Robinson
Land Development

Carleton / Lanark Residential Subdivision Carleton Place, ON Servicing and Stormwater Management Report

Prepared For:

Inverness Homes

Prepared By:

Robinson Land Development

Our Project No. 22043
December 2022

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LEGAL NOTIFICATION

This report was prepared by Robinson Land Development for the account of **Inverness Homes.**

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1.0 INTRODUCTION

Robinson Land Development have been retained by Inverness Homes to complete a detailed engineering servicing and grading design for the proposed residential subdivision development located off of Carleton and Lanark Streets in the Town of Carleton Place. The 6.4-hectare subject site is located in the Town of Carleton Place and will provide for the extensions of the existing Lanark Street and Carleton Street north of Townline Road (refer to **Figure 1 – Key Plan** following page 1).

The proposed residential development (herein noted as the Carleton Lanark Subdivision) contains a mixture of townhome, terrace homes and a SWM pond. The intent of this report is to provide a servicing scenario for the site that is free of conflicts, provides on-site servicing, and utilizes the existing local infrastructure.

2.0 EXISTING CONDITIONS

The 6.4-hectare subject site is bordered by an existing industrial park to the east, undeveloped land owned by the Town of Carleton Place to the north and undeveloped land and tree farm to the west.

The site is currently mostly undeveloped with rock outcrops across the property. Existing elevations generally slope from west to east.

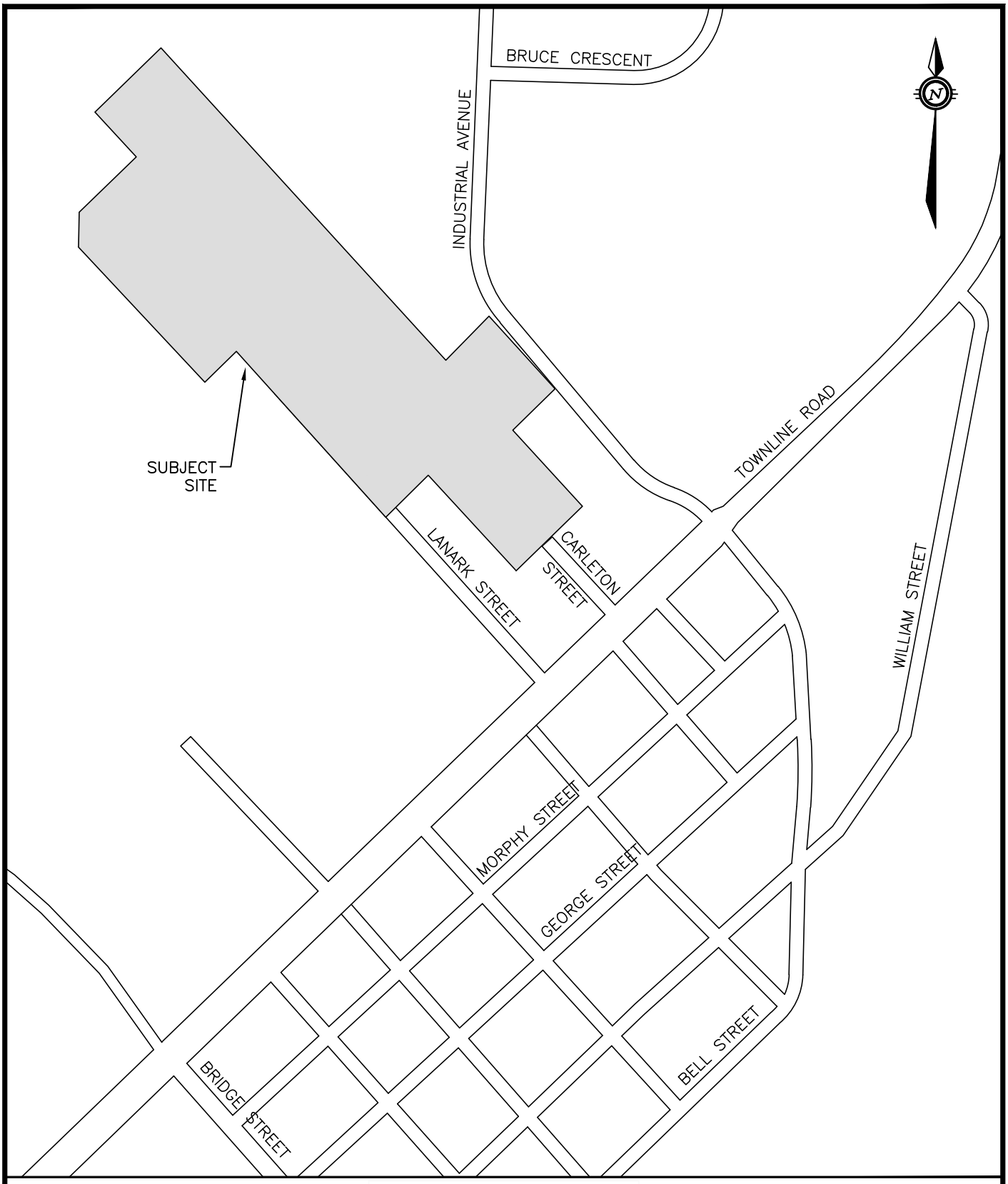
Refer to **Figure 2 – Existing Conditions** below for an aerial view of the site in its current development state and the Existing Conditions Plan (DWG. 22048-PRE1) in **Appendix A**.

Figure 2: Existing Conditions

An existing 150 mm diameter watermain is available within the Carleton and Lanark Street right-of-ways.

An existing 250mm diameter sanitary sewer is in the right-of-way of Industrial Avenue.

Under current conditions, stormwater runoff is generally conveyed west to east via overland surface drainage to the exiting ditch on Industrial Avenue.



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scale N.T.S.	CARLETON LANARK SUBDIVSION	project no. 22043
date 19/12/22		
drawn by JHB	KEY PLAN	FIG 1.0

3.0 DEVELOPMENT PROPOSAL

The residential subdivision development site consists of an area of approximately 6.4-hectares of which about 0.4-hectares will be occupied by a proposed stormwater management pond. The development within the residential site will comprise of 88 townhouse residential units on the front portion of the development and 160 stacked terrace homes (conceptual only) in the back portion of the development. Each townhouse and terrace home will be provided with individual water, storm, and sanitary service connections to the municipal system.

4.0 WATER SERVICING

4.1 Existing System

An existing 150 mm diameter watermain is available on the east side of the Lanark Street to the subject site. The existing watermain terminates at the existing hydrant, located approximately 210 metres north of Townline Road. An existing 150 mm diameter watermain is also available on Carleton Street. The location of the watermain and the termination of the watermain is unknown from Town of Carleton Place as builts.

4.2 Proposed System

New municipal watermains will be required to service the proposed Carleton Lanark Subdivision. The proposed watermains will be 203 mm in diameter. The new watermain on Lanark Street will connect to the existing watermain approximately 45m south of the location of the current watermain end. The existing watermain will be removed as there will be a significant amount of fill being placed overtop. The new watermain on Carleton Street is currently designed to connect to a known watermain stub approximately 12 metres from Townline Road. An additional watermain connection to provide sufficient pressure will be made to Industrial Avenue, at approximately 270m from Townline Road. New fire hydrants will be provided within the municipal right-of-ways with maximum spacing of 110 metres in accordance with the Ministry of Environment (MECP) Water Design Guidelines. Each residential unit will be serviced with individual 19 mm water services.

The design will ensure that the required range of water pressure under average day, maximum day and peak hour demands is 50 to 70 psi but no less than 40 psi. The maximum pressure at any point in the water system should not exceed 100 psi. Pressure reducing valves are required to service areas where the pressure is expected to be greater than 80 psi.

4.3 Water Distribution Hydraulic Model

A water distribution hydraulic model was created using EPANET2 software for the Carleton Lanark Subdivision (refer to **Figure A - Water Distribution Hydraulic Model** in **Appendix B**). The hydraulic model incorporated the proposed watermain layout, proposed hydrant locations and hydrant elevations, boundary conditions, and typical “C” factors in accordance with the (MECP) Water Design Guidelines.

Boundary conditions for the proposed connections to the existing watermain system on Townline Road were provided by the Town of Carleton Place based on provided estimated water demands for the proposed development. The boundary conditions are summarized in **Table 4.3** below and are also provided in **Appendix B**.

Table 4.3: Boundary Conditions
(200mm dia. watermain from connection point #1 – Townline Road/Carleton Street)

Demand Scenario	Connection 1		Connection 2		Connection 3	
	Pressure (psi)	HGL (m)	Pressure (psi)	HGL (m)	Pressure (psi)	HGL (m)
Average Day	62	183.20	65	183.20	65	183.20
Peak Hour	54	178.13	58	178.06	58	178.04
Max. Day	58	180.69	61	180.67	62	180.66
Max. Day + Fire Flow	38	166.51	38	164.23	39	164.15

(assuming a required fire flow of 5,000 L/min.)

4.4 Domestic Water Demands

Domestic water demands have been calculated for the development in accordance with the following current City of Ottawa Water Design Guidelines:

- Average Day Demand — 280 L/person/day
- Max. Daily Demand — 2.5 x Avg. Day
- Max. Hourly Demand — 2.2 x Max. Day
- Single-Family Homes — 3.4 persons/unit
- Townhouses — 2.7 persons/unit

Total

Population = (19 units x 3.4 cap/unit) = **64.60 persons**
Population = (320 units x 2.7 cap/unit) = **864.00 persons**
Population = (128 units x 1.8 cap/unit) = **230.40 persons**

Average Day Demand = (1159 persons) x (280 L/person/day) / 86400 s/day = **3.76 L/s**

Maximum Daily Demand = (2.5) x (3.76 L/s) = **9.39L/s**

Maximum Hour Demand = (2.2) x (9.39 L/s) = **20.66 L/s**

Note that the calculated water demands above do not included the lots which are serviced via the existing watermain systems along Lanark Street and Carleton Street. A water demand allowance has also been added for the future development of the lands to the west this proposed subdivision. Refer to the watermain design sheet provided in **Appendix B** for more details.

4.5 Domestic Model Results

A hydraulic simulation was completed for the development. The results of the hydraulic simulation for domestic demand are summarized in **Table 4.5** below:

Table 4.5: Hydraulic Simulation Domestic Demands

Condition	psi
Average Day Pressure	59.53 to 62.29
Peak Hourly Pressure	52.21 to 55.01
Max. Day Pressure	55.92 to 58.69

The hydraulic simulation has determined that for each condition noted above the pressures are within the required allowable of 40 – 80 psi.

4.6 Fire Flows

It is recommended that the water distribution system will be able to supply the maximum day demand plus fire flow (Max. Day + FF) at a minimum residual pressure of 138 kPa (20 psi) in the distribution system.

The total required fire flow for the Carleton Lanark Subdivision has been calculated using the Fire Underwriters Survey (v. 2020) The following input criteria were used in the FUS calculations:

- Type of Construction: Wood Frame
- Occupancy Content Hazard: Limited Combustible
- Number of Storeys: 2; Based on building layout provided by Developer
- Ground Floor Area: Based on building dimensions provided by Developer
- Length–Height Factor: Lengths based on building dimensions provided by Developer
- Exposure Distance: Distances based on building separations as per lotting provided by Developer

Using the parameters above, the required fire flow for the for the subdivision is 11,000 L/min. Refer to minimum water supply calculations in **Appendix B** for more details.

