

2668867 Ontario Inc.

155 Dun Skipper Drive

Design Brief

August 15, 2025

November 2024
Revised August 2025

155 Dun Skipper Drive

Design Brief

City of Ottawa

Development Application File: D07-12-24-0169

June 2nd, 2025

Prepared By:

Arcadis Professional Services (Canada) Inc.
333 Preston Street, Suite 500
Ottawa, Ontario K1S 5N4
Canada
Phone: 613 241 3300

Prepared For:

2668867 Ontario Inc.
C/o Mr. Omkar Atwal

4836 Bank Street
Ottawa Ontario K1X 1G6

Our Ref:

148290-6.04.03



Ryan Magladry, C.E.T
Associate Principal
Practice Lead, Land Engineering



Demetrius Yannouloupoulos, P. Eng
Principal – Practice Lead, Land Engineering

This document is intended only for the use of the individual or entity for which it was prepared and may contain information that is privileged, confidential and exempt from disclosure under applicable law. Any dissemination, distribution or copying of this document is strictly prohibited.

Contents

- 1 Introduction2
 - 1.1 Scope2
 - 1.2 Subject Site2
 - 1.3 Previous Studies3
 - 1.4 Geotechnical Considerations3
- 2 Water Supply5
 - 2.1 Existing Conditions5
 - 2.2 Design Criteria5
 - 2.2.1 Water Demands5
 - 2.2.2 System Pressure5
 - 2.2.3 Fire Flow Rates6
 - 2.2.4 Boundary Conditions6
 - 2.2.5 Hydraulic Model7
 - 2.3 Proposed Water Plan7
 - 2.3.1 Proposed Water Plan7
 - 2.3.2 Hydraulic Analysis8
 - 2.3.3 Modeling Results8
- 3 Wastewater Disposal9
 - 3.1 Existing Conditions9
 - 3.2 Design Criteria9
 - 3.3 Recommended Wastewater Plan9
- 4 Site Stormwater Management10
 - 4.1 Existing Conditions10
 - 4.2 Design Criteria10
 - 4.3 Proposed Minor System10
 - 4.4 Stormwater Management11
 - 4.5 Inlet Control11
 - 4.6 On-Site Detention12
 - 4.6.1 Site Inlet Control12
 - 4.6.2 Roof Inlet Controls13
 - 4.6.3 Overall Release Rate14
 - 4.7 Underground Storage14

4.8 Interim conditions 14

5 Grading and Roads..... 17

5.1 Site Grading 17

5.2 Road Network 17

6 Source Controls 18

6.1 General 18

6.2 Lot Grading 18

6.3 Vegetation 18

6.4 Groundwater Recharge 18

7 Conveyance Controls 19

7.1 Generals..... 19

7.2 Catch basins and Maintenance Hole Sumps 19

8 Sediment and Erosion Control Plan 20

8.1 General 20

8.2 Trench Dewatering 20

8.3 Seepage Barriers 20

8.4 Surface Structure Filters 20

9 Conclusion 21

Tables

Table 1-1 Pavement Structure – Car Only Parking Areas on Podium Deck.....3

Table 1-2 Pavement Structure – Access Lanes, Fire Routes and Heavy Truck Parking Areas on Podium Deck.....4

Table 1-3 Pavement Structure – Car Only Parking Areas on Overburden4

Table 1-4 Pavement Structure – Access Lanes, Fire Routes and Heavy Truck Parking Areas on Overburden.....4

Table 2-1 Hydraulic Boundary Conditions – Dun Skipper Dr. (Pre-SUC Pressure Zone Reconfiguration)6

Table 2-2 Hydraulic Boundary Conditions – Bank Street (Pre-SUC Pressure Zone Reconfiguration).....7

Table 2-3 Hydraulic Boundary Conditions – Dun Skipper Dr. (Post-SUC Pressure Zone Reconfiguration) ..7

Table 2-4 Hydraulic Boundary Conditions – Bank Street (Post-SUC Pressure Zone Reconfiguration)7

Table 4-1 Post-Development Storage Summary Table 13

Table 4-2 Post-Development Roof Storage Summary Table 13

Table 4-3 Underground Storage Summary Table 14

Table 4-4 Post-Development Roof Storage Summary Table 15

Table 4-5 100-Year Storage Calculation for Interim Conditions 15

Table 4-6 Post-Development Storage Summary Table for Interim Conditions 15

Figures

Figure 1.1 Subject Site Location2

Appendices

Appendix A

- Site Plan
- Site Servicing Plan 148290-C-001
- AOV Legal Plan
- Site Servicing Plan 119351-C-001
- Pre-Consultation City Comments
- Study and Plan Identification List

Appendix B

- Watermain Boundary Conditions
- Water Demand Calculations
- FUS Calculations
- Water Model Results

Appendix C

- Sanitary Sewer Design Sheet
- Sanitary Drainage Area Plan 148290-C-400
- Sanitary Sewer Design Sheet 119351
- Sanitary Drainage Area Plan 119351-C-400

Appendix D

- Storm Sewer Design Sheet
- Storm Water Management Sheet
- Storm Drainage Area Plan 148290-C-500
- Interim Storm Drainage Area Plan 148290-C-501
- Ponding Plan 148290-C-600
- Interim Ponding Plan 148290-C-601
- Stormtech Underground Chamber Specifications
- Orifice Sizing Calculations
- As-built Design Sheets 119351 & 137175 Pathways Block 204
- Storm Water Management Sheet 119351
- Storm Drainage Area Plan 119351-C-500
- Ponding Plan 119351-C-600

Appendix E

- Grading Plan 148290-C-200
- Interim Grading Plan 148290-C-201
- Sediment and Erosion Plan 148290-C-900
- Grading Plan 119351-C-200

1 Introduction

1.1 Scope

Arcadis Professional Services (Canada) Inc. (Arcadis, formerly IBI Group) has been retained by 2668867 Ontario Inc. to prepare the necessary engineering plans, specifications and documents to support the proposed amended Site Plan Application for the subject property in accordance with the policies set out by the Planning and Development Branch of the City of Ottawa. This Brief will present a detailed grading and servicing scheme to support the Phase 2 site plan adjustment and will include sections on-site grading, water supply, wastewater management, minor and major stormwater management, and erosion and sediment control.

1.2 Subject Site

The proposed development is part of the previously approved Leitrim Home Hardware site, which is located at the southwest corner of the Bank Street and Dun Skipper Drive intersection. The approved site plan is approximately 2.5 hectares in size and is also bounded by the Idone subdivision to the south and east. Please refer to **Figure 1.1** below for more information regarding the site location.



Figure 1.1 Subject Site Location

The subject property consists of a Home Hardware building (Building A) and three other proposed buildings (Building B-D) with two vehicular accesses. The approved site plan is included in **Appendix A**. Although the subject site will eventually include four buildings, the property owner plans to phase the site development. The first phase includes only Building A, associated parking, and vehicular connection to both Bank Street and Dun Skipper Drive. Please refer to 119351-001 Site Servicing Plan for Phase 1 limits, included in **Appendix A**. Phase 1 was fully constructed in 2022. The previous site plan identified Building B as a 500-bed hotel, while the new site plan changed

it to a mixed use apartment building (1-bed: 87 units; 2-bed: 36 units; 3-bed: 18 units) with commercial area on the ground floor.

A site plan of the proposed development is included in **Appendix A**.

1.3 Previous Studies

Design of this project has been undertaken in accordance with the following reports:

- Design Brief – Bank Street Development, 4836 Bank Street prepared by IBI Group, April 2019, Revised April 2020

An engineering pre-consultation with the City of Ottawa was held in October 2023 regarding the proposed development. Notes from this meeting is included in **Appendix A**.

1.4 Geotechnical Considerations

Paterson Group Inc. was retained to prepare a geotechnical investigation for the site. The objectives of the investigation were to prepare a report to:

- Determine the subsoil and groundwater conditions at the site by means of test pits and boreholes
- To provide geotechnical recommendations pertaining to the design of the proposed development including construction considerations

The geotechnical investigation report PG2934-1 Dated October 4, 2024 confirmed that the site consists of fill underlain by glacial till. The fill generally consists of silty sand with some gravel. The glacial till underlying the fill consists of compact to very dense, brown to grey silty sand with gravel, cobbles and boulders.

The report contains recommendations which include but are not limited to the following:

- Fill used for grading beneath the proposed development to meet OPSS Granular 'A' or Granular 'B' Type II placed in lifts no greater than 300 mm compacted to 98% SPMDD
- Pavement Structures as identified below

Table 1-1 Pavement Structure – Car Only Parking Areas on Podium Deck

Local Road – Parking Areas	Thickness
12.5 Asphaltic Concrete	50 mm
OPSS Granular A Base	200 mm
Thermal Break	Depends on grade of insulation

Table 1-2 Pavement Structure – Access Lanes, Fire Routes and Heavy Truck Parking Areas on Podium Deck

Local Road	Thickness
12.5 Asphaltic Concrete	40 mm
19.0 Asphaltic Concrete	50 mm
OPSS Granular A Base	300 mm
Thermal Break	Depends on grade of insulation

Table 1-3 Pavement Structure – Car Only Parking Areas on Overburden

Local Road – Parking Areas	Thickness
12.5 Asphaltic Concrete	50 mm
OPSS Granular A Base	150 mm
OPSS Granular B Type II Subbase	300 mm

Table 1-4 Pavement Structure – Access Lanes, Fire Routes and Heavy Truck Parking Areas on Overburden

Local Road	Thickness
12.5 Asphaltic Concrete	40 mm
19.0 Asphaltic Concrete	50 mm
OPSS Granular A Base	150 mm
OPSS Granular B Type II Subbase	450 mm

The report contains recommendations which include but are not limited to the following:

- Pipe bedding and cover: The pipe bedding for water and pipes placed on a relatively dry, undisturbed subgrade surface should consist of at least 150 mm of OPSS Granular A material. Where the bedding is located upon silty clay the thickness of the bedding material should be increased to a minimum of 300 mm of OPSS Granular A. The bedding layer should extend to the spring line of the pipe. Cover material, from the spring line to at least 300 mm above the obvert of the pipe should consist of OPSS Granular A. The bedding and cover materials should be placed in maximum 300 mm thick lifts compacted to a minimum of 99% of the material's SPMDD.
- The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level.

2 Water Supply

2.1 Existing Conditions

As previously noted, the proposed development is located west of Bank Street and south of Dun Skipper Drive. The subject site is flanked on both the north and east sides by existing watermain. Existing 400mm diameter watermain are included in both Bank Street and Dun Skipper Drive. Both watermain fall within the City of Ottawa's pressure district Zone 4C which will provide the water supply to the site. As part of Phase 1, a 200mm watermain has been built to connect to the existing 400mm watermain in Bank Street and Dun Skipper Drive, to create a looped system to service the site.

2.2 Design Criteria

2.2.1 Water Demands

Water demands have been calculated for the development using consumption rates from Table 4.2 of the Ottawa Design Guidelines – Water Distribution. Buildings A, C and D are one or two-storey retail buildings. Building B was identified as a 4-storey hotel with an estimated 500 beds, while the proposed site plan changed to an apartment building (1-bed: 87 units; 2-bed: 36 units; 3-bed: 18 units) with commercial area on the ground floor. A summary of the water consumption rates is as follows:

• Commercial Shopping Center	2500 l/1000m ² /day
• Other Commercial	28,000 l/gross ha/day
• Residential	280 l/cap/day
• 2 Bedroom Apartment	2.1 persons/unit
• 1 Bedroom Apartment	1.4 persons/unit
• ICI Average Day Demand	28,000 l/gross ha/day
• ICI peak Daily Demand	42,000 l/gross ha/day
• ICI Peak Hour Demand	75,600 l/gross ha/day

A watermain demand calculation sheet is included in **Appendix B** and the total water demands are summarized as follows:

• Average Day	0.96 l/s
• Maximum Day	2.26 l/s
• Peak Hour	4.89 l/s

2.2.2 System Pressure

The Ottawa Design Guidelines – Water Distribution (WDG001), July 2010, City of Ottawa, Clause 4.2.2 states that the preferred practice for design of a new distribution system is to have normal operating pressures range between 345 kPa (50 psi) and 480 kPa (80 psi) under maximum daily flow conditions. Other pressure criteria identified in Clause 4.2.2 of the guidelines and Fire Underwriters Survey (FUS) 2020 are as follows:

Minimum Pressure	Minimum system pressure under peak hour demand conditions shall not be less than 276 kPa (40 psi)
Fire Flow	During the period of maximum day demand, the system pressure shall not be less than 150 kPa (22 psi) during a fire flow event.
Maximum Pressure	In accordance with the Ontario Building/Plumbing Code, the maximum pressure should not exceed 552 kPa (80 psi). Pressure reduction controls will be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

2.2.3 Fire Flow Rates

The subject site plan contains 3 storage buildings (Building A, C & D) and an apartment building with partial commercial ground floor (Building B). Calculations using the Fire Underwriter Survey (FUS) method were conducted to determine the fire flow requirement for Building 'A' in the approved Home Hardware site plan. Results of the calculations show a fire demand of 11,000 l/min (183.3 l/s) for Building 'A'. A copy of the FUS calculations is included in **Appendix B**.

The proposed Building B will fall under Group C and D, residential and commercial shops/Stores occupancy and combustibility. The sprinkler system will be designed and installed in accordance with NFPA-13 requirements. The sprinkler system will be supplied from the city water connection and the demand will be calculated using the hazard classification plus the appropriate inside/outside hose allowances.

Calculations using the Fire Underwriting Survey (FUS version 2020) were conducted to determine the fire flow requirement for the site. Results of the analysis provides a maximum fire flow rate of 10,000 l/min (166.7 l/s) for Building B. Therefore, 11,000 l/min (183.3 l/s) is used for fire flow in the hydraulic analysis. A copy of the FUS calculations is included in **Appendix B**.

2.2.4 Boundary Conditions

The City of Ottawa has provided hydraulic boundary conditions at two locations, one at the existing main on Dun Skipper Drive at the entrance to the site and the other is on the existing Bank Street main at the Bank Street entrance. Boundary conditions have been supplied for the 2019 existing conditions and for the future SUC zone reconfiguration. HGL under basic day scenario is higher in pre-SUC condition while peak hour and max day is lower. Therefore, the existing condition Max HGL is used for the basic day analysis to determine the maximum pressure as it represents the highest HGL elevation. For the peak hour and max day plus fire analysis the existing condition is used in the analysis as these represent the lowest HGL elevations. A copy of the boundary conditions is included in **Appendix B** and summarized as follows:

Table 2-1 Hydraulic Boundary Conditions – Dun Skipper Dr. (Pre-SUC Pressure Zone Reconfiguration)

Criteria	Hydraulic Head (m)	Pressure (psi)
Max HGL (Basic Day)	154.6	78.3
Peak Hour	143.9	63.1
Max Day + Fire Flow (11,000 L/m)	125.1	36.3

Ground elevation: 99.5 m

Table 2-2 Hydraulic Boundary Conditions – Bank Street (Pre-SUC Pressure Zone Reconfiguration)

Criteria	Hydraulic Head (m)	Pressure (psi)
Max HGL (Basic Day)	154.6	79.1
Peak Hour	143.9	63.9
Max Day + Fire Flow (11,000 L/m)	124.6	36.4

Ground elevation: 99.0 m

Table 2-3 Hydraulic Boundary Conditions – Dun Skipper Dr. (Post-SUC Pressure Zone Reconfiguration)

Criteria	Hydraulic Head (m)	Pressure (psi)
Max HGL (Basic Day)	147.3	67.9
Peak Hour	144.6	64.1
Max Day + Fire Flow (11,000 L/m)	140.2	57.8

Ground elevation: 99.5 m

Table 2-4 Hydraulic Boundary Conditions – Bank Street (Post-SUC Pressure Zone Reconfiguration)

Criteria	Hydraulic Head (m)	Pressure (psi)
Max HGL (Basic Day)	147.3	68.7
Peak Hour	144.3	64.5
Max Day + Fire Flow (11,000 L/m)	139.2	57.2

Ground elevation: 99.0 m

2.2.5 Hydraulic Model

A computer model for the subject site has been developed using the InfoWater Pro program by Autodesk. The model includes the existing watermain and boundary condition at Dun Skipper Drive and Bank Street.

2.3 Proposed Water Plan

2.3.1 Proposed Water Plan

In order to provide additional reliability to the system in case of a watermain break, two connections to the City's watermain system were proposed and constructed in Phase 1. One proposed connection is to the existing 400 mm watermain within the Dun Skipper Drive right of way and the other proposed connection is to the 400 mm watermain in Bank Street. The approved water plan, Drawing 119351-001 Site Servicing Plan, is included in **Appendix B**. The proposed fire hydrant layout also includes an unobstructed path of no more than 45m between the hydrant and Siamese connections as required by the Ontario Building Code. Refer to the general plan of services **Drawing C-001** for detailed watermain layout for the proposed development.

2.3.2 Hydraulic Analysis

The hydraulic model was run under basic day conditions to determine the maximum pressure for the site. The minimum pressure for the site is determined in the peak hour analysis using the provided boundary condition. The site are serviced by two connections to the existing 400 mm watermain on Dun Skipper Drive and Bank Street. All watermain are 200 mm diameter except for the 150 mm diameter stubs which services Buildings 'A', 'B' and 'D'. There are three fire hydrants, represented by nodes TH-010, TH-030 and T-150 in the model. Nodes TH-010 and TH-030 are adjacent to Buildings 'A' and 'D' with a fire demand of 11,000 l/min, which have been built in Phase 1. Node T-150 is adjacent to Buildings 'B' with a fire demand of 10,000 l/min. An existing hydrant on Dun Skipper Drive also provides fire protection to Building 'B' and is represented by Node S15-300 in the water model. Results of the analysis for the site are summarized in Section 2.3.2. Water model schematic and detailed model results are included in **Appendix B**.

The main level finished floor elevation for Building B will be approximately 100.85m. Under peak hour condition, the hydraulic head is 143.89m. The head difference to the main level is 43.04m which converts to a water pressure inside the building is 422 kPa, which exceeds the minimum requirement of 276 kPa per the City guidelines.

The minimum pressures of 276kPa are not achieved when the floor levels are higher than 14.90m under the peak hour conditions. Therefore, the pressures are not achieved at elevation 115.75m. The 5th floor elevation is approximately 114.95m and the 6th floor elevation is approximately 118.25m. The minimum pressures are not provided for levels higher than 5th floor. Therefore, booster pumps are required and shall be designed by a qualified mechanical engineer at building permit stage.

2.3.3 Modeling Results

The hydraulic model was run under basic day, maximum day with fire flows and under peak hour conditions. Results of the hydraulic model are included in **Appendix B** and summarized as follows:

• Basic Day (Max HGL) Pressure Range (kPa)	510.54 – 542.39
• Peak Hour (Min HGL) Pressure Range (kPa)	405.64 – 437.53
• Fire Flow @ 11,000 L/min Residual Pressure (kPa)	168.21 – 199.61
• Residual Pressure @ 150 kPa Available Fire Flow (l/s)	209.22 – 330.22

A comparison of the results and design criteria is summarized as follows:

Maximum Pressure	No nodes in basic day scenario exceed 552 kPa (80 psi), therefore no pressure reducing control is required for the buildings in this development.
Minimum Pressure	All nodes in the model exceed the minimum value of 276 kPa (40 psi). Considering this is a 9-storey apartment building, the water pressure at the 6 th to 9 th levels drop below the minimum pressure. Therefore, booster pumps are required for the proposed building.
Fire Flow	The minimum design fire flow under maximum day conditions with minimum system pressure of 150 kPa is 209.22 l/s for retail which exceeds the requirement of 183.3 l/s (11,000 l/min) from Section 2.3.3.

3 Wastewater Disposal

3.1 Existing Conditions

The subject site is located within the Leirtrim Development Area where sanitary flows ultimately outlet to the Leirtrim Sanitary Pumping Station. As part of the adjacent downstream developments, the outlet sanitary sewer system for the subject site was completed. A 200mm diameter sanitary sewer in Dun Skipper Drive was constructed as part of the Pathways Phase 1 project. That sewer (at MH1A) was also sized for the upstream Idone commercial lands. To service Building A (Home Hardware) in Phase 1, a 200mm diameter sanitary sewer has been built within the site. A copy of the sanitary sewer design sheet and drainage area plan for the approved overall site 119351-400 can be found in **Appendix C**.

3.2 Design Criteria

The sanitary sewers for the subject site will be based on the City of Ottawa design criteria. It should be noted that the sanitary sewer design for this study incorporates the latest City of Ottawa design parameters identified in Technical Bulletin ISTB-2018-01. Some of the key criteria will include the following:

- Average commercial flow = 28,000 l/s/ha
- Peak ICI flow factor = 1.5 if ICI area is > 20% total area
1.0 if ICI area is ≤ 20% total area
- Inflow and Infiltration Rate = 0.33 l/s/ha
- Minimum Full Flow Velocity = 0.60 m/s
- Maximum Full Flow Velocity = 3.0 m/s
- Minimum Pipe Size = 250 mm diameter (for ICI lands per OSDG)

3.3 Recommended Wastewater Plan

The on-site sanitary system will consist of a network of 200mm PVC sewers installed at normal depth and slope and will provide a single service connection to each commercial building. The sewers have been designed using the criteria noted above in Section 3.2 and outlet via a connection to the sanitary sewer (*EXMH6138A*) within the Dun Skipper Drive right of way. The Dun Skipper sanitary sewer was designed assuming 4.07 Ha of commercial lands from the subject site, including upstream Idone commercial property, with a total flow of 4.67 l/s. As noted previously, Building B was originally approved as a 500-bed hotel. The proposed new building will include less units (141 units in total) and less building area. This site generates approximately 6.23 l/s. The minor (1.56 l/s) increase in flow to MH 6138A has negligible impact on the system as it has over 76% spare capacity up to MH 6136A.

A copy of the sanitary sewer design sheet can be found in **Appendix C**. Please refer to the General Plan of Services **Drawing C-001** for further details.

4 Site Stormwater Management

4.1 Existing Conditions

The 2016 Updated Serviceability Report recommended that the subject site and the upstream Idone commercial site be serviced with a 1350 mm diameter minor storm sewer. That sewer was constructed in 2017 as part of the downstream Pathway Phase 1 development and is presently terminated near the north-east corner on the subject site.

As noted previously, the subject development will be sub phased. The first phase has been fully constructed, which include Building A, associated parking, and vehicular connection to both Bank Street and Dun Skipper Drive. A 750 mm diameter storm sewer was built near the Dun Skipper Drive driveway access, and extended throughout the site to the upstream Idone commercial site. Phase 2 will only include Building B and associated parking.

4.2 Design Criteria

IBI Group completed the municipal infrastructure design for the Pathways Phase 1 development. That design included a review of the allowable flow from the subject site including the adjacent Idone commercial property. The “Pathways” design assumed that the allowable minor storm release rate for the two commercial sites was 760 l/s and that the 1:100 year storm event would be self-contained with no overflow to adjacent properties. The emergency overflow for events greater than the 1:100 year event would be directed to Bank Street.

The stormwater system was designed following the principles of dual drainage, making accommodations for both major and minor flow.

Some of the key criteria include the following:

- Design Storm 1:2 year return (Ottawa)
- Rational Method Sewer Sizing 1:2 year return (Ottawa)
- Initial Time of Concentration 10 minutes
- Runoff Coefficients
 - Landscaped Areas C = 0.20
 - Asphalt/Concrete C = 0.90
 - Roof C = 0.90
- Pipe Velocities 0.80 m/s to 6.0 m/s
- Minimum Pipe Size 250 mm diameter
(200 mm CB Leads)

4.3 Proposed Minor System

Using the criteria identified in Section 4.2, the proposed on-site storm sewers were sized accordingly. A detailed storm sewer design sheet and the associated Storm Sewer Drainage Area plan (drawing 119351-500) for the overall site are both included in **Appendix D**. The overall Site Servicing Plan (drawing 119351-001), depicting all on-site storm sewers can be found in **Appendix A**.

The proposed minor storm sewers will range in size between 250 mm diameter and 450 mm diameter in Phase 2. The minor storm sewer outlet will be via the 750 mm diameter pipe which ultimately connects to the existing 1350 mm diameter storm sewer in Dun Skipper Drive.

The 1350 mm diameter storm sewer in Dun Skipper Drive ultimately outlets to the Findlay Creek Village SWMF. This facility provides 80% TSS removal, as such no additional on-site stormwater quality control is required within the subject lands.

A detailed storm sewer design sheet and the associated storm sewer drainage area plan is included in **Appendix D**. The General Plan of Services, depicting all on-site storm sewers can be found in **Appendix A**.

4.4 Stormwater Management

The subject site will be limited to a release rate established using the criteria described in section 4.2. This will be achieved through a combination of inlet control devices (ICD's) at inlet locations and surface storage.

Flows generated that are in excess of the site's allowable release rate will be stored on site in strategic surface storage areas or by the use of roof top storage and gradually released into the minor system so as not to exceed the site's allocation.

The maximum surface retention depth located within the developed areas will be limited to 300mm during a 1:100 year event as shown on the ponding and grading plans located in **Appendix D**.

Overland flow routes will be provided in the grading to permit emergency overland flow, in excess of the 100-year event, from the site.

At certain locations within the site, the opportunity to store runoff is limited due to grading constraints and building geometry. These locations are generally located at the perimeter of the site where it is necessary to tie into public boulevards and adjacent properties or in areas where ponding stormwater is undesirable. The area west of building D (Drainage Area MH6136), will flow uncontrolled to the Dun Skipper right-of-way. This uncontrolled area – 0.01 hectares in total, have an average C value of 0.5 (x1.25 as per City Comment). Based on 1:100 year storm uncontrolled flows, the uncontrolled areas generate 3.10 l/s runoff (refer to Section 4.5 for the calculation). Another uncontrolled area along north and east property side, adjacent to Building B (Drainage Area UNRES) – 0.05 hectares in total, have an average C value of 0.9 (x1.25, maximum 1.0 as per City Comment). Based on 1:100 year storm uncontrolled flows, the uncontrolled areas generate 24.82 l/s runoff (refer to Section 4.5 for the calculation).

The site grading and ponding has been designed to control water generated during the 1:100-year event, with no overflow leaving the site. Please refer to the SWM calculations in **Appendix D**.

4.5 Inlet Control

The allowable 2-year post-development release rate for the 2.49 Ha site can be calculated as follows:

Q_{allowable}	= 760 L/s as per IBI Pathways Phase 1 Report – EXT 4 drainage area
Total Area EXT 4	= 4.04 Ha
Subject Land share	= 62% of EXT4 release rate (2.5 Ha / 4.04 Ha = 0.62)
Q_{allowable subject land}	= 468.42 L/s

As noted in Section 4.4, the landscaped area along the west property line will drain offsite uncontrolled.

