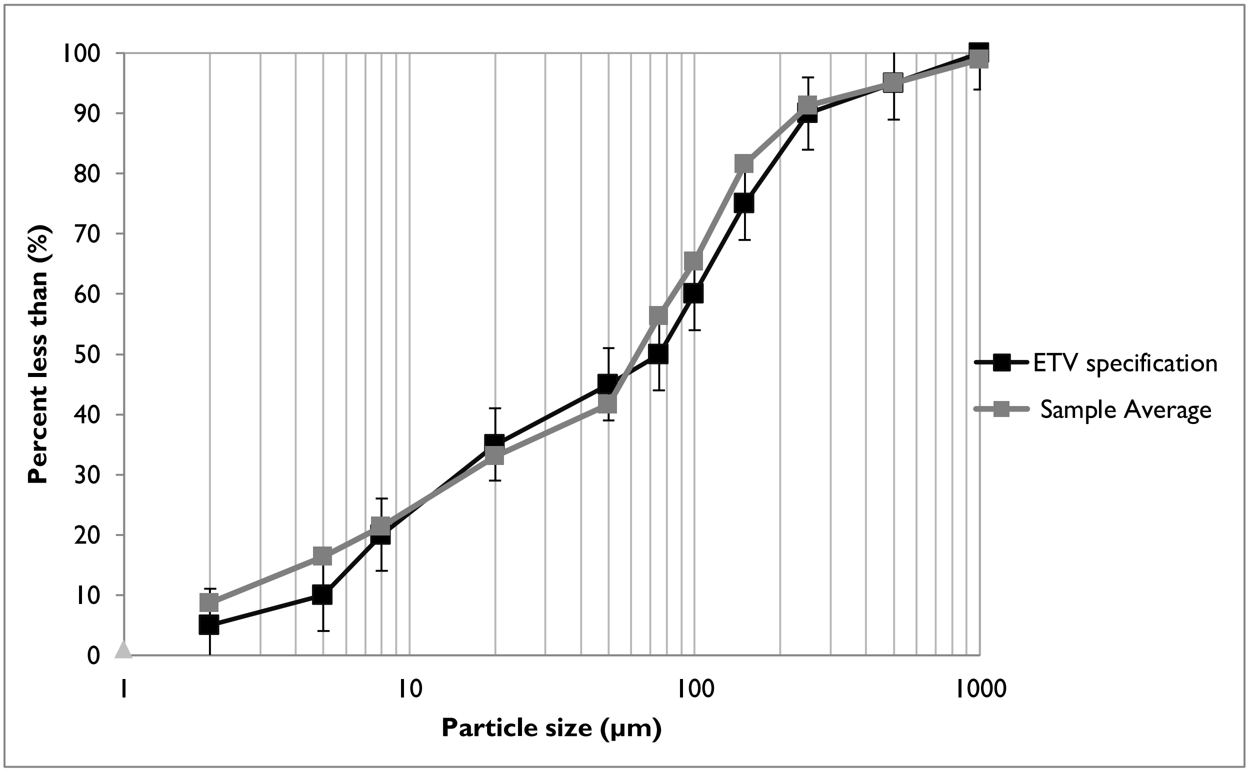


Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the device to retain sediment was determined at seven surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run. Performance was evaluated with a false floor simulating the technology filled to 50% of the manufacturer's recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment as a whole were determined for each of the tested surface loading rates (Table 1). Since the EF and EFO models are identical except for the weir height, which bypasses flows from the EFO model at a surface loading rate of 535 L/min/m^2 (13.1 gpm/ft^2), sediment capture tests at surface loading rates from 40 to 400 L/min/m^2 were only performed on the EF unit. Surface loading rates of 600, 1000, and 1400 L/min/m^2 were tested on both units separately. Results for the EFO model at these higher flow rates are presented in Table 2.

In some instances, the removal efficiencies were above 100% for certain particle size fractions. These discrepancies are not unique to any one test laboratory and may be attributed to errors relating to the blending of sediment, collection of representative samples for laboratory submission, and laboratory analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see Bulletin # CETV 2016-11-0001). The results for "all particle sizes by mass balance" (see Table 1 and 2) are based on measurements of the total injected and retained sediment mass, and are therefore not subject to blending, sampling or PSD analysis errors.

Table 1. Removal efficiencies (%) of the EF4 at specified surface loading rates

Particle size fraction (µm)	**Surface loading rate (L/min/m²)**						
	40	80	200	400	600	1000	1400
>500	90	58	58	100*	86	72	100*
250 - 500	100*	100*	100	100*	100*	100*	100*
150 - 250	90	82	26	100*	100*	67	90
105 - 150	100*	100*	100*	100*	100*	100*	100
75 - 105	100*	92	74	82	77	68	76
53 - 75	Undefined [a]	56	100*	72	69	50	80
20 - 53	54	100*	54	33	36	40	31
8 - 20	67	52	25	21	17	20	20
5 – 8	33	29	11	12	9	7	19
<5	13	0	0	0	0	0	4
All particle sizes by mass balance	**70.4**	**63.8**	**53.9**	**47.5**	**46.0**	**43.7**	**49.0**

[a] An outlier in the feed sample sieve data resulted in a negative removal efficiency for this size fraction.
* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 101 and 171% (average 128%). See text and Bulletin # CETV 2016-11-0001 for more information.

Table 2. Removal efficiencies (%) of the EFO4 at surface loading rates above the bypass rate of 535 L/min/m²

Particle size fraction (µm)	**Surface loading rate (L/min/m²)**		
	600	1000	1400
>500	89	83	100*
250 - 500	90	100*	92
150 - 250	90	67	100*
105 - 150	85	92	77
75 - 105	80	71	65
53 - 75	60	31	36
20 - 53	33	43	23
8 - 20	17	23	15
5 – 8	10	3	3
<5	0	0	0
All particle sizes by mass balance	**41.7**	**39.7**	**34.2**

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 103 and 111% (average 107%). See text and Bulletin # CETV 2016-11-0001 for more information.

Figure 3 compares the particle size distribution (PSD) of the three sample average of the test sediment to the PSD of the sediment retained by the EF4 at each of the tested surface loading rates. Figure 4 shows the same graph for the EFO4 unit at surface loading rates above the bypass rate of 535 L/min/m².

As expected, the capture efficiency for fine particles in both units was generally found to decrease as surface loading rates increased.

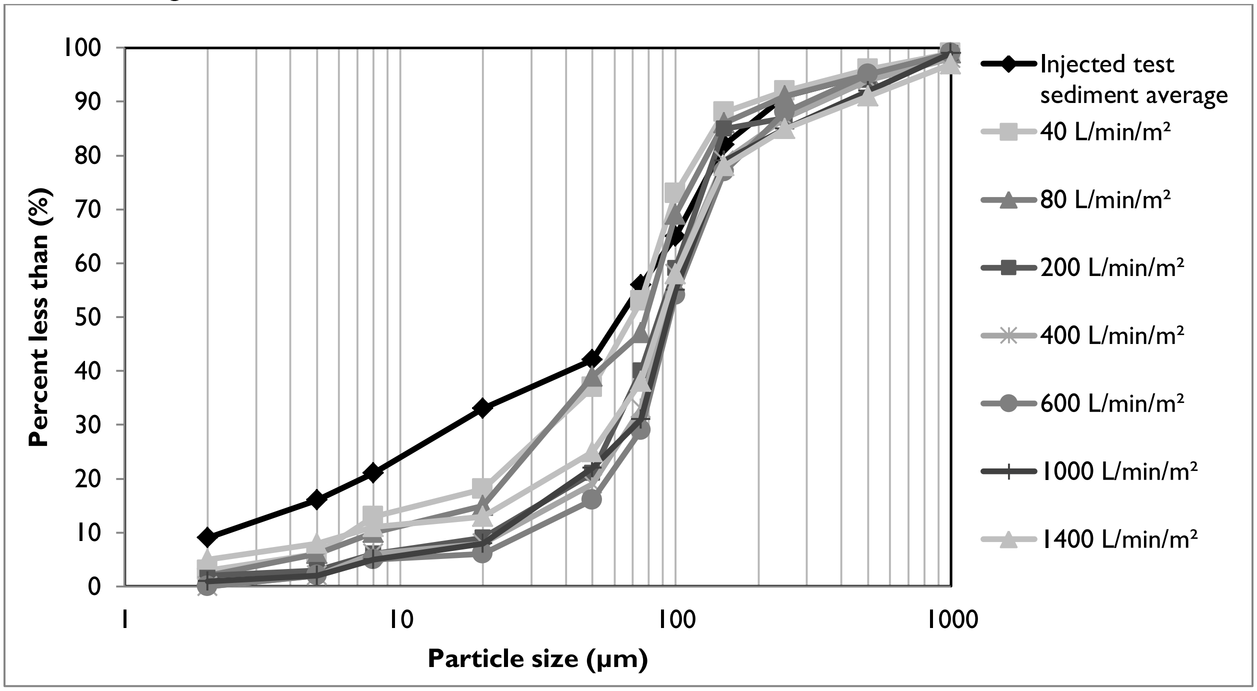


Figure 3. Particle size distribution of sediment retained in the EF4 in relation to the injected test sediment average.

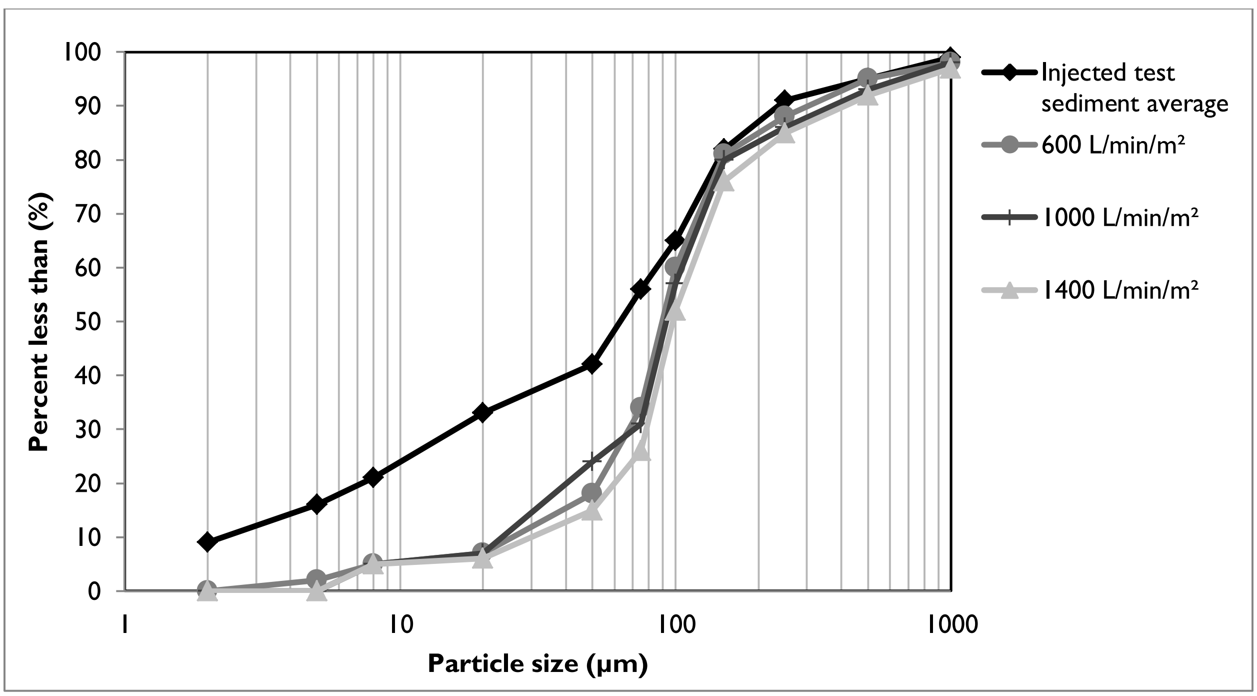


Figure 4. Particle size distribution of sediment retained in the EFO4 in relation to the injected test sediment average at surface loading rates above the bypass rate of 535 L/min/m²

Table 4 shows the results of the sediment scour and re-suspension test for the EF4 unit. The EFO4 was not tested as it was reasonably assumed that scour rates would be lower given that flow bypass occurs at a lower surface loading rate. The scour test involved preloading 10.2 cm of fresh test sediment into the sedimentation sump of the device. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum recommended sediment storage depth. Clean water was run through the device at five surface loading rates over a 30 minute period. Each flow rate was maintained for 5 minutes with a one minute transition time between flow rates. Effluent samples were collected at one minute sampling intervals and analyzed for Suspended Sediment Concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water. Typically, the smallest 5% of particles captured during the 40 L/min/m^2 sediment capture test is also used to adjust the concentration, as per the method described in [Bulletin # CETV 2016-09-0001](). However, since the composites of effluent concentrations were below the Reporting Detection Limit of the Laser Diffraction PSD methodology, this adjustment was not made. Results showed average adjusted effluent sediment concentrations below 5 mg/L at all tested surface loading rates.