The water system for the proposed subdivision has been designed based on a minimum fire flow value of 5,000 L/min. Using the above parameters again and providing a fire wall between all the units the total required fire flow is calculated as 5,000 L/min. Refer to minimum water supply calculations in **Appendix B** for more details.

The minimum available fire flow throughout the system is at Hydrant # 7 with 5724.00 L/min. which meets the minimum required.

5.0 SANITARY SERVICING

5.1 Existing System

From the topographic information obtained, the existing residential development along the south ends of Lanark Street and Carleton Street are serviced from existing sanitary services extended from the 200 mm sanitary sewer along Townline Road East. It is considered that the sewers along Lanark Street and Carleton Street are of substandard installation. As such none of the proposed development is proposed to be serviced by the existing sanitary sewers along Lanark Street and Carleton Street. The proposed sanitary sewer will be directed through an easement about 220 metres north of Townline Road East to the existing sanitary sewer along Industrial Avenue.

5.2 Sanitary Sewer Design

Sanitary sewer flows for this proposed development have been calculated based on the current 2012 City of Ottawa's Sewer Design Guidelines. The design criteria for this development are as follows:

- Population Townhouse 2.7 persons/unit
- Population Terrace Home 2.7 persons/unit
- Average Industrial Flow 28,000 L/ha/day
- Average Daily Flow 280 L/person/day
- Infiltration Allowance 0.33 L/s/ha
- Peaking Factor 1 + 14/ (4 + (population/1000)0.5)
- Minimum Velocity 0.60 m/s
- Maximum Velocity 3.0 m/s
- Minimum pipe size 200 mm
- If 10 or fewer units are tributary to a sewer, than a 200 mm diameter sewer at a minimum grade of 0.65% shall be used.
- Manhole spacing < 120 metres
- Minimum cover to pipe obvert 2.5 metres

Refer to the sanitary sewer design sheet and Sanitary Drainage Area Plan (DWG. 22043-SAN1) provided in **Appendix C** for more details.

5.3 Proposed System

Based on the above design criteria, to service the subdivision, the proposed sewer size will be 200 mm diameter. The sanitary sewer on Street No. 1 and the outlet to Industrial Avenue has been sized to accommodate the future tree farm development as per the concept plan in **Appendix C**.

The sanitary sewage flow for the proposed development was calculated based on the City of Ottawa Sewer Design Guidelines (Section 4.3 and 4.4).

6.0 STORM SEWER DESIGN

6.1 Existing System

There are no municipal storm sewers available near the subject site. Stormwater runoff is conveyed by an existing roadside ditch system which consists of open ditches and culverts. Drainage from the subject site is conveyed by the existing roadside ditch system north on Industrial Avenue, east through an unopened road allowance (Bruce Crescent), before crossing under the Canadian Pacific Railway. The drainage is ultimately conveyed to the Mississippi River, approximately 1300 metres from the subject site.

6.2 Storm Sewer Design

The proposed storm sewer system for the Carleton Lanark Subdivision has been designed in accordance with current City of Ottawa Sewer Design Guidelines. The proposed storm sewer system will include roadside and boulevard catch basins, maintenance holes and storm sewers ranging from 200 mm to 1050 mm in diameter. The storm sewer system has also been designed to include the 5 year pre-development flow from a future development (existing tree farm development) west of the proposed subdivision at the intersection of Lanark Street and proposed Street No. 1. Stormwater runoff from the roadways and lots will be conveyed to an on-site detention facility. The storm sewer system will also include an inline stormwater treatment unit to provide quality control. To provide sufficient cover over the storm sewer system and provide positive drainage from the subdivision, the existing outlet ditch on Industrial Avenue will need to be lowered for approximately 470 metres.

The storm sewer system has been designed using the following parameters:

Design Return Period	1:5 Year – Local Roads
Time of Concentration	10 minutes
Manning's Roughness Coefficient	0.013
Minimum Full Flow Velocity	0.80 m/s
Maximum Full Flow Velocity	3.0 m/s
Minimum Pipe Diameter	250 mm
Runoff Coefficients	0.90 for impervious areas (hard surface area and roofs) 0.80 for gravel surfaces 0.20 for pervious areas

Weighted average runoff coefficients have been calculated for each individual storm drainage area based on the total impervious and pervious areas within each respective catchment. The method used in calculating the weighted runoff coefficients will provide a reasonable representation of the land cover within the subdivision without unnecessarily oversizing the storm sewer system.

Refer to Storm Drainage Area Plan (DWG. 22043-STM1) and the Storm Sewer Design Sheet provided in **Appendix D** for more details.

7.0 STORMWATER MANAGEMENT DESIGN

7.1 Design Criteria

The design objective is to control stormwater outflow to the 5-year pre-development level for the 5-year design event to mitigate impacts to the downstream ditch system. Given the presence of the riverine wetland and the diverse fishery in the river (i.e. Mississippi River approximately 1300 metres downstream of the subject site), enhanced level quality control of stormwater runoff has been provided.

- Control post-development outflows to pre-development levels for the 5-year and 100-year design events respectively.
- Provide on-site stormwater storage, in excess of the allowable pre-development flow, for all events up to and including the 100-year design event.
- Enhanced Level (80% TSS removal) quality control.

7.2 Pre-Development Flows

Post-development flows from the proposed development must be controlled to pre-development rates. Under pre-development conditions, runoff is generally conveyed by overland flow to the east corner of the property before entering the existing ditch on Industrial Avenue. The 5-year pre-development flow for the subject lands has been calculated using the Rational Method using the following parameters:

- 5-Year Runoff Coefficient 0.20
- Rainfall Intensity IDF Curve Equations (City of Ottawa)
- Time of Concentration 39.3 min. (Airport Formula)
- Effective Pre-Development Area 8.13 ha

Using the above parameters, the 5-year pre-development flow have been summarized in **Table 7.2** below:

Table 7.2: Pre-Development Flow

Design Event	Runoff Coefficient	Rainfall Intensity (mm/hr)	Area (ha)	Flow (L/s)
5-Year	0.20	39.3	8.13	404.7

As indicated in **Table 7.2** above, the pre-development flow from the subject site has been calculated to be 404.7 L/s for the 5-year design event. Refer to the Existing Conditions Plan in **Appendix A**.

7.3 Quantity Control

In accordance with the design criteria outlined for the subject site, post-development outflows must be controlled to the pre-development rates provided in **Table 7.2** above. Stormwater runoff from the proposed development will be captured by the storm sewer system and conveyed to the on-site detention facility. The proposed detention facility, located along the eastern property boundary, will utilize flow control (ie. orifice plug) to restrict the site's runoff to the allowable release rate (i.e. pre-development flow) for the 5-year and 100-year design events respectively.

Based on the allowable release rate above, the required quantity storage volumes have been determined for the 5 year and 100 year design storm events. The storage volume requirements for the subdivision (to be contained within the on-site detention facility) have been summarized in **Table 7.3** below:

Table 7.3
Storage Volume Requirements

Return Period	Peak Flow (L/s)	Release Rate (L/s)	Net Runoff to be Stored (L/s)	Required Storage Volume (m^3)
5 Year	906.5	404.7	501.8	451.6
100 Year	1245.8	404.7	841.1	1514.0

As indicated in **Table 7.3** above, 451.6 m3 and 1514.0 m3 of stormwater storage is required for the 5 year and 100 year design storm events respectively. The required storage volume will be provided within the on-site detention facility for all events up to and including the 100 year design storm. Refer to the storage volume table in **Appendix D** for more details.

7.4 Provided Storage Volume

As a result of restricting the subdivision's stormwater outflow to the allowable rates calculated in **Section 7.2** above, stormwater storage will be required within the on-site detention facility. The detention facility, located at the east of the property, will provide the required storage volume for the 5 year and 100 year design storm events as indicated in **Table 2**:

Table 7.4
Provided Storage Volume

Return Period	Required Storage Volume (m^3)	Provided Storage Volume (m^3)	Ponding Elevation (m)
5 Year	451.6	461.7	136.50
100 Year	1514.0	1528.1	137.20

Note: 1. The provided storage volume is calculated using "Civil 3D" by Autodesk. The program creates three dimensional models of the proposed detention facility and of the top of ponded water surface. It then calculates a volume between these two surfaces, using three different algorithms, to ensure an accurate result.

As indicated in **Table 7.4** above, the subdivision's detention facility will provide adequate storage volume to contain the net runoff of the 5 year and 100 year design storm events. For storm events exceeding the 100 year design storm, the stormwater runoff would be conveyed via the overland flow route to the existing off-site roadside ditch located on Industrial Avenue and ultimately to the Mississippi River. Refer to the Grading and Drainage Plan (DWG. 22043-GR1) in **Appendix A**.

7.5 Inlet Control Device Calculations

In order to restrict the site's stormwater runoff to the allowable release rates calculated in **Section 4.4** above, an inlet control device will be utilized within the on-site detention facility. The outlet pipe will use an orifice to control the stormwater outflow to 404.7 L/s during the 5 year and 100 year design storm events. The orifice has been sized for the 5 year allowable flow as follows:

Given:

Orifice Outflow (Q):	404.7 L/s (0.4047 m^3/s)
Loss Coefficient for Orifice (C):	0.60
Head (h):	1.017 m (measured to centroid of orifice)
Area of Orifice (A):	πr^2
Radius of Orifice (r):	
Diameter of Orifice (d):	2r
Acceleration Due to Gravity (g):	9.81 m/s^2

$Q = C(A)(2gh)^{0.5}$

$A = Q / (C(2gh)^{0.5})$
$A = 0.4047 / (0.6((2)(9.81)(1.017))^{0.5})$
$A = 0.15099\ m^2$

$A = \pi r^2$
$r = (A / \pi)^{0.5}$
$r = (0.15099 / \pi)^{0.5}$
$r = 0.2193$ m

$d = 2r$
$d = 2(0.2193)$
$d = 0.4386$ m = 438.6 mm

As calculated above, a 438.6 mm diameter circular orifice will restrict the outflow to the allowable 5 year release rate of 404.7 L/s.

7.6 Quality Control

Stormwater quality controls will be implemented into the on-site design to mitigate the impacts to the receiving watercourse (i.e. Mississippi River) located approximately 1300 metres downstream from the subject site. Enhanced level (80% TSS removal) quality control of stormwater runoff is recommended; however, it is acknowledged that quality control measures are limited due to site constraints (i.e. shallow roadside ditch outlet and bedrock). A "treatment train" approach, utilizing a combination of Low Impact Development (LID) measures is proposed to achieve a degree of quality cleansing for stormwater runoff as detailed below.

<u>Stormwater Treatment Unit (OGS)</u>

Stormwater runoff from most of the site's asphalt areas will be captured by the on-site storm sewer system and conveyed through a detention facility to a proposed stormwater treatment (OGS) unit. The OGS unit will be installed inline with the storm sewer outlet from the detention facility system and will treat the site's stormwater runoff prior to discharging into the existing ditch on Industrial Avenue. The OGS unit (denoted as OGS 1 on the Servicing Plan). The

Stormceptor removes stormwater pollutants through gravity separation and floatation, and 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. The Stormceptor EFO 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. The unit will be designed to achieve enhanced level (minimum 80% TSS removal) quality control based on site specific parameters.