Based on a 100-year event, the flow from the 0.01 Ha uncontrolled area MH6136 can be determined as:

$$\begin{aligned}
 Q_{\text{uncontrolled}} &= 2.78 \times C \times i_{100\text{yr}} \times A \quad \text{where:} \\
 C &= \text{Average runoff coefficient of uncontrolled area} = 0.50 \\
 i_{100\text{yr}} &= \text{Intensity of 100-year storm event (mm/hr)} \\
 &= 1735.688 \times (T_c + 6.014)^{0.820} = 178.56 \text{ mm/hr; where } T_c = 10 \text{ minutes} \\
 A &= \text{Uncontrolled Area} = 0.01 \text{ Ha}
 \end{aligned}$$

Therefore, the uncontrolled release rate can be determined as:

$$\begin{aligned}
 Q_{\text{uncontrolled}} &= 2.78 \times 1.25C \times i_{100\text{yr}} \times A \\
 &= 2.78 \times 1.25 \times 0.50 \times 178.56 \times 0.01 \\
 &= 3.10 \text{ L/s}
 \end{aligned}$$

The flow from the uncontrolled area UNRES to the north and east side of Building B can be determined as:

$$\begin{aligned}
 Q_{\text{uncontrolled}} &= 2.78 \times C \times i_{100\text{yr}} \times A \\
 &= 2.78 \times 1.0 \times 178.56 \times 0.05 \\
 &= 24.82 \text{ L/s}
 \end{aligned}$$

The maximum allowable release rate from the remainder of the site can then be determined as:

$$\begin{aligned}
 Q_{\text{max allowable}} &= Q_{\text{restricted}} - Q_{\text{uncontrolled}} \\
 &= 468.42 \text{ L/s} - 3.10 \text{ L/s} - 24.82 \text{ L/s} \\
 &= 440.49 \text{ L/s}
 \end{aligned}$$

Based on the flow allowance at the various inlet locations, a combination of various sizes of inlet control devices (ICDs) were chosen for the design. The design of the inlet control devices is unique to each drainage area and is determined based on several factors, including hydraulic head and allowable release rate. The inlet control devices were sized according to the manufacturer's design charts. The restrictions will cause the on-site catch basins and manholes to surcharge, generating surface ponding in the parking and landscaped areas. Ponding locations and elevations are summarized on the Ponding Plan **Drawing C-600**, and included in **Appendix D**.

4.6 On-Site Detention

Any excess storm water up to the 100-year event is to be stored on-site to avoid surcharging the downstream municipal storm sewer system. Detention will be provided in parking and landscape areas and building rooftops, where feasible. As previously noted, the volume of storage is dependent on the characteristics of each individual drainage area and the ICDs were chosen accordingly. It should be noted that 0.30m of vertical separation has been provided from all maximum ponding elevations to lowest building openings. Stormwater management and on-site underground storage volume calculations, and manufacturers spec sheets are included in **Appendix D**.

4.6.1 Site Inlet Control

The following Table summarizes the on-site storage requirements during 1:100-year events.

Table 4-1 Post-Development Storage Summary Table

Drainage Area	ICD Structure Location	Tributary Area (Ha)	Restricted Flow (L/s)	Storage Required (m ³)	Storage Provided (m ³)		
			100-year	100-year	Surface	Underground	Total
<i>MH9/MH9B</i>	<i>MH8</i>	<i>0.14</i>	<i>10</i>	<i>44.84</i>	<i>20.64</i>	<i>10.07</i>	<i>30.71</i>
<i>MH8</i>	<i>CB1</i>	<i>0.17</i>	<i>16</i>	<i>43.02</i>	<i>50.59</i>	<i>5.58</i>	<i>56.17</i>
<i>MH5B</i>	<i>CB16</i>	<i>0.01</i>	<i>6</i>	<i>1.56</i>	<i>0.31</i>	<i>0.00</i>	<i>0.31</i>
<i>MH5A</i>	<i>CB17</i>	<i>0.09</i>	<i>9</i>	<i>25.47</i>	<i>0.84</i>	<i>5.10</i>	<i>5.94</i>
CB20	CB20	0.12	15	30.02	12.51	0.00	12.51
MH22	MH22	0.06	6	4.00	2.87	46.61	49.48
CB24	CB24	0.10	15	22.31	0.00	0.00	0.00
CB25	CB25	0.02	6	2.36	0.27	0.00	0.27
MH21	MH21	0.24	33	81.05	11.79	96.68	108.47
MH1D	CB10	0.11	45	8.77	6.81	0.00	6.81
<i>CBMH2</i>	<i>CBMH2</i>	<i>0.08</i>	<i>20</i>	<i>11.83</i>	<i>6.21</i>	<i>0.00</i>	<i>6.21</i>
<i>CBMH1C</i>	<i>CB7</i>	<i>0.08</i>	<i>30</i>	<i>7.30</i>	<i>6.97</i>	<i>0.00</i>	<i>6.97</i>
<i>CBMH1B</i>	<i>CB6</i>	<i>0.07</i>	<i>20</i>	<i>9.01</i>	<i>13.66</i>	<i>0.00</i>	<i>13.66</i>
<i>CBMH1A</i>	<i>CB5</i>	<i>0.06</i>	<i>15</i>	<i>8.87</i>	<i>3.41</i>	<i>0.00</i>	<i>3.41</i>
MH1B	CB8	0.17	47	22.66	24.90	1.60	26.5
<i>MH10A</i>	<i>CB4</i>	<i>0.03</i>	<i>6</i>	<i>5.42</i>	<i>10.62</i>	<i>0.00</i>	<i>10.62</i>
<i>MH10B</i>	<i>CBMH1</i>	<i>0.08</i>	<i>20</i>	<i>11.83</i>	<i>0.00</i>	<i>0.00</i>	<i>0</i>
MH1A	CB9	0.15	43	19.23	10.83	0.00	10.83
CBMH20	CBMH20	0.10	15	32.84	131.62	0.00	131.62
TOTAL		1.88	377	392.39	314.85	165.64	480.49

* Existing (*italic*) and future (**bold**) drainage areas are grey hatched.

4.6.2 Roof Inlet Controls

The proposed buildings will have roof inlet controls that help to control the amount of stormwater being released into the system. The restricted flow rate for the proposed building is shown below.

Table 4-2 Post-Development Roof Storage Summary Table

Roof Area	Tributary Area	100-Year Storm		
		Restricted Flow (L/s)	Required Storage (m ³)	Storage Provided (m ³)
<i>Building A</i>	<i>0.30</i>	<i>27.0</i>	<i>89.56</i>	<i>90.00</i>

Building B	0.19	20.0	52.35	57.00
Building C	0.05	8.0	10.68	13.50
Building D	0.05	8.0	10.68	11.25
TOTAL	0.62	63.0	163.27	171.75

* Existing (*italic*) and future (**bold**) drainage areas are grey hatched.

4.6.3 Overall Release Rate

As noted above, the site uses new inlet control devices to restrict the 100 year storm event to the criteria approved by the City of Ottawa. Restricted stormwater will be contained onsite by utilizing surface ponding, in structure/pipe and rooftop storage. In the 100 year event, there will be no off-site overflow.

The sum of restrictions on the site, rooftops and uncontrolled flows is 467.92 l/s (377 l/s + 63.00 l/s + 3.10 l/s + 24.82 l/s), which is less than the allowable release of 468.42 l/s noted in section 4.6.

4.7 Underground Storage

Due to the site's constraints and the stormwater management plan, underground storage was deemed the best option to contain the 100-year storm event on site. The table below summarizes underground storage, and additional information about the underground storage structures is found in **Appendix D**.

Table 4-3 Underground Storage Summary Table

Storage Name	Structure Type	Storage Provided (m ³)
MH22	Clear Stone Gallery	43.01
MH21	Stormtech SC-310 or approved equivalent Plus the storage pipe and structures	88.64

The overall site plan was approved in 2022, and 100+20% stressed test analysis was not provided. Building B follows the overall site plan design standards, and 0.3m free board are provided throughout the site. The site grading and ponding has been designed to control water generated during the 1:100-year event, with no overflow leaving the site.

As noted in Section 4.4, the 1350 mm diameter storm sewer in Dun Skipper Drive ultimately outlets to the Findlay Creek Village SWMF. This facility provides 80% TSS removal, as such no additional on-site stormwater quality control is required within the subject lands.

4.8 Interim conditions

During interim conditions, flows from future development lands at the site's southeast corner will be directed into the dry pond, including the areas from phases 1 & 2 that drain towards the future lands. The total area is calculated to be 0.57 ha, with an average C of 0.56. Refer to Interim Storm Drainage Area Plan C-501 for details. The roof

November 2024
Revised August 2025

area of the proposed Building B will be restricted to a flow rate of 20 L/s. Roof area storage is summarized in Table 4-4.

Table 4-4 Post-Development Roof Storage Summary Table

Roof Area	Tributary Area	100-Year Storm		
		Restricted Flow (L/s)	Required Storage (m ³)	Storage Provided (m ³)
Building A	0.30	27.0	89.56	90.00
Building B	0.19	20.0	52.35	57.00
TOTAL	0.49	47.0	141.91	147.00

* Building A is the existing Home Hardware building.

The permanent ICD will be installed for CBMH20, with a release rate of 15 L/s. Table 4-5 below provides detailed calculations for the storage required during interim conditions for a 100-year event. Table 4.6 summarizes the on-site storage requirements during 1:100-year events.

Table 4-5 100-Year Storage Calculation for Interim Conditions

Drainage Area	CBMH20	Interim Conditions			
Area (Ha)	0.57				
C =	0.56	Restricted Flow Q _r (L/s) =		15.00	
100-Year Ponding					
<i>T_c</i>	<i>i_{100yr}</i>	<i>Peak Flow</i>	<i>Q_r</i>	<i>Q_p-Q_r</i>	<i>Volume</i>
<i>Variable</i>		<i>Q_p=2.78xCi_{100yr}A</i>			<i>100yr</i>
<i>(min)</i>	<i>(mm/hour)</i>	<i>(L/s)</i>	<i>(L/s)</i>	<i>(L/s)</i>	<i>(m³)</i>
49	64.91	57.60	15.00	42.60	125.23
50	63.95	56.75	15.00	41.75	125.25
51	63.03	55.93	15.00	40.93	125.26
52	62.14	55.14	15.00	40.14	125.24
53	61.28	54.37	15.00	39.37	125.21
	Storage (m ³)				
	Overflow	Required	Surface	Sub-surface	Balance
	29.75	155.01	173.14	0.00	0.00

Table 4-6 Post-Development Storage Summary Table for Interim Conditions

Drainage Area	ICD Structure Location	Tributary Area (Ha)	Restricted Flow (L/s)	Storage Required (m ³)	Storage Provided (m ³)		
			100-year	100-year	Surface	Underground	Total
MH9/MH9B	MH8	0.14	10	44.84	20.64	10.07	30.71
MH8	CB1	0.17	16	43.02	50.59	5.58	56.17

November 2024
Revised August 2025

MH5B	CB16	0.01	6	1.56	0.31	0.00	0.31
MH5A	CB17	0.09	9	25.47	0.84	5.10	5.94
CB20	CB20	0.12	15	30.02	12.51	0.00	12.51
MH22	MH22	0.06	6	4.00	2.87	46.61	49.48
CB24	CB24	0.10	15	22.31	0.00	0.00	0.00
CB25	CB25	0.02	6	2.36	0.27	0.00	0.27
MH21	MH21	0.24	33	81.05	11.79	96.68	108.47
CBMH2	CBMH2	0.08	20	11.83	6.21	0.00	6.21
CBMH1C	CB7	0.08	30	7.30	6.97	0.00	6.97
CBMH1B	CB6	0.07	20	9.01	13.66	0.00	13.66
CBMH1A	CB5	0.06	15	8.87	3.41	0.00	3.41
MH10A	CB4	0.03	6	5.42	10.62	0.00	10.62
MH10B	CBMH1	0.08	20	11.83	0.00	0.00	0
CBMH20	CBMH20	0.53	15	128.26	173.14	0.00	173.14
TOTAL		1.88	242	437.15	313.83	164.04	477.87

* Existing drainage areas are grey hatched.

During interim conditions, the total restrictions on the site, rooftops and uncontrolled flows is 316.92 l/s (242 l/s + 47.00 l/s + 3.10 L/s + 24.82 l/s), which is less than the allowable release of 468.42 l/s noted in section 4.6. The interim site grading and ponding have been designed to control water generated during the 1:100-year event, with no overflow leaving the site. Interim Grading Plan C-201, Interim Storm Drainage Area Plan C-501 and Interim Ponding Plan C-601 are included in **Appendix D**.

5 Grading and Roads

5.1 Site Grading

The existing grades within portions of the proposed development lands vary significantly due to the existing topography of the site. The grading plan will require the balancing of various requirements including but not limited to geotechnical constraints, minimum/maximum slopes, overland routing of stormwater, all to ensure the site is graded in accordance with municipal and accessibility standards.

Refer to the grading plan provided in **Appendix E**.

In order to meet the stringent stormwater management criteria, every effort was made to reduce uncontrolled discharge from the site. In landscape areas where typical 2-7% grading cannot be met, 3:1 maximum terracing has been utilized to tie the proposed grading into existing.

5.2 Road Network

No public roads are proposed through the site. A minimum 9.0m wide drive aisle has been provided, as shown on the Site Plan in **Appendix A**. An internal Fire route has been shown where fire truck access is required, as determined by the site architect.

There are a total of 387 parking stalls provided, including 160 parking stalls for Building A & D, 194 for Building B and 33 for Building C. A total of 7 barrier-free parking stalls are provided for the proposed Building B.

Pedestrian access facilities are provided in the unsecured area of the site nearest to Bank Street and Dun Skipper Drive, which provide access to the building.

A bicycle parking facility has been proposed adjacent to each building entrance where feasible.

Earthbin (or similar approved type) garbage facilities have been provided throughout.

Noise attenuation features and indoor noise clause provisions will not be required for commercial use lands for road noise generated by the adjacent roads.

6 Source Controls

6.1 General

Since an end of pipe treatment facility is already provided for the development lands, stormwater site management for the subject lands will focus on site level or source control management of runoff. Such controls or mitigative measures are proposed for this development not only for final development but also during construction and build out. Some of these measures are:

- Flat site grading where possible
- Vegetation planting
- Groundwater recharge in landscaped areas

6.2 Lot Grading

Where possible, all of the proposed blocks within the development will make use of gentle surface slopes on hard surfaces such as asphalt and concrete. In accordance with local municipal standards, all grading will be between 0.5 and 5.0 percent for hard surfaces and 2.0 and 7.0 percent for all landscaped areas. Significant grade changes will be accomplished through the use of terracing (3:1 max slope), ramps and/or retaining walls. All street and parking lot catch basins shall be equipped with 3.0m subdrains on opposite sides of a curbside catch basin running parallel to the curb, and with 3.0m subdrains extending out from all 4 sides of parking lot catch basins.

6.3 Vegetation

As with most site plans, the developer will be required to complete a vegetation and planting program. Vegetation throughout the development including planting along roadsides and within the individual blocks provides opportunities to re-create lost vegetation.

6.4 Groundwater Recharge

Groundwater recharge targets have not been identified for this site. Perforated sub-drain systems will be implemented at capture locations in all vegetated areas. This will promote increased infiltration during low flow events before water is collected by the storm sewer system.

7 Conveyance Controls

7.1 Generals

Besides source controls, the development also proposes to use several conveyance control measures to improve runoff quality. These will include:

- Vegetated swales
- Catch basin sumps and manhole sumps

7.2 Catch basins and Maintenance Hole Sumps

All catch basins within the development, either rear yard or street, will be constructed with minimum 600 mm deep sumps. These sumps trap pollutants, sand, grit and debris which can be mechanically removed prior to being flushed into the minor pipe system. Both rear yard and street catch basins will be to OPSD 705.02. All storm sewer maintenance holes serving local sewers less than 900 mm diameter shall be constructed with a 300 mm sump as per City standards.

8 Sediment and Erosion Control Plan

8.1 General

During construction, existing stream and conveyance systems can be exposed to significant sediment loadings. Although construction is only a temporary situation, it is proposed to possibly introduce a number of mitigative construction techniques to reduce unnecessary construction sediment loadings. These may include:

- Until the local storm sewer is constructed, groundwater in construction trenches shall be pumped into a filter mechanism prior to release to the environment
- Vegetated swale sediment capture filter socks will remain on open surface structures such as maintenance holes and catch basins until these structures are commissioned and put into use
- Silt fence on the site perimeter will be installed

8.2 Trench Dewatering

Any trench dewatering using pumps will be discharged into a filter trap made up of geotextile filters and straw bales similar in design to the OPSD 219.240 Dewatering Trap. These will be constructed in a bowl shape with the fabric forming the bottom and the straw bales forming the sides. Any pumped groundwater will be filtered prior to release to the existing surface runoff. The contractor will inspect and maintain the filters as needed, including sediment removal and disposal and material replacement as needed. It should be noted that the contractor will be responsible for the design and management of the trap(s).

8.3 Seepage Barriers

In order to further reduce sediment loading to the stormwater management facility, seepage barriers will be installed on any surface water courses at appropriate locations that may become evident during construction. These barriers will be Light Duty Straw Bale Barriers per OPSD 219.100 and Heavy-Duty Silt Fence Barriers per OPSD 219.130; locations are shown on the Sediment and Erosion Control Plan included in **Appendix E**. They are typically made of layers of straw bales or geotextile fabric staked in place. All seepage barriers will be inspected and maintained as needed.

8.4 Surface Structure Filters

All catch basins, and to a lesser degree, manholes, convey surface water to sewers. Until streets are asphalted and curbed, all catch basins and manholes will be constructed with sediment capture inserts or equivalent located between the structure frame and cover. These will stay in place and be maintained during construction and build until it is appropriate to remove same.

9 Conclusion

This report and the accompanying working drawings clearly indicate that the proposed development meets the requirements of the stakeholder regulators, including the City of Ottawa, provincial MECP and SNC. The proposed development is in general conformance with the recommendations of both the 2016 Updated Serviceability Report and the Pathways Phase 1 design.

There is a reliable water supply available adjacent to the proposed development; a wastewater outlet is available adjacent to the site; local storm sewers have been installed adjacent to the site and an expansion to the existing Findlay Creek Village Stormwater Facility has been constructed to collect and treat runoff from the subject site.

Based on the information provided within this report, the plans prepared for the subject development can be serviced to meet City of Ottawa requirements.

Appendix A

- **Site Plan**
- **Site Servicing Plan 148290-C-001**
- **AOV Legal Plan**
- **Site Servicing Plan 119351-C-001**
- **Pre-Consultation City Comments**
- **Study and Plan Identification List**



DO NOT SCALE DRAWINGS

CHECK AND VERIFY ALL DIMENSIONS BEFORE
PROCEEDING WITH THE WORK.

DRAWINGS NOT TO BE USED FOR CONSTRUCTION
UNLESS STAMPED AND SIGNED BY THE
CONSULTANT.

THESE DRAWINGS HAVE BEEN DESIGNED IN
CONFORMANCE WITH THE ONTARIO BUILDING
CODE.

Revisions

Revision Number	Revision Date	Revision Description
1	2024-02-20	MINOR VARIANCE
2	2024-12-09	MINOR VARIANCE r1
3	2025-02-24	MINOR VARIANCE r1b
4	2025-03-07	SITE PLAN CONTROL r1
5	2025-04-24	SITE PLAN CONTROL r2
6	2025-06-03	SITE PLAN CONTROL r3
7	2025-07-16	SITE PLAN CONTROL r4

LEGEND

- SOD
- CONCRETE SIDEWALK
- ASPHALT
- FIRE HYDRANT
- FIRE DEPT. CONNECTION
- TACTILE STRIP
- D.C. DEPRESSED CURB
- ENTRANCE/EXIT
- CROSSWALK

OWNER
2688867 ONTARIO INC.
4836 BANK STREET, OTTAWA, K1X1G6

APPLICANT
ALISON CLARKE, THE STIRLING GROUP
DEVELOPMENT INITIATIVES INC
1650 PROVIDENCE CRESCENT, KINGSTON,
ON, K7P0H8



Alexander Wilson Architect Inc
Admiralty Place
103-20 Gore Street
Kingston Ontario, K7L 2L1
t: 613.545.3744 ext 213
f: 613.545.1411

Stamp

Project

**155 DUN SKIPPER DRIVE
SENIORS APARTMENTS**

155 DUN SKIPPER DRIVE

Drawing

SITE PLAN

Drawn By

AW

Checked By

-

Scale

1 : 300

Date

2025-07-16 10:12:03 AM

Project No.

2330

Revision

7

Drawing No.

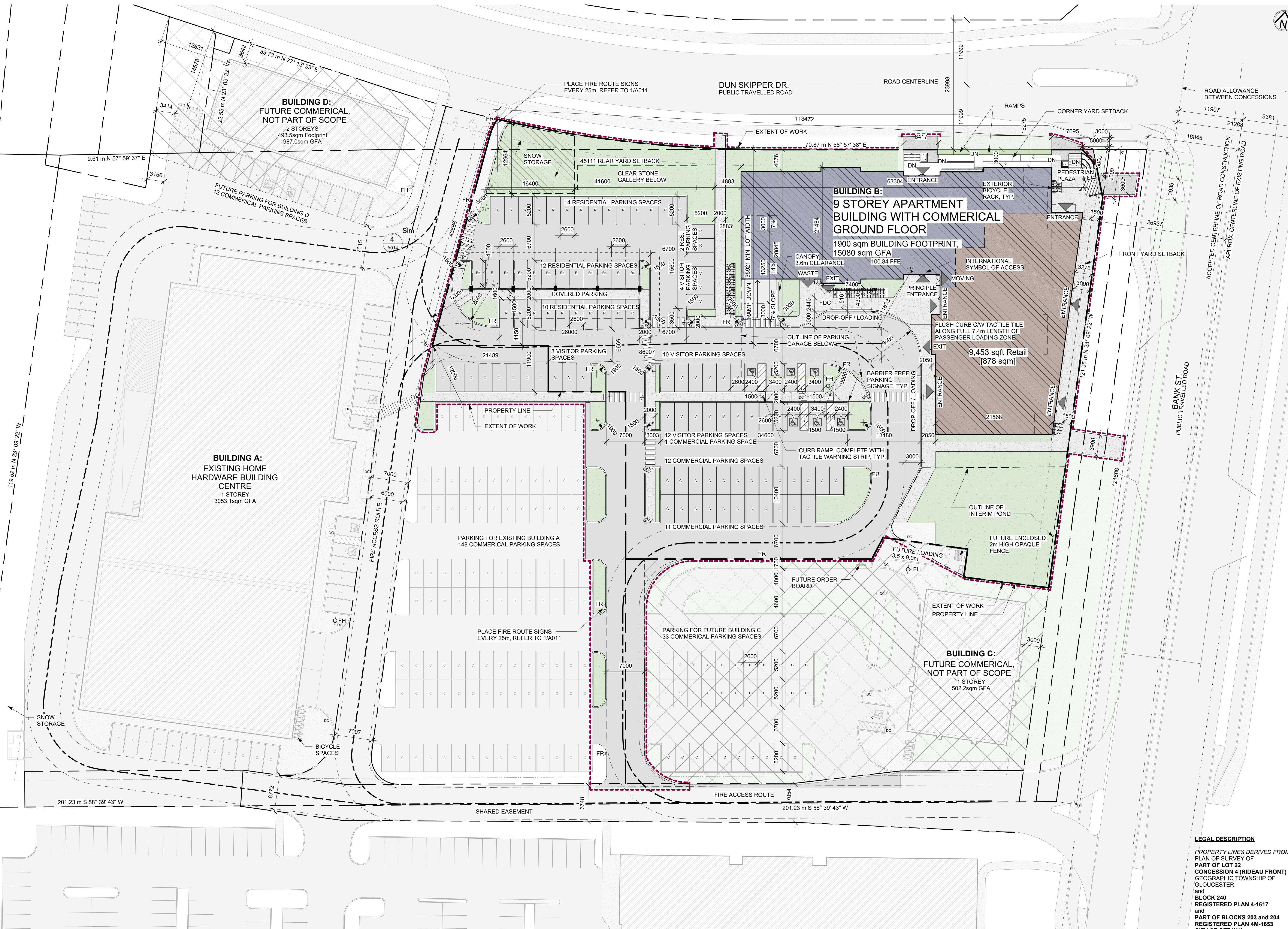
A010

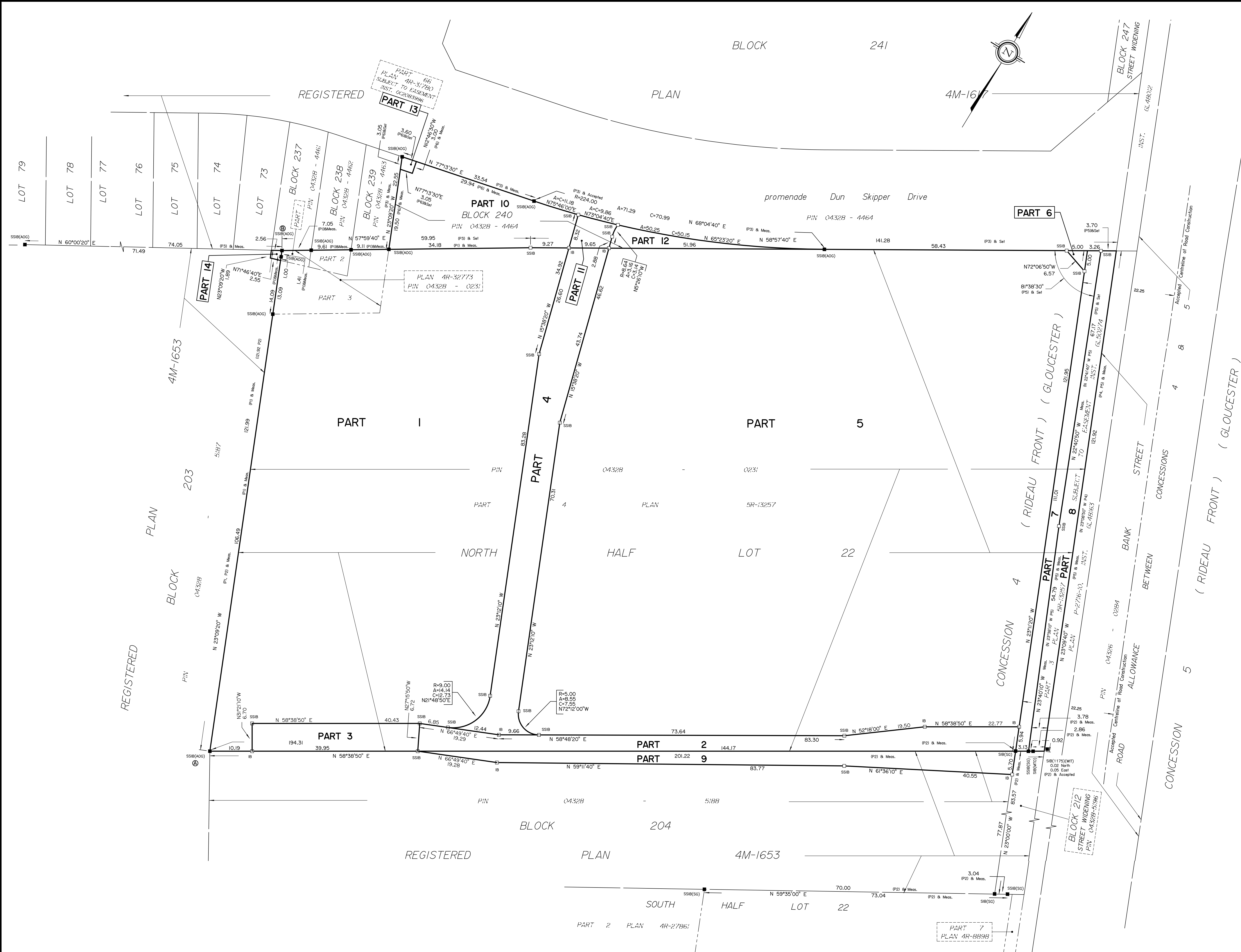
PROPERTY PIN: 043285555

APPLICATION NUMBER D07-12-24-0169
PLAN NUMBER: 19213

LEGAL DESCRIPTION

PROPERTY LINES DERIVED FROM:
PLAN OF SURVEY OF
**PART OF LOT 22
CONCESSION 4 (RIDEAU FRONT)**
GEOGRAPHIC TOWNSHIP OF
GLOUCESTER
and
**BLOCK 240
REGISTERED PLAN 4-1617**
and
**PART OF BLOCKS 203 and 204
REGISTERED PLAN 4M-1653**
CITY OF OTTAWA
BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.