It should be noted that the EF4 starts to internally bypass water at 1135 L/min/m^2, potentially resulting in the dilution of effluent concentrations, which would not normally occur under typical field conditions because the field influent concentration would contain a much higher sediment concentration than during the lab test. Recalculation of effluent concentrations to account for dilution at surface loading rates above the bypass rate showed sediment effluent concentrations to be below 1.6 mg/L.

Table 4. Scour test adjusted effluent sediment concentration.

Run	Surface loading rate (L/min/m^2)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L) [a]	Average (mg/L)
1	200	1:00	<RDL	11.9	4.6
		2:00		7.0	
		3:00		4.4	
		4:00		2.2	
		5:00		1.0	
		6:00		1.2	
2	800	7:00	<RDL	1.1	0.7
		8:00		0.9	
		9:00		0.6	
		10:00		1.4	
		11:00		0.1	
		12:00		0	
3	1400	13:00	<RDL	0	0
		14:00		0.1	
		15:00		0	
		16:00		0	
		17:00		0	
		18:00		0	
4	2000	19:00	1.2	0.2	0.2
		20:00		0	
		21:00		0	
		22:00		0.7	
		23:00		0	

		24:00		0.4	
5	2600	25:00	1.6	0.3	0.4
		26:00		0.4	
		27:00		0.7	
		28:00		0.4	
		29:00		0.2	
		30:00		0.4	

[a] The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the background concentration. For more information see Bulletin # CETV 2016-09-0001.

The results of the light liquid re-entrainment test used to evaluate the unit's capacity to prevent re-entrainment of light liquids are reported in Table 5. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m^2) of surrogate low-density polyethylene beads within the oil collection skirt and running clean water through the device continuously at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m^2). Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates. The effluent flow was screened to capture all re-entrained pellets throughout the test.

Table 5. Light liquid re-entrainment test results for the EFO4.

Surface Loading Rate (L/min/m2)	Time Stamp	Amount of Beads Re-entrained			
		Mass (g)	Volume (L)[a]	% of Pre-loaded Mass Re-entrained	% of Pre-loaded Mass Retained
200	62	0	0	0.00	100
800	247	168.45	0.3	0.52	99.48
1400	432	51.88	0.09	0.16	99.83
2000	617	55.54	0.1	0.17	99.84
2600	802	19.73	0.035	0.06	99.94
Total Re-entrained		295.60	0.525	0.91	--
Total Retained		32403	57.78	--	99.09
Total Loaded		32699	58.3	--	--

[a] Determined from bead bulk density of 0.56074 g/cm^3

Variances from testing Procedure

The following minor deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

1. During the capture test, the 40 L/min/m^2 and 80 L/min/m^2 surface loading rates were evaluated over 3 and 2 days respectively due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit at these lower flow rates. Pumps were shut down at the end of each intermediate day, and turned on again the following morning. The target flow rate was re-established within 30 seconds of switching on the pump. This procedure may have allowed sediments to be captured that otherwise may have exited the unit if the test was

continuous. On the basis of practical considerations, this variance was approved by the verifier prior to testing.

2. During the scour test, the coefficient of variation (COV) for the lowest flow rate tested (200 L/min/m^2) was 0.07, which exceeded the specified limit of 0.04 target specified in the OGS Procedure. A pump capable of attaining the highest flow rate of 3036 L/min had difficulty maintaining the lowest flow of 234 L/min but still remained within +/- 10% of the target flow and is viewed as having very little impact on the observed results. Similarly, for the light liquid re-entrainment test the COV for the flow rate of the 200 L/min/m^2 run was 0.049, exceeding the limit of 0.04, but is believed to introduce negligible bias.

3. Due to pressure build up in the filters, the runs at 1000 L/min/m^2 for the Stormceptor® EF4 and 1000 and 1400 L/min/m^2 for the Stormceptor® EFO4 were slightly shorter than the target. The run times were 54, 59 and 43 minutes respectively, versus targets of 60 and 50 minutes. The final feed samples were timed to coincide with the end of the run. Since >25 lbs of sediment was fed, the shortened time did not invalidate the runs.

Verification

The verification was completed by the Verification Expert, Toronto and Region Conservation Authority, contracted by GLOBE Performance Solutions, using the International Standard ***ISO 14034:2016 Environmental management -- Environmental technology verification (ETV)***. Data and information provided by Imbrium Systems Inc. to support the performance claim included the following: Performance test report prepared by Good Harbour Laboratories, and dated September 8, 2017; the report is based on testing completed in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014).

What is ISO14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV), and was developed and published by the *International Organization for Standardization (ISO)*. The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the Stormceptor® EF4 and EFO4 please contact:

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Limitation of verification

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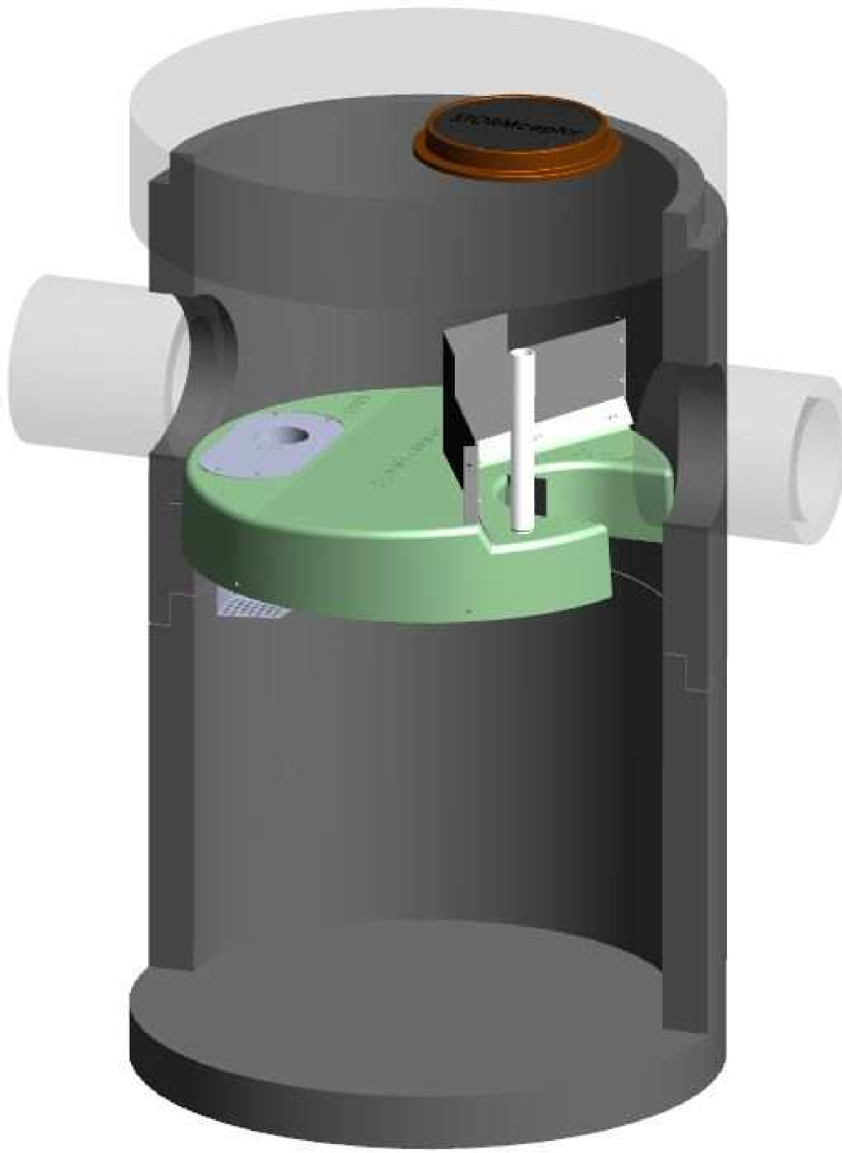
Stormceptor® EF

Owner's Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,180,305
Canadian Patent No. 2,327,768
Canadian Patent No. 2,694,159
Canadian Patent No. 2,697,287
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 729,096
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Japanese Patent No. 5,997,750
Japanese Patent No. 5,555,160
Korean Patent No. 0519212
Korean Patent No. 1451593
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Patent pending

Table of Contents:

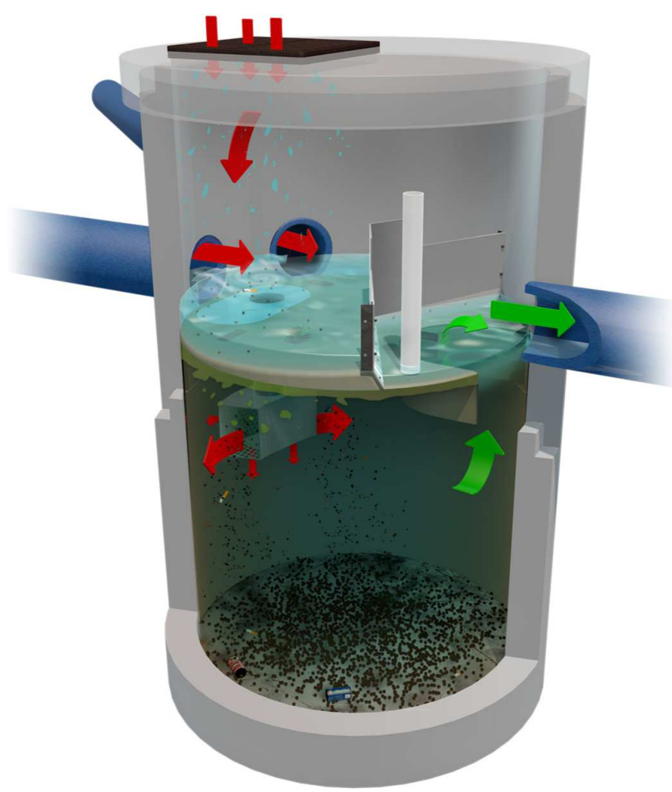
OVERVIEW

Stormceptor® EF is a continuation and evolution of the most globally recognized oil grit separator (OGS) stormwater treatment technology - ***Stormceptor®***. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at flow rates higher than the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention platform ensures sediment is retained during all rainfall events.

Stormceptor EF offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe, multiple inlet pipes, and/or from the surface through an inlet grate. Stormceptor EF can also serve as a junction structure, accommodate a 90-degree inlet to outlet bend angle, and be modified to ensure performance in submerged conditions. With its scour prevention and internal bypass, Stormceptor EF can be installed online, eliminating the need for costly additional bypass structures.

OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and other floatables rise up within the channel surrounding the central riser pipe and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.
- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.