Structure Sumps

The proposed catch basin and storm maintenance hole structures which comprise the storm sewer system will be constructed with sumps to capture larger sediments and debris.

Detention Facility

Although the primary function of the on-site detention facility is to provide stormwater quantity storage (refer to **Section 7.4**), the facility will also provide quality cleansing benefits. The long flow length and low longitudinal slope of the facility will further reduce flow velocities and promote sedimentation. The ability of the facility to provide stormwater attenuation during larger storm events will promote further settling of sediments prior to discharging off-site.

Existing Ditch System

Stormwater runoff will receive additional quality cleansing from the existing ditch systems located between the subject site and the downstream receiver. Stormwater runoff will be conveyed through approximately 1300 metres of vegetated ditches prior to ultimately discharging into the Mississippi River downstream. The existing ditches will promote further infiltration, filtration and sedimentation of the site's runoff.

Bedrock

The presence of bedrock at or near the surface across most of the subject site is expected to impede the effectiveness of LID measures which are intended to infiltrate stormwater runoff into the underlying soils. The measures noted above are proposed as a best management strategy to improve the overall water quality from the subject site.

Runoff from areas of the site which are considered "clean" (i.e. roofs and landscape areas) are not required to receive quality control, however, will receive a degree of quality cleansing via filtration, infiltration and sediment capture within the proposed "treatment train" system.

The proposed "treatment train", which includes the OGS unit, rip-rap protection, detention facility and existing ditch system will provide a reasonable amount of quality control for the site's stormwater runoff prior to discharging into the Industrial Avenue roadside ditch and ultimately the Mississippi River.

8.0 EROSION AND SEDIMENT CONTROL

To protect downstream infrastructure and watercourses, erosion and sediment control measures must be implemented prior to construction and maintained until vegetation has been re-established in disturbed areas. The following erosion and sediment control (ESC) measures have been proposed for the subject site:

- Limiting the extent of exposed soils at any given time.
- Erosion and sediment control measures shall be maintained until vegetation has been re-established in all disturbed areas. Re-vegetate disturbed areas in accordance with approved Landscape Plan as soon as possible.
- Stockpile soil away (15 metres or greater) from watercourses, drainage features and top of steep slopes.
- Installation of silt sacks between frame and cover on all proposed and existing catch basins and open cover storm manholes until construction is completed.
- Silt fence and straw bales to be installed and maintained where indicated.
- Install mud mats at all construction entrances.
- During active construction periods, visual inspections shall be undertaken on a weekly basis and after major storm events (>25mm of rain in 24 hour period) on ESC and any damage repaired immediately.
- ESC shall also be assessed (and repaired as required) following significant snowmelt events.
- Visual inspections shall also be undertaken in anticipation of large storm events (or a series of rainfall and/or snowmelt days) that could potentially yield significant runoff volumes.
- Care shall be taken to prevent damage to ESC during construction operations.
- In some cases, barriers may be removed temporarily to accommodate construction operations. The affected barriers shall be reinstated immediately after construction operations are completed.
- ESC should be adjusted during construction to adapt to site features as the site becomes developed.
- ESC shall be cleaned of accumulated sedimentation as required and replaced as necessary.
- During the course of construction, if the Engineer believes that additional prevention methods are required to control erosion and sedimentation, the Contractor shall implement additional measures, as required, to the satisfaction of the Engineer.
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) 805.

Refer to the Erosion and Sediment Control Plan (DWG. 22043-ESC1) provided in **Appendix A** for more details.

9.0 CONCLUSIONS

It has been demonstrated that the proposed Carleton Lanark Subdivision in the Town of Carleton Place can be accomplished in accordance with current City of Ottawa Design Guidelines. The proposed servicing and stormwater management designs will be achieved by implementing the following key features:

- Wastewater flows will be collected and conveyed by a new municipal gravity sanitary sewer system with outlets to the existing sanitary sewer systems on Industrial Avenue.
- Water supply for domestic use and fire protection will be provided by a new municipal watermain distribution network via connections to the existing watermains on Carleton Street and Lanark Street.
- The servicing design has included the future development of the existing tree farm.
- Stormwater will be collected and conveyed by a new municipal gravity storm sewer system (minor) with an outlet to a Stormwater Management Facility.
- Stormwater runoff will be controlled to 5-year pre-development levels by utilizing an outlet control structure.
- On-site stormwater storage facility will be provided for all storm events up to and including the 100 year design storm.
- Erosion and sediment controls will be implemented prior to construction and maintained until vegetation has been re-established in disturbed areas.

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Reviewed By:

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Appendix A

Design Drawings (Under Separate Cover)

Servicing Plans
(DWG. 22043-S1-S2)

Grading Plans
(DWG. 22043-GR1-GR2)

Plan Profiles (22043-P1-P7)

Erosion and Sediment Control Plan
(DWG. 22043-ESC1)

Notes and Details
(DWG. 22043-N1-N2)

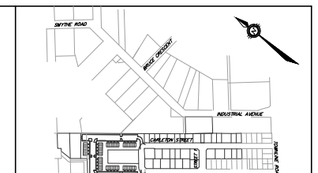
Existing Conditions Plan
(DWG. 22018-PRE1)

NOTES:

1. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE ULTIMATE RECEIVING WATERCOURSE DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
2. LIMIT THE EXTENT OF EXPOSED SOILS AT ANY GIVEN TIME.
3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED UNTIL VEGETATION HAS BEEN RE-ESTABLISHED IN ALL DISTURBED AREAS. RE-VEGETATE DISTURBED AREAS AS SOON AS POSSIBLE.
4. STOCKPILE SOIL AWAY (15 METRES OR GREATER) FROM WATERCOURSES, DRAINAGE FEATURES AND TOP OF STEEP SLOPES.
5. SILT SACKS ARE TO BE PLACED UNDERNEATH THE FRAME AND COVER OF ALL PROPOSED AND EXISTING CATCH BASIN AND OPEN COVER STORM MANHOLES UNTIL CONSTRUCTION IS COMPLETED.
6. A SILT FENCE BARRIER SHALL BE INSTALLED AS PER OPSD 219.1100 WHERE INDICATED AND MAINTAINED AS REQUIRED.
7. STRAW BALE CHECK DAMS TO BE INSTALLED AS PER OPSD 219.1800 WHERE INDICATED AND MAINTAINED AS REQUIRED.
8. DURING ACTIVE CONSTRUCTION PERIODS, VISUAL INSPECTIONS SHALL BE UNDERTAKEN ON A WEEKLY BASIS AND AFTER MAJOR STORM EVENTS (>25mm RAIN IN 24 HOUR PERIOD) ON SEDIMENT CONTROL BARRIERS AND ANY DAMAGE REPAIRED IMMEDIATELY.
9. EROSION AND SEDIMENT CONTROL BARRIERS SHALL ALSO BE ASSESSED (AND REPAIRED AS REQUIRED) FOLLOWING SIGNIFICANT SNOWMELT EVENTS.
10. VISUAL INSPECTIONS SHALL ALSO BE UNDERTAKEN IN ANTICIPATION OF LARGE STORM EVENTS (OR A SERIES OF RAINFALL AND/OR SNOWMELT DAYS) THAT COULD POTENTIALLY YIELD SIGNIFICANT RUNOFF VOLUMES.
11. CARE SHALL BE TAKEN TO PREVENT DAMAGE TO EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION OPERATIONS.
12. IN SOME CASES, BARRIERS MAY BE REMOVED TEMPORARILY TO ACCOMMODATE THE CONSTRUCTION OPERATIONS. THE AFFECTED BARRIERS SHALL BE REINSTATED IMMEDIATELY AFTER CONSTRUCTION OPERATIONS ARE COMPLETED.
13. SEDIMENT CONTROL DEVICES SHALL BE CLEANED OF ACCUMULATED SEDIMENTATION AS REQUIRED AND REPLACED AS NECESSARY.
14. DURING THE COURSE OF CONSTRUCTION, IF THE ENGINEER BELIEVES THAT ADDITIONAL PREVENTION METHODS ARE REQUIRED TO CONTROL EROSION AND SEDIMENTATION, THE CONTRACTOR SHALL IMPLEMENT ADDITIONAL MEASURES, AS REQUIRED, TO THE SATISFACTION OF THE ENGINEER.
15. CONSTRUCTION AND MAINTENANCE REQUIREMENTS FOR EROSION AND SEDIMENT CONTROLS ARE TO COMPLY WITH OPSS 805.
16. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OR SOONER IF ENVIRONMENTAL RECEPTORS ARE AT IMMINENT AND FORESEEABLE RISK OF ADVERSE IMPACT.
17. TEMPORARY SEDIMENT CONVEYANCE SYSTEMS AND SEDIMENT POND TO BE IMMEDIATELY STABILIZED.

LEGEND

- STORM SEWER AND MANHOLE
- EXISTING STORM SEWER AND MANHOLE
- ROADSIDE CATCH BASIN AND LEAD
- SILT FENCE
- STRAW BALE CHECK DAM
- SILT SACK (SS)



KEY PLAN

NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NO.	REVISION DESCRIPTION	DATE	BY
1	ISSUED FOR REVIEW	14/12/21	AHJ

SCALE

HORIZONTAL 1:750

LICENSED PROFESSIONAL ENGINEER
DEC. 19/22
A.H. JONKMAN
PROVINCE OF ONTARIO

Robinson Land Development
350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

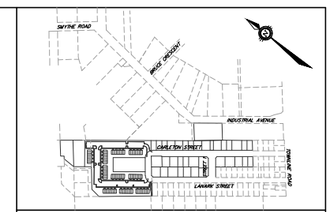
DESIGN	JHB
CHECKED	AHJ
DRAWN	JHB
CHECKED	AHJ
APPROVED	AHJ

INVERNESS HOMES

CARLETON / LANARK SUBDIVISION
CARLETON PLACE, ONTARIO

EROSION AND SEDIMENT CONTROL PLAN

PROJECT No.	22043
SURVEY	FMW
DATED	DEC. 2022
DWG. No:	22043-ESC1



KEY PLAN

NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NO.	REVISION DESCRIPTION	DATE	BY
1	ISSUED FOR REVIEW	14/12/21	AHJ

SCALE

0 10m 20m 40m

HORIZONTAL 1:1000

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SUBDIVISION
CARLETON PLACE, ONTARIO

EXISTING CONDITIONS PLAN

PROJECT No.	22043
SURVEY	FMW
DATED	DEC. 2022
DWG. No:	22043-PRE1

Appendix B

Boundary Conditions

Figure A - Water Distribution Hydraulic Model

Watermain Design Sheet

FUS Calculations

Hydraulic Model Outputs

Good Morning John,

Please see requested boundary conditions below.

Regards,

Guy

From: Razafimaharo, Christene <Christene.Razafimaharo@stantec.com>
Sent: December 13, 2022 10:20 AM
To: Guy Bourgon <gbourgon@carletonplace.ca>
Cc: Alemany, Kevin <kevin.alemany@stantec.com>; Wilder, Pierre <Pierre.Wilder@stantec.com>
Subject: RE: Carleton Lanark Watermain Boundary Conditions

Hello Guy,

As requested, we have updated the boundary conditions for the proposed Carleton-Lanark Subdivision (originally submitted on November 28th, 2022). The boundary conditions below consider the addition of a third connection to the water distribution system on Industrial Ave.