1 REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT.
DATE:-----

T. HARTWICK
ONTARIO LAND SURVEYOR

PLAN 4R-
RECEIVED AND DEPOSITED
DATE:-----

REPRESENTATIVE FOR
LAND REGISTRAR FOR THE
LAND TITLES DIVISION OF
OTTAWA-CARLETON NO. 4.

SCHEDULE				
AREA (sqm)	PART	LOT / BLOCK	CONCESSION / PLAN	PIN
7621.5	1	PART OF 22	4 (RIDEAU FRONT)	ALL OF 04328-0231
647.5	2			
269.4	3			
967.7	4			
14006.8	5			
12.4	6	PART OF 204	4M-1653	PART OF 04328-5188
353.7	7			
483.2	8			
477.6	9			
653.4	10	ALL OF 240	4M-1617	ALL OF 04328-4464
66.6	11			
99.8	12			
10.0	13	PART OF 203	4M-1653	PART OF 04328-5187
5.4	14			

Part 8: Subject to easement, Inst. GL50274.
Part 13: Subject to easement, Inst. OC2083996.

PLAN OF SURVEY OF
PART OF 22
CONCESSION 4 (RIDEAU FRONT)
Geographic Townsgip of Gloucester
and
BLOCK 240
REGISTERED PLAN 4M-1617
and
PART OF BLOCKS 203 and 204
REGISTERED PLAN 4M-1653
CITY OF OTTAWA
Surveyed by Annis, O'Sullivan, Vollebakk Ltd.
Scale 1 : 400

Metric.

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

Surveyor's Certificate

I CERTIFY THAT :
1. This survey and plan are correct and in accordance with the Surveys
Act, the Surveyors Act and the Land Titles Act and the regulations
made under them.
2. The survey was completed on the ____ day of _____, 2020.

Date

T. Hartwick
Ontario Land Surveyor

Notes & Legend

Denotes

Survey Monument Planted
Survey Monument Found
Standard Iron Bar
Short Standard Iron Bar
Iron Bar
Witness
Annis, O'Sullivan, Vollebakk Ltd.
Measured
Plan 4R-32773
Registered Plan 4M-1653
Registered Plan 4M-1617
Plan 4R-29630
Plan 5R-13257
Plan 4R-31780

Distances shown on this plan are ground distances and can be converted
to grid distances by multiplying by the combined scale factor of 0.99996.

Bearings are grid, derived from Can-Net 2016 Real Time Network GPS
observations on reference points A and B, shown hereon, having a
bearing of N 23°09'20" W and are referenced to Specified Control Points
01919760735 and 01919871649, MTM Zone 9 (76°30' West Longitude)
NAD-83 (original).

For bearing comparisons, a rotation of 0°40'40" counter-clockwise was
applied to bearings on plan (P5).

Coordinates are derived from Can-Net 2016 Real Time Network GPS
observations referenced to Specified Control Points 01919760735 and
01919871649, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

Coordinate values are to urban accuracy in accordance with O. Reg. 216/10.

.01919760735 Northing 5026903.34 Easting 376968.72
.01919871649 Northing 5007189.87 Easting 372435.05
.Point A Northing 5019079.47 Easting 376200.08
.Point B Northing 5019191.65 Easting 376152.10

Cauton: Coordinates cannot, in themselves, be used to re-establish corners
or boundaries shown on this plan.

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aoi.net

Ontario
Land Surveyors

Reg. No. 18935-20 Alwd. Pl. 22, C4, R6, G, B, D7

11

Y:\2020\18935-20_Concours Gate, Suite 500\Drawings\18935-20 Alwd. Pl. 22, C4, R6, G, B, D7.dwg
Y:\2020\18935-20_Concours Gate, Suite 500\Drawings\18935-20 Alwd. Pl. 22, C4, R6, G, B, D7.dwg

Appendix B

- **Watermain Boundary Conditions**
- **Water Demand Calculations**
- **FUS Calculations**
- **Water Model Results**

Boundary Conditions 155 Dun Skipper Drive

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	58	0.97
Maximum Daily Demand	138	2.30
Peak Hour	299	4.98
Fire Flow Demand #1	11,000	183.33

Location



Results

Existing Condition (Pre- SUC Pressure Zone Reconfiguration)

Connection 1 – Dun Skipper Road

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	154.6	78.3
Peak Hour	143.9	63.1
Max Day plus Fire Flow 1	125.1	36.3
Ground Elevation =	99.5	m

Connection 1 – Bank Street

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	154.6	79.1
Peak Hour	143.9	63.9
Max Day plus Fire Flow 1	124.6	36.4
Ground Elevation =	99.0	m

Future Condition (Post- SUC Pressure Zone Reconfiguration)

Connection 1 – Dun Skipper Road

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	147.3	67.9
Peak Hour	144.6	64.1
Max Day plus Fire Flow 1	140.2	57.8
Ground Elevation =	99.5	m

Connection 1 – Bank Street

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	147.3	68.7
Peak Hour	144.3	64.5
Max Day plus Fire Flow 1	139.2	57.2
Ground Elevation =	99.0	m

Notes

1. Any connection to a watermain 400 mm or larger should be approved by DWS as per the Water Design Guidelines Section 2.4 Review by Drinking Water Services.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.



IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

WATERMAIN DEMAND CALCULATION SHEET

PROJECT : 4836 Bank Street
LOCATION : Leitrim Development Area - City of Ottawa
DEVELOPER : Leitrim Home Hardware

FILE: 119351.5.7.3
DATE PRINTED: 22-Apr-25
DESIGN: LME
PAGE : 1 OF 1

Node	Residential				Non-Residential			Average Daily Demand (l/s)			Maximum Daily Demand (l/s)			Maximum Hourly			Fire Demand (l/min)
	Units			Hotel Beds	Indtrl (ha.)	Inst. (ha.)	Retail (m²)	Res.	Non-res.	Total	Res.	Non-res.	Total	Res.	Non-res.	Total	
	1-Bed	2-Bed	3-Bed														
T-120 (Building A and D)							3,490	0.00	0.10	0.10	0.00	0.15	0.15	0.00	0.27	0.27	
T-150 (Building B Revised)	87	36	18				878	0.82	0.025	0.85	2.05	0.04	2.09	4.51	0.07	4.58	10,000
T-160 (Building C)							502	0.00	0.01	0.01	0.00	0.02	0.02	0.00	0.04	0.04	
Fire Nodes																	
TH-110, TH-030																	11,000
TH-020, TH-040																	10,000
TOTAL										0.96			2.26			4.89	

ASSUMPTIONS

RESIDENTIAL DENSITIES

1 Bedroom Units

1.4 p / p / u

2 Bedroom Units

2.1 p / p / u

3 Bedroom Units

3.1 p / p / u

AVG. DAILY DEMAND

- Hotel (Table 4.2)

225 l / cap / day

- Retail (Shopping Centre)

2,500 l / 1000m² / day

MAX. DAILY DEMAND

- Hotel (Table 4.2)

338 l / cap / day

- Retail (Shopping Centre)

3,750 l / 1000m² / day

MAX. HOURLY DEMAND

- Hotel (Table 4.2)

608 l / cap / day

- Retail (Shopping Centre)

6,750 l / 1000m² / day

FIRE FLOW

- Hotel

10,000 l / min

- Retail

11,000 l / min



ARCADIS IBI GROUP
500-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
ibigroup.com

IBI GROUP

WATERMAIN DEMAND CALCULATION SHEET
155 Dun Skipper Dr, Seniors Departments | 2668867 Ontario Inc.
148290-6.0 | Rev #2 | 2025-04-22
Prepared By: WZ | Checked By: RM

NODE	RESIDENTIAL				NON-RESIDENTIAL (ICI)			AVERAGE DAILY DEMAND (l/s)			MAXIMUM DAILY DEMAND (l/s)			MAXIMUM HOURLY DEMAND (l/s)			FIRE DEMAND (l/min)
	1 bedroom	2 bedroom	3 bedroom	POPULATION	INDUST. (ha)	COMM. (ha)	INSTIT. (ha)	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	
	UNITS	UNITS	UNITS														
<u>Building B</u>	87	36	18	253.20		0.0878		0.821	0.025	0.85	2.05	0.04	2.09	4.51	0.07	4.58	10,000
<u>TOTAL</u>	87	36	18	253.20		0.09				0.85			2.09			4.58	

ASSUMPTIONS						
POPULATION DENSITY	WATER DEMAND RATES		PEAKING FACTORS		FIRE DEMANDS	
1 Bedroom Units	1.4 persons/unit	Residential	280 l/cap/day	Maximum Daily	Single Family	10,000 l/min (166.7 l/s)
				Residential	2.5 x avg. day	
2 Bedroom Units	2.1 persons/unit			Commercial	1.5 x avg. day	
		Commercial Shopping Center	2,500 L/(1000m2)/day	Maximum Hourly	Semi Detached & Townhouse	10,000 l/min (166.7 l/s)
3 Bedroom Units	3.1 persons/unit			Residential	2.2 x max. day	
				Commercial	1.8 x max. day	Medium Density 15,000 l/min (250 l/s)

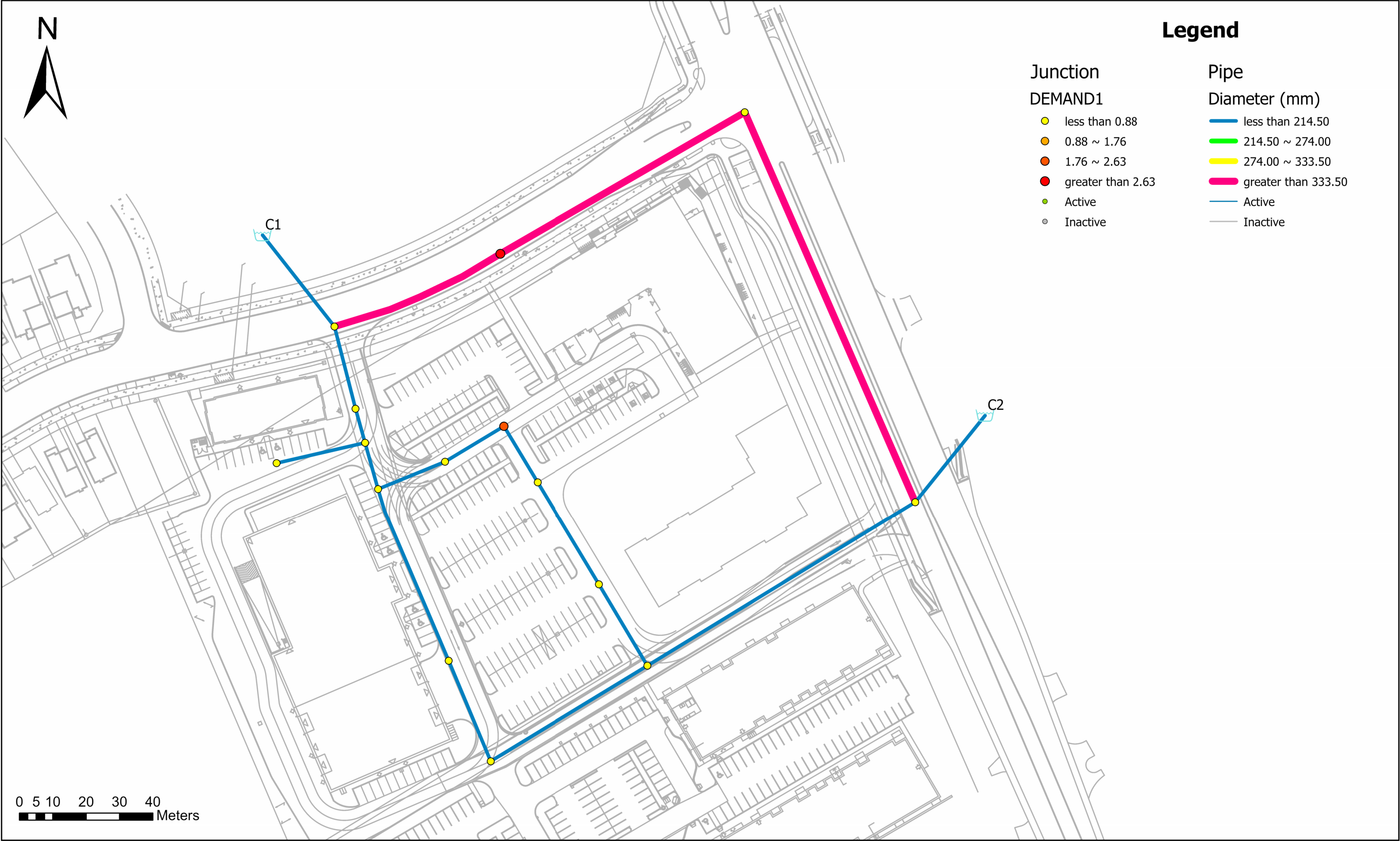
STEP	Contents	Description	Adjustment Factor	Result
1	Building A (9-storey)	1st Floor Area	1900	Height 2.8m 1 1900 m2
		2nd Floor Area	1900	Height 2.8m 1 1900 m2
		3rd Floor Area	1680	Height 2.8m 0.5 840 m2
		4th Floor Area	1680	Height 2.8m 0.5 840 m2
		5th Floor Area	1680	Height 2.8m 0.5 840 m2
		6th Floor Area	1665	Height 2.8m 0.5 833 m2
		7th Floor Area	1665	Height 2.8m 0.5 833 m2
		8th Floor Area	1665	Height 2.8m 0.5 833 m2
		9th Floor Area	1672	Height 2.8m 0.5 836 m2
Total Effective Floor Area		(Storage space exceeding 3m in height, floor area X 3) 6726.8 m2		
2	Type of Construction	Type V Wood Frame 1.5 Type III Ordinary Construction 1.0 Type II Noncombustible Construction 0.8 Type I Fire Resistive Construction 0.6	Type II Noncombustible Construction 0.8	
3	Required Fire Flow	RFF = 220C√A, rounded to nearest 1000 L/min		14000 L/min
4	Occupancy and Contents	Noncombustible Contents	-25%	Combustible - Residential/Commercial 0% 0 L/min
		Limited Combustible Contents	-15%	
		Combustible Contents	0%	
Free Burning Contents		15%		
Rapid Burning Contents		25%		
Fire Flow				14000 L/min
5	Automatic Sprinkler Protection	Automatic Sprinkler Conforming to NFPA 13	-30%	Yes -30% -4200 L/min
		Standard Water Supply for both the system and Fire Department Hose Lines	-10%	Yes -10% -1400 L/min
		Fully Supervised System	0%	No
Total Sprinkler Adjustment				-5600 L/min
6	Exposure Adjustment		Based on Table 6 Exposure Adjustment Charges for Subject Building	
	North	Separation (m)	>30	With unprotected opening 0% 0 L/min
		Length X Height Factor (m.storeys)	0	
		Construction Type	Type II	
	South	Separation (m)	21.9	With unprotected opening 10% 1400 L/min
		Length X Height Factor (m.storeys)	108	
		Construction Type	Type II	
	East	Separation (m)	>30	With unprotected opening 0% 0 L/min
Length X Height Factor (m.storeys)		0		
Construction Type		Type II		
West	Separation (m)	>30	With unprotected opening 0% 0 L/min	
	Length X Height Factor (m.storeys)	0		
	Construction Type	Type II		
Total Exposure Adjustment				1400 L/min
7	Total Required Fire Flow			9800 L/min
		Rounded to Nearest 1000 L/min		10000 L/min

167 L/s

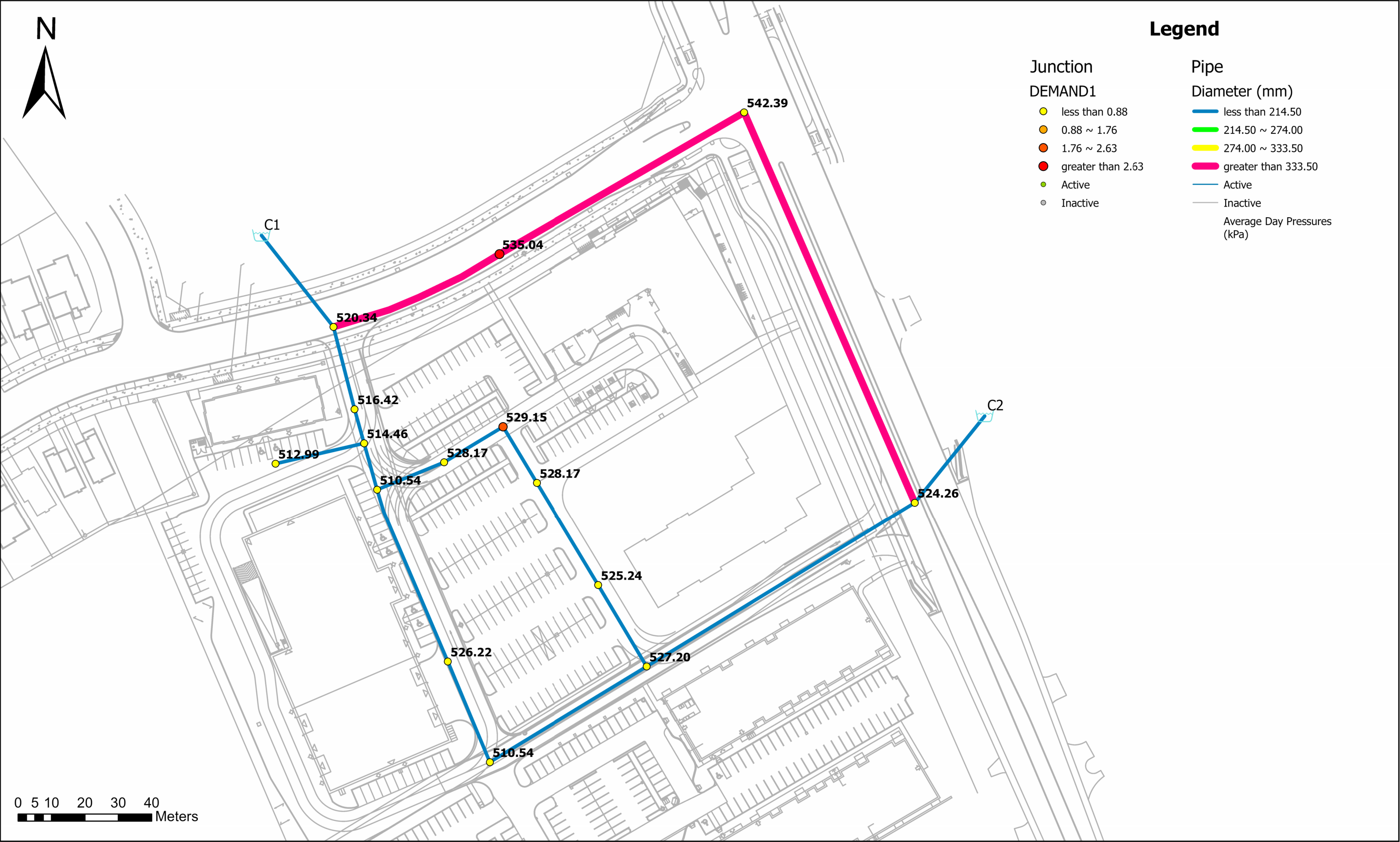
Notes 1. Fire flow calculation are based on Fire Underwriters Survey version 2020.

2. If any vertical opening in the building are unprotected (e.g. interconnected floor spaces, elevators etc.), consider the two largest adjoining floor area plus 50% of all floors immediately above them up to a maximum of eight.

Junctions and Pipes Layouts



Average Day Pressure (kPa)



Average Day Results

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)	Water Age (hrs)
1	☐	B-200	0.68	99.25	154.60	542.39	3.45
2	☐	S15-300	2.34	100.00	154.60	535.04	2.85
3	☐	T-100	0.00	101.50	154.60	520.34	0.00
4	☐	T-110	0.00	102.10	154.60	514.46	0.59
5	☐	T-120	0.10	102.25	154.60	512.99	2.02
6	☐	T-130	0.00	102.50	154.60	510.54	2.86
7	☐	T-140	0.00	102.50	154.60	510.54	13.76
8	☐	T-150	0.85	100.60	154.60	529.15	3.86
9	☐	T-160	0.01	101.00	154.60	525.24	2.85
10	☐	T-170	0.00	100.80	154.60	527.20	2.13
11	☐	T-180	0.00	101.10	154.60	524.26	0.01
12	☐	TH-010	0.00	101.90	154.60	516.42	0.42
13	☐	TH-020	0.00	100.70	154.60	528.17	3.22
14	☐	TH-030	0.00	100.90	154.60	526.22	20.65
15	☐	TH-040	0.00	100.70	154.60	528.17	3.78

Legend

Junction

DEMAND1

- less than 0.88
- 0.88 ~ 1.76
- 1.76 ~ 2.63
- greater than 2.63
- Active
- Inactive

Pipe

Diameter (mm)

- less than 214.50
- 214.50 ~ 274.00
- 274.00 ~ 333.50
- greater than 333.50

Active

Inactive

Peak Hour Pressures (kPa)

0 5 10 20 30 40 Meters

N

C1

C2

437.53

430.18

415.48

411.54

409.57

408.10

423.27

424.23

423.26

405.64

420.33

421.32

422.30

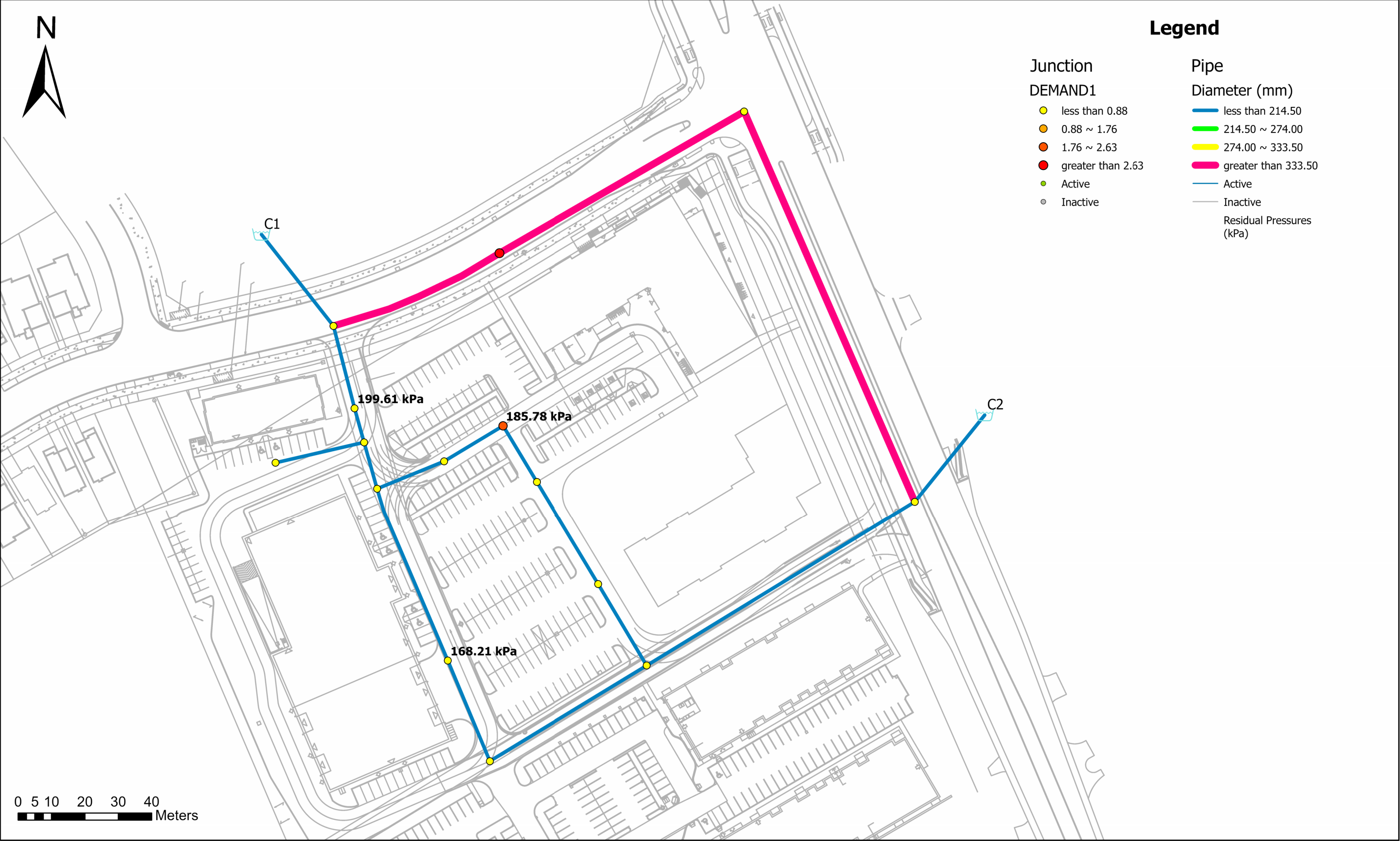
405.64

419.40

Peak Hour Results

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)	Water Age (hrs)
1	☐	B-200	1.02	99.25	143.90	437.53	1.41
2	☐	S15-300	6.31	100.00	143.90	430.18	1.20
3	☐	T-100	0.00	101.50	143.90	415.48	0.00
4	☐	T-110	0.00	102.10	143.90	409.57	0.12
5	☐	T-120	0.27	102.25	143.90	408.10	0.64
6	☐	T-130	0.00	102.50	143.90	405.65	0.66
7	☐	T-140	0.00	102.50	143.90	405.65	4.50
8	☐	T-150	4.58	100.60	143.89	424.23	0.81
9	☐	T-160	0.04	101.00	143.89	420.33	0.56
10	☐	T-170	0.00	100.80	143.90	422.30	0.42
11	☐	T-180	0.00	101.10	143.90	419.40	0.00
12	☐	TH-010	0.00	101.90	143.90	411.54	0.08
13	☐	TH-020	0.00	100.70	143.89	423.27	0.73
14	☐	TH-030	0.00	100.90	143.90	421.32	6.91
15	☐	TH-040	0.00	100.70	143.89	423.26	0.73