COMPONENTS

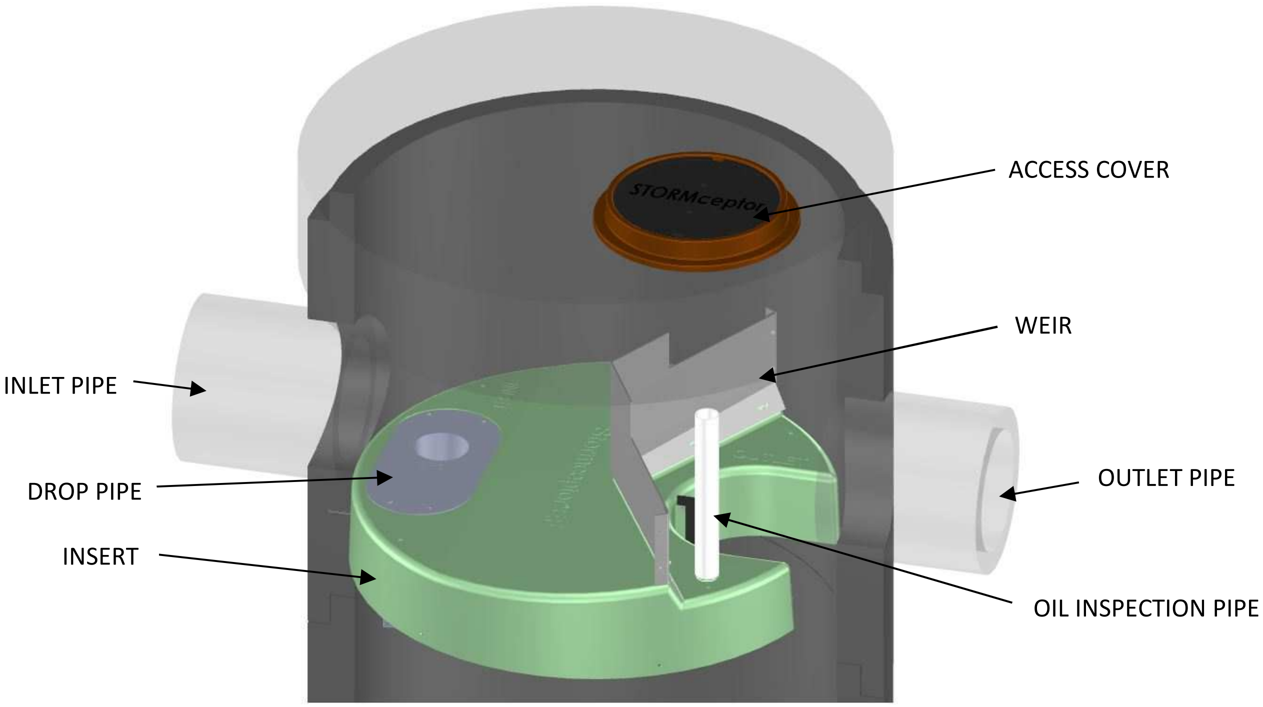


Figure 1

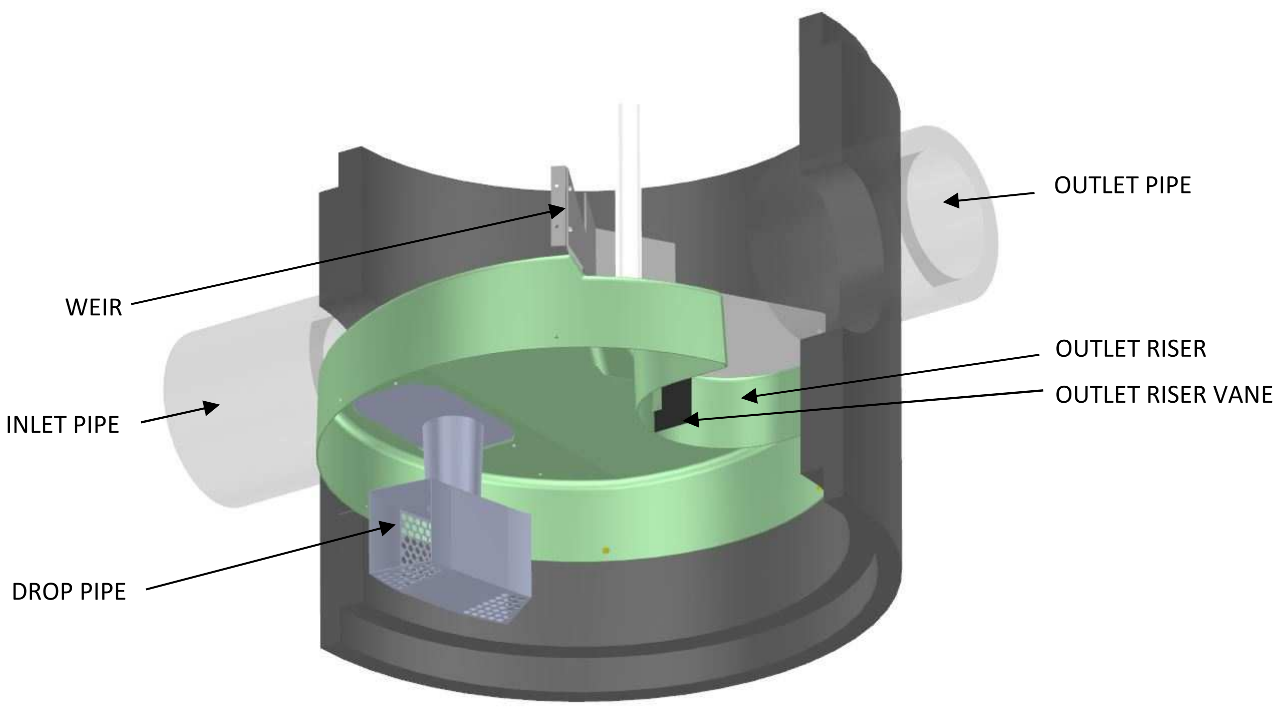


Figure 2

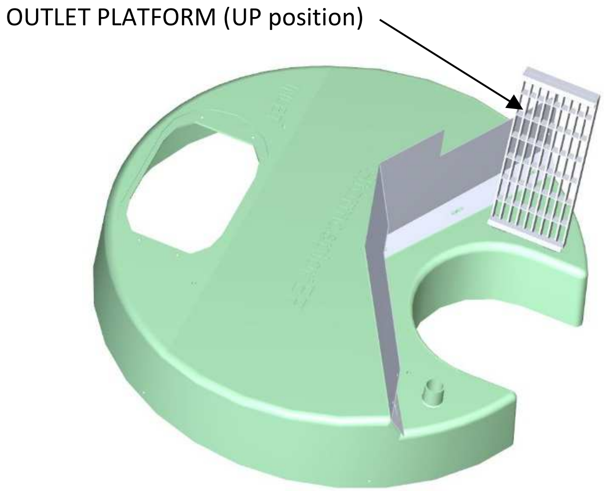


Figure 3A

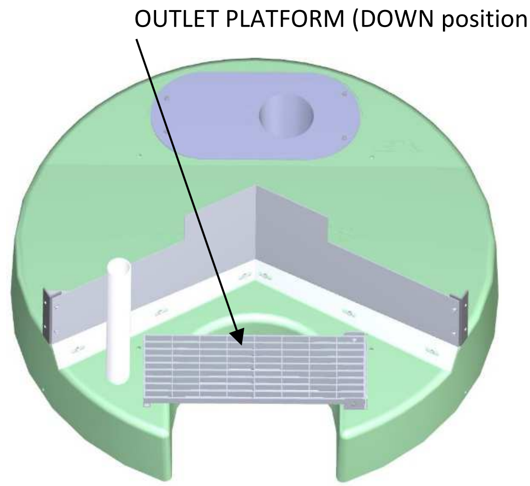


Figure 3B

- **Insert** – separates vessel into upper and lower chambers, and provides double-wall containment of hydrocarbons
- **Weir** – creates stormwater ponding and driving head on top side of insert
- **Drop pipe** – conveys stormwater and pollutants into the lower chamber
- **Outlet riser** – conveys treated stormwater from the lower chamber to the outlet pipe, and provides primary inspection and maintenance access into the lower chamber
- **Outlet riser vane** – prevents formation of a vortex in the outlet riser during high flow rate conditions
- **Outlet platform (optional)** – safety platform in the event of manned entry into the unit
- **Oil inspection pipe** – primary access for measuring oil depth

PRODUCT DETAILS

METRIC DIMENSIONS AND CAPACITIES

Table 1

Stormceptor Model	Inside Diameter (m)	Minimum Surface to Outlet Invert Depth (mm)	Depth Below Outlet Pipe Invert (mm)	Wet Volume (L)	Sediment Capacity [1] (m^3)	Hydrocarbon Storage Capacity [2] (L)	Maximum Flow Rate into Lower Chamber [3] (L/s)	Peak Conveyance Flow Rate [4] (L/s)
EF4 / EFO4	1.22	915	1524	1780	1.19	265	22.1 / 10.4	425
EF6 / EFO6	1.83	915	1930	5070	3.47	610	49.6 / 23.4	990
EF8 / EFO8	2.44	1219	2591	12090	8.78	1070	88.3 / 41.6	1700
EF10 / EFO10	3.05	1219	3251	23700	17.79	1670	138 / 65	2830
EF12 / EFO12	3.66	1524	3886	40800	31.22	2475	198.7 / 93.7	2830

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/m^2.
EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/m^2.

[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 1.5 m/s.

U.S. DIMENSIONS AND CAPACITIES

Table 2

Stormceptor Model	Inside Diameter (ft)	Minimum Surface to Outlet Invert Depth (in)	Depth Below Outlet Pipe Invert (in)	Wet Volume (gal)	Sediment Capacity [1] (ft^3)	Hydrocarbon Storage Capacity [2] (gal)	Maximum Flow Rate into Lower Chamber [3] (cfs)	Peak Conveyance Flow Rate [4] (cfs)
EF4 / EFO4	4	36	60	471	42	70	0.78 / 0.37	15
EF6 / EFO6	6	36	76	1339	123	160	1.75 / 0.83	35
EF8 / EFO8	8	48	102	3194	310	280	3.12 / 1.47	60
EF10 / EFO10	10	48	128	6261	628	440	4.87 / 2.30	100
EF12 / EFO12	12	60	153	10779	1103	655	7.02 / 3.31	100

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 27.9 gpm/ft^2.
EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 13.1 gpm/ft^2.

[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 5 fps.

IDENTIFICATION

Each Stormceptor EF/EFO unit is easily identifiable by the trade name ***Stormceptor®*** embossed on the access cover at grade as shown in **Figure 3**. The tradename ***Stormceptor®*** is also embossed on the top of the insert upstream of the weir as shown in **Figure 3**.

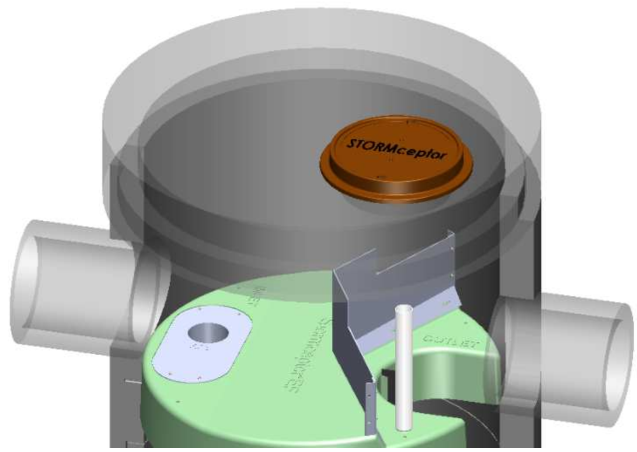


Figure 4

The specific Stormceptor EF/EFO model number is identified on the top of the aluminum Drop Pipe as shown in **Figure 4**. The unit serial number is identified on the top of the insert upstream of the weir as shown in **Figure 4**.

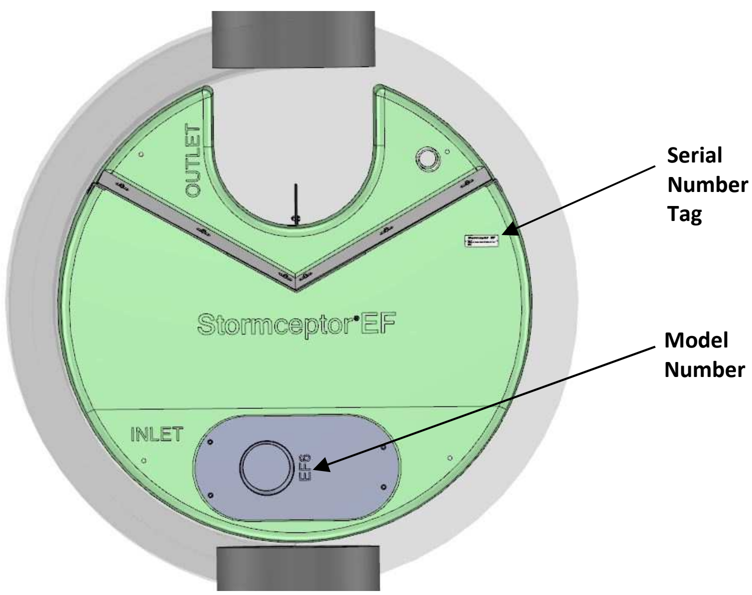


Figure 5

INSPECTION AND MAINTENANCE

It is very important to perform regular inspection and maintenance. Regular inspection and maintenance ensures maximum operation efficiency, keeps maintenance costs low, and provides continued of natural waterways.