The model updated and used as part of the 2021 Water Master Plan (WMP) was used for this assessment. The proposed development was added as a point demand (assuming full occupancy), connected to the existing 150 mm diameter watermain (WM) on Townline Rd, at Carleton St, to the existing 150 mm diameter WM on Lanark St, and to the existing 250 mm diameter WM on Industrial Ave, north of Townline Rd. The connection points are illustrated in the figure below.

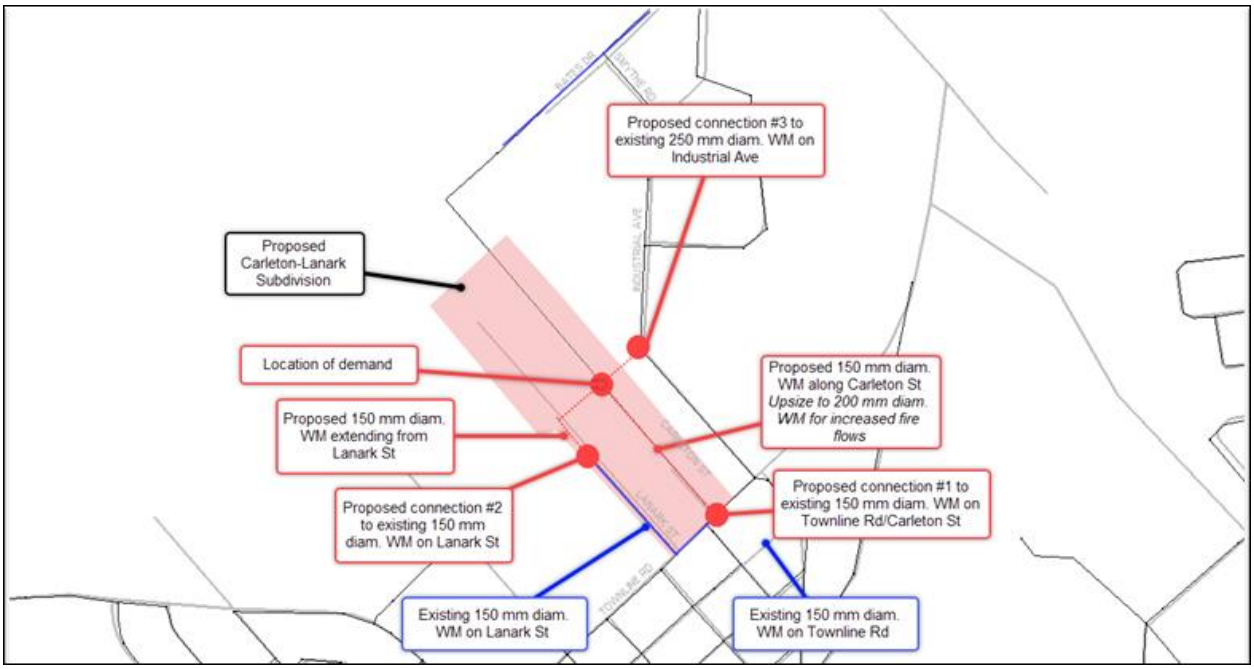
The table below shows the different demand conditions, the total demands, and the resulting hydraulic grade lines (HGLs) and pressures at each proposed connection point. Since a required fire flow (RFF) for the proposed subdivision was not specified, the HGLs for RFFs of 5,000 L/min to 7,000 L/min are reported.

Based on the proposed watermain servicing layout, the future WM from connection point #1 (Townline Rd/Carleton St) is proposed to be a 150 mm diameter WM. To achieve a fire flow of 7,000 L/min at a residual pressure of 20 psi at all 3 connection points, a WM diameter of 200 mm from connection point #1 is needed; boundary conditions for this alternative are also provided below.

150 mm Diameter WM from Connection Point #1 (Townline Rd/Carleton St)					
Demand Scenario		**Total Demand (L/s)**	**HGL (m) [Pressure (psi)]**		
			Proposed Connection Point #1 Townline Rd/Carleton St Model Elevation:139.83 m	**Proposed Connection Point #2 Lanark St** Model Elevation: 137.50 m	**Proposed Connection Point #3 Industrial Ave** Model Elevation: 137.00 m
Average Day (AVDY)		2.15	183.20 m [62 psi]	183.20 m [65 psi]	183.19 m [66 psi]
Maximum Day (MXDY)		5.38	180.69 m [58 psi]	180.65 m [61 psi]	180.65 m [62 psi]
Peak Hour (PKHR)		11.84	178.15 m [54 psi]	178.01 m [58 psi]	177.99 m [58 psi]
Maximum Day + Fire Flow (MXDY+FF)	FF = 5,000 L/min	88.38	166.73 m [38 psi]	162.91 m [36 psi]	162.93 m [37 psi]
	FF = 6,000 L/min	105.38	161.89 m [31 psi]	156.63 m [27 psi]	156.68 m [28 psi]

	FF = 7,000 L/min	122.05	156.40 m [24 psi]	149.50 m [17 psi]	149.58 m [18 psi]

200 mm Diameter WM from Connection Point #1 (Townline Rd/Carleton St)					
Demand Scenario		**Total Demand (L/s)**	**HGL (m) [Pressure (psi)]**		
			Proposed Connection Point #1 Townline Rd/Carleton St Model Elevation:139.83 m	**Proposed Connection Point #2 Lanark St** Model Elevation: 137.50 m	**Proposed Connection Point #3 Industrial Ave** Model Elevation: 137.00 m
Average Day (AVDY)		2.15	183.20 m [62 psi]	183.20 m [65 psi]	183.20 m [65 psi]
Maximum Day (MXDY)		5.38	180.69 m [58 psi]	180.67 m [61 psi]	180.66m [62 psi]
Peak Hour (PKHR)		11.84	178.13 m [54 psi]	178.06m [58 psi]	178.04 m [58 psi]
Maximum Day + Fire Flow (MXDY+FF)	FF = 5,000 L/min	88.38	166.51 m [38 psi]	164.23 m [38 psi]	164.15 m [39 psi]
	FF = 6,000 L/min	105.38	161.59 m [31 psi]	158.44 m [30 psi]	158.35 m [30 psi]
	FF = 7,000 L/min	122.05	156.02 m [23 psi]	151.88 m [20 psi]	151.78 m [21 psi]



Please let us know if you have any questions,

Best regards,

Christène Razafimaharo M.Sc., EIT
Water Resources Engineer in Training

Mobile: 343 996-7086
Christene.Razafimaharo@stantec.com

LEGEND

JUNCTION NODE

RESERVOIR

PROPOSED 203mmø WATERMAIN

KEY PLAN

INDUSTRIAL AVENUE

CARLETON STREET

LANARK STREET

TOWNLINE ROAD

STREET No. 1

BC-3

BC-1

BC-2

EX. 152mmØ

PROP. 203mmØ

HYD-1

HYD-2

HYD-3

HYD-4

HYD-5

HYD-6

HYD-7

HYD-8

HYD-9

HYD-10

HYD-11

HYD-12

J1

J2

J3

J4

J5

J7

CONCEPTUAL ONLY

NOTES

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1	ISSUED FOR REVIEW	14/12/21	AHJ

SCALE

0 5m 10m 30m

HORIZONTAL 1:750

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INVERNESS HOMES

CARLETON / LANARK
SUBDIVISION
CARLETON PLACE, ONTARIO

WATER DISTRIBUTION
HYDRAULIC MODEL

PROJECT No.	22043
SURVEY	FMW
DATED	DEC. 2022
DWG. No:	FIGURE A

WATERMAIN DESIGN SHEET

Carleton - Lanark Subdivision - Inverness Homes

Project No. 22043

Robinson Consultants

Junction Node Number	RESIDENTIAL POPULATION				NON-RES		AVG. DAILY				MAX. DAILY				MAX. HOURLY			
	ACTUAL COUNT				COMM. (HA)	INST. (HA)	DEMAND (l/s)				DEMAND (l/s)				DEMAND (l/s)			
	Low Density	Medium Density	High Density	Total Population			RES.	COMM.	INST.	TOTAL	RES.	COMM.	INST.	TOTAL	RES.	COMM.	INST.	TOTAL
R1																		
HYD1		15		40.50			0.13			0.13	0.33			0.33	0.72			0.72
HYD2																		
J1		21		56.70			0.18			0.18	0.46			0.46	1.01			1.01
HYD3		21		56.70			0.18			0.18	0.46			0.46	1.01			1.01
HYD4																		
J2		18		48.60			0.16			0.16	0.39			0.39	0.87			0.87
HYD5		24		64.80			0.21			0.21	0.53			0.53	1.16			1.16
HYD6		32		86.40			0.28			0.28	0.70			0.70	1.54			1.54
HYD7		22		59.40			0.19			0.19	0.48			0.48	1.06			1.06
HYD8		56		151.20			0.49			0.49	1.23			1.23	2.70			2.70
HYD9																		
J3		24		64.80			0.21			0.21	0.53			0.53	1.16			1.16
HYD10		12		32.40			0.11			0.11	0.26			0.26	0.58			0.58
J4		3		8.10			0.03			0.03	0.07			0.07	0.14			0.14
J5	19	72	128	489.40			1.59			1.59	3.97			3.97	8.72			8.72
J6																		
J7																		
Total	**19**	**320**	**128**	**1159.00**			**3.76**			**3.76**	**9.39**			**9.39**	**20.66**			**20.66**

Residential Densities

Low Density (SFH's) = 3.4 cap/unit

Medium Density (Townhouses) = 2.7 cap/unit

High Density (Apartments) = 1.8 cap/unit

Avg. Daily Demand:

Residential = 280 L/cap/day

Max. Daily Demand:

2.5 x Avg. Day

Max. Hourly Demand:

2.2 x Max. Day

Project Name:	Carleton/Lanark Subdivision
Project Location:	Carleton Place, ON
Project No:	22043
Date:	Dec. 13-22
Building Type:	4-Unit Townhouse
Building Being Considered:	TH-27

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	**Type of Construction**	**Options**	**C**			
		Wood Frame (Type V)	1.5	Wood Frame (Type V)	1.5	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				346.0	m^2
	Second Floor Area				346.0	m^2
	Total Effective Floor Area				**692.0**	**m^2**
C	**Fire Flow**				**9,000**	**L/min**
D	**Occupancy Class**	**Options**	**Charge**			
		Non-combustible	-0.25	Limited Combustible	-0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**-1350**	**L/min**
	Fire Flow				**7,650**	**L/min**
E	**Sprinkler Protection**	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	None	0.00	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	No	0.00	
		Full Supervision of the Sprinker System	-0.10	No	0.00	
	Sprinkler Reduction				**0**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				0	m
	Exposed Wall No. of Storeys				0	
	Length-Height Factor of Exposed Wall				0	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Wood Frame		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	31.0	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			14.3	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			28.6	m.storeys
	Construction Type of Exposed Wall	**Options**	Wood Frame		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			3.6	m
	North Side Exposure Charge			**0.16**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			18.4	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			36.8	m.storeys
	Construction Type of Exposed Wall	**Options**	Wood Frame		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			15.0	m
	East Side Exposure Charge			**0.11**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			14.3	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			28.6	m.storeys
	Construction Type of Exposed Wall	**Options**	Wood Frame		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			3.4	m
	South Side Exposure Charge			**0.16**	
	Total Exposure Charage			**0.43**	**< 0.75**
	Increase for Exposures			**3289.5**	**L/min**
G	**Total Required Fire Flow**			**11,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Floor areas used in Step B are conservative values as they include the exterior footprint and garages.

3. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

4. To be conservative, all townhouse front facades have been assumed to be wood frame, however, a brick façade may be installed (i.e. ordinary construction).

Project Name:	Carleton/Lanark Subdivision
Project Location:	Carleton Place, ON
Project No:	22043
Date:	Dec. 13-22
Building Type:	4-Unit Townhouse
Building Being Considered:	TH-27

Robinson Land Development

Calculations for Total Required Fire Flow with Units having Fire Walls

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**	Wood Frame (Type V)	1.5	
		Wood Frame (Type V)	1.5			
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				86.5	m^2
	Second Floor Area				86.5	m^2
	Total Effective Floor Area				**173.0**	**m^2**
C	**Fire Flow**				**4,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**	Limited Combustible	-0.15	
		Non-combustible	-0.25			
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**-600**	**L/min**
	Fire Flow				**3,400**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**	None	0.00	
		Automatic Sprinkler Protection	-0.30			
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	No	0.00	
		Full Supervision of the Sprinker System	-0.10	No	0.00	
	Sprinkler Reduction				**0**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				0	m
	Exposed Wall No. of Storeys				0	
	Length-Height Factor of Exposed Wall				0	m.storeys
	Construction Type of Exposed Wall	**Options**		Wood Frame		
		Wood Frame				
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	31.0	m
	West Side Exposure Charge				**0.00**	

	North Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			14.3	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			28.6	m.storeys
	Construction Type of Exposed Wall	**Options**	Wood Frame		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			3.6	m
	North Side Exposure Charge			**0.16**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			18.4	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			36.8	m.storeys
	Construction Type of Exposed Wall	**Options**	Wood Frame		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			15.0	m
	East Side Exposure Charge			**0.11**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			14.3	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			28.6	m.storeys
	Construction Type of Exposed Wall	**Options**	Wood Frame		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			3.4	m
	South Side Exposure Charge			**0.16**	
	Total Exposure Charage			**0.43**	**< 0.75**
	Increase for Exposures			**1462**	**L/min**
G	**Total Required Fire Flow**			**5,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Floor areas used in Step B are conservative values as they include the exterior footprint and garages.

3. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

4. To be conservative, all townhouse front facades have been assumed to be wood frame, however, a brick façade may be installed (i.e. ordinary construction).

Carleton Lanark Subdivsion
Average Day Junction Report

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
HYD-1	0.13	141.53	183.20	59.53
HYD-10	0.11	139.82	183.20	61.97
HYD-11	0.00	139.47	183.20	62.47
HYD12	0.00	140.65	183.20	60.79
HYD-2	0.00	139.55	183.20	62.35
HYD-3	0.18	139.75	183.20	62.07
HYD-4	0.00	140.80	183.20	60.57
HYD-5	0.21	141.98	183.20	58.88
HYD-6	0.28	142.88	183.20	57.59
HYD-7	0.19	143.75	183.20	56.35
HYD-8	0.47	143.83	183.20	56.24
HYD-9	0.00	143.32	183.20	56.97
J1	0.18	139.48	183.20	62.45
J2	0.16	141.50	183.20	59.57
J3	0.21	143.44	183.20	56.79
J4	0.03	139.66	183.20	62.20
J5	1.59	139.68	183.20	62.17
J7	0.00	139.60	183.20	62.29

Carleton Lanark Subdivsion
Peak Hour Junction Report

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
HYD-1	0.72	141.53	178.08	52.21
HYD-10	0.58	139.82	178.00	54.54
HYD-11	0.00	139.47	178.03	55.08
HYD12	0.00	140.65	178.09	53.48
HYD-2	0.00	139.55	178.03	54.98
HYD-3	1.01	139.75	178.01	54.65
HYD-4	0.00	140.80	177.99	53.13
HYD-5	1.16	141.98	177.98	51.43
HYD-6	1.54	142.88	177.98	50.14
HYD-7	1.06	143.75	177.98	48.90
HYD-8	2.60	143.83	177.98	48.78
HYD-9	0.00	143.32	177.99	49.52
J1	1.01	139.48	178.02	55.06
J2	0.87	141.50	177.99	52.12
J3	1.16	143.44	177.99	49.35
J4	0.14	139.66	178.02	54.79
J5	8.72	139.68	178.01	54.75
J7	0.00	139.60	178.11	55.01

Carleton Lanark Subdivsion
Max Day Junction Report

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
HYD-1	0.33	141.53	180.68	55.92
HYD-10	0.26	139.82	180.65	58.33
HYD-11	0.00	139.47	180.66	58.84
HYD12	0.00	140.65	180.68	57.18
HYD-2	0.00	139.55	180.66	58.73
HYD-3	0.46	139.75	180.66	58.44
HYD-4	0.00	140.80	180.65	56.93
HYD-5	0.53	141.98	180.65	55.24
HYD-6	0.70	142.88	180.65	53.96
HYD-7	0.48	143.75	180.65	52.71
HYD-8	1.18	143.83	180.65	52.60
HYD-9	0.00	143.32	180.65	53.33
J1	0.46	139.48	180.66	58.83
J2	0.39	141.50	180.65	55.93
J3	0.53	143.44	180.65	53.16
J4	0.07	139.66	180.66	58.57
J5	3.97	139.68	180.66	58.54
J7	0.00	139.60	180.68	58.69

Carleton Lanark Subdivsion
Max Day + Fire Flow Report

ID	Total Demand (Lpm)	Critical Node ID	Cridical Node Pressure (psi)	Critical Node Head (m)	Available Flow ay Hydrant (Lpm)	Available Flow Pressure (psi)
HYD-1	5022.60	HYD-1	31.71	165.55	14178.00	20.00
HYD-10	5015.40	HYD-10	31.86	164.32	11454.00	20.00
HYD-11	5000.00	HYD-11	34.43	164.29	21132.00	20.00
HYD12	5000.00	HYD12	26.00	165.03	6618.00	20.00
HYD-2	5000.00	HYD-2	34.43	164.61	17724.00	20.00
HYD-3	5027.40	HYD-3	32.29	164.39	12162.00	20.00
HYD-4	5000.00	HYD-4	29.57	164.35	9648.00	20.00
HYD-5	5031.60	HYD-5	25.43	164.33	6972.00	20.00
HYD-6	5041.80	HYD-6	23.29	164.33	6096.00	20.00
HYD-7	5028.60	HYD-7	22.00	164.33	5724.00	20.00
HYD-8	5070.60	HYD-8	23.00	164.33	6186.00	20.00
HYD-9	5000.00	HYD-9	25.71	164.33	7932.00	20.00

Carleton Lanark Subdivsion
Pipe Report

	Pipe ID (Char)	Pipehyd: Length (Num)	Pipehyd: Diameter (Num)	Link: From (Char)	Link: To (Char)	Pipehyd: Roughness (Num)
1	P1	100.19	203.00	BC-1	HYD-1	110
2	P2	99.99	203.00	HYD-1	HYD-2	110
3	P3	20.11	203.00	HYD-2	J1	110
4	P4	62.58	203.00	J1	HYD-3	110
5	P5	88.33	203.00	HYD-3	HYD-4	110
6	P6	23.65	203.00	HYD-4	J2	110
7	P7	86.87	203.00	J2	HYD-5	110
8	P8	86.79	203.00	HYD-5	HYD-6	110
9	P9	86.79	203.00	HYD-6	HYD-7	110
10	P10	86.49	203.00	HYD-7	HYD-8	110
11	P11	74.72	203.00	HYD-8	J3	110
12	P12	9.60	203.00	J3	HYD-9	110
13	P13	56.29	203.00	HYD-9	J2	110
14	P14	92.64	203.00	J3	HYD-10	110
15	P15	78.12	203.00	HYD-10	J4	110
16	P16	69.62	203.00	J1	J4	110
17	P17	11.33	203.00	J4	J5	110
18	P18	14.55	203.00	J4	HYD-11	110
19	P19	44.23	203.00	HYD-11	BC-2	110
20	P20	73.65	152.00	BC-1	J7	100
21	P21	83.24	152.00	BC-2	HYD12	100
22	P22	80.44	152.00	HYD12	J7	100
23	P23	148.04	203.00	BC-3	J1	110

Appendix C

Sanitary Sewer Design Sheet

Sanitary Drainage Area Plan
(DWG. 22043-SAN1)