Max day + Fire Flow



Max Day + Fire Flow Results

		ID	Static Demand (L/s)	Static Pressure (kPa)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (kPa)	Hydrant Available Flow (L/s)	Hydrant Pressure at Available Flow (kPa)
1	☐	T-150	2.09	237.93	124.88	166.67	185.80	224.35	150.0
2	☐	TH-010	0.00	226.12	124.98	183.33	199.62	330.25	150.0
3	☐	TH-030	0.00	235.02	124.88	183.33	168.23	209.24	150.0

Max Day + Fire Flow - Piper Report

		ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	Water Age (hrs)
1	☐	2107	S15-300	B-200	84.75	393.00	120.00	83.06	0.68	0.12	0.02
2	☐	791	B-200	T-180	127.53	393.00	120.00	82.38	0.68	0.18	0.06
3	☐	P13	T-100	TH-010	25.45	204.00	110.00	18.24	0.56	0.06	0.00
4	☐	P15	TH-010	T-110	10.56	204.00	110.00	18.24	0.56	0.03	0.01
5	☐	P17	T-110	T-120	27.22	155.00	100.00	0.15	0.01	0.00	0.02
6	☐	P19	T-130	T-110	14.44	204.00	110.00	-18.09	0.55	0.03	0.02
7	☐	P21	T-130	TH-020	21.69	204.00	110.00	10.01	0.31	0.02	0.03
8	☐	P23	T-130	TH-030	55.80	204.00	110.00	8.08	0.25	0.03	0.03
9	☐	P25	TH-030	T-140	32.64	204.00	110.00	8.08	0.25	0.02	0.09
10	☐	P27	T-150	TH-020	20.64	204.00	110.00	-10.01	0.31	0.02	0.04
11	☐	P29	TH-040	T-150	19.63	204.00	110.00	-7.92	0.24	0.01	0.06
12	☐	P31	TH-040	T-160	35.83	204.00	110.00	7.92	0.24	0.02	0.09
13	☐	P33	T-160	T-170	28.39	204.00	110.00	7.90	0.24	0.01	0.13
14	☐	P35	T-140	T-170	55.09	204.00	110.00	8.08	0.25	0.03	0.12
15	☐	P39	T-170	T-180	94.13	204.00	110.00	15.98	0.49	0.18	0.17
16	☐	P41	T-100	S15-300	54.54	393.00	120.00	86.57	0.71	0.08	0.00
17	☐	P43	C2	T-180	1.00	204.00	110.00	-98.36	3.01	0.06	0.13
18	☐	P45	C1	T-100	1.00	204.00	110.00	104.81	3.21	0.06	0.00

Appendix C

- **Sanitary Sewer Design Sheet**
- **Sanitary Drainage Area Plan 148290-C-400**
- **Sanitary Sewer Design Sheet 119351**
- **Sanitary Drainage Area Plan 119351-C-400**



155 Dun Skipper Drive
City of Ottawa
2668867 Ontario Inc

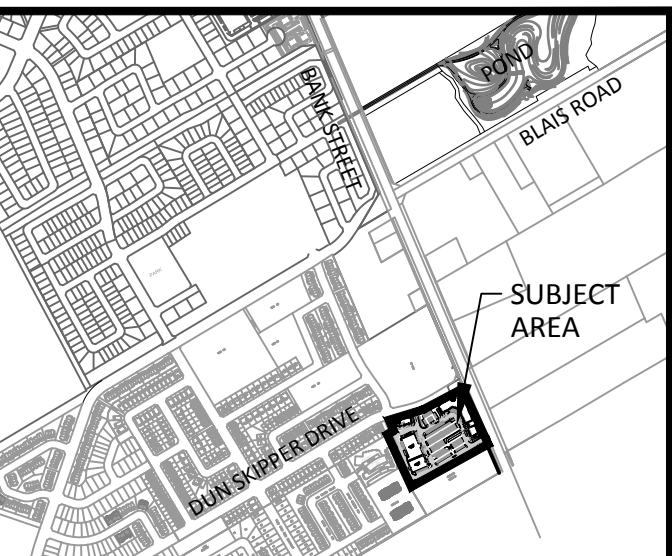
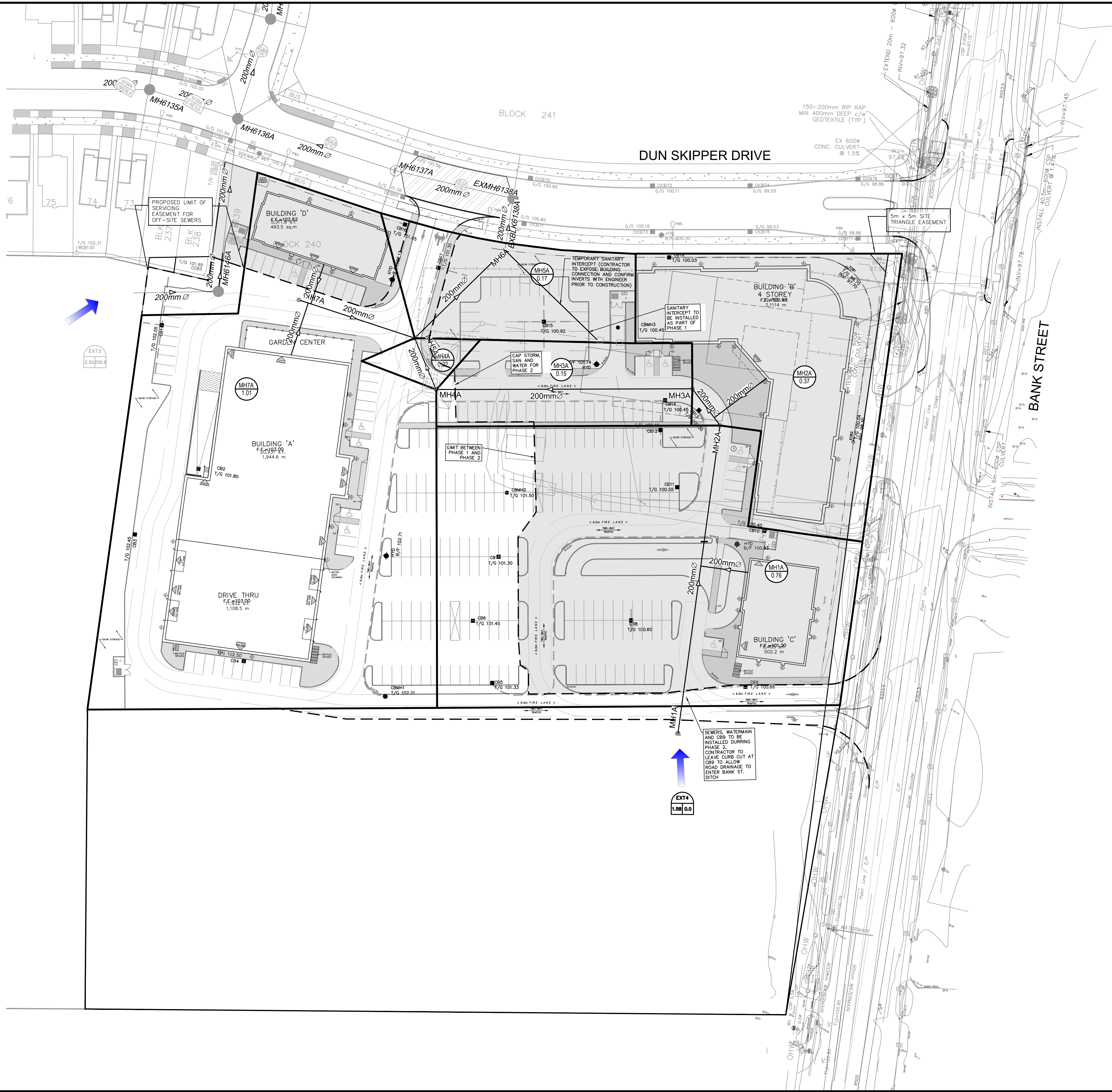
[https://arcadiso365.sharepoint.com/sites/148290/Internal Documents/6.0_Technical/6.04_Civil/04_Design-Analysis/Submission#3/CCS_148290_119351 SanitarySewer Design_2025-02-18](https://arcadiso365.sharepoint.com/sites/148290/Internal%20Documents/6.0_Technical/6.04_Civil/04_Design-Analysis/Submission#3/CCS_148290_119351_SanitarySewer_Design_2025-02-18)



4836 Bank Street
CITY OF OTTAWA
Home Hardware

J:\119351_4836BankSt\5.7 Calculations\5.7.1 Sewers & Grading\CCS_SanitarySewer Design_2019-04-15

\\11351_4338\dwg\53.9 Drawings\Sanitary\Sanitary-FULL.CDW Plot Scale: 1:25.4 Printed At: 6/27/2020 7:28 AM Last Saved By: alvino Last Saved At: Jun 23, 20



KEY PLAN (NTS)

- NOTES:**
- SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
 - SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR H.A. KEN SHIPMAN SURVEYING LTD.

- LEGEND :**
- 6115A
0.81/43.2
EXISTING AREA NUMBER
EXISTING POPULATION
EXISTING AREA IN HECTARES
 - FUTURE FLOW DIRECTION
 - MH2A
0.37
EXISTING AREA NUMBER
EXISTING AREA IN HECTARES
 - MH2A
0.37
AREA NUMBER
AREA IN HECTARES

14			
13			
12			
11			
10			
9			
8			
7			
6			
5	ADD PHASING	JIM	2020-06-23
4	REVISED AS PER CITY COMMENTS	JIM	2020-04-20
3	REVISED AS PER CITY COMMENTS	JIM	2019-12-09
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	JIM	2019-10-11
1	ISSUED FOR SPA	JIM	2019-04-15
No.	REVISIONS	By	Date

IBI GROUP
400 – 333 Preston Street
Oshawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

BANK STREET DEVELOPMENT

4836 BANK STREET

Drawing Title

SANITARY DRAINAGE AREA PLAN

Scale
1 : 500

Design	SEL	Date	FEB. 2019
Drawn	DPS	Checked	JIM
Project No.	119351	Drawing No.	400

Appendix D

- **Storm Sewer Design Sheet**
- **Storm Water Management Sheet**
- **Storm Drainage Area Plan 148290-C-500**
- **Interim Storm Drainage Area Plan 148290-C-501**
- **Ponding Plan 148290-C-600**
- **Interim Ponding Plan 148290-C-601**
- **Stormtech Underground Chamber Specifications**
- **Orifice Sizing Calculations**
- **As-built Design Sheets 119351 & 137175 Pathways Block 204**
- **Storm Water Management Sheet 119351**
- **Storm Drainage Area Plan 119351-C-500**
- **Ponding Plan 119351-C-600**



IBI GROUP
400-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

STORM SEWER DESIGN SHEET

155 Dun Skipper Drive
City of Ottawa
2668867 Ontario Inc.

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW														SEWER DATA										
STREET	AREA ID	FROM	TO	C= 0.25	C= 0.30	C= 0.40	C= 0.50	C= 0.55	C= 0.65	C= 0.81	C= 0.75	C= 0.90	C= 1.00	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (2) (mm/hr)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	2yr PEAK FLOW (L/s)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm)			SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (2yr)		
																															DIA	W	H					
EXISTING PHASE 1	MH9	CB3	MH9-MH8								0.12			0.25	0.25	10.00	0.11	10.11	76.81	104.19	122.14	178.56	19.22	26.07	30.56	44.68		19.22	34.22	6.73	200				1.00	1.055	15.00	43.84%
	MH9B	CB2	MH9-MH8									0.02		0.05	0.05	10.00	0.12	10.12	76.81	104.19	122.14	178.56	3.84	5.21	6.11	8.94		3.84	34.22	7.69	200				1.00	1.055	30.37	88.77%
		MH9	MH8											0.00	0.30	10.12	0.64	10.76	76.34	103.56	121.39	177.46	22.92	31.09	36.45	53.28		22.92	158.48	53.17	375				0.75	1.390	135.56	85.54%
	MH8	CB1	MH8-MH7								0.17			0.35	0.35	10.00	0.17	10.17	76.81	104.19	122.14	178.56	27.22	36.93	43.29	63.29		27.22	34.22	10.80	200				1.00	1.055	6.99	20.44%
		MH8	MH7											0.00	0.65	10.76	0.45	11.21	74.01	100.35	117.61	171.91	48.45	65.70	77.00	112.55		48.45	48.63	26.20	250				0.61	0.960	0.18	0.36%
	MH7	BLDG D	MH7-MH5										0.05	0.13	0.13	10.00	0.20	10.20	76.81	104.19	122.14	178.56	9.61	13.03	15.28	22.34		9.61	34.22	12.60	200				1.00	1.055	24.61	71.92%
	MH7A	BLDG A	MH7-MH5									0.30		0.75	0.75	10.00	0.18	10.18	76.81	104.19	122.14	178.56	57.65	78.21	91.68	134.03		57.65	62.04	12.97	250				1.00	1.224	4.39	7.07%
		MH7	MH5											0.00	1.53	11.21	0.47	11.68	72.44	98.19	115.07	168.17	110.86	150.27	176.11	257.37		110.86	225.20	38.55	450				0.57	1.372	114.34	50.77%
	MH10A	CB4	MH10-CBMH1										0.03	0.08	0.08	10.00	0.12	10.12	76.81	104.19	122.14	178.56	5.76	7.82	9.17	13.40		5.76	34.22	7.78	200				1.00	1.055	28.45	83.15%
	MH10B	MH10	CBMH1										0.08	0.20	0.28	10.12	0.71	10.83	76.34	103.55	121.38	177.44	21.01	28.50	33.41	48.84		21.01	49.16	41.40	250				0.63	0.970	28.16	57.27%
	CBMH1A	CB5	CBMH1-CBMH2									0.06	0.15	0.15	10.00	0.36	10.36	76.81	104.19	122.14	178.56	11.53	15.64	18.34	26.81		11.53	34.22	22.72	200				1.00	1.055	22.69	66.30%	
	CBMH1B	CB6	CBMH1-CBMH2									0.07	0.18	0.18	10.00	0.15	10.15	76.81	104.19	122.14	178.56	13.45	18.25	21.39	31.27		13.45	34.22	9.78	200				1.00	1.055	20.76	60.69%	
	CBMH1C	CB7	CBMH1-CBMH2									0.08	0.20	0.20	10.00	0.15	10.15	76.81	104.19	122.14	178.56	15.37	20.86	24.45	35.74		15.37	34.22	9.59	200				1.00	1.055	18.84	55.07%	
		CBMH1	CBMH2										0.00	0.80	10.83	0.81	11.64	73.74	99.98	117.18	171.28	59.04	80.05	93.82	137.13		59.04	65.96	63.25	250				1.13	1.302	6.92	10.49%	
	CBMH2	CBMH2	MH4									0.08	0.20	1.00	11.64	0.70	12.34	71.02	96.24	112.78	164.81	71.08	96.32	112.87	164.94		71.08	58.89	33.75	300				0.34	0.807	-12.19	-20.70%	
PHASE 2	MH22	CB23	MH22	0.06										0.04	0.04	10.00	0.08	10.08	76.81	104.19	122.14	178.56	3.20	4.34	5.09	7.45		3.20	34.22	5.20	200				1.00	1.055	31.01	90.64%
		CB20	CB20	MH22-MH20									0.12	0.30	0.30	10.00	0.06	10.06	76.81	104.19	122.14	178.56	23.06	31.28	36.67	53.61		23.06	34.22	3.93	200				1.00	1.055	11.16	32.61%
		MH22	MH20											0.00	0.34	10.08	0.64	10.72	76.49	103.76	121.63	177.81	26.16	35.48	41.59	60.80		26.16	59.68	31.32	300				0.35	0.818	33.53	56.18%
	ROOF B	BLDG B	MH20									0.19	0.48	0.48	10.00	0.08	10.08	76.81	104.19	122.14	178.56	36.51	49.53	58.06	84.88		36.51	62.04	6.06	250				1.00	1.224	25.53	41.15%	
	MH21-1	CB21	MH23										0.12	0.30	0.30	10.00	0.14	10.14	76.81	104.19	122.14	178.56	23.06	31.28	36.67	53.61		23.06	34.22	9.04	200				1.00	1.055	11.16	32.61%
	MH21-2	CB22	MH23-MH21										0.12	0.30	0.30	10.00	0.05	10.05	76.81	104.19	122.14	178.56	23.06	31.28	36.67	53.61		23.06	34.22	3.16	200				1.00	1.055	11.16	32.61%
		MH23	U/G Chamber											0.00	0.60	10.14	0.11	10.26	76.26	103.44	121.26	177.26	45.79	62.12	72.81	106.44		45.79	59.68	5.63	300				0.35	0.818	13.89	23.27%
		U/G Chamber	MH21											0.00	0.60	10.26	0.06	10.32	75.83	102.85	120.56	176.24	45.53	61.76	72.40	105.83		45.53	59.68	2.99	300				0.35	0.818	14.15	23.71%
		MH21	MH20											0.00	0.60	10.26	0.35	10.61	75.83	102.85	120.56	176.24	45.53	61.76	72.40	105.83		45.53	59.68	17.25	300				0.35	0.818	14.15	23.71%
		MH20	MH3											0.00	1.42	10.72	0.23	10.95	74.15	100.54	117.83	172.23	105.12	142.54	167.06	244.19		105.12	175.96	15.01	450				0.35	1.072	70.84	40.26%
	CB24	CB24	MH3-MH4									0.10	0.25	0.25	10.00	0.02	10.02	76.81	104.19	122.14	178.56	19.22	26.07	30.56	44.68		19.22	34.22	1.08	200				1.00	1.055	15.00	43.84%	
	CBMH20	CBMH20	MH1-MH3		0.10									0.08	0.08	10.00	1.19	11.19	76.81	104.19	122.14	178.56	6.41	8.69	10.19	14.89		6.41	59.68	58.53	300				0.35	0.818	53.28	89.27%
	ROOF C, MH1B	BLDG C	MH1-MH3									0.16	0.40	0.40	10.00	0.68</																						



155 Dun Skipper Drive
City of Ottawa
2668867 Ontario Inc.

https://arcadis365.sharepoint.com/sites/148290/Internal Documents/6.0 Technical/6.04 Civil/04 Design-Analysis/Submission#3/CCS_148290_119351 Interim StormSewer Design 2025-04-22 2025-04-22 11:13 AM



IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

PROJECT: 155 Dun Skipper
DATE: 2025-04-22
FILE: 148590-6.04.04
REV #: 3
DESIGNED BY: WZ
CHECKED BY: RM

STORMWATER MANAGEMENT

Formulas and Descriptions

$i_{2yr} = 1:2 \text{ year Intensity} = 732.951 / (T_c + 6.199)^{0.810}$
 $i_{5yr} = 1:5 \text{ year Intensity} = 998.071 / (T_c + 6.053)^{0.814}$
 $i_{100yr} = 1:100 \text{ year Intensity} = 1735.688 / (T_c + 6.014)^{0.820}$
 T_c = Time of Concentration (min)
 C = Average Runoff Coefficient
 A = Area (Ha)
 Q = Flow = $2.78CIA$ (L/s)

Maximum Allowable Release Rate

Restricted Flowrate

Taken from City of Ottawa approved Design Brief "Pathways at Findlay Creek" (D07-16-13-0023) drainage area EXT 4

EXT 4 Release Rate	760.00 L/s
Area EXT 4 TOTAL =	4.04 Ha
Area Subject Lands	2.49
Percentage Share of release rate	62%

$Q_{TOTAL} =$	468.42 L/s
---------------	------------

Uncontrolled Release ($Q_{uncontrolled} = 2.78 \cdot C \cdot i_{100yr} \cdot A_{uncontrolled}$)

For Drainage Area **MH6136**

$C =$	0.625
$T_c =$	10 min
$i_{100yr} =$	178.56 mm/hr
$A_{uncontrolled} =$	0.01 Ha

$Q_{uncontrolled} =$	3.10 L/s
----------------------	----------

Uncontrolled Release ($Q_{uncontrolled} = 2.78 \cdot C \cdot i_{100yr} \cdot A_{uncontrolled}$)

For Drainage Area **UNRES**

$C =$	1.00
$T_c =$	10 min
$i_{100yr} =$	178.56 mm/hr
$A_{uncontrolled} =$	0.05 Ha

$Q_{uncontrolled} =$	24.82 L/s
----------------------	-----------

Maximum Allowable Release Rate ($Q_{max \text{ allowable}} = Q_{restricted} - Q_{uncontrolled}$)

$Q_{max \text{ allowable}} =$	440.49 L/s
-------------------------------	------------

MODIFIED RATIONAL METHOD (100-Year & 5-Year Ponding & 2-Year Ponding)

Drainage Area		MH9/MH9B		Drainage Area Plan - MH9/MH9B	
Area (Ha)		0.14		Restricted Flow Q _r (L/s)= 10.00	
C =		0.98			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
30	91.87	34.86	10.00	24.86	44.75
32	87.89	33.35	10.00	23.35	44.83
33	86.03	32.65	10.00	22.65	44.84
34	84.27	31.98	10.00	21.98	44.83
36	80.96	30.72	10.00	20.72	44.76

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	44.84	20.64	10.07	14.13

Length (m)	Dia (m)	Area (m ²)	Volume (m ³)
54.91	0.375	0.110	6.06
6.73	0.200	0.21	0.21
7.69	0.200	0.031	0.24
			6.51

overflows to: CB1

Drainage Area		CB1	Drainage Area Plan - MH8			
Area (Ha)		0.17	Restricted Flow Q _r (L/s)= 16.00			
C =		0.94				
100-Year Ponding						
T _c Variable (min)	I _{100yr} (mm/hour)	Peak Flow Q _p =2.76xCI _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)	
21	116.30	50.01	16.00	34.01	42.85	
23	109.68	47.17	16.00	31.17	43.01	
24	106.68	45.87	16.00	29.87	43.02	
25	103.85	44.66	16.00	28.66	42.99	
27	98.66	42.43	16.00	26.43	42.81	

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
14.13	57.15	50.59	5.58	0.98

Length (m)	Dia (m)	Area (m ²)	Volume (m ³)
31.00	0.450	0.159	4.93
			4.93

overflows to: CB17

Drainage Area		CB16	Drainage Area Plan - MH5B			
Area (Ha)		0.010	Restricted Flow Q _r (L/s)= 6.00			
C =		0.38				
100-Year Ponding						
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)	
-6	57497.20	599.41	16.00	583.41	-210.03	
-4	977.56	10.19	16.00	-5.81	1.39	
-3	702.38	7.32	16.00	-8.68	1.56	
-2	555.31	5.79	16.00	-10.21	1.23	
0	398.62	4.16	16.00	-11.84	0.00	

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	1.56	0.31	0.00	1.25

overflows to: CB17

Drainage Area		CB17		Drainage Area Plan - MH5A	
Area (Ha)		0.090			
C =		1.00	Restricted Flow Q _r (L/s)=		9.00
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
22	112.88	28.24	9.00	19.24	25.40
24	106.68	26.69	9.00	17.69	25.47
25	103.85	25.98	9.00	16.98	25.47
26	101.18	25.32	9.00	16.32	25.45
28	96.27	24.09	9.00	15.09	25.35

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
2.24	27.71	0.84	5.10	21.77

Length (m)	Dia (m)	Area (m ²)	Volume (m ³)
28.00	0.450	0.159	4.45
			4.45

overflows to: MH22

Drainage Area MH9/MH9B		5-Year Ponding				
Area (Ha)	0.14	Restricted Flow Q _r (L/s)= 10.00				
C =	0.78					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)	
13	90.63	27.51	10.00	17.51	13.66	
15	83.56	25.37	10.00	15.37	13.83	
16	80.46	24.43	10.00	14.43	13.85	
17	77.61	23.56	10.00	13.56	13.83	
19	72.53	22.02	10.00	12.02	13.70	

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	13.85	20.64	10.07	0.00

Structure	Depth	Area (m ²)	Volume (m ³)
CB3 (600mm x 600mm)	1.80	0.36	0.65
CB2 (600mm x 600mm)	1.80	0.36	0.65
CBMH10 (1200mm round)	2.00	1.13	2.26
			3.56

overflows to: CB1

Drainage Area CB1		5-Year Ponding				
Area (Ha)	0.17	Restricted Flow Q _r (L/s)= 16.00				
C =	0.75					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)	
7	123.30	42.42	16.00	26.42	11.10	
9	109.79	37.77	16.00	21.77	11.76	
10	104.19	35.85	16.00	19.85	11.91	
11	99.19	34.12	16.00	18.12	11.96	
13	90.63	31.18	16.00	15.18	11.84	

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	11.91	50.59	5.58	0.00

Structure	Depth	Area (m ²)	Volume (m ³)
CB3 (600mm x 600mm)	1.80	0.36	0.65
			0.65

overflows to: CB17

Drainage Area CB16		5-Year Ponding				
Area (Ha)	0.010	Restricted Flow Q _r (L/s)= 6.00				
C =	0.30					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)	
7	123.30	1.03	6.00	-4.97	-2.09	
9	109.79	0.92	6.00	-5.08	-2.75	
10	104.19	0.87	6.00	-5.13	-3.08	
11	99.19	0.83	6.00	-5.17	-3.41	
13	90.63	0.76	6.00	-5.24	-4.09	

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	-3.08	0.31	0.00	0.00

overflows to: CB17

Drainage Area CB17		5-Year Ponding				
Area (Ha)	0.090	Restricted Flow Q _r (L/s)= 9.00				
C =	0.90					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)	
10	104.19	23.46	9.00	14.46	8.88	
12	94.70	21.32	9.00	12.32	8.87	
13	90.63	20.41	9.00	11.41	8.90	
14	86.93	19.58	9.00	10.58	8.88	
16	80.46	18.12	9.00	9.12	8.75	

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	8.90	0.84	5.10	2.96

Structure	Depth	Area (m ²)	Volume (m ³)
CB3 (600mm x 600mm)	1.80	0.36	0.65
			0.65

overflows to: MH22

Drainage Area MH9/MH9B		2-Year Ponding				
Area (Ha)	0.140	Restricted Flow Q _r (L/s)= 10.00				
C =	0.78					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)	
10	76.81	23.32	10.00	13.32	7.99	
11	73.17	22.21	10.00	12.21	8.06	
12	69.89	21.22	10.00	11.22	8.08	
13	66.93	20.32	10.00	10.32	8.05	
15	61.77	18.75	10.00	8.75	7.88	

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	8.08	20.64	10.07	0.00

overflows to: CB1

Drainage Area CB1		2-Year Ponding				
Area (Ha)	0.165	Restricted Flow Q _r (L/s)= 16.00				
C =	0.75					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)	
7	90.66	31.19	16.00	15.19	6.38	
9	80.87	27.82	16.00	11.82	6.38	
10	76.81	26.42	16.00	10.42	6.25	
11	73.17	25.17	16.00	9.17	6.05	
13	66.93	23.03	16.00	7.03	5.48	