Quick Reference

- Typical inspection and maintenance is performed from grade
- Remove manhole **cover(s)** or **inlet grate** to access insert and lower chamber
  NOTE: EF4/EFO4 requires the removal of a **flow deflector** beneath inlet grate
- Use Sludge Judge® or similar sediment probe to check sediment depth through the **outlet riser**
- Oil dipstick can be inserted through the **oil inspection pipe**
- Visually inspect the **insert** for debris, remove debris if present
- Visually inspect the **drop pipe** opening for blockage, remove blockage if present
- Visually inspect **insert** and **weir** for damage, schedule repair if needed
- Insert vacuum hose and jetting wand through the outlet riser and extract sediment and floatables
- Replace flow deflector (EF4/EFO4), inlet grate, and cover(s)
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess pollutant accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

What equipment is typically required for inspection?

- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

When is maintenance cleaning needed?

- If the post-construction inspection indicates presence of construction sediment of a depth greater than a few inches, maintenance is recommended at that time.
- For optimum performance and normal operation the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, see **Table 3**.
- Maintain immediately after an oil, fuel, or other chemical spill.

Table 3

Recommended Sediment Depths for Maintenance Service*	
MODEL	Sediment Depth (in/mm)
EF4 / EFO4	8 / 203
EF6 / EFO6	12 /305
EF8 / EFO8	24 / 610
EF10 / EFO10	24 / 610
EF12 / EFO12	24 / 610

* Based on a minimum distance of 40 inches (1,016 mm) from bottom of outlet riser to top of sediment bed

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, disposal costs, and transportation distance.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required (adhere to all OSHA / CCOSH standards)

What conditions can compromise Stormceptor performance?

- Presence of construction sediment and debris in the unit prior to activation
- Excessive sediment depth beyond the recommended maintenance depth
- Oil spill in excess of the oil storage capacity
- Clogging or restriction of the drop pipe inlet opening with debris
- Downstream blockage that results in a backwater condition

Maintenance Procedures

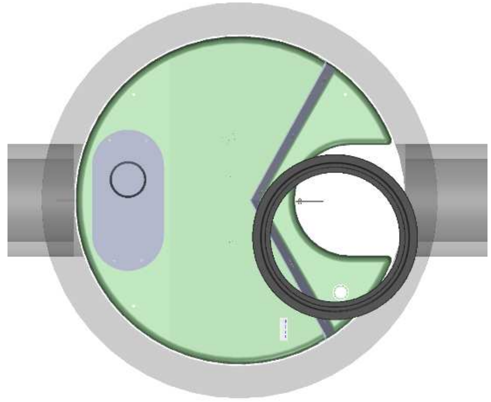


Figure 6

- Maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is maintained from grade through a standard surface manhole access cover or inlet grate.
- In the case of submerged or tailwater conditions, extra measures are likely required, such as plugging the inlet and outlet pipes prior to conducting maintenance.
- Inspection and maintenance of upstream catch basins and other stormwater conveyance structures is also recommended to extend the time between future maintenance cycles.
- Sediment depth inspections are performed through the **Outlet Riser** and oil presence can be determined through the **Oil Inspection Pipe**.
- Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths.

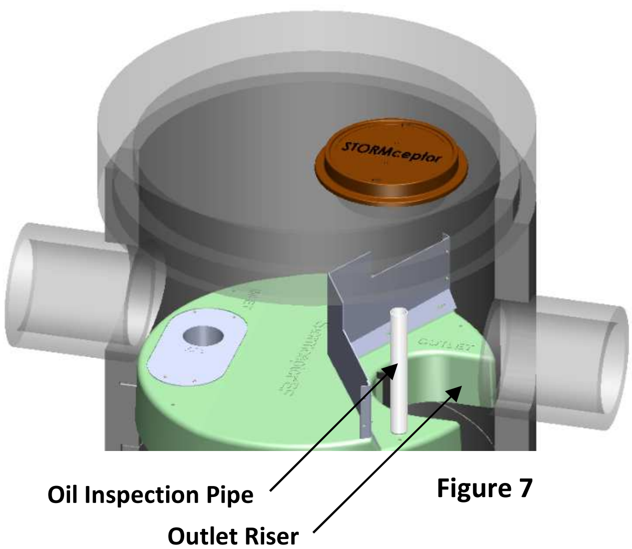


Figure 7

Figure 8

- Visually inspect the insert, weir, and drop pipe inlet opening to ensure there is no damage or blockage.
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

- When maintenance is required, a standard vacuum truck is used to remove the pollutants from the lower chamber of the unit through the **Outlet Riser**.

Figure 9

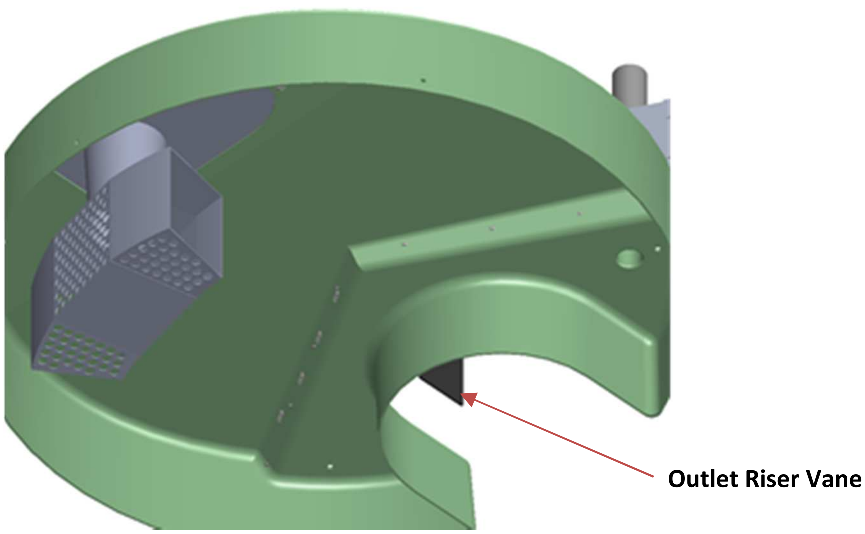


Figure 10

NOTE: The Outlet Riser Vane is durable and flexible and designed to allow maintenance activities with minimal, if any, interference.

Removable Flow Deflector

- Top grated inlets for the Stormceptor EF4/EFO4 model requires a removable flow deflector staged underneath a 24-inch x 24-inch (600 mm x 600 mm) square inlet grate to direct flow towards the inlet side of the insert, and avoid flow and pollutants from entering the outlet side of the insert from grade. The EF6/EFO6 and larger models do not require the flow deflector.

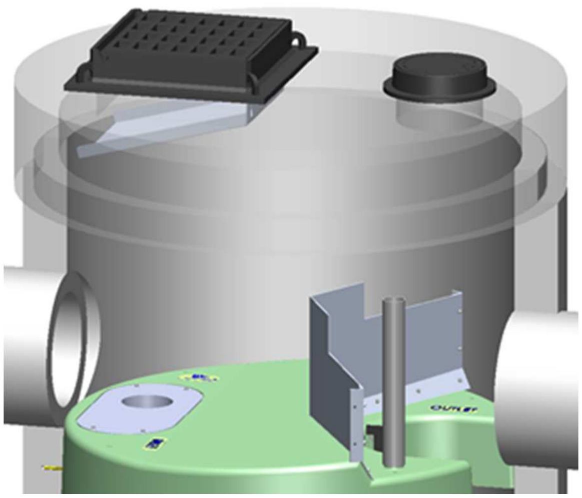
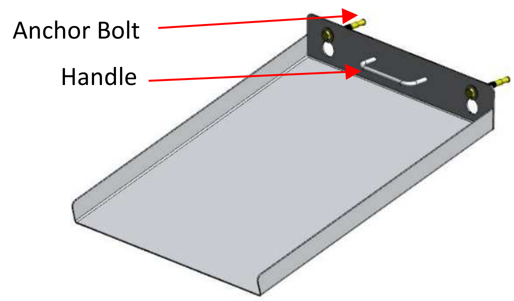


Figure 11

How to Remove:

1. Loosen anchor bolts
2. Pull up and out using the handle



Removable Flow Deflector

Hydrocarbon Spills

Stormceptor is often installed on high pollutant load hotspot sites with vehicular traffic where hydrocarbon spill potential exists. Should a spill occur, or presence of oil be identified within a Stormceptor EF/EFO, it should be cleaned immediately by a licensed liquid waste hauler.

Disposal

Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of material.

Oil Sheens

When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations (< 10 mg/L). Despite the appearance of a sheen, Stormceptor EF/EFO may still be functioning as intended.

Oil Level Alarm

To mitigate spill liability with 24/7 detection, an electronic monitoring system can be employed to trigger a visual and audible alarm when a pre-set level of oil is captured within the lower chamber or when an oil spill occurs. The oil level alarm is available as an optional feature to include with Stormceptor EF/EFO as shown in **Figure 11**. For additional details about the Oil Level Alarm please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-systems.

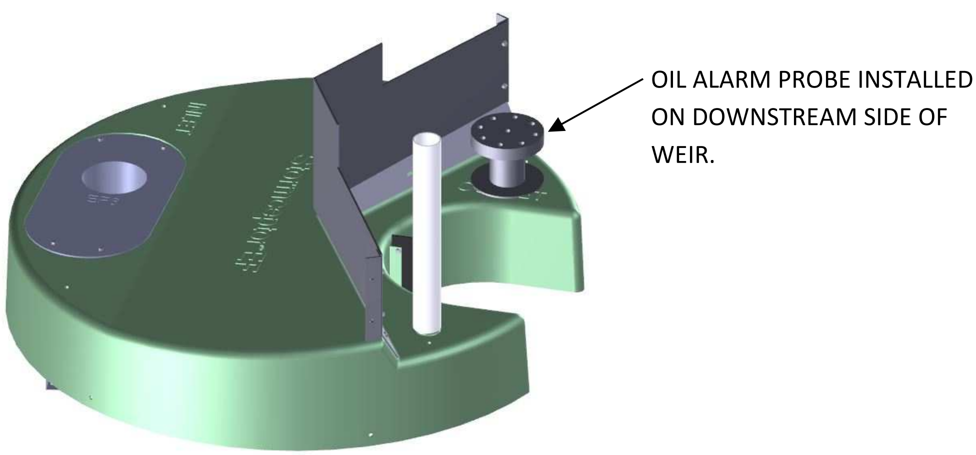


Figure 12

Replacement Parts

Stormceptor has no moving parts to wear out. Therefore inspection and maintenance activities are generally focused on pollutant removal. Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. However, if replacement parts are necessary, they may be purchased by contacting your local Stormceptor representative.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: ________________________

Serial Number: ________________________

Installation Date: ________________________

Location Description of Unit: ________________________

Recommended Sediment Maintenance Depth: ________________________

DATE	SEDIMENT DEPTH (inch or mm)	OIL DEPTH (inch or mm)	SERVICE REQUIRED (Yes / No)	MAINTENANCE PERFORMED	MAINTENANCE PROVIDER	COMMENTS

Other Comments:

Contact Information

Questions regarding Stormceptor EF/EFO can be addressed by contacting your local Stormceptor representative or by visiting our website at **www.stormceptor.com**.