Tree Farm Concept Plan

SANITARY SEWER DESIGN SHEET
for
CARLETON LANARK SUBDIVISION, TOWN OF CARLETON PLACE

Robinson Land Development

LOCATION			UNIT COUNT			RESIDENTIAL AREA AND POPULATION				COMM./INST. FLOW		RESIDENTIAL FLOW			PEAK DESIGN FLOW (L/s)	PIPE						
						INDIVIDUAL		CUMULATIVE														
STREET	FROM MH	TO MH	SINGLE-FAMILY	Apartments	TOWNHOUSE	POP.	AREA (ha)	POP.	AREA (ha)	PEAK FACTOR	PEAK FLOW (L/s)	PEAK FACTOR	PEAK POP. FLOW (L/s)	EXTRAN. FLOW (L/s)		LENGTH (m)	DIAMETER (mm)	SLOPE (%)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	EXCESS CAPACITY (L/s)	PERCENT FULL
Private Road	101	102			21	56.7	0.61	56.7	0.61			4.00	0.74	0.20	0.94	69.8	201.16	0.50	23.58	0.74	22.64	3.97
Private Road	102	103			19	51.3	0.54	108.0	1.15			4.00	1.40	0.38	1.78	69.8	201.16	0.36	20.01	0.63	18.23	8.90
Private Road	103	104			0	0.0	0.04	108.0	1.19			4.00	1.40	0.39	1.79	11.3	201.16	0.35	19.73	0.62	17.93	9.09
Private Road	104	105			24	64.8	0.65	172.8	1.84			4.00	2.24	0.61	2.85	94.9	201.16	0.35	19.73	0.62	16.88	14.43
Private Road	105	106			0	0.0	0.06	172.8	1.90			4.00	2.24	0.63	2.87	11.3	201.16	0.35	19.73	0.62	16.86	14.53
Private Road	106	107			7	18.9	0.30	191.7	2.20			4.00	2.49	0.73	3.21	64.3	201.16	0.34	19.44	0.61	16.23	16.52
Private Road	107	108			9	24.3	0.42	216.0	2.62			4.00	2.80	0.86	3.66	64.3	201.16	0.36	20.01	0.63	16.34	18.32
Private Road	108	109			0	0.0	0.04	216.0	2.66			4.00	2.80	0.88	3.68	10.3	201.16	0.39	20.82	0.66	17.14	17.66
Private Road	109	111			0	0.0	0.05	216.0	2.71			4.00	2.80	0.89	3.69	17.6	201.16	0.80	29.82	0.94	26.13	12.39
Carleton Street	111	112			18	48.6	0.62	264.6	3.33			4.00	3.43	1.10	4.53	91.1	201.16	1.93	46.32	1.46	41.79	9.78
Carleton Street	112	113			16	43.2	0.54	307.8	3.87			4.00	3.99	1.28	5.27	86.5	201.16	0.35	19.73	0.62	14.46	26.70
Carleton Street	114	115			14	37.8	0.39	37.8	0.39			4.00	0.49	0.13	0.62	53.4	201.16	2.68	54.58	1.72	53.96	1.13
Carleton Street	115	113			12	32.4	0.36	70.2	0.75			4.00	0.91	0.25	1.16	63.1	201.16	1.28	37.72	1.19	36.56	3.07
Lanark Street	116	117			12	32.4	0.40	32.4	0.40			4.00	0.42	0.13	0.55	83.7	201.16	3.81	65.08	2.05	64.53	0.85
Lanark Street	117	118			6	16.2	0.26	48.6	0.66			4.00	0.63	0.22	0.85	83.7	201.16	0.79	29.63	0.93	28.79	2.86
Future Development (Tree Farm) (refer to Concept Plan in Appendix C)	Stub	118	19	128	72	527.8	6.27	527.8	6.27			4.00	6.84	2.07	8.91	19.5	201.16	0.51	23.81	0.75	14.90	37.42
Street 1	118	113			10	27.0	0.38	603.4	7.31			4.00	7.82	2.41	10.23	75.6	201.16	0.54	24.50	0.77	14.27	41.77
Santary Outlet	113	119			0	0.0	0.03	981.4	11.21			4.00	12.72	3.70	16.42	41.8	201.16	0.48	23.10	0.73	6.68	71.09
Santary Outlet	119	120			0	0.0	0.34	981.4	11.55			4.00	12.72	3.81	16.53	40.9	201.16	1.76	44.23	1.39	27.70	37.38
Santary Outlet	120	121			0	0.0	0.05	981.4	11.60			4.00	12.72	3.83	16.55	44.7	201.16	0.47	22.86	0.72	6.31	72.40
Santary Outlet	121	Ex. SAN MH 2			0	0.0	0.00	981.4	11.60			4.00	12.72	3.83	16.55	17.6	201.16	0.45	22.37	0.70	5.82	73.99

DESIGN PARAMETERS

			Per Unit Populations:		
Average Daily Flow =	280	L/person/day	Single Family	3.4	persons/unit
Comm./Inst. Flow =	28000	L//ha/day	Semi-detached	2.7	persons/unit
Industrial Flow =			Duplex	2.3	persons/unit
Maximum Residential Peak Factor =	4.0		Townhouse	2.7	persons/unit
Harmon - Correction Factor (K) =	0.8		Apartments:		
Comm./Inst. Peak Factor =	1.5		Bachelor	1.4	persons/unit
Extraneous Flow =	0.33	L/s/ha	1 Bedroom	1.4	persons/unit
Minimum Velocity =	0.6	m/s	2 Bedroom	2.1	persons/unit
Maximum Velocity =	3.0	m/s	3 Bedroom	3.1	persons/unit
			Average Apt.	1.8	persons/unit

LEGEND

SINGLE SERVICE
135mmø SANITARY
100mmø STORM
19mmø WATER

DOUBLE SERVICE
2–135mmø SANITARY
2–100mmø STORM
2–19mmø WATER

SANITARY SEWER AND MANHOLE
EXISTING SANITARY SEWER AND MANHOLE
SANITARY DRAINAGE AREA BOUNDARY

POPULATION
3.4 | 0.25 — AREA (ha)
100
DOWNSTREAM MANHOLE

KEY PLAN

INDUSTRIAL AVENUE
CARLETON STREET
LANARK STREET
TOWNLINE ROAD
STREET No. 1
EX. 250mmø SAN
EX. 200mmø SAN
EX. 200mmø STORM
EXISTING 150mmø SANITARY FORCEMAIN
TH-1 TH-2 TH-3 TH-4 TH-5 TH-6 TH-7 TH-8 TH-9 TH-10 TH-11 TH-12 TH-13 TH-14 TH-15 TH-16 TH-17 TH-18 TH-19 TH-20 TH-21 TH-22 TH-23 TH-24 TH-25 TH-26 TH-27 TH-28 TH-29 TH-30 TH-31 TH-32 TH-33 TH-34 TH-35 TH-36 TH-37 TH-38 TH-39 TH-40 TH-41 TH-42
SINGLE – 19 UNITS
TOWNHOMES – 72 UNITS
APARTMENTS – 128 UNITS
(AS PER TREE FARM CONCEPT PLAN)
1 STOREY METAL SIDED BUILDING
2 STOREY METAL SIDED BUILDING (UNITS)
1 STOREY CONCRETE BLOCK BUILDING
WOODED AREA
GRAVEL PATH

NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NO.	REVISION DESCRIPTION	DATE	BY
1	ISSUED FOR REVIEW	14/12/21	AHJ

SCALE
0 5m 10m 30m
HORIZONTAL 1:750

LICENSED PROFESSIONAL ENGINEER
DEC. 19/22
A.H. JONKMAN
PROVINCE OF ONTARIO

Robinson Land Development
350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

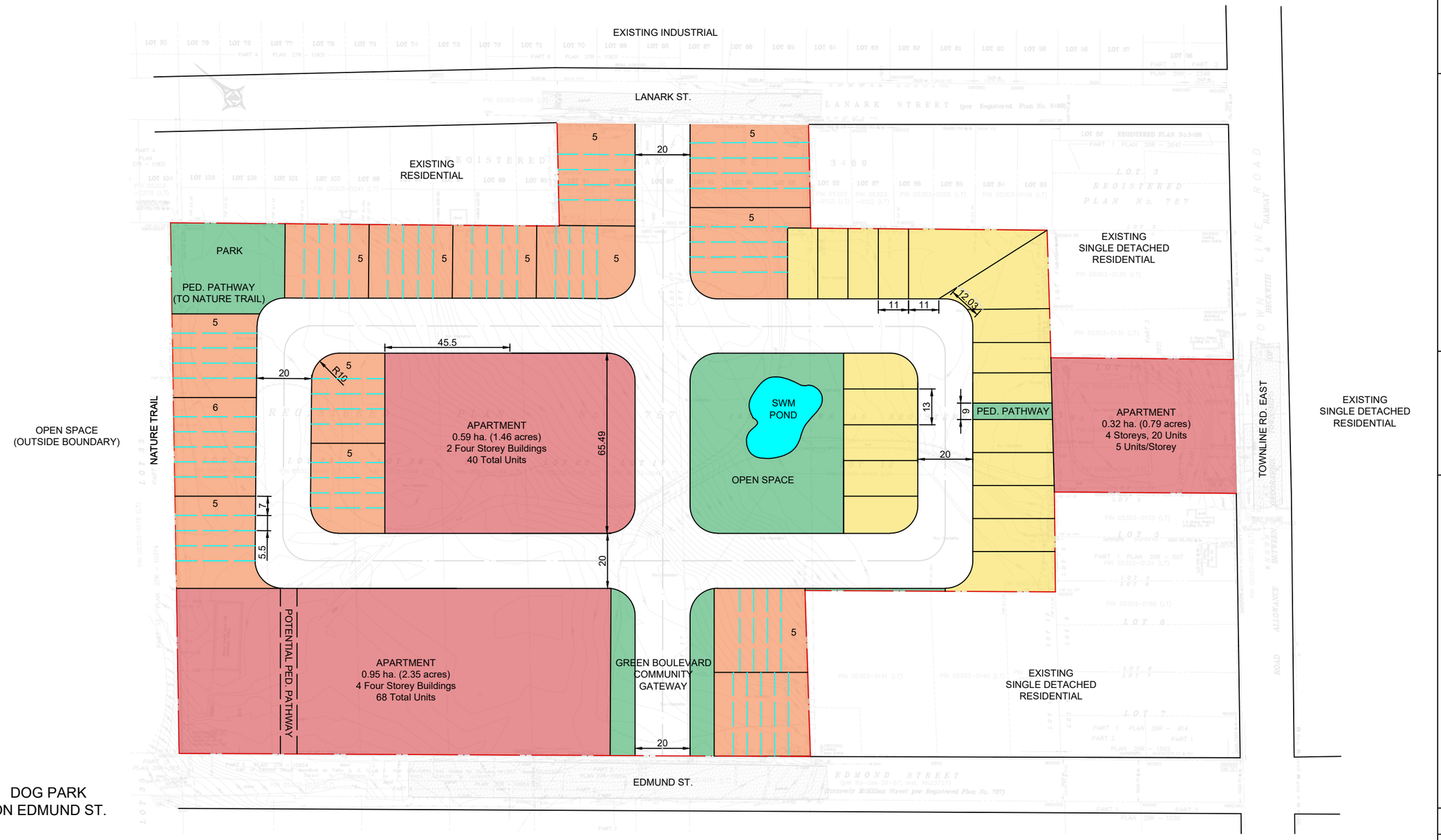
DESIGN	JHB
CHECKED	AHJ
DRAWN	JHB
CHECKED	AHJ
APPROVED	AHJ

INVERNESS HOMES

CARLETON / LANARK SUBDIVISION
CARLETON PLACE, ONTARIO

SANITARY DRAINAGE AREA PLAN

PROJECT No.	22043
SURVEY	FMW
DATED	DEC. 2022
DWG. No:	22043-SAN1



LEGEND

- Single Detached
- Townhouse
- Apartment
- Open Space
- Storm Water Pond
- Property Boundary
- ROW Centreline
- Townhome Lotline

KEY MAP (N.T.S.)

CONCEPTUAL LAND USE PLAN

400 LANARK STREET*
CARLETON PLACE
LANARK COUNTY

LT 7 TO 11; LT 19 TO 25; LT 34 TO 41; PT LT 45; LT 47 TO 50; LT 53; LT 54; LT 68; LT 74 TO 76 PL 3469 LANARK N RAMSAY; TOWN OF CARLETON PLACE

PT LT 72 PL 3469 LANARK N RAMSAY AS IN RN85279; TOWN OF CARLETON PLACE

LandPro Planning Solutions
110 James St. #204, St. Catharines
(289) 687-3730

SCHEDULE OF LAND USE		
LAND USE TYPE	AREA	PERCENT OF TOTAL LAND
Single Detached	0.71 ha. (1.75 acres)	11.32%
Townhouse	1.37 ha. (3.39 acres)	21.85%
Apartment	1.87 ha. (4.62 acres)	29.82%
Open Space	0.55 ha. (1.36 acres)	8.77%
SWM	0.057 ha. (0.14 acres)	0.92%
ROW	1.70 ha. (4.20 acres)	27.11%
Total	6.27 ha. (15.49 acres)	100.00%

SCHEDULE OF UNITS		
UNIT TYPE	NUMBER OF UNITS	DENSITY
Single Detached	19	26.76 uph
Townhouse	72	52.55 uph
Apartment	128	68.45 uph
Total	219	55.26 uph

REQUIRED APPLICATIONS

Council approval for apartment buildings fronting onto local-designated ROW (Edmund Street and new internal streets)

OPA to allow for high density residential

REVISIONS

REV 1	Adjusted layout
REV 2	Merged apt., added condo
REV 3	Removed condo

SCALE: 1:1500
DATE: JUN 30, 2022

Appendix D

Time of Concentration Calculations

Pre-Development Flow Calculations

Storm Sewer Design Sheet

Hydraulic Grade Line Calculations

Storm Drainage Area Plan
(DWG. 22043-STM1)

Storage Tables

Tree Farm Concept Plan

EL 1 =	144.80	m
El 2 =	137.10	m
L =	433	m
S =	0.018	m/m
S =	1.778	%

Time of Concentration - Airport Formula

$$t_c = \frac{3.26 \times (1.1 - C) \times L^{0.5}}{S_w{}^{0.33}}$$

tc	time of concentration (min)
C	runoff coefficient
L	catchment length (m)
Sw	catchment slope (%)

C =	0.40	
L =	433	m
Sw =	1.778	%

tc =	39.3	min.