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	6.25	50.59	5.58	0.00

overflows to: CB17

Drainage Area		CB16				
Area (Ha)		0.010				
C =		0.30	Restricted Flow Q _r (L/s)= 6.00			
2-Year Ponding						
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)	
7	90.66	0.76	6.00	-5.24	-2.20	
9	80.87	0.67	6.00	-5.33	-2.88	
10	78.81	0.64	6.00	-5.36	-3.22	
11	73.17	0.61	6.00	-5.39	-3.56	
13	66.93	0.56	6.00	-5.44	-4.24	

Drainage Area		CB20			
Area (Ha)	0.120	Restricted Flow Q _r (L/s)= 15.00			
C =	1.00				
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
17	132.63	44.24	15.00	29.24	29.83
19	123.87	41.32	15.00	26.32	30.01
20	119.95	40.02	15.00	25.02	30.02
21	116.30	38.80	15.00	23.80	29.98
23	109.68	36.59	15.00	21.59	29.79
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	30.02	12.51	0.00	17.51	

overflows to: MH22

Drainage Area		MH22			
Area (Ha)	0.060	Restricted Flow ICD Actual (L/s)= 6.00			
C =	0.31	Restricted Flow Q _r for swm calc (L/s)= 3.00			
50% reduction for sub-surface storage					
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p =2.78xCl _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
13	155.11	8.08	3.00	5.08	3.97
14	148.72	7.75	3.00	4.75	3.99
15	142.89	7.45	3.00	4.45	4.00
16	137.55	7.17	3.00	4.17	4.00
18	128.08	6.68	3.00	3.68	3.97
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
39.28	43.28	2.87	46.61	0.00	
Length (m)	Dia (m)	Area (m ²)	Volume (m ³)		
33.40	0.250	0.049	1.64		
23.23	0.300	0.071	1.64		
		TOTAL	3.28		

overflows to: Dun Skipper Drive

Drainage Area		CB24			
Area (Ha)	0.100				
C =	1.00	Restricted Flow Q _r (L/s)= 15.00			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
13	155.11	43.12	15.00	28.12	21.93
15	142.89	39.72	15.00	24.72	22.25
16	137.55	38.24	15.00	23.24	22.31
17	132.63	36.87	15.00	21.87	22.31
19	123.87	34.44	15.00	19.44	22.16
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	22.31	0.00	0	22.31	
overflows to: MH21					

overflows to: MH21

Drainage Area		CB25			
Area (Ha)	0.020				
C =	1.00	Restricted Flow Q _r (L/s)= 6.00			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p =2.78xCI _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
8	199.20	11.08	6.00	5.08	2.44
9	188.25	10.47	6.00	4.47	2.41
10	178.56	9.93	6.00	3.93	2.36
11	169.91	9.45	6.00	3.45	2.27
13	155.11	8.62	6.00	2.62	2.05
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	2.36	0.27	0.00	2.09	
overflows to: MH21					

overflows to: MH21

Drainage Area		CB20			
Area (Ha)	0.120	Restricted Flow Q _r (L/s)= 15.00			
C =	0.90				
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78x C i _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
7	123.30	37.02	15.00	22.02	9.25
9	109.79	32.96	15.00	17.96	9.70
10	104.19	31.28	15.00	16.28	9.77
11	99.19	29.78	15.00	14.78	9.76
13	90.63	27.21	15.00	12.21	9.52
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	9.77	12.51	0.00	0.00	

overflows to: MH22

Drainage Area		MH22			
Area (Ha)		0.060			
C =		0.25		Restricted Flow Q _r (L/s)= 3.00	
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78C i _{5yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 5yr (m ³)
7	123.30	5.14	3.00	2.14	0.90
9	109.79	4.58	3.00	1.58	0.85
10	104.19	4.34	3.00	1.34	0.81
11	99.19	4.14	3.00	1.14	0.75
13	90.63	3.78	3.00	0.78	0.61
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
2.96	3.77	2.87	46.61	0.00	
Structure	Depth	Area (m ²)	Volume (m ³)		
CB23 (600mm x 600mm)	0.89	0.36	0.32		
Clear Stone Gallery	1.45	100	43.01		
		TOTAL	43.33		

overflows to: Dun Skipper Drive

Drainage Area		CB24			
Area (Ha)		0.100			
C =		0.90	Restricted Flow Q _r (L/s)= 15.00		
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p =2.78xCl _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
7	123.30	30.85	15.00	15.85	6.66
9	109.79	27.47	15.00	12.47	6.73
10	104.19	26.07	15.00	11.07	6.64
11	99.19	24.82	15.00	9.82	6.48
13	90.63	22.68	15.00	7.68	5.99
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	6.64	0.00	0.00	6.64	
overflows to: MH21					

overflows to: MH21

Drainage Area		CB25			
Area (Ha)	0.020				
C =	0.90	Restricted Flow Q _r (L/s)= 6.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
8	116.11	5.81	6.00	-0.19	-0.09
9	109.79	5.49	6.00	-0.51	-0.27
10	104.19	5.21	6.00	-0.79	-0.47
11	99.19	4.96	6.00	-1.04	-0.68
12	94.70	4.74	6.00	-1.26	-0.91
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	0.00	0.27	0.00	0.00	

overflows to: MH21

overflows to: MH21

Drainage Area		CB20			
Area (Ha)	0.120				
C =	0.90	Restricted Flow Q _r (L/s)= 15.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p =2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
7	90.66	27.22	15.00	12.22	5.13
9	80.87	24.28	15.00	9.28	5.01
10	76.81	23.06	15.00	8.06	4.84
11	73.17	21.97	15.00	6.97	4.60
13	66.93	20.09	15.00	5.09	3.97
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	4.84	12.51	0.00	0.00	

overflows to: MH22

Drainage Area		MH22			
Area (Ha)	0.060				
C =	0.25	Restricted Flow Q_r (L/s)= 3.00			
2-Year Ponding					
T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78 \times C I_{2yr} A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume $2yr$ (m^3)
7	90.66	3.78	3.00	0.78	0.33
9	80.87	3.37	3.00	0.37	0.20
10	76.81	3.20	3.00	0.20	0.12
11	73.17	3.05	3.00	0.05	0.03
13	66.93	2.79	3.00	-0.21	-0.16
Storage (m^3)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	0.12	2.87	46.61	0.00	

overflows to: Dun Skipper Drive

Drainage Area		CB24			
Area (Ha)	0.100				
C =	0.90	Restricted Flow Q _r (L/s)= 15.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78 x C i _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
7	90.66	22.68	15.00	7.68	3.23
9	80.87	20.23	15.00	5.23	2.83
10	76.81	19.22	15.00	4.22	2.53
11	73.17	18.31	15.00	3.31	2.18
13	66.93	16.75	15.00	1.75	1.36
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	2.53	0.00	0.00	2.53	
overflows to: MH21					

overflows to: MH21

Drainage Area		CB25			
Area (Ha)	0.020				
C =	0.90	Restricted Flow Q _r (L/s)= 6.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
8	85.46	4.28	6.00	-1.72	-0.83
9	80.87	4.05	6.00	-1.95	-1.05
10	76.81	3.84	6.00	-2.16	-1.29
11	73.17	3.66	6.00	-2.34	-1.54
12	69.89	3.50	6.00	-2.50	-1.80
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	0.00	0.27	0.00	0.00	
overflows to: MH21					

overflows to: MH21

Drainage Area		MH21			
Area (Ha)	0.240	Restricted Flow ICD <i>Actual</i> (L/s)=	33.00		
C =	1.00	Restricted Flow Q _r <i>for swm calc</i> (L/s)=	16.50		
50% reduction for sub-surface storage					
100-year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCI _{100yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume (100yr) (m ³)
33	86.03	57.40	16.50	40.90	80.99
34	84.27	56.22	16.50	39.72	81.03
35	82.58	55.10	16.50	38.60	81.05
36	80.96	54.02	16.50	37.52	81.04
38	77.93	52.00	16.50	35.50	80.93

Storage (m³)				
Overflow	Required	Surface	Sub-surface	Balance
24.40	105.45	11.79	96.68	0.00

Length (m)	Dia (m)	Area (m²)	Volume (m³)
8.30	0.200	0.031	0.26
3.10	0.200	0.031	0.10
8.62	0.300	0.071	0.61
		TOTAL	0.97

overflows to: CBMH20

Drainage Area		CBMH2		Drainage Area Plan - CBMH2	
Area (Ha)	0.080				
C =	1.00	Restricted Flow Q _r (L/s)=		20.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78 x C i _{100yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 100yr (m ³)
7	211.67	47.07	20.00	27.07	11.37
9	188.25	41.87	20.00	21.87	11.81
10	178.56	39.71	20.00	19.71	11.83
11	169.91	37.79	20.00	17.79	11.74
13	155.11	34.50	20.00	14.50	11.31

Storage (m³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	11.83	6.21	0.00	5.62

overflows to: CB10

Drainage Area CB10		Drainage Area Plan - MH1D			
Area (Ha)	0.110	Restricted Flow Q _r (L/s)= 45.00			
C =	1.00				
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
3	286.05	87.47	45.00	42.47	7.65
4	262.41	80.24	45.00	35.24	8.46
5	242.70	74.22	45.00	29.22	8.77
6	226.01	69.11	45.00	24.11	8.68
8	199.20	60.92	45.00	15.92	7.64

Storage (m³)				
Overflow	Required	Surface	Sub-surface	Balance
5.62	14.38	6.81	0.00	7.57

overflows to: CBMH20

Drainage Area		CB7	Drainage Area Plan - CBMH1C		
Area (Ha)	5	0.080			
C =		1.00	Restricted Flow Q _r (L/s)=	30.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p =2.78xCI _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
3	286.05	63.62	30.00	33.62	6.05
5	242.70	53.98	30.00	23.98	7.19
6	226.01	50.26	30.00	20.26	7.30
7	211.67	47.07	30.00	17.07	7.17
9	188.25	41.87	30.00	11.87	6.41

Storage (m³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	7.30	6.97	0.00	0.33

overflows to: CB8

Drainage Area		MH21			
Area (Ha)	0.240				
C =	0.90	Restricted Flow Q _r (L/s)=	16.50		
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78C i _{5yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 5yr (m ³)
16	80.46	48.31	16.50	31.81	30.54
18	74.97	45.02	16.50	28.52	30.80
19	72.53	43.55	16.50	27.05	30.84
20	70.25	42.18	16.50	25.68	30.82
22	66.15	39.72	16.50	23.22	30.65

Storage (m³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	30.84	11.79	96.68	0.00

Structure	Depth	Area (m²)	Volume (m³)
CB21 (600mm x 600mm)	1.40	0.36	0.50
CB22 (600mm x 600mm)	1.40	0.36	0.50
MH21 (1200mm)	3.40	1.13	3.84
MH23 (1200mm)	1.97	1.13	2.23
Underground Chamber			88.64
		TOTAL	95.72

overflows to: CBMH20

Drainage Area		CBMH2			
Area (Ha)	0.080	Restricted Flow Q _r (L/s)= 20.00			
C =	0.90				
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78 x C i _{5yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 5yr (m ³)
1	203.51	40.73	20.00	20.73	1.24
3	166.09	33.24	20.00	13.24	2.38
4	152.51	30.53	20.00	10.53	2.53
5	141.18	28.26	20.00	8.26	2.48
7	123.30	24.68	20.00	4.68	1.97

Storage (m³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	2.53	6.21	0.00	0.00

overflows to: CBMH20

Drainage Area		CB10			
Area (Ha)	0.110	Restricted Flow Q _r (L/s)= 45.00			
C =	0.90				
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p =2.78xCl _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
0	230.48	63.43	45.00	18.43	0.00
2	182.69	50.28	45.00	5.28	0.63
3	166.09	45.71	45.00	0.71	0.13
4	152.51	41.97	45.00	-3.03	-0.73
6	131.57	36.21	45.00	-8.79	-3.16

Storage (m³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.13	6.81	0.00	0.00

overflows to: CBMH20

Drainage Area		MH21			
Area (Ha)	0.240				
C =	0.90	Restricted Flow Q _r (L/s)= 16.50			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p =2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
11	73.17	43.94	16.50	27.44	18.11
13	66.93	40.19	16.50	23.69	18.48
14	64.23	38.57	16.50	22.07	18.54
15	61.77	37.09	16.50	20.59	18.53
17	57.42	34.48	16.50	17.98	18.34

Storage (m³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	18.54	11.79	96.68	0.00

overflows to: CBMH20

Drainage Area		CBMH2			
Area (Ha)	0.080	Restricted Flow Q _r (L/s)= 20.00			
C =	0.90				
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
7	90.66	18.15	20.00	-1.85	-0.78
9	80.87	16.19	20.00	-3.81	-2.06
10	76.81	15.37	20.00	-4.63	-2.78
11	73.17	14.65	20.00	-5.35	-3.53
13	66.93	13.40	20.00	-6.60	-5.15

Storage (m³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	6.21	0.00	0.00

overflows to: CBMH20

Drainage Area		CB10			
Area (Ha)	0.110	Restricted Flow Q _r (L/s)= 45.00			
C=	0.90				
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p =2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
7	90.66	24.95	45.00	-20.05	-8.42
9	80.87	22.26	45.00	-22.74	-12.28
10	76.81	21.14	45.00	-23.86	-14.32
11	73.17	20.14	45.00	-24.86	-16.41
13	66.93	18.42	45.00	-26.58	-20.73

Storage (m³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	6.81	0.00	0.00

overflows to: CBMH20

Drainage Area		CB7			
Area (Ha)	0.080	Restricted Flow Q _r (L/s)= 30.00			
C =	0.90				
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p =2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
7	90.66	18.15	30.00	-11.85	-4.98
9	80.87	16.19	30.00	-13.81	-7.46
10	76.81	15.37	30.00	-14.63	-8.78
11	73.17	14.65	30.00	-15.35	-10.13
13	66.93	13.40	30.00	-16.60	-12.95

Storage (m³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	6.97	0.00	0.00

overflows to: CB8

Drainage Area		CB6 Drainage Area Plan - CBMH1B			
Area (Ha)	0.070				
C =	1.00	Restricted Flow Q _r (L/s)= 20.00			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p =2.78xCl _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
5	242.70	47.23	20.00	27.23	8.17
7	211.67	41.19	20.00	21.19	8.90
8	199.20	38.76	20.00	18.76	9.01
9	188.25	36.63	20.00	16.63	8.98
11	169.91	33.06	20.00	13.06	8.62
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	9.01	13.66	0.00	0.00	

overflows to: CB8

Drainage Area		CB5 Drainage Area Plan - CBMH1A			
Area (Ha)	0.060				
C =	1.00	Restricted Flow Q _r (L/s)=		15.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{100yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 100yr (m ³)
7	211.67	35.31	15.00	20.31	8.53
9	188.25	31.40	15.00	16.40	8.86
10	178.56	29.78	15.00	14.78	8.87
11	169.91	28.34	15.00	13.34	8.80
13	155.11	25.87	15.00	10.87	8.48
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	8.87	3.41	0.00	5.46	
overflows to: CB8					

overflows to: CB8

Drainage Area		CB8 Drainage Area Plan - MH1B			
Area (Ha)	0.170				
C =	1.00	Restricted Flow Q _r (L/s)= 47.00			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{100yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 100yr (m ³)
6	226.01	106.81	47.00	59.81	21.53
8	199.20	94.14	47.00	47.14	22.63
9	188.25	88.97	47.00	41.97	22.66
10	178.56	84.39	47.00	37.39	22.43
12	162.13	76.62	47.00	29.62	21.33
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
5.79	28.45	24.90	1.60	1.95	
Length (m)	Dia (m)	Area (m ²)	Volume (m ³)		
6.00	0.450	0.159	0.95		
			0.95		

overflows to: MH1A

overflows to: MH1A

Drainage Area		CB4 Drainage Area Plan - MH10A			
Area (Ha)	0.030				
C =	1.00	Restricted Flow Q _r (L/s)= 6.00			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p =2.78xCI _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
9	188.25	15.70	6.00	9.70	5.24
11	169.91	14.17	6.00	8.17	5.39
12	162.13	13.52	6.00	7.52	5.42
13	155.11	12.94	6.00	6.94	5.41
15	142.89	11.92	6.00	5.92	5.33
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	5.42	10.62	0.00	0.00	
overflows to: CBMH1					

overflows to: CBMH1

Drainage Area		CB6			
Area (Ha)		0.070			
C =		0.90			
Restricted Flow Q _r (L/s)=		20.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCI _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
0	230.48	40.37	20.00	20.37	0.00
2	182.69	32.00	20.00	12.00	1.44
3	166.09	29.09	20.00	9.09	1.64
4	152.51	26.71	20.00	6.71	1.61
6	131.57	23.04	20.00	3.04	1.10
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	1.64	13.66	0.00	0.00	

overflows to: CB8

Drainage Area		CB5			
Area (Ha)		0.060			
C =	0.90	Restricted Flow Q _r (L/s)= 15.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p =2.78xCl _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
1	203.51	30.55	15.00	15.55	0.93
3	166.09	24.93	15.00	9.93	1.79
4	152.51	22.89	15.00	7.89	1.89
5	141.18	21.19	15.00	6.19	1.86
7	123.30	18.51	15.00	3.51	1.47
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	1.89	3.41	0.00	0.00	

overflows to: CB8

overflows to: CB8

Drainage Area		CB8			
Area (Ha)	0.170				
C =	0.90	Restricted Flow Q_r (L/s)= 47.00			
5-Year Ponding					
T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78C i_{5yr} A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
1	203.51	86.56	47.00	39.56	2.37
3	166.09	70.64	47.00	23.64	4.26
4	152.51	64.87	47.00	17.87	4.29
5	141.18	60.05	47.00	13.05	3.91
7	123.30	52.45	47.00	5.45	2.29
Storage (m^3)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	4.29	24.90	1.60	0.00	
Structure	Depth	Area (m^2)	Volume (m^3)		
CB8 (600mm x 600mm)	1.80	0.36	0.65		
			0.65		

overflows to: CB8

Drainage Area		CB6			
Area (Ha)	0.070				
C =	0.90	Restricted Flow Q _r (L/s)= 20.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78 x C i _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
7	90.66	15.88	20.00	-4.12	-1.73
9	80.87	14.16	20.00	-5.84	-3.15
10	76.81	13.45	20.00	-6.55	-3.93
11	73.17	12.81	20.00	-7.19	-4.74
13	66.93	11.72	20.00	-8.28	-6.46
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	0.00	13.66	0.00	0.00	

overflows to: CB8

Drainage Area		CB5			
Area (Ha)		0.060			
C =		0.90	Restricted Flow Q _r (L/s)= 15.00		
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
7	90.66	13.61	15.00	-1.39	-0.58
9	80.87	12.14	15.00	-2.86	-1.54
10	76.81	11.53	15.00	-3.47	-2.08
11	73.17	10.98	15.00	-4.02	-2.65
13	66.93	10.05	15.00	-4.95	-3.86
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	0.00	3.41	0.00	0.00	
overflows to: CB8					

overflows to: CB8

Drainage Area		CB8			
Area (Ha)		0.170			
C=		0.90			
Restricted Flow Q _r (L/s)=		47.00			
2-year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
7	90.66	38.56	47.00	-8.44	-3.54
9	80.87	34.40	47.00	-12.60	-6.80
10	76.81	32.67	47.00	-14.33	-8.60
11	73.17	31.12	47.00	-15.88	-10.48
13	66.93	28.47	47.00	-18.53	-14.46
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	0.00	24.90	1.60	0.00	

overflows to: CB8

Drainage Area		CB4			
Area (Ha)		0.030			
C =		0.90	Restricted Flow Q _r (L/s)= 6.00		
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.75xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
7	90.66	6.81	6.00	0.81	0.34
9	80.87	6.07	6.00	0.07	0.04
10	76.81	5.76	6.00	-0.24	-0.14
11	73.17	5.49	6.00	-0.51	-0.34
13	66.93	5.02	6.00	-0.98	-0.76
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	0.00	10.62	0.00	0.00	
overflows to: CBMH1					

overflows to: CBMH1

Drainage Area CBMH1		Drainage Area MH10B			
Area (Ha)	0.080				
C =	1.00	Restricted Flow Q _r (L/s)= 20.00			
100-Year Ponding					
T _c Variable (min)	I _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCI _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
7	211.67	47.07	20.00	27.07	11.37
9	188.25	41.87	20.00	21.87	11.81
10	178.56	39.71	20.00	19.71	11.83
11	169.91	37.79	20.00	17.79	11.74
13	155.11	34.50	20.00	14.50	11.31

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	11.83	0.00	0.00	11.83

overflows to: MH1A

Drainage Area		MH1A			
Area (Ha)	0.150				
C =	1.00	Restricted Flow Q _r (L/s)= 43.00			
100-Year Ponding					
T _c Variable (min)	I _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCI _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
5	242.70	101.21	43.00	58.21	17.46
7	211.67	88.27	43.00	45.27	19.01
8	199.20	83.07	43.00	40.07	19.23
9	188.25	78.50	43.00	35.50	19.17
11	169.91	70.85	43.00	27.85	18.38

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
13.78	33.01	10.83	0.00	22.18

overflows to: CBMH20

Drainage Area		CBMH20	Previously CB18, Drainage Area Plan - MH11		
Area (Ha)		0.100			
C =		0.38	Restricted Flow Q _r (L/s)= 15.00		
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCI _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
3	286.05	26.82	15.00	11.82	2.67
4	262.41	27.36	15.00	12.36	2.97
5	242.70	25.30	15.00	10.30	3.09
6	226.01	23.56	15.00	8.56	3.08
7	211.67	22.07	15.00	7.07	2.97

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
29.75	32.84	131.62	0.00	0.00

overflows to: offsite

Drainage Area		RA	Drainage Area Plan - MH7A		
Area (Ha)		0.300			
C =		1.00	Restricted Flow Q _r (L/s)= 27.00		
100-Year Ponding					
T _c Variable (min)	I _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCI _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
25	103.85	86.61	27.00	59.61	89.41
26	101.18	84.38	27.00	57.38	89.52
27	98.66	82.28	27.00	55.28	89.56
28	96.27	80.29	27.00	53.29	89.53
29	94.01	78.41	27.00	51.41	89.45

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	89.56	90.00	0.00	0.00

Drainage Area		CBMH1			
Area (Ha)	0.080				
C =	0.90	Restricted Flow Q _r (L/s)= 20.00			
5-Year Ponding					
T _c Variable (min)	I _{5yr} (mm/hour)	Peak Flow Q _p = 2.78C _i S _y A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
1	203.51	40.73	20.00	20.73	1.24
3	166.09	33.24	20.00	13.24	2.38
4	152.51	30.53	20.00	10.53	2.53
5	141.18	28.26	20.00	8.26	2.48
7	123.30	24.68	20.00	4.68	1.97

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	2.53	0.00	0.00	2.53

overflows to: MH1A

Drainage Area		MH1A			
Area (Ha)	0.160				
C =	0.90	Restricted Flow Q _r (L/s)= 43.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{5yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 5yr (m ³)
2	182.69	73.13	43.00	30.13	3.62
4	152.51	61.05	43.00	18.05	4.33
5	141.18	56.52	43.00	13.52	4.05
6	131.57	52.67	43.00	9.67	3.48
8	116.11	46.48	43.00	3.48	1.67

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
2.53	6.58	10.83	0.00	0.00

overflows to: CBMH20

Drainage Area		CBMH20			
Area (Ha)	0.160				
C =	0.30	Restricted Flow Q _r (L/s)= 15.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
1	203.51	27.16	15.00	12.16	0.73
2	182.69	24.38	15.00	9.38	1.13
3	166.09	22.16	15.00	7.16	1.29
4	152.51	20.35	15.00	5.35	1.28
5	141.18	18.84	15.00	3.84	1.15

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	1.29	131.62	0.00	0.00

overflows to: offsite

Drainage Area		RA			
Area (Ha)		0.300			
C =		0.90			
		Restricted Flow Q _r (L/s)= 27.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78C i _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
13	90.63	68.03	27.00	41.03	32.00
14	86.93	65.25	27.00	38.25	32.13
15	83.56	62.72	27.00	35.72	32.15
16	80.46	60.39	27.00	33.39	32.06
17	77.61	58.25	27.00	31.25	31.88

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	32.15	90.00	0.00	0.00

Drainage Area		CBMH1			
Area (Ha)	0.080				
C =	0.90	Restricted Flow Q _r (L/s)= 20.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
7	90.66	18.15	20.00	-1.85	-0.78
9	80.87	16.19	20.00	-3.81	-2.06
10	76.81	15.37	20.00	-4.63	-2.78
11	73.17	14.65	20.00	-5.35	-3.53
13	66.93	13.40	20.00	-6.60	-5.15

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	0.00	0.00	0.00

overflows to: MH1A

Drainage Area		MH1A			
Area (Ha)	0.150				
C =	0.90	Restricted Flow Q _r (L/s)= 43.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
7	90.66	34.03	43.00	-8.97	-3.77
9	80.87	30.35	43.00	-12.65	-6.83
10	76.81	28.82	43.00	-14.18	-8.51
11	73.17	27.46	43.00	-15.54	-10.26
13	66.93	25.12	43.00	-17.88	-13.95

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	10.83	0.00	0.00

overflows to: CBMH20

Drainage Area		CBMH20			
Area (Ha)		0.100			
C =		0.30	Restricted Flow Q _r (L/s)= 15.00		
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
0	167.22	13.95	15.00	-1.05	0.00
1	148.14	12.36	15.00	-2.64	-0.16
2	133.33	11.12	15.00	-3.88	-0.47
3	121.46	10.13	15.00	-4.87	-0.88
4	111.72	9.32	15.00	-5.68	-1.36

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	131.62	0.00	0.00

Drainage Area		RA				
Area (Ha)		0.300				
C =		0.90	Restricted Flow Q _r (L/s)= 27.00			
2-Year Ponding						
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)	
8	85.46	64.14	27.00	37.14	17.83	
10	76.81	57.65	27.00	30.65	18.39	
11	73.17	54.92	27.00	27.92	18.43	
12	69.89	52.46	27.00	25.46	18.33	
14	64.23	48.21	27.00	21.21	17.82	

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	18.43	90.00	0.00	0.00

Drainage Area		RB Drainage Area Plan - MH2A			
Area (Ha)	0.190				
C =	1.00	Restricted Flow Q _r (L/s)= 20.00			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
20	119.95	63.36	20.00	43.36	52.03
22	112.88	59.62	20.00	39.62	52.30
23	109.68	57.93	20.00	37.93	52.35
24	106.68	56.35	20.00	36.35	52.34
26	101.18	53.44	20.00	33.44	52.17
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	52.35	57.00	0.00	0.00	

Drainage Area		RC Drainage Area Plan - MH7			
Area (Ha)	0.050				
C =	1.00	Restricted Flow Q _r (L/s)= 8.00			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
12	162.13	22.54	8.00	14.54	10.47
14	148.72	20.67	8.00	12.67	10.64
15	142.89	19.86	8.00	11.86	10.68
16	137.55	19.12	8.00	11.12	10.67
18	128.08	17.80	8.00	9.80	10.59
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	10.68	13.50	1.00	0.00	