Imbrium Systems Inc. & Imbrium Systems LLC

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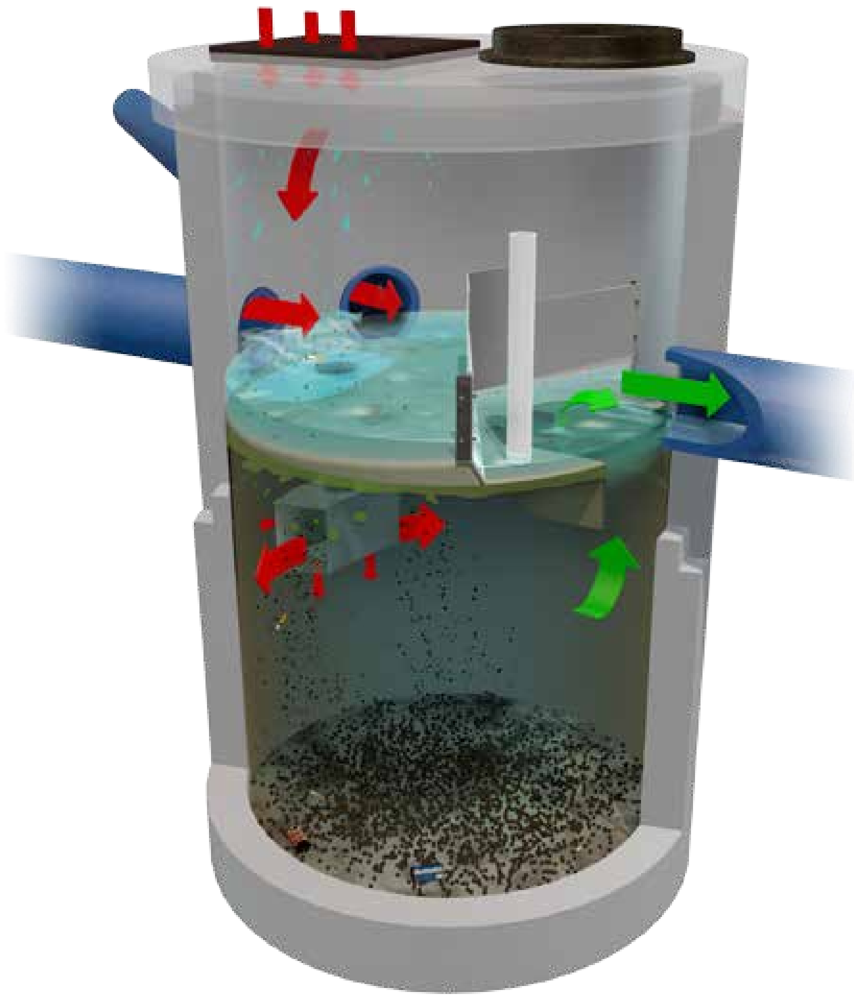
www.stormceptor.com
info@imbriumsystems.com

Stormceptor® EF

Technical Manual



imbrium®

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Stormceptor® EF is a continuation and evolution of the most globally recognized oil-grit separator (OGS) stormwater treatment technology - ***Stormceptor®***. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil-grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at higher flow rates as compared to the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention technology and internal bypass ensures sediment is retained during all rainfall events..

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OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and other floatables rise up and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for online installation, avoiding the cost of additional bypass structures. During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.
- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.
- **Refer to components identified in Figures 1 and 2 to understand the Stormceptor EF operation.**

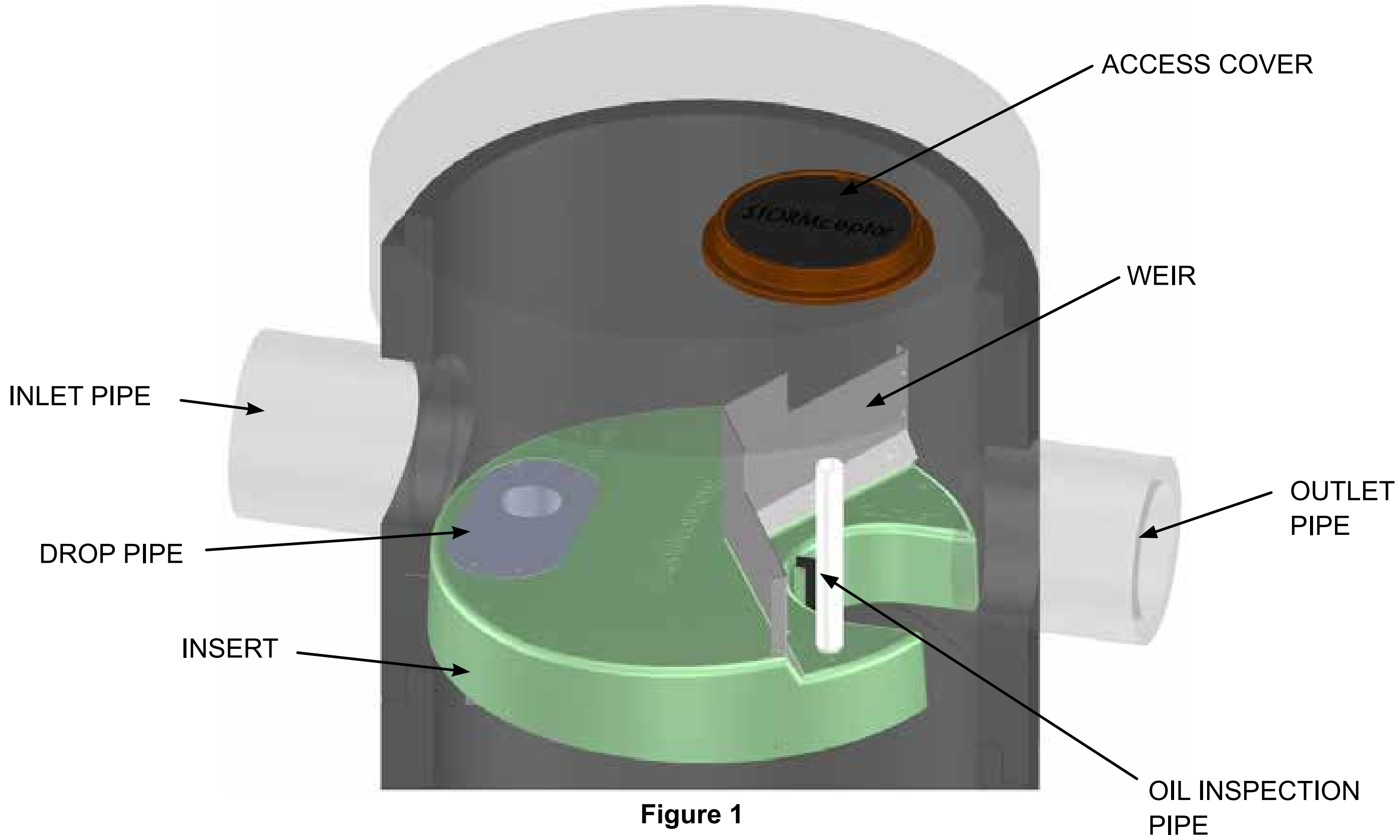

Figure 1

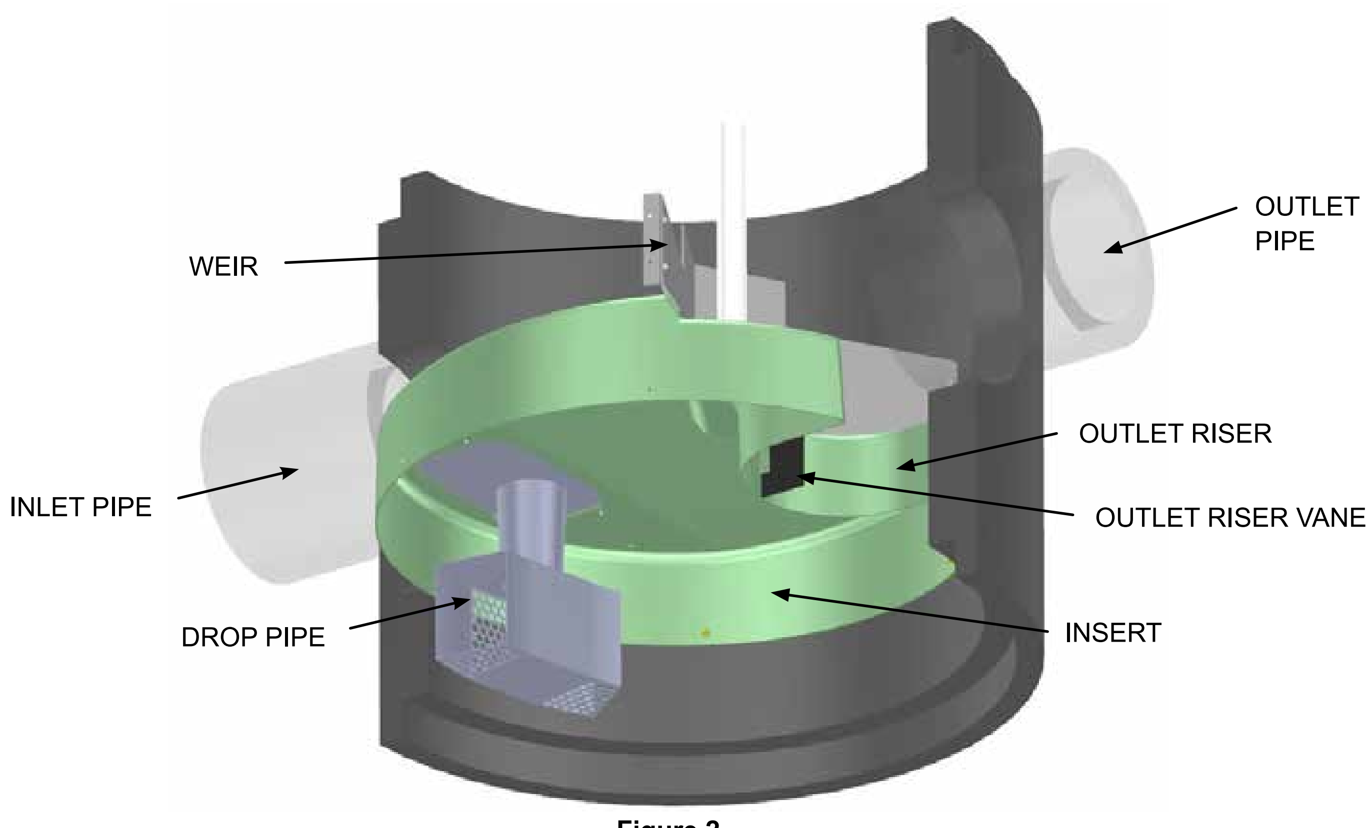

Figure 2

FEATURES AND BENEFITS

FEATURE	BENEFITS
Patent-pending enhanced flow, TSS treatment technology	Superior, verified third-party performance
Scour prevention with an internal bypass	Validated online installation and cost savings
Third-party verified light liquid capture (oil) and retention (Stormceptor EFO)	Proven performance for fuel/oil hotspot locations
Functions as bend, junction or inlet structure	Cost savings & design flexibility
Minimal drop between inlet and outlet	Site installation ease
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade

APPLICATIONS

Stormceptor EF is designed as an ‘at source’ solution for commercial and industrial sites, urban environments, and residential developments. Stormceptor EF is ideal for:

- Pretreatment of wet ponds, filters, infiltration systems, bioretention, and other Low Impact Development (LID) applications
- Commercial sites
- Manufacturing/Industrial sites
- Residential developments
- Fueling stations, convenience stores, fast food restaurants
- Roads and highways
- Airports, seaports, and military bases
- Hydrocarbon spill, high pollutant load hotspots (Stormceptor EFO)

PRODUCT DETAILS

METRIC DIMENSIONS AND CAPACITIES								
Stormceptor Model	Inside Diameter	Minimum Surface to Outlet Invert Depth	Depth Below Outlet Pipe Invert	Wet Volume	Sediment Capacity[1]	Hydrocarbon Storage Capacity[2]	Maximum Flow Rate into Lower Chamber[3]	Peak Conveyance Flow Rate[4]
	(m)	(mm)	(mm)	(L)	(m^3)	(L)	(L/s)	(L/s)
EF4 / EFO4	1.22	915	1524	1780	1.19	265	22.1 / 10.4	425
EF6 / EFO6	1.83	915	1930	5070	3.47	610	49.6 / 23.4	990
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EF12 / EFO12	3.66	1524	3886	40800	31.22	2475	198.7 / 93.7	2830

U.S. DIMENSIONS AND CAPACITIES								
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	(ft)	(in)	(in)	(gal)	(ft^3)	(gal)	(cfs)	(cfs)
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1. Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
2. Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
3. EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/m^2 (27.9 gpm/ft^2). EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/m^2 (13.1 gpm/ft^2).
4. Peak Conveyance Flow Rate is limited by a maximum velocity of 1.5 m/s (5 fps).