Pre-Development Flow Calculations

Given:

Area (ha) = 8.13

C = 0.40

C (100 YR) = 0.50

Return Period	Time of Concentration (min)	Rainfall Intensity, i (mm/hr)	Flow, Q (L/s)
5 Year	39.3	44.8	404.7

Notes:

1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method (Q = 2.78CiA).

STORM SEWER DESIGN SHEET
for
CARLETON LANARK SUBDIVISION, TOWN OF CARLETON PLACE

Robinson
Land Development

LOCATION				5 YEAR				100 YEAR				FLOW						PROPOSED SEWER						
DRAINAGE AREA	STREET	FROM MH	TO MH	AREA (ha)	C	INDIV. 2.78AC	ACCUM. 2.78AC	AREA (ha)	C	INDIV. 2.78AC	ACCUM. 2.78AC	TIME OF CONC. (min)	5 YEAR RAINFALL INTENSITY (mm/hr)	100 YEAR RAINFALL INTENSITY (mm/hr)	5 YEAR PEAK FLOW (L/s)	100 YEAR PEAK FLOW (L/s)	DESIGN PEAK FLOW (L/s)	PIPE DIA. (mm)	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
201	Private Road	200	201	0.71	0.48	0.95	0.95					10.00	104.19	178.56	99.00	0.00	99.00	366.42	0.50	70.3	116.67	1.11	1.06	85%
202	Private Road	201	202	0.13	0.73	0.26	1.22					11.06	98.91	169.43	120.19	0.00	120.19	457	0.20	69.1	133.00	0.81	1.42	90%
203	Private Road	202	203	0.33	0.48	0.45	1.66					12.48	92.70	158.68	153.99	0.00	153.99	457	0.34	11.6	173.40	1.06	0.18	89%
204	Private Road	203	204	0.46	0.62	0.81	2.47					12.66	91.96	157.40	226.84	0.00	226.84	457	0.66	97.5	241.60	1.47	1.10	94%
	Private Road	204	205	0.00	0.00	0.00	2.47					13.77	87.77	150.17	216.50	0.00	216.50	457	0.60	11.6	230.35	1.40	0.14	94%
206	Private Road	205	206	0.71	0.46	0.92	3.38					13.90	87.28	149.32	295.28	0.00	295.28	533.0	0.50	67.6	316.93	1.42	0.79	93%
207	Private Road	206	207	0.50	0.50	0.69	4.07					14.70	84.55	144.61	344.52	0.00	344.52	533.0	0.69	63.6	372.31	1.67	0.64	93%
	Private Road	207	208	0.00	0.00	0.00	4.07					15.33	82.50	141.07	336.17	0.00	336.17	533.0	0.69	8.7	372.31	1.67	0.09	90%
211-2	Private Road	CB 37	Main	0.36	0.32	0.32	0.32					15.00	83.56	142.89	26.94	0.00	26.94	201.16	1.01	11.9	33.51	1.05	0.19	80%
211-1	Private Road	208	211	0.03	0.63	0.05	4.44					15.42	82.23	140.60	365.36	0.00	365.36	533.0	0.80	20.3	400.89	1.80	0.19	91%
210	Carleton Street	209	210	0.16	0.47	0.21	0.21					10.00	104.19	178.56	21.98	0.00	21.98	299.36	3.02	12.6	167.26	2.38	0.09	13%
	Carleton Street	210	211	0.00	0.00	0.00	0.21					10.09	103.73	177.76	21.88	0.00	21.88	299.36	3.00	14.0	166.71	2.37	0.10	13%
212	Carleton Street	211	212	0.25	0.53	0.37	5.02					15.61	81.65	139.60	409.93	0.00	409.93	533.0	1.10	84.8	470.09	2.11	0.67	87%
213-5	Carleton Street	CB 38	213	0.43	0.48	0.57	0.57					15.00	83.56	142.89	47.84	0.00	47.84	251.5	1.03	11.7	61.39	1.24	0.16	78%
213-1	Carleton Street	212	213	0.42	0.64	0.75	6.35					16.28	79.64	136.14	505.50	0.00	505.50	914.0	0.10	90.6	597.13	0.91	1.66	85%
215	Carleton Street	214	215	0.17	0.63	0.30	0.30					10.00	104.19	178.56	31.57	0.00	31.57	299.36	3.26	53.4	173.78	2.47	0.36	18%
213-2	Carleton Street	215	213	0.38	0.66	0.69	0.99					10.36	102.33	175.33	101.55	0.00	101.55	457.00	0.30	62.5	162.89	0.99	1.05	62%
217	Lanark Street	216	217	0.50	0.36	0.50	0.50					10.00	104.19	178.56	51.83	0.00	51.83	299.36	4.08	80.9	194.41	2.76	0.49	27%
218-1	Lanark Street	217	218	0.49	0.47	0.64	1.14					10.49	101.68	174.22	115.43	0.00	115.43	366.42	0.55	91.3	122.37	1.16	1.31	94%
218-2	Lanark Street	CB 26	Main					0.08	0.30	0.07	0.07	15.00	0.00	142.89	0.00	9.53	9.53	201.2	1.00	11.0	33.34	1.05	0.17	29%
218-3	Lanark Street	221	218					0.62	0.59	1.01	1.08	10.00	0.00	178.56	0.00	192.88	192.88	533.00	0.23	52.2	214.96	0.96	0.90	90%
218-4	Tree Farm Development	Stub	218	6.39	0.20	3.55	3.55						230.48	398.62	818.87	0.00	818.87	914.0	0.29	17.5	1016.87	1.55	0.19	81%
213-4	Carleton Street	CB 42	Main					0.16	0.55	0.25	0.25	15.00	0.00	142.89	0.00	35.08	35.08	251.5	1.01	34.8	60.79	1.22	0.47	58%
213-3	Street 1	218	213	0.28	0.64	0.50	6.51					11.80	95.56	163.63	622.18	227.96	850.14	1067.0	0.11	78.7	946.26	1.06	1.24	90%
	Storm Outlet	213	219	0.00	0.00	0.00	13.85					13.04	90.48	154.85	1253.16	227.96	1481.12	1067.0	0.28	35.8	1509.72	1.69	0.35	98%
	Storm Outlet	219	Headwall	0.00	0.00	0.00	13.85					13.39	89.14	152.53	1234.59	227.96	1462.55	1067.0	0.28	14.4	1509.72	1.69	0.14	97%
				12.71																				

Design Parameters

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equatios.
2. Peak flows calculated using the Rational Method.
   Q = 2.78CIA, where:
   Q = Peak Flow (L/s)
   A = Drainage Area (ha)
   I = Rainfall Intensity (mm/hr)
   C = Runoff Coefficient
3. Manning's roughness coefficient = 0.013
4. Full flow velocity: MIN 0.8 m/s; MAX 3.0 m/s (City of Ottawa Sewer Design Guidelines, v.2012)
5. Local roads return frequency = 2 Yr; Collector roads return frequency = 5 Yr (City of Ottawa Technical Bulletin PIEDTB-2016-01)

HYDRAULIC GRADE LINE COMPUTATION FORM

From Manhole	To Manhole	U/S Invert	D/S Invert	U/S Obvert	D/S Obvert	Slope	TW	Diameter D_o	Area	Hydraulic Radius	Peak Flow Q_o	Length L_o	Velocity V_o	Velocity Head $V_o^2/2g$	Friction Slope Sf_o	Friction Loss H_f	Angle of Deflection at U/S MH	Sewer Bend Loss Coefficient[*1]	Hydraulic Loss at MH	EGL_o	EGL_i	HGL_o	HGL_i	Ground Elev.	Surcharge Depth	Free Board
		m	m	m	m	m/m	m	m	m^2	m	m^3/s	m	m/s	m	m/m	m	degrees	K_b	m	m	m	m	m	m	m	m
Headwall	219	136.24	136.20	137.31	137.27	0.0028	136.82	1.067	0.89	0.27	1.463	14.4	1.64	0.14	0.0026	0.04	0	0.02	0.00	136.96	137.00	136.82	136.86	139.04	-0.45	2.18
219	213	136.35	136.25	137.42	137.32	0.0028	136.86	1.067	0.89	0.27	1.481	35.8	1.66	0.14	0.0027	0.10	0	0.02	0.00	137.00	137.10	136.86	136.96	139.48	-0.46	2.52
213	218	136.44	136.35	137.51	137.42	0.0011	136.96	1.067	0.89	0.27	0.8501	78.7	0.95	0.05	0.0009	0.070	0	0.02	0.0009	137.01	137.08	136.96	137.03	139.64	-0.48	2.61
218	217	137.58	137.08	137.95	137.45	0.0055	137.03	0.366	0.11	0.09	0.1154	91.3	1.09	0.06	0.0049	0.448	90	1.32	0.0806	137.09	137.62	137.03	137.56	140.26	-0.39	2.70
217	216	140.95	137.65	141.25	137.95	0.0408	137.56	0.299	0.07	0.07	0.0518	80.9	0.74	0.03	0.0029	0.235	0	0.02	0.0006	137.59	137.82	137.56	137.80	143.50	-3.45	5.70
218	221	136.95	136.83	137.48	137.36	0.0023	137.03	0.533	0.22	0.13	0.1929	52.2	0.86	0.04	0.0019	0.097	90	1.32	0.0503	137.07	137.22	137.03	137.18	138.13	-0.30	0.95
213	215	137.11	136.92	137.57	137.38	0.0030	136.96	0.457	0.16	0.11	0.1016	62.5	0.62	0.02	0.0012	0.073	90	1.32	0.0258	136.98	137.08	136.96	137.06	140.03	-0.51	2.97
215	214	139.00	137.26	139.30	137.56	0.0326	137.06	0.299	0.07	0.07	0.0316	53.4	0.45	0.01	0.0011	0.058	0	0.02	0.0002	137.07	137.13	137.06	137.12	141.53	-2.18	4.41
213	212	136.57	136.48	137.48	137.39	0.0010	136.96	0.914	0.66	0.23	0.5055	90.6	0.77	0.03	0.0007	0.065	90	1.32	0.0400	136.99	137.10	136.96	137.07	139.84	-0.42	2.77
212	211	137.84	136.94	138.37	137.47	0.0106	137.07	0.533	0.22	0.13	0.4099	84.8	1.84	0.17	0.0084	0.711	0	0.02	0.0034	137.24	137.95	137.07	137.78	141.27	-0.59	3.49
211	208	138.60	138.44	139.13	138.97	0.0079	137.78	0.533	0.22	0.13	0.3654	20.3	1.64	0.14	0.0067	0.135	45	0.39	0.0533	137.92	138.10	137.78	137.97	141.83	-1.17	3.86
208	207	138.69	138.63	139.22	139.16	0.0069	137.97	0.533	0.22	0.13	0.3362	8.7	1.51	0.12	0.0056	0.049	45	0.39	0.0451	138.08	138.18	137.97	138.06	141.99	-1.16	3.93
207	206	139.16	138.72	139.69	139.25	0.0069	138.06	0.533	0.22	0.13	0.3445	63.6	1.54	0.12	0.0059	0.377	45	0.39	0.0474	138.18	138.61	138.06	138.49	142.05	-1.21	3.56
206	205	139.53	139.19	140.06	139.72	0.0050	138.49	0.533	0.22	0.13	0.2953	67.6	1.32	0.09	0.0043	0.294	0	0.02	0.0018	138.58	138.87	138.49	138.78	142.71	-1.28	3.93
205	204	139.67	139.60	140.13	140.06	0.0060	138.78	0.457	0.16	0.11	0.2165	11.6	1.32	0.09	0.0053	0.062	45	0.39	0.0346	138.87	138.97	138.78	138.88	142.81	-1.25	3.93