Drainage Area		RD Drainage Area Plan - MH1C			
Area (Ha)	0.050				
C =	1.00	Restricted Flow Q _r (L/s)= 8.00			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
12	162.13	22.54	8.00	14.54	10.47
14	148.72	20.67	8.00	12.67	10.64
15	142.89	19.86	8.00	11.86	10.68
16	137.55	19.12	8.00	11.12	10.67
18	128.08	17.80	8.00	9.80	10.59
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	10.68	11.25	1.00	0.00	

Drainage Area		EXTERNAL			
Area (Ha)	1.550				
C =	1.00	Restricted Flow Q _r (L/s)= 291.58			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
10	178.56	769.41	291.58	477.83	286.70
12	162.13	698.63	291.58	407.05	293.08
13	155.11	668.36	291.58	376.78	293.89
14	148.72	640.85	291.58	349.27	293.38
16	137.55	592.70	291.58	301.12	289.08
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	293.89	270.00	0.00	23.89	

Drainage Area		RB			
Area (Ha)		0.190			
C =		0.90			
		Restricted Flow Q _r (L/s)= 20.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
11	99.19	47.15	20.00	27.15	17.92
13	90.63	43.08	20.00	23.08	18.01
14	86.93	41.33	20.00	21.33	17.91
15	83.56	39.72	20.00	19.72	17.75
17	77.61	36.89	20.00	16.89	17.23
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	17.91	57.00	0.00	0.00	

Drainage Area		RC				
Area (Ha)		0.050				
C =		0.90	Restricted Flow Q _r (L/s)= 8.00			
5-Year Ponding						
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)	
5	141.18	17.66	8.00	9.66	2.90	
7	123.30	15.43	8.00	7.43	3.12	
8	116.11	14.53	8.00	6.53	3.13	
9	109.79	13.74	8.00	5.74	3.10	
11	99.19	12.41	8.00	4.41	2.91	
Storage (m ³)						
Overflow	Required	Surface	Sub-surface	Balance		
0.00	3.13	13.50	0.00	0.00		

Drainage Area		RD				
Area (Ha)		0.050				
C =		0.90	Restricted Flow Q _r (L/s)=		8.00	
5-Year Ponding						
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)	
5	141.18	17.66	8.00	9.66	2.90	
7	123.30	15.43	8.00	7.43	3.12	
8	116.11	14.53	8.00	6.53	3.13	
9	109.79	13.74	8.00	5.74	3.10	
11	99.19	12.41	8.00	4.41	2.91	
Storage (m ³)						
Overflow	Required	Surface	Sub-surface	Balance		
0.00	3.13	11.25	0.00	0.00		

Drainage Area		EXTERNAL			
Area (Ha)	1.550				
C =	0.80	Restricted Flow Q _r (L/s)		291.58	
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78C i _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
2	182.69	629.76	291.58	338.18	40.58
4	152.51	525.73	291.58	234.15	56.19
5	141.18	486.67	291.58	195.09	58.53
6	131.57	453.54	291.58	161.96	58.31
8	116.11	400.26	291.58	108.68	52.17
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	58.53	270.00	0.00	0.00	

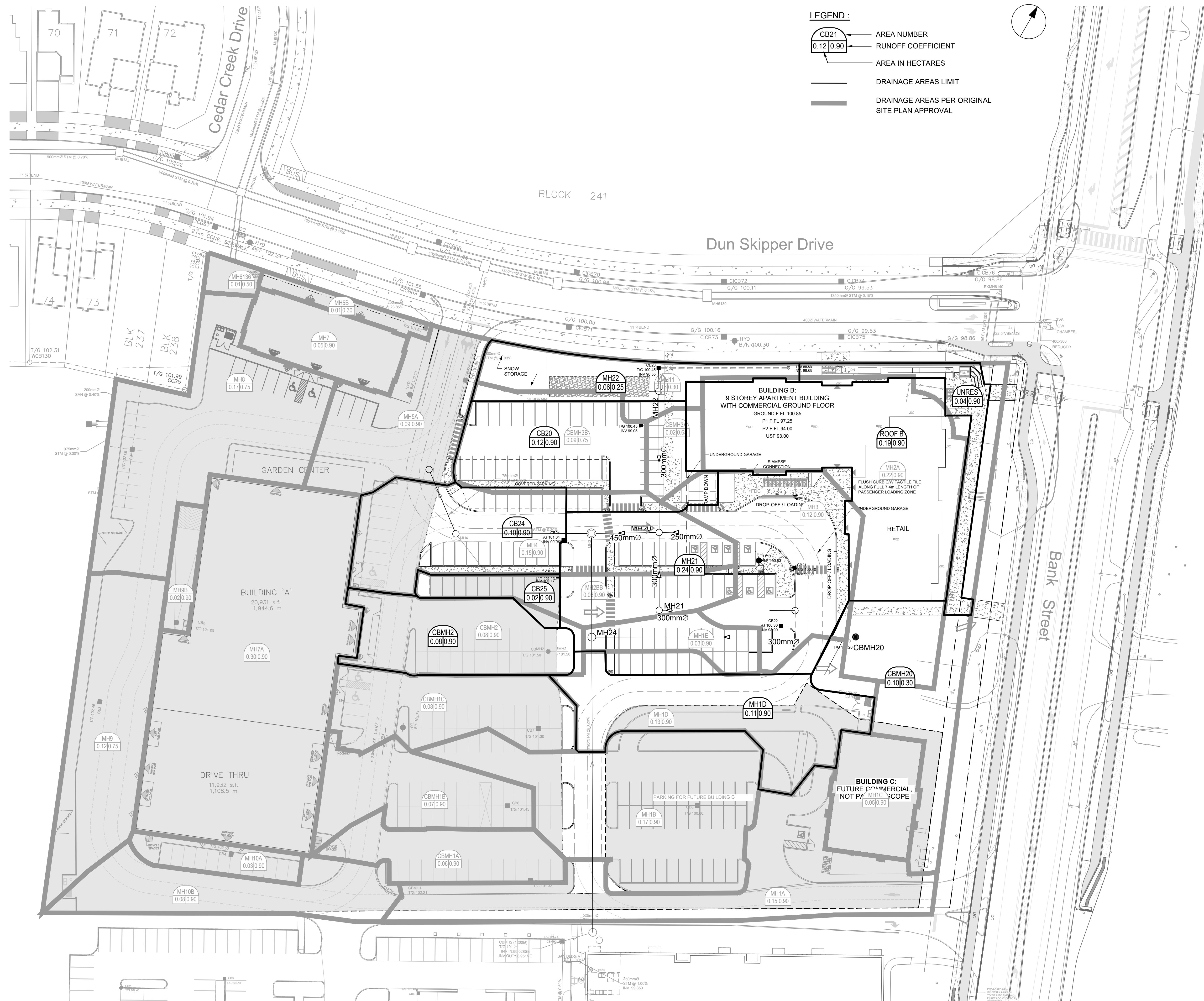
Drainage Area		RB				
Area (Ha)		0.190				
C =		0.90	Restricted Flow Q _r (L/s)= 20.00			
2-Year Ponding						
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)	
6	96.64	45.94	20.00	25.94	9.34	
8	85.46	40.62	20.00	20.62	9.90	
9	80.87	38.45	20.00	18.45	9.96	
10	76.81	36.51	20.00	16.51	9.91	
12	69.89	33.23	20.00	13.23	9.52	
Storage (m ³)						
Overflow	Required	Surface	Sub-surface	Balance		
0.00	9.96	57.00	0.00	0.00		

Drainage Area		RC			
Area (Ha)	0.050				
C =	0.90	Restricted Flow Q _r (L/s)= 8.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
2	133.33	16.68	8.00	8.68	1.04
4	111.72	13.98	8.00	5.98	1.43
5	103.57	12.96	8.00	4.96	1.49
6	96.64	12.09	8.00	4.09	1.47
8	85.46	10.69	8.00	2.69	1.29
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	1.49	13.50	0.00	0.00	

Drainage Area		RD				
Area (Ha)		0.050				
C =		0.90	Restricted Flow Q _r (L/s)= 8.00			
2-Year Ponding						
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)	
2	133.33	16.68	8.00	8.68	1.04	
4	111.72	13.98	8.00	5.98	1.43	
5	103.57	12.96	8.00	4.96	1.49	
6	96.64	12.09	8.00	4.09	1.47	
8	85.46	10.69	8.00	2.69	1.29	
Storage (m ³)						
Overflow	Required	Surface	Sub-surface	Balance		
0.00	1.49	11.25	0.00	0.00		

Drainage Area		EXTERNAL			
Area (Ha)	1.550				
C =	0.80	Restricted Flow Q _r (L/s)= 291.58			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCl _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
0	167.22	576.45	291.58	284.87	0.00
2	133.33	459.62	291.58	168.04	20.16
3	121.46	418.71	291.58	127.13	22.88
4	111.72	385.13	291.58	93.55	22.45
6	96.64	333.13	291.58	41.55	14.96
Storage (m ³)					
Overflow	Required	Surface	Sub-surface	Balance	
0.00	22.88	270.00	0.00	0.00	

	Area	Flow
Buildings		63.00
Site		377.00
Uncontrolled	0.06	27.92
External		291.58
	0.060	759.50
Allowable		760.00
		TRUE



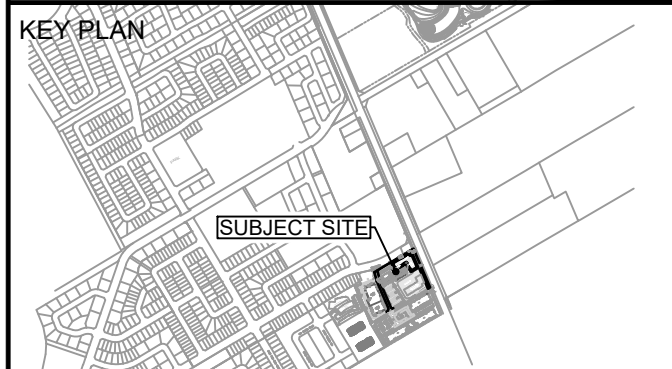
CLIENT
2668867 Ontario Inc.

COPYRIGHT
This drawing has been prepared solely for the intended use, thus any reproduction or distribution for any purpose other than authorized by Arcadis is forbidden. Written dimensions shall have precedence over scaled dimensions. Contractors shall verify and be responsible for all dimensions and conditions on the job, and Arcadis shall be informed of any variations from the dimensions and conditions shown on the drawing. Shop drawings shall be submitted to Arcadis for general conformance before proceeding with fabrication.

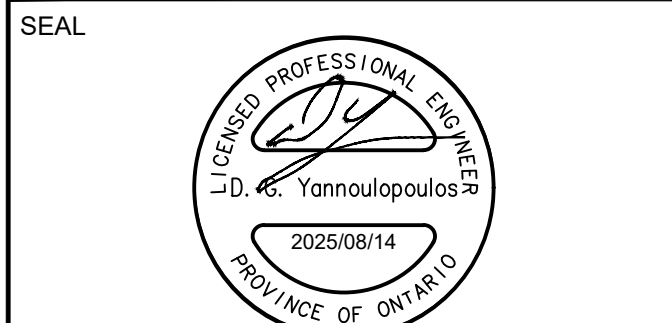
Arcadis Professional Services (Canada) Inc.
Formerly (B) Group Professional Services (Canada) Inc.

ISSUES		
No.	DESCRIPTION	DATE
1	SUBMISSION NO.1 FOR CITY REVIEW	2024-11-26
2	SUBMISSION NO.2 FOR CITY REVIEW	2025-02-18
3	SUBMISSION NO.3 FOR CITY REVIEW	2025-04-22
4	REVISED PER CITY COMMENTS	2025-06-02
5	REVISED SITE PLAN	2025-08-14

SEE 010 FOR NOTES, LEGEND AND DETAILS



CONSULTANTS



PRIME CONSULTANT
ARCADIS
333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

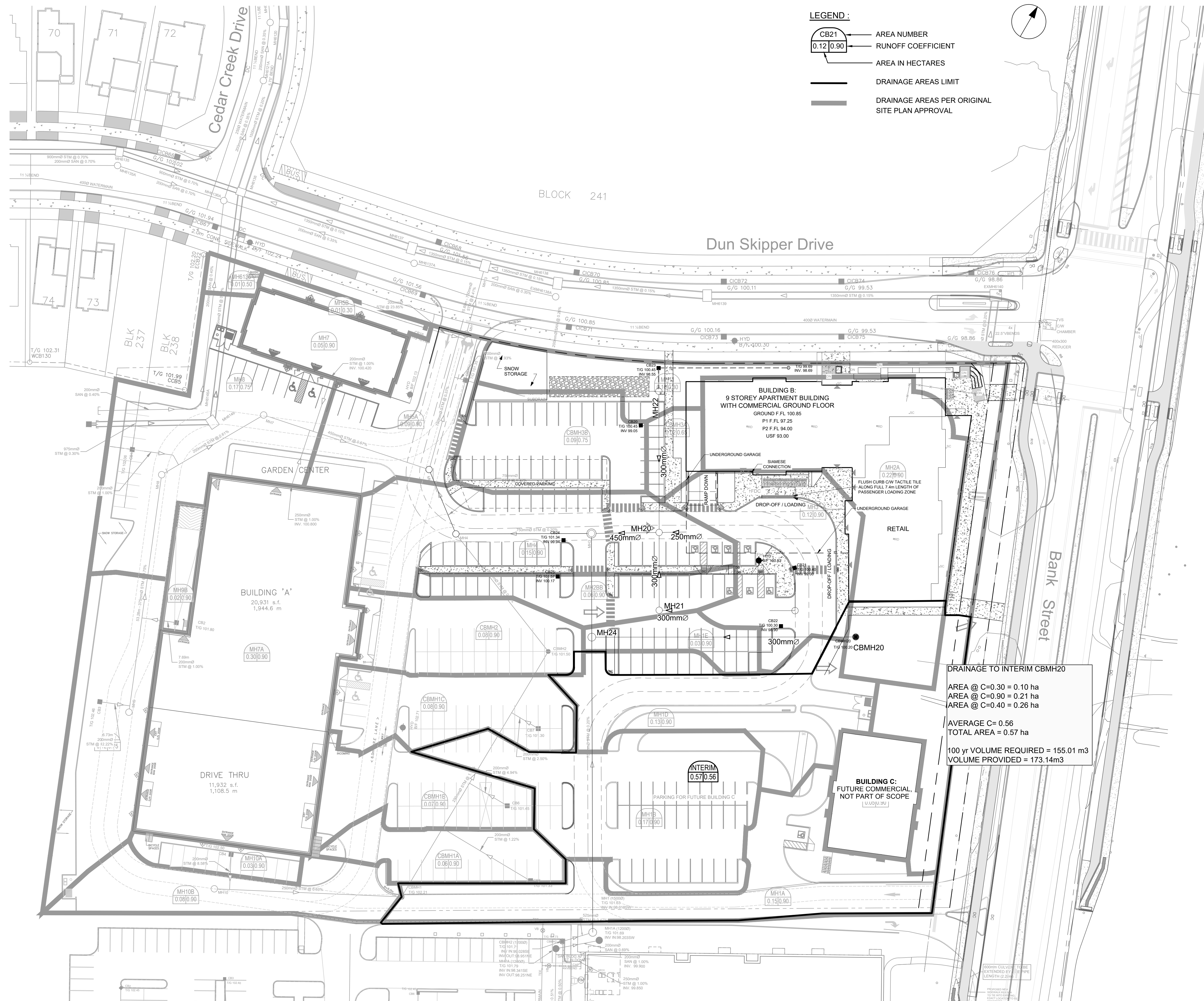
PROJECT
SENIORS APARTMENTS

BANK STREET AT DUN SKIPPER DRIVE

PROJECT NO:
148290
DRAWN BY:
M.M.
CHECKED BY:
R.M.
PROJECT MGR:
R.M.
APPROVED BY:
A.Z.

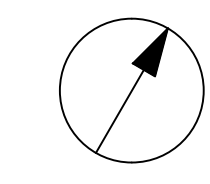
SHEET TITLE
STORM DRAINAGE AREA PLAN

SHEET NUMBER
C-500
ISSUE
5



LEGEND :

- AREA NUMBER
- RUNOFF COEFFICIENT
- AREA IN HECTARES
- DRAINAGE AREAS LIMIT
- DRAINAGE AREAS PER ORIGINAL SITE PLAN APPROVAL



CLIENT

2668867 Ontario Inc.

COPYRIGHT

This drawing has been prepared solely for the intended use, thus any reproduction or distribution for any purpose other than authorized by Arcadis is forbidden. Written dimensions shall have precedence over scaled dimensions. Contractors shall verify and be responsible for all dimensions and conditions on the job, and Arcadis shall be informed of any variations from the dimensions and conditions shown on the drawing. Shop drawings shall be submitted to Arcadis for general conformance before proceeding with fabrication.

Arcadis Professional Services (Canada) Inc.

Formerly B Group Professional Services (Canada) Inc.

ISSUES		
No.	DESCRIPTION	DATE
1	SUBMISSION NO.1 FOR CITY REVIEW	2024-11-26
2	SUBMISSION NO.2 FOR CITY REVIEW	2025-02-18
3	SUBMISSION NO.3 FOR CITY REVIEW	2025-04-22
4	REVISED PER CITY COMMENTS	2025-06-02
5	REVISED SITE PLAN	2025-08-14

SEE 010 FOR NOTES, LEGEND AND DETAILS

KEY PLAN

CONSULTANTS

SCALE

1:400

SEAL

PRIME CONSULTANT

333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

PROJECT

SENIORS APARTMENTS

BANK STREET AT DUN SKIPPER DRIVE

PROJECT NO:

148290

DRAWN BY:

M.M.

CHECKED BY:

R.M.

PROJECT MGR:

R.M.

APPROVED BY:

A.Z.

SHEET TITLE

INTERIM STORM DRAINAGE AREA PLAN

SHEET NUMBER

C-501

ISSUE

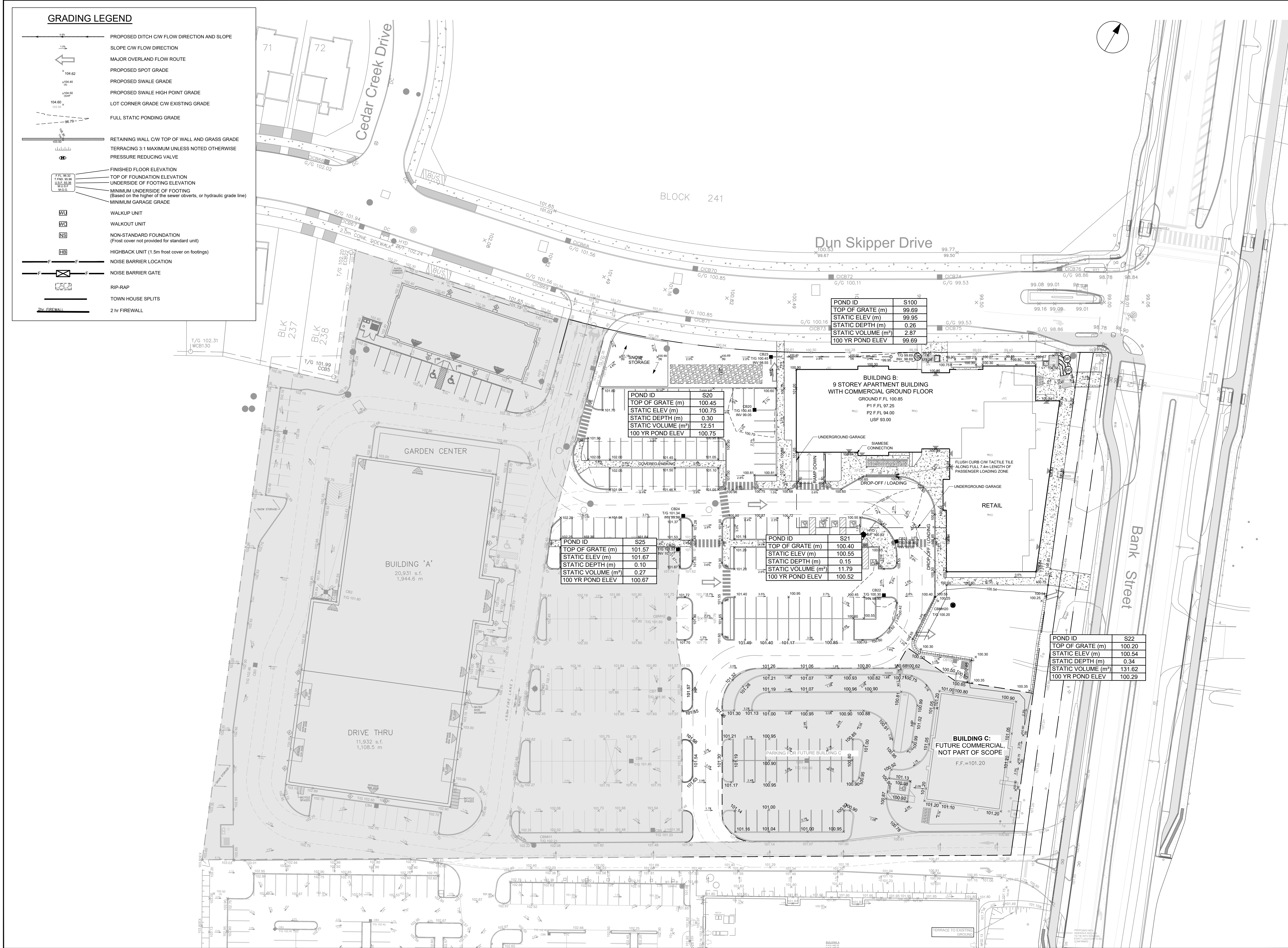
5

DRAINAGE TO INTERIM CBMH20

AREA @ C=0.30 = 0.10 ha
AREA @ C=0.90 = 0.21 ha
AREA @ C=0.40 = 0.26 ha

AVERAGE C= 0.56
TOTAL AREA = 0.57 ha

100 yr VOLUME REQUIRED = 155.01 m3
VOLUME PROVIDED = 173.14m3



CLIENT

2668867 Ontario Inc.

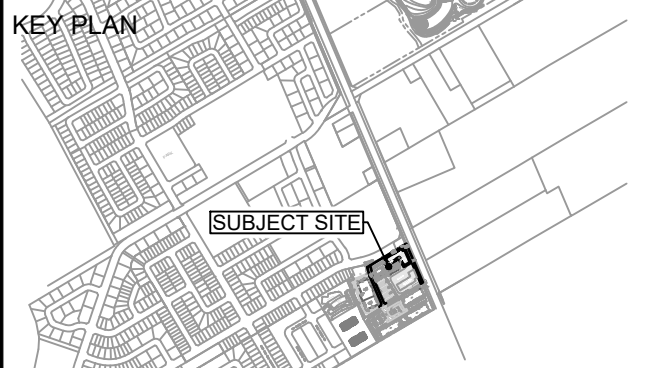
COPYRIGHT

This drawing has been prepared solely for the intended use, thus any reproduction or distribution for any purpose other than authorized by Arcadis is forbidden. Written dimensions shall have precedence over scaled dimensions. Contractors shall verify and be responsible for all dimensions and conditions on the job, and Arcadis shall be informed of any variations from the dimensions and conditions shown on the drawing. Shop drawings shall be submitted to Arcadis for general conformance before proceeding with fabrication.

Arcadis Professional Services (Canada) Inc.
Formerly B Group Professional Services (Canada) Inc.

ISSUES		
No.	DESCRIPTION	DATE
1	SUBMISSION NO.1 FOR CITY REVIEW	2024-11-26
2	SUBMISSION NO.2 FOR CITY REVIEW	2025-02-18
3	SUBMISSION NO.3 FOR CITY REVIEW	2025-04-22
4	REVISED PER CITY COMMENTS	2025-06-02
5	REVISED SITE PLAN	2025-08-14

SEE 010 FOR NOTES, LEGEND AND DETAILS



CONSULTANTS

SEAL



PRIME CONSULTANT

ARCADIS

333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

PROJECT

SENIORS APARTMENTS

BANK STREET AT DUN SKIPPER DRIVE

PROJECT NO:
148290

DRAWN BY:
M.M.

CHECKED BY:
R.M.

PROJECT MGR:
R.M.

APPROVED BY:
A.Z.

SHEET TITLE

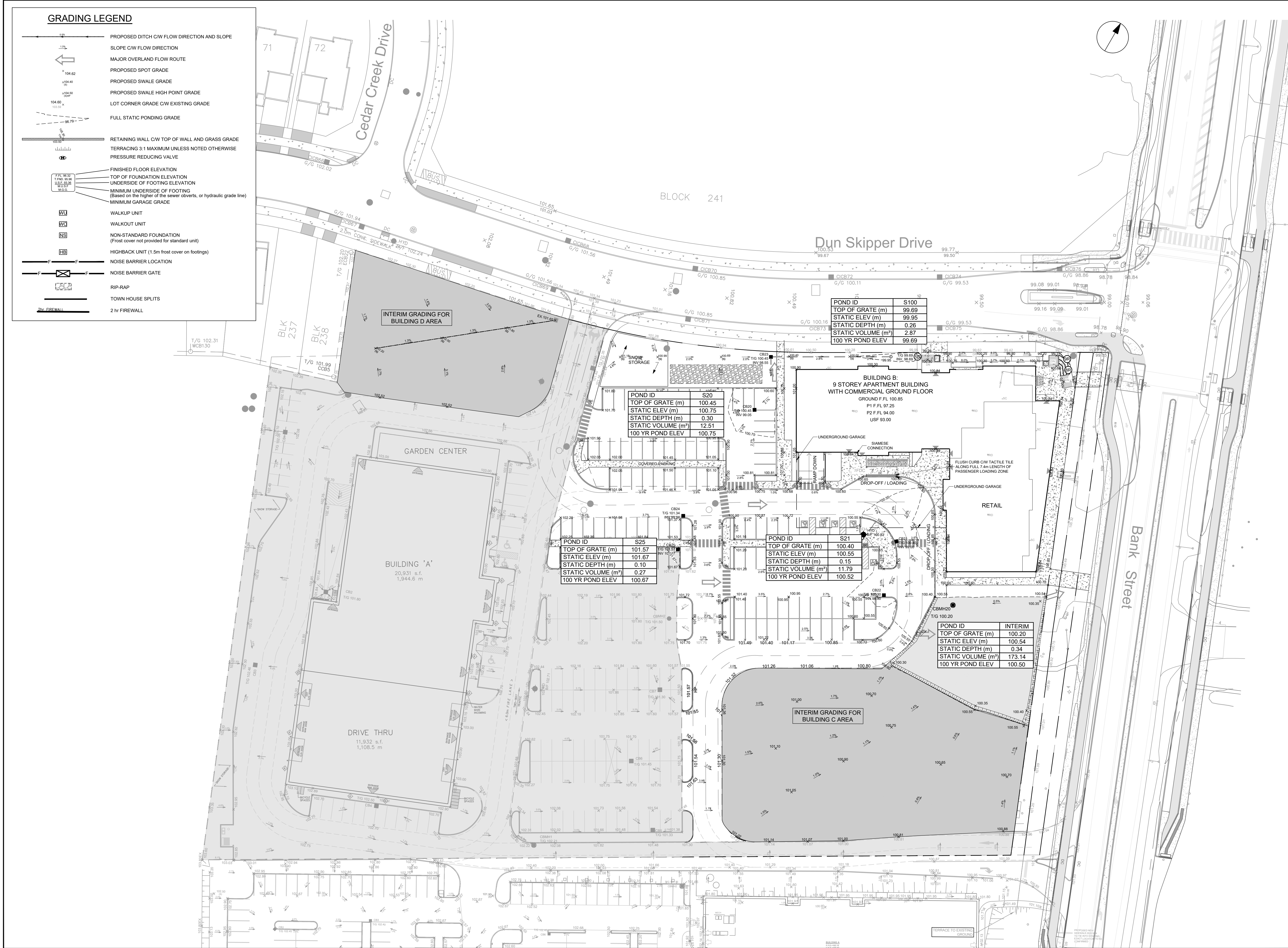
PONDING PLAN

SHEET NUMBER

C-600

ISSUE

5



CLIENT

2668867 Ontario Inc.

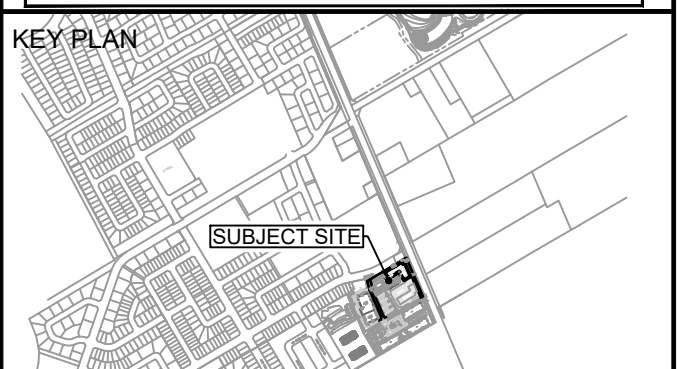
COPYRIGHT

This drawing has been prepared solely for the intended use, thus any reproduction or distribution for any purpose other than authorized by Arcadis is forbidden. Written dimensions shall have precedence over scaled dimensions. Contractors shall verify and be responsible for all dimensions and conditions on the job, and Arcadis shall be informed of any variations from the dimensions and conditions shown on the drawing. Shop drawings shall be submitted to Arcadis for general conformance before proceeding with fabrication.