UNIT DESIGN

Sizing Methodology

Stormceptor® EF and Stormceptor® EFO are sized using local historical rainfall data for the site of interest, specific site parameters, and a performance curve for TSS removal derived from third-party testing conducted in accordance with the Canadian Environmental Technology Verification (ETV) Program's ***Procedure for Laboratory Testing of Oil-Grit Separators***. Every Stormceptor unit is designed to achieve the specified target TSS removal, however, for sites where oil/fuel capture and retention is an additional specified water quality objective Stormceptor EFO is the proper selection. The sizing methodology includes various considerations, including:

- Site parameters
- Local historical rainfall data
- Capture of the Canadian ETV particle size distribution
- Requirements for oil/fuel capture and retention
- Performance results from third-party testing and verification

State, provincial, and local regulatory agencies and municipalities may have specific sizing and design criteria for stormwater treatment systems such as OGS devices. To ensure proper sizing and design, contact your local Stormceptor representative for sizing and design assistance or visit www.imbriumsystems.com for more information.

ONLINE APPLICATION

Stormceptor EF's internal bypass and patent-pending scour prevention technology has demonstrated very effective retention of pollutants in third-party testing and verification following the Canadian ETV's ***Procedure for Laboratory Testing of Oil-Grit Separators***. Sediment scour prevention demonstrated an effluent concentration of less than 10 mg/L for sediment particles ranging from 1 to 1,000 microns, even during peak influent flow rates associated with infrequent high intensity storm events. While Stormceptor EF will capture oil, only the Stormceptor EFO configuration has been third-party tested and verified to retain greater than 99% of captured oil.

Based on these verified performance attributes, the most efficient and widely accepted application of Stormceptor EF is an online configuration, which allows all upstream conveyance flows to enter and exit the unit. The online application eliminates the need for costly additional bypass structures, piping and installation expense.

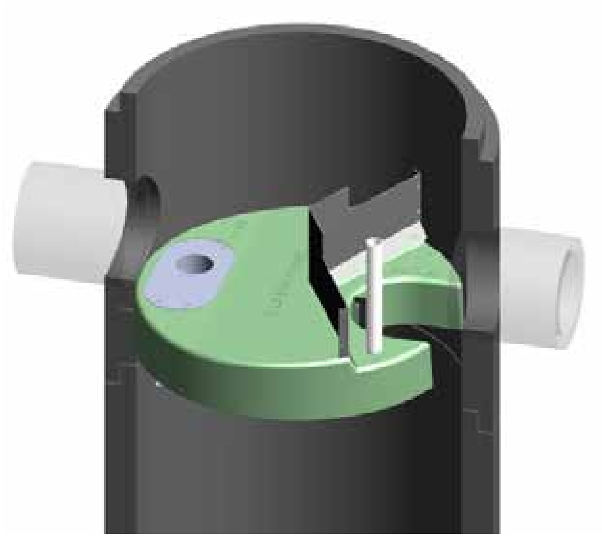

Figure 3

FLOW ENTRANCE OPTIONS

Single Inlet Pipe – A common design which includes one inlet pipe and one outlet pipe. A 90-degree (maximum) bend is also accepted with this configuration. **Example seen in Figure 3**.

MAXIMUM PIPE DIAMETER		
MODEL	INLET (in / mm)	OUTLET (in / mm)
EF4 / EFO4	24 / 610	24 / 610
EF6 / EFO6	36 / 915	36 / 915
EF8 / EFO8	48 / 1220	48 / 1220
EF10 / EFO10	72 / 1828	72 / 1828
EF12 / EFO12	72 / 1828	72 / 1828

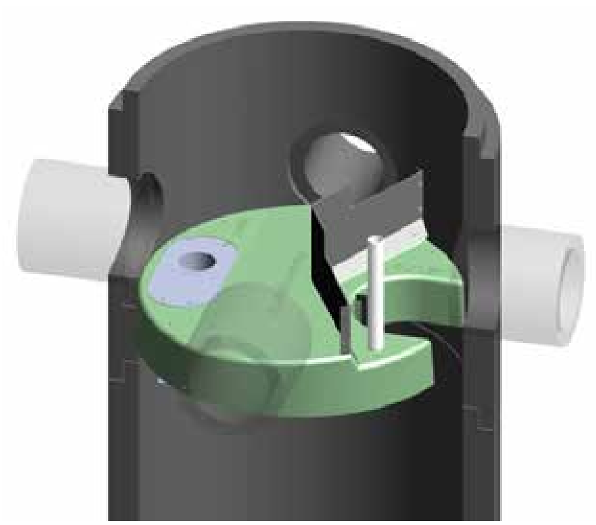

Figure 4

Multiple Inlet Pipes – Allows for multiple inlet pipes of various diameters to enter the unit. **Example seen in Figure 4**.

MAXIMUM PIPE DIAMETER		
MODEL	INLET (in / mm)	OUTLET (in / mm)
EF4 / EFO4	18 / 457	24 / 610
EF6 / EFO6	30 / 762	36 / 915
EF8 / EFO8	42 / 1067	48 / 1220
EF10 / EFO10	60 / 1524	72 / 1828
EF12 / EFO12	60 / 1524	72 / 1828

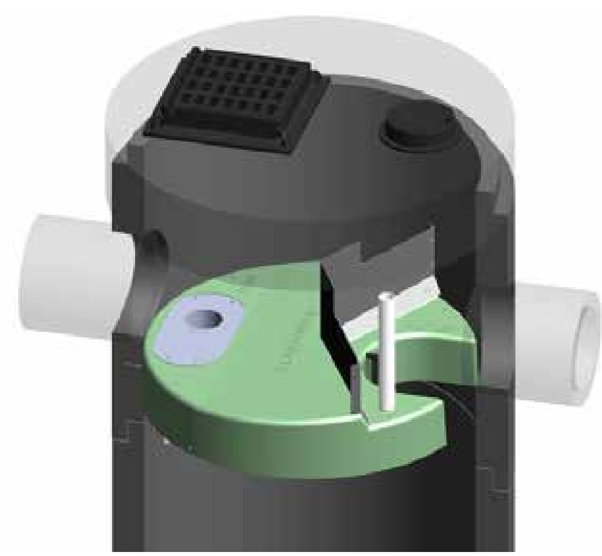

Figure 5

Inlet Grate – Allows surface runoff to enter the unit from grade. The inlet grate option can also be used in conjunction with one inlet pipe or multiple inlet pipes. A removable flow deflector is added in the Stormceptor EF4/EFO4. **Example seen in Figure 5**.

MAXIMUM PIPE DIAMETER		
MODEL	INLET (in / mm)	OUTLET (in / mm)
EF4 / EFO4	24 / 610	24 / 610
EF6 / EFO6	36 / 915	36 / 915
EF8 / EFO8	48 / 1220	48 / 1220
EF10 / EFO10	72 / 1828	72 / 1828
EF12 / EFO12	72 / 1828	72 / 1828

INLET-TO-OUTLET DROP

Elevation differential between the inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit (**illustration seen in Figure 6**).

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.

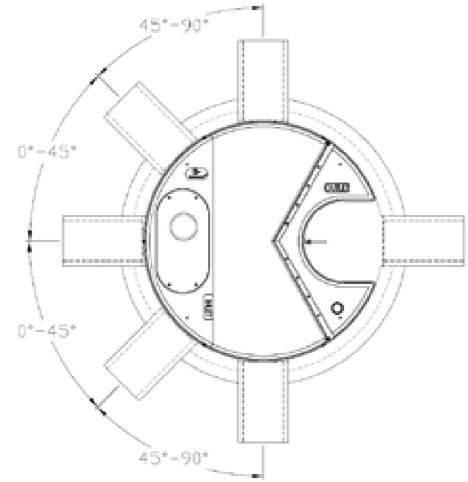

Figure 6

SUBMERGED (TAILWATER) DESIGN

Submerged or tailwater conditions are defined as standing water above the insert elevation during zero-runoff conditions. A weir height modification allows Stormceptor EF to operate under submerged conditions. The following information is necessary to properly design Stormceptor EF for the submerged condition:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

NOTE: The maximum weir height for Stormceptor EF is 48 inches (1200 mm). Contact your local Stormceptor representative for design assistance.

LIVE LOAD

Stormceptor EF is typically designed for local highway truck loading. In instances where other live loads are required, Stormceptor EF can be customized to meet the necessary structural requirements. Contact your local Stormceptor representative for design assistance.

SHALLOW COVER

Stormceptor EF is typically designed with a minimum depth of burial to the outlet invert based on the diameter of the inlet and outlet pipes. A common minimum burial depth to the outlet invert is 48 inches (1.2 meters). In instances where there may be site constraints to the depth of burial contact your local Stormceptor representative for design assistance.

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.

ABOVE-GROUND INSTALLATIONS

Stormceptor EF can be designed as a free-standing above-ground unit, constructed of fiberglass as illustrated in **Figure 7**. These customized units are lightweight and can be installed within a building footprint, providing structural support and installation advantages. Contact your local Stormceptor representative for design assistance.

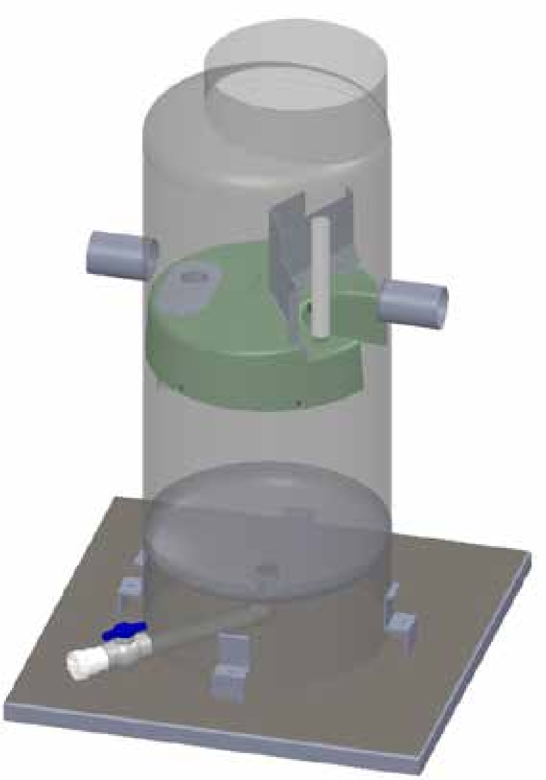

Figure 7

PERFORMANCE VERIFICATION TESTING

Stormceptor EF has been third-party performance tested according to the Canadian Environmental Technical Verification (ETV) Procedure for ***Laboratory Testing of Oil-Grit Separators***, and has received ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

For more information, please visit www.imbriumsystems.com or contact your local Stormceptor representative.

INSTALLATION

For installation details, please visit www.imbriumsystems.com and refer to the Stormceptor EF Installation Guideline or contact your local Stormceptor representative.

INSPECTION AND MAINTENANCE

As with any stormwater treatment device, periodic inspection and maintenance of Stormceptor EF is required for long-term performance.

Inspection and maintenance is performed from grade without entering the unit. Sediment depth inspections are performed through the outlet riser, and oil presence can be determined through the oil inspection pipe. Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths. Visual inspections of the insert can be performed to ensure there is no damage or blockages. A beneficial feature of Stormceptor EF in comparison to many other treatment practices is that once it is maintained, Stormceptor EF is functionally restored to its original condition.

When maintenance is required, a standard vacuum truck is used to remove the pollutants (sediment and floatables) from the lower chamber of the unit through the outlet riser. When an appreciable amount of oil or other hydrocarbons is present, these floatable pollutants can be removed by hydrovac from the water surface. Should an oil/fuel spill occur, or presence of oil/fuel be identified within the unit, it should be cleaned immediately by a licensed liquid waste hauler.