Notes:
1. From "Sewer Bend Loss Coefficient Design Chart", Appendix 6-B, City of Ottawa Sewer Design Guidelines, 2004

Designed: JHB	**Project:** Carleton / Lanark Subdivision	
Checked:	**Location:** Carleton Place, ON	
Dwg. Reference:	**Project No.:** 22043	**Date:** 14-Dec-22

Deflection Angle	Bend Loss Coefficient
0	0.02
30	0.22
35	0.27
45	0.39
50	0.46
55	0.54
60	0.64
90	1.32

From "Sewer Bend Loss Coefficient Design Chart", Appendix 6-B, City of Ottawa Sewer Design Guidelines, 2012

LEGEND

SINGLE SERVICE
135mmø SANITARY
100mmø STORM
19mmø WATER

DOUBLE SERVICE
2–135mmø SANITARY
2–100mmø STORM
2–19mmø WATER

STORM SEWER AND MANHOLE
CATCH BASIN AND LEAD
EXISTING CATCH BASIN
SWALE
EXISTING DITCH
STORM DRAINAGE AREA BOUNDARY
MAJOR OVERLAND FLOW ROUTE

RUNOFF COEFFICIENT
0.65 0.15 — AREA (ha)
200
DOWNSTREAM MANHOLE

KEY PLAN

INDUSTRIAL AVENUE
CARLETON STREET
LANARK STREET
TOWNLINE ROAD
STREET No. 1
SWM FACILITY
POND
TH-1 TH-2 TH-3 TH-4 TH-5 TH-6 TH-7 TH-8 TH-9 TH-10 TH-11 TH-12 TH-13 TH-14 TH-15 TH-16 TH-17 TH-18 TH-19 TH-20 TH-21 TH-22 TH-23 TH-24 TH-25 TH-26 TH-27 TH-28 TH-29 TH-30 TH-31 TH-32 TH-33 TH-34 TH-35 TH-36 TH-37 TH-38 TH-39 TH-40 TH-41 TH-42

CONCEPTUAL ONLY

NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NO.	REVISION DESCRIPTION	DATE	BY
1	ISSUED FOR REVIEW	14/12/21	AHJ

SCALE
0 5m 10m 30m
HORIZONTAL 1:750

LICENSED PROFESSIONAL ENGINEER
DEC. 19/22
A.H. JONKMAN
PROVINCE OF ONTARIO

Robinson Land Development
350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

DESIGN	JHB
CHECKED	AHJ
DRAWN	JHB
CHECKED	AHJ
APPROVED	AHJ

INVERNESS HOMES

CARLETON / LANARK
SUBDIVISION
CARLETON PLACE, ONTARIO

STORM DRAINAGE
AREA PLAN

PROJECT No.	22043
SURVEY	FMW
DATED	DEC. 2022
DWG. No:	22043-STM1

Flow and Storage Volume Calculations

Given:

Area (ha) = 8.13

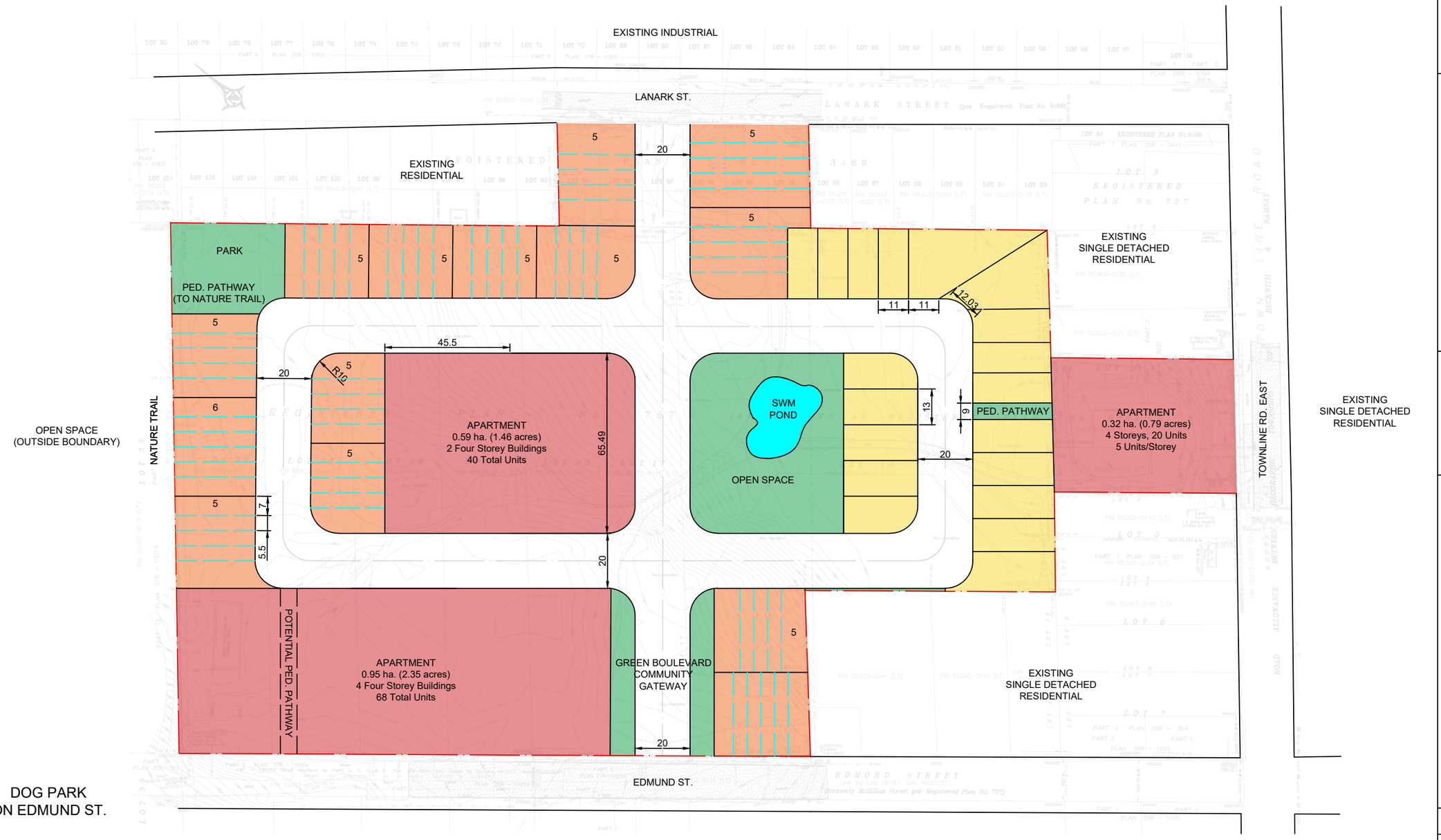
C = 0.48

C (100 YR)[*3] = 0.60

Return Period	Time of Concentration (min)	Intensity[*1], i (mm/hr)	Flow[*2], Q (L/s)	Allowable Release Rate[*4] (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
5 Year	5	141.2	1531.6	404.7	1126.9	338.1
	10	104.2	1130.4	404.7	725.7	435.4
	15	**83.6**	**906.5**	**404.7**	**501.8**	**451.6**
	20	70.3	762.1	404.7	357.4	428.9
	25	60.9	660.6	404.7	256.0	383.9
	30	53.9	585.0	404.7	180.4	324.6
100 Year	20	120.0	1626.6	404.7	1221.9	1466.3
	25	103.8	1408.3	404.7	1003.6	1505.4
	30	**91.9**	**1245.8**	**404.7**	**841.1**	**1514.0**
	35	82.6	1119.8	404.7	715.2	1501.8
	40	75.1	1019.0	404.7	614.4	1474.4
	45	69.1	936.4	404.7	531.7	1435.6

Notes:

1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method (Q = 2.78CiA).
3. C (100 YR) = C + 25% (Max. 1.0)
4. Allowable Release Rate = Pre-Development Flow



LEGEND

- Single Detached
- Townhouse
- Apartment
- Open Space
- Storm Water Pond
- Property Boundary
- ROW Centreline
- Townhome Lotline

KEY MAP (N.T.S.)

CONCEPTUAL LAND USE PLAN

400 LANARK STREET*
CARLETON PLACE
LANARK COUNTY

LT 7 TO 11; LT 19 TO 25; LT 34 TO 41; PT LT 45; LT 47 TO 50; LT 53; LT 54; LT 68; LT 74 TO 76 PL 3469 LANARK N RAMSAY; TOWN OF CARLETON PLACE

PT LT 72 PL 3469 LANARK N RAMSAY AS IN RN85279; TOWN OF CARLETON PLACE

LandPro Planning Solutions
110 James St. #204, St. Catharines
(289) 687-3730

SCHEDULE OF LAND USE		
LAND USE TYPE	AREA	PERCENT OF TOTAL LAND
Single Detached	0.71 ha. (1.75 acres)	11.32%
Townhouse	1.37 ha. (3.39 acres)	21.85%
Apartment	1.87 ha. (4.62 acres)	29.82%
Open Space	0.55 ha. (1.36 acres)	8.77%
SWM	0.057 ha. (0.14 acres)	0.92%
ROW	1.70 ha. (4.20 acres)	27.11%
Total	6.27 ha. (15.49 acres)	100.00%

SCHEDULE OF UNITS		
UNIT TYPE	NUMBER OF UNITS	DENSITY
Single Detached	19	26.76 uph
Townhouse	72	52.55 uph
Apartment	128	68.45 uph
Total	219	55.26 uph

REQUIRED APPLICATIONS

Council approval for apartment buildings fronting onto local-designated ROW (Edmund Street and new internal streets)

OPA to allow for high density residential

REVISIONS

REV 1	Adjusted layout
REV 2	Merged apt., added condo
REV 3	Removed condo

SCALE: 1:1500
DATE: JUN 30, 2022