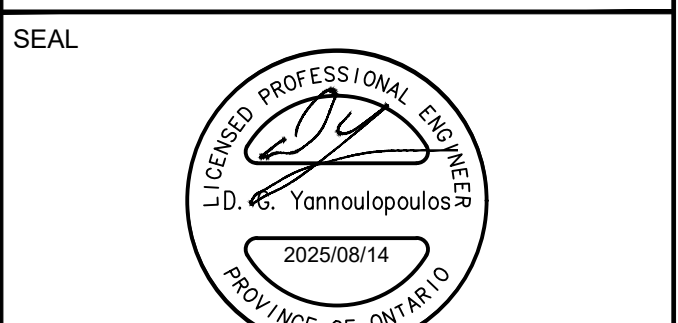
Arcadis Professional Services (Canada) Inc.
Formerly B Group Professional Services (Canada) Inc.

ISSUES		
No.	DESCRIPTION	DATE
1	SUBMISSION NO.1 FOR CITY REVIEW	2024-11-26
2	SUBMISSION NO.2 FOR CITY REVIEW	2025-02-18
3	SUBMISSION NO.3 FOR CITY REVIEW	2025-04-22
4	REVISED PER CITY COMMENTS	2025-06-02
5	REVISED SITE PLAN	2025-08-14

SEE 010 FOR NOTES, LEGEND AND DETAILS



CONSULTANTS



PRIME CONSULTANT

ARCADIS

333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

PROJECT

SENIORS APARTMENTS

BANK STREET AT DUN SKIPPER DRIVE

PROJECT NO:
148290

DRAWN BY:
M.M.

CHECKED BY:
R.M.

PROJECT MGR:
R.M.

APPROVED BY:
A.Z.

SHEET TITLE

INTERIM PONDING PLAN

SHEET NUMBER

C-601

ISSUE

5

User Inputs

Chamber Model:	SC-310
Outlet Control Structure:	Yes
Project Name:	148290 Dun Skipper
Engineer:	Amy Zhuang
Project Location:	Ontario
Measurement Type:	Metric
Required Storage Volume:	88.00 cubic meters.
Stone Porosity:	30%
Stone Foundation Depth:	200 mm.
Stone Above Chambers:	600 mm.
Design Constraint Dimensions:	(9.01 m. x 22.01 m.)

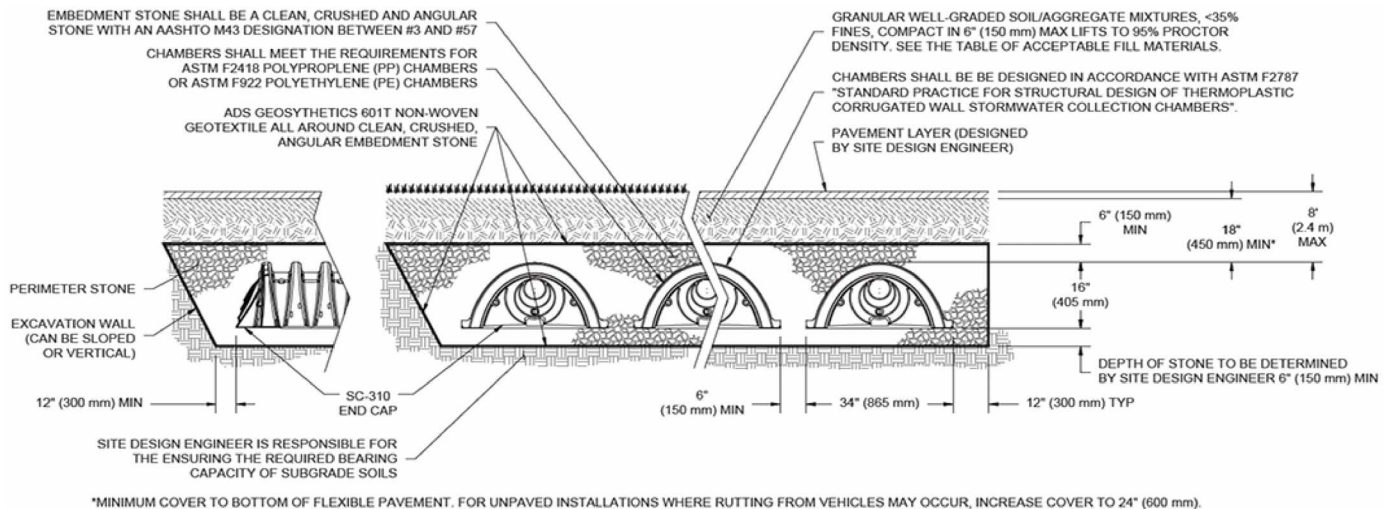
Results

System Volume and Bed Size

Installed Storage Volume:	88.64 cubic meters.
Storage Volume Per Chamber:	0.42 cubic meters.
Number Of Chambers Required:	72
Number Of End Caps Required:	16
Chamber Rows:	8
Maximum Length:	21.51 m.
Maximum Width:	8.77 m.
Approx. Bed Size Required:	186.96 square meters.
Average Cover Over Chambers:	N/A .

System Components

Amount Of Stone Required:	196 cubic meters
Volume Of Excavation (Not Including Fill):	226 cubic meters
Total Non-woven Geotextile Required:	537 square meters
Woven Geotextile Required (excluding Isolator Row):	27 square meters
Woven Geotextile Required (Isolator Row):	30 square meters
Total Woven Geotextile Required:	56 square meters
Impervious Liner Required:	0 square meters



Orifice coefficients	
Cv =	0.60

	Invert (m)	Diameter (mm)	Centre ICD (m)	Max. Pond Elevation (m)	Hydraulic Slope (m)	Target Flow (l/s)	Theoretical		Recommended	
							Orifice (m)	Actual Flow (l/s)	Orifice (m)	Actual Flow (l/s)
CB20	99.050	200	99.150	100.750	1.600	15.00	0.067	15.00	0.067	15.00
CB24	99.940	200	100.040	101.340	1.300	15.00	0.070	15.00	0.070	15.00
CB25	100.170	200	100.270	101.670	1.400	6.00	0.044	6.00	0.044	6.00
CBMH20	98.474	300	98.624	100.500	1.876	15.00	0.064	15.00	0.064	15.00
MH21	98.373	300	98.523	100.550	2.027	33.00	0.093	33.00	0.093	33.00
MH22	98.422	300	98.572	100.750	2.178	6.00	0.039	6.00	0.039	6.00
						90.00				89.99



4838 Bank Street
CITY OF OTTAWA
Home Hardware



4836 Bank Street
CITY OF OTTAWA
Home Hardware

[illegible]

Sewer Design and As-built Data							
U/S Man	D/S Man	Design Slope	As-built Slope	Design Length	As-built Length	U/S Invert	As-built U/S Invert
BLOG D	MHTA-MHSA	1.00		11.10		100.420	98.828
BLOG A	MHTA-MHSA	1.00		14.61		100.880	98.818
MHTA	MHSA	0.65	0.67	32.62	32.765	98.852	98.640 98.630
MHSA	MHSA	0.35	0.33	90.34	92.163	97.847	97.810 97.535 97.501
MHSA	MHSA	0.35	0.30	30.01	30.462	97.475	97.616 97.376 97.460
MHSA	MHSA	0.35	0.39	14.90	15.219	97.340	97.288 97.260
MHSA	MHSA	0.35	0.33	33.69	33.650	97.228	97.230 97.110 97.120





4836 Bank Street
City of Ottawa
Home Hardware



4836 Bank Street
City of Ottawa
Home Hardware

LOCATION				RATIONAL DESIGN FLOW																	SEWER DATA																			
STREET	AREA ID	FROM	TO	C=0.20	C=0.30	C=0.40	C=0.50	C=0.55	C=0.65	C=0.70	C=0.75	C=0.90	C=1.00	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (2) (mm/hr)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	2yr PEAK FLOW (L/s)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm)			SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (2yr) (%)				
																															DIA	W	H							
		CB3	MH9-MH8									0.12		0.25	0.25	10.00	0.11	10.11	76.81	104.19	122.14	178.56	19.22	26.07		44.68		19.22	34.22	6.73	200				1.00	1.055	15.00	43.84%		
		CB2	MH9-MH8									0.02		0.05	0.05	10.00	0.12	10.12	76.81	104.19	122.14	178.56	3.84	5.21	6.11	8.94		3.84	34.22	7.69	200				1.00	1.055	30.37	88.77%		
		MH9	MH8											0.00	0.30	10.12	0.64	10.76	76.34	103.56	121.39	177.46	22.92	31.09	36.45	53.28		22.92	158.48	53.17	375			0.75	1.390	135.56	85.54%			
		CB1	MH8-MH7									0.17		0.35	0.35	10.00	0.17	10.17	76.81	104.19	122.14	178.56	27.22	36.93	43.29	63.29		27.22	34.22	10.80	200				1.00	1.055	6.99	20.44%		
		MH7	MH8											0.00	0.65	10.76	0.46	11.21	76.81	104.19	122.14	178.56	11.21	15.81	18.45	26.20		11.21	48.63	26.20	250			0.67	0.860	0.18	0.30%			
		BLDG A	MH7-MH5											0.13	0.13	10.00	0.20	10.20	76.81	104.19	122.14	178.56	9.61	13.03	15.28	22.34		9.61	34.22	12.60	200				1.00	1.055	24.61	71.92%		
		BLDG A	MH7-MH5									0.30		0.75	0.75	10.00	0.18	10.18	76.81	104.19	122.14	178.56	57.65	78.21	91.68	134.03		57.65	62.04	12.97	250				1.00	1.224	4.39	7.07%		
		MH7	MH5											0.00	1.53	11.21	0.47	11.68	72.44	98.19	115.07	168.17	110.86	150.27	176.11		110.86	225.20	38.55	450			0.57	1.372	114.34	50.77%				
		CB4	MH10-CBMH1									0.03		0.08	0.08	10.00	0.12	10.12	76.81	104.19	122.14	178.56	5.76	7.82	9.17	13.40		5.76	34.22	7.78	200				1.00	1.055	28.45	83.15%		
		MH10	CBMH1											0.00	0.08	10.12	0.71	10.83	76.34	103.55	121.38	177.44	5.73	7.77	9.11	13.32		5.73	49.16	41.40	250			0.63	0.970	43.43	88.35%			
		CB5	CBMH1-CBMH2											0.15	0.15	10.00	0.36	10.36	76.81	104.19	122.14	178.56	11.53	15.64	18.34	26.81		11.53	34.22	22.72	200				1.00	1.055	22.69	66.30%		
		CB6	CBMH1-CBMH2											0.18	0.18	10.00	0.15	10.15	76.81	104.19	122.14	178.56	13.45	18.25	21.39	31.27		13.45	34.22	9.78	200				1.00	1.055	20.76	60.69%		
		CB7	CBMH1-CBMH2											0.20	0.20	10.00	0.15	10.15	76.81	104.19	122.14	178.56	15.37	20.86	24.45	35.74		15.37	34.22	9.59	200				1.00	1.055	18.84	55.07%		
		CBMH1	CBMH2											0.08	0.20	0.80	10.83	0.81	11.64	73.74	99.98	117.18	171.28	59.04	80.05	93.82	137.13		59.04	65.96	63.25	250			1.13	1.302	6.92	10.49%		
		CBMH2	MH4											0.00	0.80	11.64	0.70	12.34	71.02	96.24	112.78	164.81	56.86	77.06	90.30	131.95		56.86	58.89	33.75	300			0.34	0.807	2.03	3.44%			
Ildone Commercial		MH1	MH3									1.58	0.99	5.77	5.77	10.28	1.47	11.75	75.75	102.74	120.43	176.04	437.15	502.92	695.01	1,015.97		437.15	506.25	97.97	750			0.19	1.110	69.10	13.65%			
		MH3	MH4			0.16				0.02		0.09	0.15	0.73	6.50	11.75	0.39	12.14	70.68	95.77	112.23	163.99	459.68	622.89	729.90	1,066.59		459.68	592.21	30.43	750			0.26	1.299	132.53	22.38%			
		MH4	MH5											0.00	7.30	12.14	0.18	12.32	69.46	94.10	110.25	161.10	507.34	687.32	805.33	1,176.72		507.34	660.70	15.46	750			0.32	1.449	153.36	23.21%			
		CB17	MH5-MH12									0.09		0.23	0.23	10.00	0.04	10.04	76.81	104.19	122.14	178.56	17.29	23.46	27.50	40.21		17.29	34.22	2.55	200				1.00	1.055	16.92	49.45%		
		CB16	MH5-MH12			0.01								0.01	0.01	10.00	0.14	10.14	76.81	104.19	122.14	178.56	0.64	0.87	1.02	1.49		0.64	34.22	9.09	200				1.00	1.055	33.58	98.13%		
		MH5	MH12											0.00	9.07	12.32	0.34	12.66	68.92	93.35	109.38	159.81	624.96	846.57	991.89	1,449.26		624.96	705.11	31.20	750			0.37	1.546	80.16	11.37%			
		MH12	EX 1350 SEWER											0.00	9.07	12.66	0.16	12.82	67.92	91.99	107.77	157.45	615.91	834.16	977.28	1,427.82		615.91	747.54	15.69	750			0.41	1.639	131.62	17.61%			
Definitions: Q = 2.78C/A, where: Q = Peak Flow in Litres per Second (L/s) A = Area in Hectares (Ha) i = Rainfall intensity in millimeters per hour (mm/hr) [i = 732.951 / (TC+6.199)^0.810] 5 YEAR [i = 998.071 / (TC+6.053)^0.814] 6 YEAR [i = 1174.184 / (TC+6.014)^0.816] 10 YEAR [i = 1735.688 / (TC+6.014)^0.820] 100 YEAR				Notes: 1. Mannings coefficient (n) = 0.013																	Designed:		JEB		No.		Revision										Date			
																					Checked:		JIM		Dwg. Reference:		119351-500		File Reference:		119351.5.7.1		Date:		2025-04-17		Sheet No:		1 of 1	

Sewer Design and As-built Data									
U/S MH	D/S MH	Design Slope	As-built Slope	Design Length	As-built Length	U/S Invert	As-built U/S Inv	D/S Invert	As-built D/S Invert
CB3	MH9-MH8	1.00		6.73		101.050		100.228	
CB2	MH9-MH8	1.00		7.69		100.350		100.145	
MH9	MH8	0.75	0.75	54.91	53.280	100.067	100.180	99.655	99.780
CB1	MH8-MH7	1.00		10.80		100.650		99.784	
MH8	MH7	0.75	0.61	25.16	26.040	99.750	99.730	99.562	99.570
BLDG D	MH7-MH5	1.00		12.60		100.420		99.356	
BLDG A	MH7-MH5	1.00		12.97		100.800		99.303	
MH7	MH5	0.60	0.57	38.63	38.550	99.162	99.370	98.930	99.149
CB4	MH10-CBMH1	1.00		7.78		101.200		100.532	
MH10	CBMH1	0.60	0.63	41.57	41.400	100.499	100.440	100.250	100.180
CB5	CBMH1-CBMH2	1.00		22.72		99.930		99.653	
CB6	CBMH1-CBMH2	1.00		9.78		100.050		99.568	
CB7	CBMH1-CBMH2	1.00		9.59		99.900		99.228	
CBMH1	CBMH2	1.15	1.13	63.40	63.25	99.795	99.730	99.066	99.015
CBMH2	MH4	0.35	0.34	33.14	33.75	99.016	99.015	98.900	98.900
MH1	MH3	0.20	0.19	90.34	97.97	97.942	97.970	97.764	97.800
MH3	MH4	0.20	0.26	30.07	30.43	97.704	97.730	97.645	97.650
MH4	MH5	0.25	0.32	15.46	15.45	97.849	97.645	97.810	97.595
CB17	MH5-MH12	1.00		2.55		99.950		98.112	
CB16	MH5-MH12	1.00		9.09		100.250		98.081	
MH5	MH12	0.35	0.37	31.13	31.2	97.584	97.590	97.475	97.475
MH12	EX 1350 SEWER	0.35	0.41	15.71	15.69	97.455	97.455	97.400	97.390



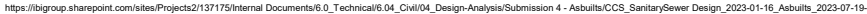


4840 Bank Street



4840 Bank Street
CITY OF OTTAWA
Block 204 Pathways South Apartments

Sewer Design and As-built Data									
U/S MH	D/S MH	Design Slope	As-built Slope	Design Length	As-built Length	U/S Invert	As-built U/S Inv	D/S Invert	As-built D/S Invert
MH 7A	MH 6A	0.60	0.59	32.05	32.068	98.930	98.920	98.739	98.730
MH 6A	MH 3A	0.60	0.60	13.12	13.296	98.680	98.680	98.601	98.600
MH 3A	MH 2A	0.54	0.51	35.42	35.342	98.534	98.530	98.341	98.350
MH 2A	MH 1A	0.49	0.69	9.77	10.175	98.251	98.260	98.203	98.190





1.34 1.51

STORM SEWER DESIGN SHEET

4840 Bank Street
City of Ottawa
Block 204 Pathways South Apartments



As-built Storm Sewers

4840 Bank Street
City of Ottawa
Block 204 Pathways South Apartments

[illegible]

Sewer Design and As-built Data									
U/S MH	D/S MH	Design Slope	As-built Slope	Design Length	As-built Length	U/S Invert	As-built U/S Inv	D/S Invert	As-built D/S Invert
MH5	MH6	0.60	0.61	81.56	81.501	99.960	99.970	99.470	99.470
MH7	MH6	0.60	0.58	29.05	29.127	99.685	99.710	99.510	99.540
MH6	MH3	0.60	0.42	16.11	16.555	99.450	99.430	99.353	99.360
MH4	MH3	0.60	0.63	45.00	44.672	99.740	99.760	99.472	99.480
MH3	CBMH2	0.50	0.47	38.68	38.202	99.221	99.230	99.028	99.050
CBMH2	MH1	0.47	0.38	7.05	7.878	98.951	98.980	98.918	98.950
			</						





IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

PROJECT: 4836 Bank St
DATE: 2019-10-08
FILE: 119351.5.7
REV #:
DESIGNED BY: JEB
CHECKED BY: JM

STORMWATER MANAGEMENT

Formulas and Descriptions

$i_{2yr} = 1:2$ year Intensity = $732.951 / (T_c + 6.199)^{0.810}$
 $i_{5yr} = 1:5$ year Intensity = $998.071 / (T_c + 6.053)^{0.814}$
 $i_{100yr} = 1:100$ year Intensity = $1735.688 / (T_c + 6.014)^{0.820}$
 T_c = Time of Concentration (min)
 C = Average Runoff Coefficient
 A = Area (Ha)
 Q = Flow = $2.78CiA$ (L/s)

Maximum Allowable Release Rate

Restricted Flowrate

Taken from City of Ottawa approved Design Brief "Pathways at Findlay Creek" (D07-16-13-0023) drainage area EXT 4

EXT 4 Release Rate 760.00 L/s
Area EXT 4 TOTAL = 4.04 Ha
Area Subject Lands 2.49
Percentage Share of release rate 62%

Q TOTAL = 468.42 L/s

Uncontrolled Release ($Q_{uncontrolled} = 2.78 \cdot C \cdot i_{100yr} \cdot A_{uncontrolled}$)

C = 0.625
 T_c = 10 min
 i_{100yr} = 178.56 mm/hr
 $A_{uncontrolled}$ = 0.01 Ha

Q uncontrolled = 3.10 L/s

Maximum Allowable Release Rate ($Q_{max\ allowable} = Q_{restricted} - Q_{uncontrolled}$)

Q max allowable = 465.31 L/s

MODIFIED RATIONAL METHOD (100-Year & 5-Year Ponding)

Drainage Area MH9/MH9B

Area (Ha) 0.14
C = 0.98 Restricted Flow Q_r (L/s)= 10.00

100-Year Ponding					
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78 \times C \times i_{100yr} \times A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 100yr (m^3)
30	91.87	34.86	10.00	24.86	44.75
32	87.89	33.35	10.00	23.35	44.83
33	86.03	32.65	10.00	22.65	44.84
34	84.27	31.98	10.00	21.98	44.83
36	80.96	30.72	10.00	20.72	44.76

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	44.84	20.64	10.07	14.13

Length (m)	Dia (m)	Area (m^2)	Volume (m^3)
54.91	0.375	0.110	6.06
6.73	0.200	0.031	0.21
7.69	0.200	0.031	0.24
			6.51

overflows to: CB1

Drainage Area MH9/MH9B

Area (Ha) 0.14
C = 0.78 Restricted Flow Q_r (L/s)= 10.00

5-Year Ponding					
T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p = 2.78 \times C \times i_{5yr} \times A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 5yr (m^3)
13	90.63	27.51	10.00	17.51	13.66
15	83.56	25.37	10.00	15.37	13.83
16	80.46	24.43	10.00	14.43	13.85
17	77.61	23.56	10.00	13.56	13.83
19	72.53	22.02	10.00	12.02	13.70

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	13.85	20.64	10.07	0.00

Structure	Depth	Area (m^2)	Volume (m^3)
CB3 (600mm x 600mm)	1.80	0.36	0.65
CB2 (600mm x 600mm)	1.80	0.36	0.65
CBMH10 (1200mm round)	2.00	1.13	2.26
			3.56

overflows to: CB1

Drainage Area MH9/MH9B

Area (Ha) 0.140
C = 0.78 Restricted Flow Q_r (L/s)= 10.00

2-Year Ponding					
T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p = 2.78 \times C \times i_{2yr} \times A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 2yr (m^3)
10	76.81	23.32	10.00	13.32	7.99
11	73.17	22.21	10.00	12.21	8.06
12	69.89	21.22	10.00	11.22	8.08
13	66.93	20.32	10.00	10.32	8.05
15	61.77	18.75	10.00	8.75	7.88

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	8.08	20.64	10.07	0.00

overflows to: CB1

Drainage Area		CB1			
Area (Ha)	0.17				
C =	0.88	Restricted Flow Q_r (L/s)= 16.00			
100-Year Ponding					
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78 \times C i_{100yr} A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 100yr (m^3)
19	123.87	49.72	16.00	33.72	38.44
21	116.30	46.68	16.00	30.68	38.65
22	112.88	45.31	16.00	29.31	38.68
23	109.68	44.02	16.00	28.02	38.67
25	103.85	41.68	16.00	25.68	38.52

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
14.13	52.82	50.59	5.58	0.00

Length (m)	Dia (m)	Area (m ²)	Volume (m ³)
31.00	0.450	0.159	4.93

overflows to: CB17

Drainage Area		CB1			
Area (Ha)		0.17			
C =	0.70	Restricted Flow Q _r (L/s)= 16.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
7	123.30	39.59	16.00	23.59	9.91
9	109.79	35.25	16.00	19.25	10.40
10	104.19	33.46	16.00	17.46	10.47
11	99.19	31.85	16.00	15.85	10.46
13	90.63	29.10	16.00	13.10	10.22

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	10.47	50.59	5.58	0.00

Structure	Depth	Area (m ²)	Volume (m ³)
CB3 (600mm x 600mm)	1.80	0.36	0.65

overflows to: CB17

Drainage Area		CB1			
Area (Ha)		0.165			
C =		0.70		Restricted Flow Q _r (L/s)= 16.00	
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
4	111.72	35.87	16.00	19.87	4.77
6	96.64	31.03	16.00	15.03	5.41
7	90.66	29.11	16.00	13.11	5.51
8	85.46	27.44	16.00	11.44	5.49
10	76.81	24.66	16.00	8.66	5.20

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	5.51	50.59	5.58	0.00

overflows to: CB17

Drainage Area		CB16			
Area (Ha)	0.010				
C =	0.38	Restricted Flow Q _r (L/s)=		6.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p ≈ 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
-6	57497.20	599.41	16.00	583.41	-210.03
-4	977.56	10.19	16.00	-5.81	1.39
-3	702.38	7.32	16.00	-8.68	1.56
-2	555.31	5.79	16.00	-10.21	1.23
0	398.62	4.16	16.00	-11.84	0.00

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	1.56	0.31	0.00	1.25

overflows to: CB17

Drainage Area		CB16			
Area (Ha)		0.010			
C =		0.30			
		Restricted Flow Q _r (L/s)= 6.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
-6	10904.38	90.94	6.00	84.94	-30.58
-4	555.75	4.63	6.00	-1.37	0.33
-3	402.34	3.36	6.00	-2.64	0.48
-2	319.47	2.66	6.00	-3.34	0.40
0	230.48	1.92	6.00	-4.08	0.00

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.48	0.31	0.00	0.17

overflows to: CB17

Drainage Area		CB16			
Area (Ha)		0.010			
C =		0.30		Restricted Flow Q _r (L/s)= 6.00	
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78x C i _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
-7	#NUM!	#NUM!	6.00	#NUM!	#NUM!
-5	632.75	5.28	6.00	-0.72	0.22
-4	387.14	3.23	6.00	-2.77	0.67
-3	285.77	2.38	6.00	-3.62	0.65
-1	192.83	1.61	6.00	-4.39	0.26