RECOMMENDED SEDIMENT DEPTHS FOR MAINTENANCE SERVICE*	
MODEL	Sediment Depth (in/mm)
EF4 / EFO4	8 / 203
EF6 / EFO6	12 /305
EF8 / EFO8	24 / 610
EF10 / EFO10	24 / 610
EF12 / EFO12	24 / 610

* Based on a minimum distance of 40 inches (1,016 mm) from bottom of outlet riser to top of sediment bed.

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, location, and transportation distance(s).

For more details on inspection and maintenance refer to the Stormceptor EF Owner's Manual at www.imbriumsystems.com.

HYDROCARBON CAPTURE AND RETENTION

Stormceptor EFO

Stormceptor is often installed on high-traffic pollutant hotspots where hydrocarbon spill potential exists.

The technology platform of Stormceptor EFO is the same as Stormceptor EF, however the maximum surface loading rate into the lower chamber is restricted to a lower value with Stormceptor EFO, thereby ensuring excellent oil retention. Third-party testing in accordance with the Light Liquid Re-entrainment testing provisions within the Canadian ETV protocol ***Procedure for Laboratory Testing of Oil-Grit Separators*** demonstrated greater than 99% oil retention. Stormceptor EFO is engineered to capture and retain free floating oil/chemical/fuel spills, not emulsified hydrocarbons.

Optional Oil Alarm

Oil Sheen

When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations (< 10 mg/L). Despite the appearance of a sheen, Stormceptor EFO may still be functioning as intended.

Disposal

Maintenance providers are to follow all federal, state/provincial, and local requirements for disposal of hydrocarbons.

Oil Level Alarm

As an added safeguard, an oil level alarm is available as an optional feature for Stormceptor EFO. This is an electronic monitoring system designed to trigger a visual and audible alarm when a preset level of oil is captured in the lower chamber. The oil level alarm is installed as illustrated in **Figure 8**.

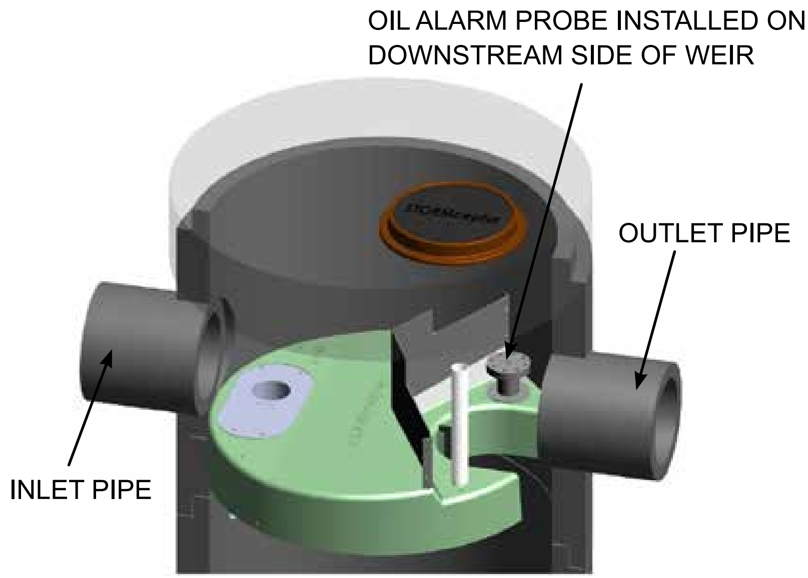

Figure 8

ADDITIONAL POLLUTANT STORAGE CAPACITY

Stormceptor EF/EFO can be easily modified to increase sediment storage capacity by extending the depth of the lower chamber. Stormceptor EFO can be modified to increase hydrocarbon storage capacity by extending the outlet riser, thereby providing the storage volumes depicted in the table below.

STORMCEPTOR EFO STORAGE VOLUME		
Stormceptor EFO Model	**Standard Hydrocarbon Storage Capacity [1]**	**Extended Hydrocarbon Storage Capacity [1,2]**
	(L / gal)	**(L / gal)**
EFO4	265 / 70	395 / 105
EFO6	610 / 160	1615 / 425
EFO8	1070 / 280	4340 / 1145
EFO10	1670 / 440	NA
EFO12	2475 / 655	NA

1. Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert.
2. Distance from bottom of the extended outlet riser to top of the sediment maintenance depth is 914 mm (36 in).
   NA –Not available in these model sizes

Additional hydrocarbon storage capacity can be added with a draw off tank.

Contact your local Stormceptor representative for additional information and design assistance.

HEALTH AND SAFETY

For all aspects of installation and inspection/maintenance, OSHA and appropriate local regulations should be followed to ensure safe practice.

Contact

888-279-8826 / 416-960-9900

info@imbriumsystems.com

www.imbriumsystems.com

IM_STC_EF_11/17

APPENDIX "G"

Excerpts from Supplementary Hydrogeological Report

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
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BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

A REPORT TO
BRAIRWOOD (DUNDALK) LTD.

HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
CON 2 SWTSR PT LOT 234
SOUTHEAST OF GREY ROAD 9 AND IDA STREET

TOWNSHIP OF SOUTHGATE (DUNDALK)

DRAFT

REFERENCE NO. 2310-W158

JANUARY 21, 2025

DISTRIBUTION

Digital Copy - Briarwood (Dundalk) Ltd.
Digital Copy - Soil Engineers Ltd. (Richmond Hill)

1.0 EXECUTIVE SUMMARY

Soil Engineers Ltd. (SEL) was retained by Briarwood (Dundalk) Ltd. to conduct a hydrogeological assessment for the parcel of land, legally described as "CON SWTSR PT LOT 234", located at southeast of Grey Road 9 and Ida Street in the Township of Southgate (Dundalk), Ontario (the Subject Site). Considering the provided details, this report will focus on the southwest portion of the Subject Site (the Study Area).

The Subject Site is bounded by few residential houses and primarily open space covered with trees and bushes along with a water body to the north, a local road, Ida Street, and open space covered with trees and bushes along with a water body, to the west, few residential houses, a sewage treatment plant and primarily open space covered with trees and bushes, to the south, and a Grey County CP Rail Trail and open space covered with trees and bushes, to the east.

The Subject Site is primarily weed-covered, with two watercourses and associated wetlands traversing through the property. At the time of investigation, the center portion of the Subject Site was flooded.

A review of the architectural drawings prepared by S&C Architects Inc., dated June 27, 2024, and the Functional Servicing & Grading Plan prepared by Valdor Engineering Inc., dated September 24, 2024, indicate that the proposed development will consist of four (4) residential buildings (buildings A, B, C, and D), with a 1-level underground parking and underground services. Buildings A and C will share an adjoined 1-level underground parking, while buildings B and D will share their own adjoined 1-level underground parking. Additionally, the proposed development will consist of underground services. Design details regarding the underground services were not available for review at the time of preparing this report. As such, dewatering flow rates were not estimated.

As per an email received from Briarwood Homes, it is understood the development will be constructed in four (4) development phases, in alphabetical sequence from building A to building D, phase 1 being building A and phase 4 being building D. The Functional Servicing & Grading Plan indicate that the Finished Floor Elevation (FFE) of the underground parking is set at El. 510.25 meters above seas level (masl). The base of excavation, footing elevation, and base of elevator pit are considered at El. 509.75, 509.0, and 508.75 masl, respectively, for excavation and construction of the proposed 1-level underground parking structure, for each of the four (4) phases. Additionally, implementing permeable shoring was assumed for the current assessment. However, since the excavation for construction of the proposed underground parking will be completed over four (4) phases, the developed shared sides for each of remaining phases 2 to 4, were considered as impermeable shared excavation walls due to previously developed phases.

The current investigation reviled that:

- The Subject Site is located within an area mapped as Till deposits known as Wentworth Till (5b) and Glaciofluvial deposits (7a). The Wentworth Till, consists of predominantly stone-poor, sandy

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silt to silty sand textured till deposits, whereas Glaciofluvial deposits consists of river deposits and delta topset facies of sandy deposits.

- The Subject Site is located within a regional physiography of Southern Ontario known as Dundalk Till Plains, consisting of drumlinized till plains
- The Subject Site is located within the Grand River Conservation Authority (GRCA) jurisdictions.
- The highest shallow stabilized groundwater levels elevations were measured at an El. 512.65 masl at BH/MW 1 location, whereas the lowest shallow stabilized groundwater level elevation was measured at an El. 509.51 masl at BH/MW 11 location.

  Hydraulic conductivity of 7.90 x 10^{-7} m/sec (geomean of in-situ hydraulic conductivity testing BH/MWs 1, 2, and 4 installed in the Study Area) were considered for sandy silt till.
- Results of Groundwater quality at a selected monitoring well (BH/MW 2) indicates that the concentration for TSS slightly exceeds the Township of Southgate Storm Sewer Use By-Law standards for unfiltered samples. However, it meets the Township of Southgate Sanitary and Combined Sewer Use By-Law.
- The assumed bulk excavation elevation for the proposed 1-level underground parking is below the highest recorded groundwater level elevation within the footprints of the proposed Buildings. Hence, groundwater seepage is anticipated in the open excavation for excavation and construction of the proposed basement structure and footing installation. Total anticipated flow rate including flow from storm event will reach to total flow rates of 227,950.0L/day, 194,200.0 L/day, 210,250.0 L/day, and 208,000.0 L/day for phases 1, 2, 3, and 4, respectively, considering a safety factor of 1.5, and 32.12 mm rain fall storm event.
- The estimated short-term construction dewatering flow rates are above EASR threshold 50,000 L/day for each of the four (4) development phases. As such, filing EASR with the MECP is required for each of the four (4) development phases, assuming each phase will be constructed separately.
- The estimated long-term foundation drainage flow rate from groundwater source reaches 64,950.0 L/day, 42,150.0 L/day, 59,250.0 L/Day, and 64,200.0 L/day for the proposed phase 1, 2, 3, and 4 developments, respectively, considering a safety factor for 1.5.
- The estimated long-term foundation drainage flow from the groundwater source exceeds the PTTW threshold of 50,000 L/day for development phases 1, 3, and 4. As such, filing PTTW with MECP is required for the phase 1, 3, and 4 developments.
- The conceptual ZOI for dewatering reaches 1112.3 m, 9.8 m, 13.1 m, and 13.1 m away from the dewatering areas for the construction of development phases 1-4, respectively. Potential impacts are as follows:

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- There are no existing buildings and roads located within a conceptual ZOI for construction. However, since the proposed development will be constructed over 4 phases, the previously constructed building will be located partially within the conceptual ZoI for the next phase, that should be considered for excavation and construction of each development phase.

- Based on the findings of the dewatering assessment, proposed excavation and construction will be completed below the shallow groundwater table of the Subject Site and the Study Area. Hence, short-term construction dewatering is anticipated for the proposed development. Record review indicates that a wetland and wooded area were identified on the Subject Site and Study Area, and within the conceptual ZOI. As such, impacts to natural heritage features are anticipated pertaining the proposed development. A review of the proposed development plan indicates that the footprint of the proposed buildings A and B will extend into the existing wetland and the wooded lot. As such, it is understood the existing natural features will be partially removed. A monitoring and mitigation plan should be proposed to prevent potential impacts to the nearby natural features during construction.

- A review of the MECP well records confirmed that there are seventeen (17) records for water supply wells that are registered within 500 m of the Subject Site. However, they are not located within the conceptual ZOI for dewatering. As such, potential impacts to the groundwater users are not anticipated.

- Source Water Impact Assessment and Mitigation Plan (SWIAMP) will be required for the Subject Site, considering location of the Subject Site within Grand River Well Head Protections area ‘B’, ‘C’ and ‘D’ with the score varying between 2 and 6.

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Table 8-2-Summary of Anticipated Short-Term Dewatering Flow Rates

Proposed Development	Groundwater Seepage (L/day)	Groundwater Seepage -S.F.* 1.5 (L/day)	Anticipated Flow over Storm Event (L/day)	Total Dewatering Flow Rates-S.F.* 1.5 (L/day)
Phase 1 (Building A) - 1-Level Underground Parking	71,500.0	107,250.0	120,700.0	227,950.0
Phase 2 (Building B) – 1-Level Underground Parking	49,000.0	73,500.0	120,700.0	194,200.0
Phase 3 (Building C) – 1-Level Underground Parking	59,700.0	89,550.0	120,700.0	210,250.0
Phase 4 (Building D) – 1-Level Underground Parking	58,200.0	87,300.0	120,700.0	208,000.0
Total	**238,400.0**	**357,600.0**	**482,800.0**	**840,400.0**

*S. F: Safety Factor

Additionally, storm water flow considering 100-year storm event for a duration of 12 hours was considered to estimate the maximum storm water that can be collected during the excavation and construction period. The maximum additional flow that can be expected in the occurrence of a 100-year could reach up to approximately 405,700.0 L/day during construction of each development phase.

The above estimated short-term dewatering flow rates, does not consider the potential impact of the drainage system for the previously developed phases.

8.4 Long-Term Foundation Drainage

Groundwater seepage and infiltration flow due to storm event should be collected for the post-construction underground parking structure. As such, a foundation drainage system should be designed to collect the anticipated flow. Proposed FFE for the underground parking level 1, and base of the drainage layer were considered at El. 510.25 and 509.75 masl, respectively, for each development phase. The highest groundwater levels were considered at 512.36 masl, 511.43 masl, 512.65 masl, and 512.65 masl for Phases 1, 2, 3, and 4, respectively.

Anticipated flow considering 32.12 mm storm event (2-year events for a duration of 3 hours) was considered to estimate the total anticipated long-term foundation drainage flow rate. Summary of the estimated flow rates is presented in **Table 8-3**.

Table 8-3- Summary of Anticipated Long-Term Foundation Drainage Flow Rates

Proposed Development	Groundwater Seepage (L/day)	Groundwater Seepage -S.F.* 1.5 (L/day)	Anticipated Flow through Infiltration (L/day)	Total Foundation Drainage Flow Rates-S.F.* 1.5 (L/day)
Phase 1 (Building A) - 1-Level Underground Parking	43,300.0	64,950.0	3,900.0	68,850.0

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Proposed Development	Groundwater Seepage (L/day)	Groundwater Seepage -S.F.* 1.5 (L/day)	Anticipated Flow through Infiltration (L/day)	Total Foundation Drainage Flow Rates-S.F.* 1.5 (L/day)
Phase 2 (Building B) – 1-Level Underground Parking	28,100.0	42,150.0	3,900.0	46,050.0
Phase 3 (Building C) – 1-Level Underground Parking	39,500.0	59,250.0	3,900.0	63,150.0
Phase 4 (Building D) – 1-Level Underground Parking	42,800.0	64,200.0	3,900.0	68,100.0
Total	**153,700.0**	**230,550.0**	**15,600.0**	**246,150.0**

*S. F: Safety Factor

The above estimated flow rate does not include potential long-term flow for elevator pit, sump pit or any other localized structures that may extend below the drainage layer, assuming the above noted structures will be waterproofed for post-development structure.

As previously mentioned, the proposed excavation and construction will be completed over 4 development phases. Each shared wall for the proposed phases 1 to 4 is excluded from the anticipated seepage calculation through infiltration to estimate long-term foundation drainage flow rate. However, since SEL is not aware of the timeline for each construction phase, additional flow from infiltration source is expected from the proposed shared walls that will be constructed later.

8.5 Permit Requirements

- *Short-Term Construction Dewatering:* Water takings of more than 50,000 L/day but less than 400,000 L/day is to be registered on EASR, while water takings of more than 400,000 L/day require a PTTW issued by the MECP. If it is identified that an EASR or PTTW is required for the Subject Site, a hydrogeological assessment report will need to be submitted in support of the application. The estimated short-term construction dewatering flow rate for construction of the proposed underground parking for phases 1, 2, 3, and 4 reach 227,950.0L/day, 194,200.0 L/day, 210,250.0 L/day, and 208,000.0 L/day, respectively. However, as per the MECP's document titled *"Streamlining Permissions for Low-Risk Short-Term Water Taking Activities"* dated June 2021, if the groundwater seepage is between 50,000 L/day and 400,000 L/day, the water taking limit only applies to groundwater. As such, since the groundwater seepage for the proposed phases 1-4 developments reach 107,250.0 L/day, 73,500.0 L/day, 89,550.0 L/day, and 87,300.0 L/day which is above the MECP EASR threshold limit of 50,000 L/day. As such, filing an EASR with the MECP is required for each of the four (4) development phases, assuming each phase will be constructed separately. Additionally, obtaining discharge agreement from the Township of Southgate is required if short-term dewatering effluent is proposed to be conveyed to the Town's sewer system.

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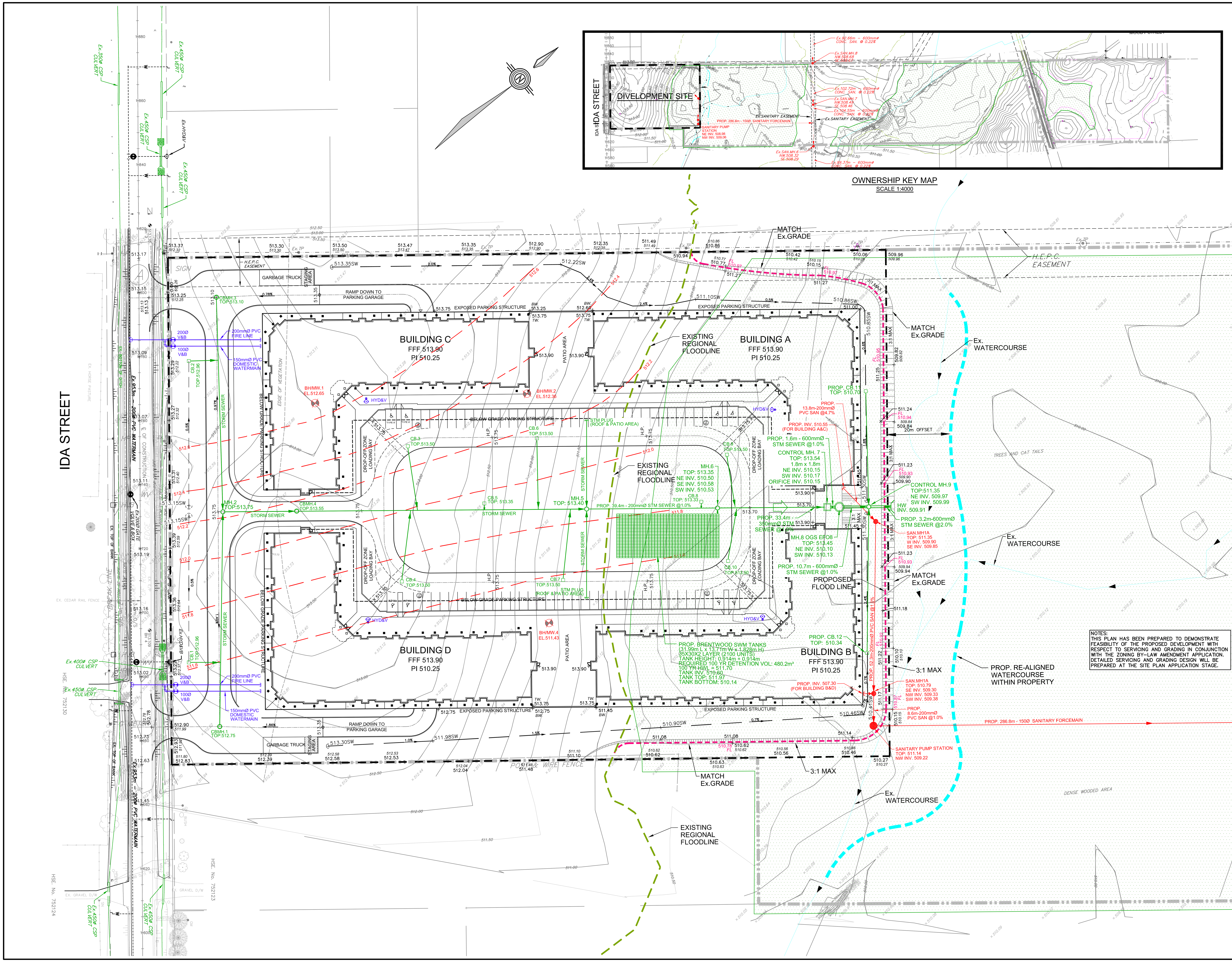
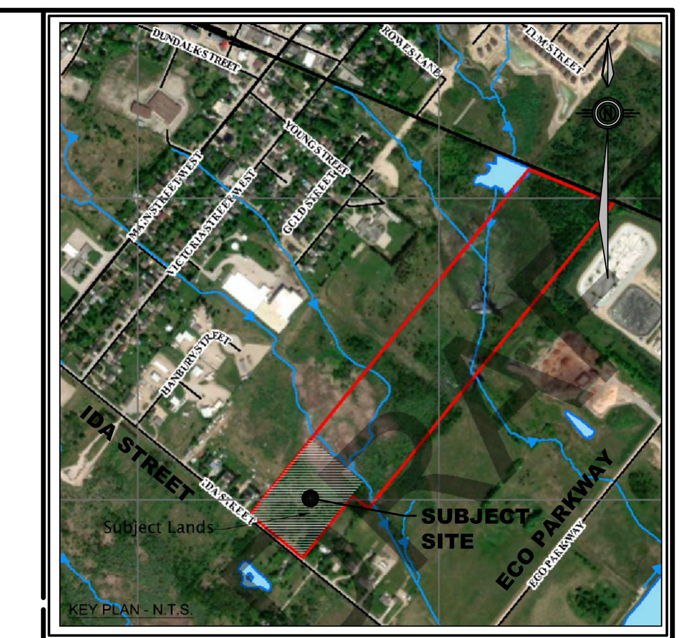
APPENDIX "H"

Functional Servicing and Grading Plan





KEY PLAN
N.T.S

LEGEND:

- SUBDIVISION BOUNDARY
- SITE BOUNDARY
- Ex.REGIONAL FLOOD LINE
- PROPOSED FLOOD LINE
- GROUNDWATER CONTOURS
- FL 510.90 — PROPOSED FLOOD LINE ELEVATION
- 301.08 — EXISTING ELEVATION
- 188.5 — EXISTING CONTOUR
- 2% — DRAINAGE FLOW DIRECTION AND SLOPE
- x126.50 — PROPOSED ELEVATION
- STORM MANHOLE
- CATCHBASIN
- SANITARY MANHOLE
- VALVE AND BOX
- VALVED HYDRANT
- WATERMAIN SERVICE CONNECTION
- PROP. OVERLAND FLOW DIRECTION
- EXTERIOR DOOR LOCATION
- BH/MW — BOREHOLE / MONITORING WELL LOCATION
- PROPOSED WATERMAIN
- PROPOSED STORM SEWER

METRIC

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

NOTES:

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B, BY REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).

FOR BEARING COMPARISONS, A ROTATION OF 00°24'45" COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON PLAN P6.
A ROTATION OF 00°26'45" COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON PLAN P4 AND P3.
A ROTATION OF 00°00'50" COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON D1.
A ROTATION OF 00°25'50" COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON P8.
A ROTATION OF 00°30'50" COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON P1.
A ROTATION OF 00°25'30" COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON P7.

ALL SET SSIB AND PB MONUMENTS WERE USED DUE TO LACK OF OVERBURDEN AND/OR PROXIMITY OF UNDERGROUND UTILITIES IN ACCORDANCE WITH SECTION 11 (4) OF O.REG. 525/91.

NOTES:
THIS PLAN HAS BEEN PREPARED TO DEMONSTRATE FEASIBILITY OF THE PROPOSED DEVELOPMENT WITH RESPECT TO SERVICING AND GRADING IN CONJUNCTION WITH THE ZONING BY-LAW AMENDMENT APPLICATION. DETAILED SERVICING AND GRADING DESIGN WILL BE PREPARED AT THE SITE PLAN APPLICATION STAGE.

No.	DATE	REVISIONS	BY.
1.	JAN 27, 2025	ISSUED FOR ZBA	D.G.

PRELIMINARY

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PROPOSED CONDOMINIUM APARTMENTS
IDA STREET, DUNDALK
TOWNSHIP OF SOUTHGATE

FUNCTIONAL SERVICING & GRADING PLAN

SCALE:	DATE:	PROJECT No.:
1:500	SEP. 27, 2024	23142
DRAWN BY: D.N.Z.	DRAWING No.: FSGP-1	
CHKD BY: D.A.G.		