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.67	0.31	0.00	0.36

overflows to: CB17

Drainage Area		CB17			
Area (Ha)		0.090			
C =		1.00		Restricted Flow Q _r (L/s)= 9.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 100yr (m ³)
22	112.88	28.24	9.00	19.24	25.40
24	106.68	26.69	9.00	17.69	25.47
25	103.85	25.98	9.00	16.98	25.47
26	101.18	25.32	9.00	16.32	25.45
28	96.27	24.09	9.00	15.09	25.35

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
1.25	26.73	0.84	5.10	20.79

Length (m)	Dia (m)	Area (m ²)	Volume (m ³)
28.00	0.450	0.159	4.45

overflows to: CB15

Drainage Area		CB17			
Area (Ha)		0.090			
C =		0.90			
		Restricted Flow Q _r (L/s)= 9.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCI _{5yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 5yr (m ³)
10	104.19	23.46	9.00	14.46	8.68
12	94.70	21.32	9.00	12.32	8.87
13	90.63	20.41	9.00	11.41	8.90
14	86.93	19.58	9.00	10.58	8.88
16	80.46	18.12	9.00	9.12	8.75

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.17	9.06	0.84	5.10	3.13

Structure	Depth	Area (m ²)	Volume (m ³)
CB3 (600mm x 600mm)	1.80	0.36	0.65

overflows to: CB15

Drainage Area		CB17			
Area (Ha)		0.090			
C =		0.90		Restricted Flow Q _r (L/s)= 9.00	
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
7	90.66	20.42	9.00	11.42	4.79
9	80.87	18.21	9.00	9.21	4.97
10	76.81	17.29	9.00	8.29	4.98
11	73.17	16.48	9.00	7.48	4.93
13	66.93	15.07	9.00	6.07	4.74

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	4.98	0.84	5.10	0.00

overflows to: CB15

Drainage Area		CB15			
Area (Ha)		0.090			
C =		0.94		Restricted Flow Q _r (L/s)= 6.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 100yr (m ³)
33	86.03	20.18	6.00	14.18	28.08
35	82.58	19.37	6.00	13.37	28.08
36	80.96	18.99	6.00	12.99	28.06
37	79.42	18.63	6.00	12.63	28.03
39	76.51	17.95	6.00	11.95	27.96

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
20.79	48.85	66.27	5.10	0.00

Length (m)	Dia (m)	Area (m ²)	Volume (m ³)
28.00	0.450	0.159	4.45 4.45

overflows to: out

Drainage Area		CB15			
Area (Ha)		0.090			
C =		0.75			
		Restricted Flow Q _r (L/s)= 6.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCI _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
13	90.63	17.01	6.00	11.01	8.59
15	83.56	15.68	6.00	9.68	8.71
16	80.46	15.10	6.00	9.10	8.73
17	77.61	14.56	6.00	8.56	8.73
19	72.53	13.61	6.00	7.61	8.67

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
3.13	11.86	66.27	5.10	0.00

Structure	Depth	Area (m ²)	Volume (m ³)
CB3 (600mm x 600mm)	1.80	0.36	0.65 0.65

overflows to: out

Drainage Area		CB15			
Area (Ha)	0.090				
C =	0.75		Restricted Flow Q _r (L/s)= 6.00		
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
9	80.87	15.18	6.00	9.18	4.95
11	73.17	13.73	6.00	7.73	5.10
12	69.89	13.12	6.00	7.12	5.12
13	66.93	12.56	6.00	6.56	5.12
15	61.77	11.59	6.00	5.59	5.03

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	5.12	66.27	5.10	0.00

overflows to: out

Drainage Area		CBMH3			
Area (Ha)	0.020				
C =	0.81	Restricted Flow Q _r (L/s)=			6.00
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
3	286.05	12.92	6.00	6.92	1.25
5	242.70	10.96	6.00	4.96	1.49
6	226.01	10.21	6.00	4.21	1.52
7	211.67	9.56	6.00	3.56	1.50
9	188.25	8.50	6.00	2.50	1.35

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	1.52	4.17	0	0.00

overflows to: CB12/13/14

Drainage Area		CBMH3			
Area (Ha)		0.020			
C =		0.90		Restricted Flow Q _r (L/s)= 6.00	
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
0	230.48	11.53	6.00	5.53	0.00
2	182.69	9.14	6.00	3.14	0.38
3	166.09	8.31	6.00	2.31	0.42
4	152.51	7.63	6.00	1.63	0.39
6	131.57	6.58	6.00	0.58	0.21

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.42	4.17	0.00	0.00

overflows to: CB12/13/14

Drainage Area		CBMH3			
Area (Ha)	0.020				
C =	0.90		Restricted Flow Q _r (L/s)=		6.00
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
-2	229.26	11.47	6.00	5.47	-0.66
0	167.22	8.37	6.00	2.37	0.00
1	148.14	7.41	6.00	1.41	0.08
2	133.33	6.67	6.00	0.67	0.08
4	111.72	5.59	6.00	-0.41	-0.10

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.08	4.17	0.00	0.00

overflows to: CB12/13/14

Drainage Area		CB11			
Area (Ha)	0.030				
C =	1.00	Restricted Flow Q _r (L/s)= 15.00			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
1	351.38	29.31	15.00	14.31	0.86
3	286.05	23.86	15.00	8.86	1.59
4	262.41	21.88	15.00	6.88	1.65
5	242.70	20.24	15.00	5.24	1.57
7	211.67	17.65	15.00	2.65	1.11

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
5.62	7.27	0.93	0	6.34

overflows to: CB12/CB13/CB14

Drainage Area		CB11			
Area (Ha)	0.030				
C =	0.90	Restricted Flow Q _r (L/s)= 15.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
-2	319.47	23.98	15.00	8.98	-1.08
0	230.48	17.30	15.00	2.30	0.00
1	203.51	15.28	15.00	0.28	0.02
2	182.69	13.71	15.00	-1.29	-0.15
4	152.51	11.45	15.00	-3.55	-0.85

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.02	0.93	0.00	0.00

overflows to: CB12/CB13/CB14

Drainage Area		CB11			
Area (Ha)	0.030				
C =	0.90		Restricted Flow Q _r (L/s)=		15.00
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
-4	387.14	29.06	15.00	14.06	-3.37
-2	229.26	17.21	15.00	2.21	-0.26
-1	192.83	14.47	15.00	-0.53	0.03
0	167.22	12.55	15.00	-2.45	0.00
2	133.33	10.01	15.00	-4.99	-0.60

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.03	0.93	0.00	0.00

overflows to: CB12/CB13/CB14

Drainage Area		CB12/CB13/CB14			
Area (Ha)	0.330	Restricted Flow Q _r (L/s)= 73.00			
C =	1.00				
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCI _{100yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 100yr (m ³)
9	188.25	172.70	73.00	99.70	53.84
10	178.56	163.81	73.00	90.81	54.49
11	169.91	155.87	73.00	82.87	54.70
12	162.13	148.74	73.00	75.74	54.53
14	148.72	136.44	73.00	63.44	53.29

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
6.34	61.03	54.36	5.07	1.60
Length (m)	Dia (m)	Area (m ²)	Volume (m ³)	
11.07	0.375	0.110	1.22	
12.00	0.450	0.159	1.91	
			3.13	

overflows to: CB10

Drainage Area		CB10			
Area (Ha)		0.130			
C =		1.00		Restricted Flow Q _r (L/s)= 45.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 100yr (m ³)
5	242.70	87.71	45.00	42.71	12.81
6	226.01	81.68	45.00	36.68	13.20
7	211.67	76.50	45.00	31.50	13.23
8	199.20	71.99	45.00	26.99	12.96
10	178.56	64.53	45.00	19.53	11.72

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
5.62	18.85	6.81	0.00	12.04

overflows to: CB18

Drainage Area		CB12/CB13/CB14			
Area (Ha)		0.330			
C =	0.90	Restricted Flow Q _r (L/s)=		73.00	
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCI _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
2	182.69	150.84	73.00	77.84	9.34
4	152.51	125.92	73.00	52.92	12.70
5	141.18	116.57	73.00	43.57	13.07
6	131.57	108.63	73.00	35.63	12.83
8	116.11	95.87	73.00	22.87	10.98

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	13.07	54.36	5.07	0.00
Structure	Depth	Area (m ²)	Volume (m ³)	
CB12 (600mm x 600mm)	1.80	0.36	0.65	
CB13 (600mm x 600mm)	1.80	0.36	0.65	
CB14 (600mm x 600mm)	1.80	0.36	0.65	
			1.94	

overflows to: CB10

Drainage Area		CB10			
Area (Ha)		0.130		Restricted Flow Q _r (L/s)= 45.00	
C =		0.90			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
-1	266.98	86.84	45.00	41.84	-2.51
1	203.51	66.19	45.00	21.19	1.27
2	182.69	59.42	45.00	14.42	1.73
3	166.09	54.02	45.00	9.02	1.62
5	141.18	45.92	45.00	0.92	0.28

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	1.73	6.81	0.00	0.00

overflows to: CB18

Drainage Area 2/CB13/CB14					
Area (Ha)	0.330				
C =	0.90	Restricted Flow Q _r (L/s)= 73.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
0	167.22	138.07	73.00	65.07	0.00
2	133.33	110.09	73.00	37.09	4.45
3	121.46	100.29	73.00	27.29	4.91
4	111.72	92.25	73.00	19.25	4.62
6	96.64	79.79	73.00	6.79	2.44

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	4.91	54.36	5.07	0.00

overflows to: CB10

Drainage Area		CB10			
Area (Ha)	0.130	Restricted Flow Q _r (L/s)= 45.00			
C =	0.90				
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
-2	229.26	74.57	45.00	29.57	-3.55
0	167.22	54.39	45.00	9.39	0.00
1	148.14	48.19	45.00	3.19	0.19
2	133.33	43.37	45.00	-1.63	-0.20
4	111.72	36.34	45.00	-8.66	-2.08

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
Balance	#VALUE!	6.81	0.00	#VALUE!

overflows to: CB18

Drainage Area		CBMH2			
Area (Ha)		0.080			
C =		1.00			
		Restricted Flow Q _r (L/s)= 20.00			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 100yr (m ³)
7	211.67	47.07	20.00	27.07	11.37
9	188.25	41.87	20.00	21.87	11.81
10	178.56	39.71	20.00	19.71	11.83
11	169.91	37.79	20.00	17.79	11.74
13	155.11	34.50	20.00	14.50	11.31

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	11.83	6.21	0.00	5.62

overflows to: CB11

Drainage Area		CB7			
Area (Ha)		0.080			
C =		1.00		Restricted Flow Q _r (L/s)= 30.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
3	286.05	63.62	30.00	33.62	6.05
5	242.70	53.98	30.00	23.98	7.19
6	226.01	50.26	30.00	20.26	7.30
7	211.67	47.07	30.00	17.07	7.17
9	188.25	41.87	30.00	11.87	6.41

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
5.62	12.91	6.97	0.00	5.94

overflows to: CB8

Drainage Area		CB6			
Area (Ha)		0.070			
C =		1.00		Restricted Flow Q _r (L/s)= 20.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
5	242.70	47.23	20.00	27.23	8.17
7	211.67	41.19	20.00	21.19	8.90
8	199.20	38.76	20.00	18.76	9.01
9	188.25	36.63	20.00	16.63	8.98
11	169.91	33.06	20.00	13.06	8.62

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	9.01	13.66	0.00	0.00

overflows to: CB8

Drainage Area		CB5			
Area (Ha)		0.060			
C =		1.00		Restricted Flow Q _r (L/s)= 15.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 100yr (m ³)
7	211.67	35.31	15.00	20.31	8.53
9	188.25	31.40	15.00	16.40	8.86
10	178.56	29.78	15.00	14.78	8.87
11	169.91	28.34	15.00	13.34	8.80
13	155.11	25.87	15.00	10.87	8.48

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	8.87	3.41	0.00	5.46

overflows to: CB8

Drainage Area		CBMH2			
Area (Ha)		0.080			
C =		0.90			
		Restricted Flow Q _r (L/s)= 20.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
1	203.51	40.73	20.00	20.73	1.24
3	166.09	33.24	20.00	13.24	2.38
4	152.51	30.53	20.00	10.53	2.53
5	141.18	28.26	20.00	8.26	2.48
7	123.30	24.68	20.00	4.68	1.97

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	2.53	6.21	0.00	0.00

overflows to: CB8

Drainage Area		CB7			
Area (Ha)		0.080			
C =	0.90	Restricted Flow Q _r (L/s)= 30.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
-1	266.98	53.44	30.00	23.44	-1.41
1	203.51	40.73	30.00	10.73	0.64
2	182.69	36.57	30.00	6.57	0.79
3	166.09	33.24	30.00	3.24	0.58
5	141.18	28.26	30.00	-1.74	-0.52

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.79	6.97	0.00	0.00

overflows to: CB8

Drainage Area		P3/L3			
Area (Ha)		0.160			
C =		0.45			
		Restricted Flow Q _r (L/s)=	20.00		
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
1	203.51	40.73	20.00	20.73	1.24
3	166.09	33.24	20.00	13.24	2.38
4	152.51	30.53	20.00	10.53	2.53
5	141.18	28.26	20.00	8.26	2.48
7	123.30	24.68	20.00	4.68	1.97

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	2.53	13.66	0.00	0.00

overflows to: CB8

Drainage Area		CBMH2			
Area (Ha)		0.080			
C =		0.90			
		Restricted Flow Q _r (L/s)= 20.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
-1	192.83	38.60	20.00	18.60	-1.12
1	148.14	29.65	20.00	9.65	0.58
2	133.33	26.69	20.00	6.69	0.80
3	121.46	24.31	20.00	4.31	0.78
5	103.57	20.73	20.00	0.73	0.22

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.80	6.21	0.00	0.00

overflows to: CB8

Drainage Area		CB7			
Area (Ha)		0.080			
C =		0.90		Restricted Flow Q _r (L/s)= 30.00	
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
-3	285.77	57.20	30.00	27.20	-4.90
-1	192.83	38.60	30.00	8.60	-0.52
0	167.22	33.47	30.00	3.47	0.00
1	148.14	29.65	30.00	-0.35	-0.02
3	121.46	24.31	30.00	-5.69	-1.02

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	6.97	0.00	0.00

overflows to: CB8

Drainage Area		CB6			
Area (Ha)		0.070			
C =		0.45		Restricted Flow Q _r (L/s)= 20.00	
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
-4	387.14	33.90	20.00	13.90	-3.34
-2	229.26	20.08	20.00	0.08	-0.01
-1	192.83	16.89	20.00	-3.11	0.19
0	167.22	14.64	20.00	-5.36	0.00
2	133.33	11.68	20.00	-8.32	-1.00

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.19	13.66	0.00	0.00

overflows to: CB8

Drainage Area		CB5			
Area (Ha)		0.060			
C =		0.90		Restricted Flow Q _r (L/s)= 15.00	
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
-1	192.83	28.95	15.00	13.95	-0.84
1	148.14	22.24	15.00	7.24	0.43
2	133.33	20.02	15.00	5.02	0.60
3	121.46	18.23	15.00	3.23	0.58
5	103.57	15.55	15.00	0.55	0.16

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
#VALUE!	#VALUE!	3.41	0.00	#VALUE!

overflows to: CB8

Drainage Area		CB8			
Area (Ha)		0.170			
C =		1.00		Restricted Flow Q _r (L/s)= 47.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
6	226.01	106.81	47.00	59.81	21.53
8	199.20	94.14	47.00	47.14	22.63
9	188.25	88.97	47.00	41.97	22.66
10	178.56	84.39	47.00	37.39	22.43
12	162.13	76.62	47.00	29.62	21.33

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
11.40	34.07	24.90	1.60	7.57

Length (m)	Dia (m)	Area (m ²)	Volume (m ³)
6.00	0.450	0.159	0.95

Drainage Area		CB8			
Area (Ha)		0.170			
C =		0.90			
		Restricted Flow Q _r (L/s)= 47.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78 x C i _{5yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 5yr (m ³)
1	203.51	86.56	47.00	39.56	2.37
3	166.09	70.64	47.00	23.64	4.26
4	152.51	64.87	47.00	17.87	4.29
5	141.18	60.05	47.00	13.05	3.91
7	123.30	52.45	47.00	5.45	2.29

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	4.29	24.90	1.60	0.00

Structure	Depth	Area (m ²)	Volume (m ³)
CB8 (600mm x 600mm)	1.80	0.36	0.65

Drainage Area		CB8			
Area (Ha)		0.170			
C =		0.90		Restricted Flow Q _r (L/s)= 47.00	
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
-1	192.83	82.02	47.00	35.02	-2.10
1	148.14	63.01	47.00	16.01	0.96
2	133.33	56.71	47.00	9.71	1.17
3	121.46	51.66	47.00	4.66	0.84
5	103.57	44.05	47.00	-2.95	-0.88

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	1.17	24.90	1.60	0.00

overflows to: CB9

Drainage Area		CB4			
Area (Ha)		0.030			
C =		1.00		Restricted Flow Q _r (L/s)= 6.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p ≈ 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
9	188.25	15.70	6.00	9.70	5.24
11	169.91	14.17	6.00	8.17	5.39
12	162.13	13.52	6.00	7.52	5.42
13	155.11	12.94	6.00	6.94	5.41
15	142.89	11.92	6.00	5.92	5.33

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
7.57	12.98	10.62	0.00	2.36

overflows to: CBMH1

Drainage Area		CB4			
Area (Ha)		0.030			
C =		0.90			
		Restricted Flow Q _r (L/s)= 6.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 5yr (m ³)
3	166.09	12.47	6.00	6.47	1.16
5	141.18	10.60	6.00	4.60	1.38
6	131.57	9.88	6.00	3.88	1.40
7	123.30	9.26	6.00	3.26	1.37
9	109.79	8.24	6.00	2.24	1.21

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	1.40	10.62	0.00	0.00

overflows to: CBMH1

Drainage Area		CB4			
Area (Ha)	0.030				
C =	0.90	Restricted Flow Q _r (L/s)= 6.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
1	148.14	11.12	6.00	5.12	0.31
3	121.46	9.12	6.00	3.12	0.56
4	111.72	8.39	6.00	2.39	0.57
5	103.57	7.77	6.00	1.77	0.53
7	90.66	6.81	6.00	0.81	0.34

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.57	10.62	0.00	0.00

overflows to: CBMH1

Drainage Area		CBMH1			
Area (Ha)	0.080				
C =	1.00	Restricted Flow Q _r (L/s)= 20.00			
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
7	211.67	47.07	20.00	27.07	11.37
9	188.25	41.87	20.00	21.87	11.81
10	178.56	39.71	20.00	19.71	11.83
11	169.91	37.79	20.00	17.79	11.74
13	155.11	34.50	20.00	14.50	11.31

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
2.36	14.19	0.00	0.00	14.19

overflows to: CB9

Drainage Area		CBMH1			
Area (Ha)		0.080			
C =		0.90			
		Restricted Flow Q _r (L/s)= 20.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
1	203.51	40.73	20.00	20.73	1.24
3	166.09	33.24	20.00	13.24	2.38
4	152.51	30.53	20.00	10.53	2.53
5	141.18	28.26	20.00	8.26	2.48
7	123.30	24.68	20.00	4.68	1.97

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	2.53	0.00	0.00	2.53

overflows to: CB9

Drainage Area		CBMH1			
Area (Ha)	0.080				
C =	0.90		Restricted Flow Q _r (L/s)= 20.00		
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
-1	192.83	38.60	20.00	18.60	-1.12
1	148.14	29.65	20.00	9.65	0.58
2	133.33	26.69	20.00	6.69	0.80
3	121.46	24.31	20.00	4.31	0.78
5	103.57	20.73	20.00	0.73	0.22

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.80	0.00	0.00	0.80

overflows to: CB9

Drainage Area		CB9			
Area (Ha)		0.150			
C =		1.00		Restricted Flow Q _r (L/s)= 43.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
5	242.70	101.21	43.00	58.21	17.46
7	211.67	88.27	43.00	45.27	19.01
8	199.20	83.07	43.00	40.07	19.23
9	188.25	78.50	43.00	35.50	19.17
11	169.91	70.85	43.00	27.85	18.38

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
21.75	40.99	10.83	0.00	30.16

overflows to: CB18

Drainage Area		CB9			
Area (Ha)		0.160			
C =		0.45		Restricted Flow Q _r (L/s)= 43.00	
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 5yr (m ³)
-3	402.34	80.53	43.00	37.53	-6.76
-1	266.98	53.44	43.00	10.44	-0.63
0	230.48	46.13	43.00	3.13	0.00
1	203.51	40.73	43.00	-2.27	-0.14
3	166.09	33.24	43.00	-9.76	-1.76

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
2.53	2.53	10.83	0.00	0.00

overflows to: CB18

Drainage Area		CB9			
Area (Ha)	0.150				
C =	0.45		Restricted Flow Q _r (L/s)= 43.00		
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
-3	285.77	53.62	43.00	10.62	-1.91
-1	192.83	36.18	43.00	-6.82	0.41
0	167.22	31.38	43.00	-11.62	0.00
1	148.14	27.80	43.00	-15.20	-0.91
3	121.46	22.79	43.00	-20.21	-3.64

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	10.83	0.00	0.00

overflows to: CB18

Drainage Area		CB18				
Area (Ha)	0.160					
C =	0.25	Restricted Flow Q _r (L/s)=		15.00		
100-Year Ponding						
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 100yr (m ³)	
3	286.05	31.81	15.00	16.81	3.03	
5	242.70	26.99	15.00	11.99	3.60	
6	226.01	25.13	15.00	10.13	3.65	
7	211.67	23.54	15.00	8.54	3.59	
9	188.25	20.93	15.00	5.93	3.20	

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
42.19	45.84	13.76	46.33	0.00

Subsurface storage calculation

450mm subdrain @ 96m	15.30 m ³
Bottom of storage medium ave. grade	98.00 m
width of S29 trench	1.00 m
depth of S29 trench (below spill elev.)	1.01 m
Volume of S29 trench	96.96 m ³
Volume of clear stone	81.66 m ³
25mm clear stone per S29	0.38 void ratio
Stoage within clear stone	31.03 m ³

overflows to: offsite

Drainage Area		RA			
Area (Ha)		0.300			
C =		1.00		Restricted Flow Q _r (L/s)= 27.00	
100-Year Ponding					
T _c Variable (min)	i _{100yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{100yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 100yr (m ³)
25	103.85	86.61	27.00	59.61	89.41
26	101.18	84.38	27.00	57.38	89.52
27	98.66	82.28	27.00	55.28	89.56
28	96.27	80.29	27.00	53.29	89.53
29	94.01	78.41	27.00	51.41	89.45

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	89.56	90.00	0.00	0.00

Drainage Area		CB18			
Area (Ha)		0.160			
C =	0.20	Restricted Flow Q _r (L/s)= 15.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
-2	319.47	28.42	15.00	13.42	-1.61
0	230.48	20.50	15.00	5.50	0.00
1	203.51	18.10	15.00	3.10	0.19
2	182.69	16.25	15.00	1.25	0.15
4	152.51	13.57	15.00	-1.43	-0.34

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.19	13.76	46.33	0.00

overflows to: offsite

Drainage Area		RA			
Area (Ha)		0.300			
C =		0.90	Restricted Flow Q _r (L/s)= 27.00		
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
13	90.63	68.03	27.00	41.03	32.00
14	86.93	65.25	27.00	38.25	32.13
15	83.56	62.72	27.00	35.72	32.15
16	80.46	60.39	27.00	33.39	32.06
17	77.61	58.25	27.00	31.25	31.88

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	32.15	90.00	0.00	0.00

Drainage Area		CB18			
Area (Ha)		0.160			
C =		0.20		Restricted Flow Q _r (L/s)= 15.00	
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
-3	285.77	25.42	15.00	10.42	-1.88
-1	192.83	17.15	15.00	2.15	-0.13
0	167.22	14.88	15.00	-0.12	0.00
1	148.14	13.18	15.00	-1.82	-0.11
3	121.46	10.81	15.00	-4.19	-0.76

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	13.76	46.33	0.00

overflows to: offsite

Drainage Area		RA			
Area (Ha)		0.300			
C =		0.90		Restricted Flow Q _r (L/s)= 27.00	
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78x C i _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
8	85.46	64.14	27.00	37.14	17.83
10	76.81	57.65	27.00	30.65	18.39
11	73.17	54.92	27.00	27.92	18.43
12	69.89	52.46	27.00	25.46	18.33
14	64.23	48.21	27.00	21.21	17.82

Storage (m ³)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	18.43	90.00	0.00	0.00

Drainage Area		RB			
Area (Ha)		0.220			
C =		1.00			
		Restricted Flow Q_r (L/s)= 20.00			
100-Year Ponding					
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
24	106.68	65.24	20.00	45.24	65.15
26	101.18	61.88	20.00	41.88	65.34
27	98.66	60.34	20.00	40.34	65.35
28	96.27	58.88	20.00	38.88	65.32
30	91.87	56.19	20.00	36.19	65.14

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	65.35	66.00	0.00	0.00

Drainage Area		RC			
Area (Ha)		0.050			
C =		1.00		Restricted Flow Q_r (L/s)= 8.00	
100-Year Ponding					
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
12	162.13	22.54	8.00	14.54	10.47
14	148.72	20.67	8.00	12.67	10.64
15	142.89	19.86	8.00	11.86	10.68
16	137.55	19.12	8.00	11.12	10.67
18	128.08	17.80	8.00	9.80	10.59

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	10.68	13.50	1.00	0.00

Drainage Area		RD			
Area (Ha)		0.050			
C =		1.00		Restricted Flow Q_r (L/s)= 8.00	
100-Year Ponding					
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
12	162.13	22.54	8.00	14.54	10.47
14	148.72	20.67	8.00	12.67	10.64
15	142.89	19.86	8.00	11.86	10.68
16	137.55	19.12	8.00	11.12	10.67
18	128.08	17.80	8.00	9.80	10.59

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	10.68	11.25	1.00	0.00

Drainage Area		EXTERNAL			
Area (Ha)		1.550			
C =		1.00		Restricted Flow Q_r (L/s)= 291.58	
100-Year Ponding					
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
9	188.25	811.19	291.58	519.61	280.59
11	169.91	732.13	291.58	440.55	290.76
12	162.13	698.63	291.58	407.05	293.08
13	155.11	668.36	291.58	376.78	293.89
15	142.89	615.73	291.58	324.15	291.74

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	293.08	270.00	0.00	23.08

Drainage Area		RB			
Area (Ha)		0.220			
C =		0.90			
		Restricted Flow Q _r (L/s)= 20.00			
5-Year Ponding					
T _c Variable (min)	i _{5yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{5yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 5yr (m ³)
11	99.19	54.60	20.00	34.60	22.84
13	90.63	49.89	20.00	29.89	23.31
14	86.93	47.85	20.00	27.85	23.40
15	83.56	45.99	20.00	25.99	23.39
17	77.61	42.72	20.00	22.72	23.17

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	23.40	66.00	0.00	0.00

Drainage Area		RC			
Area (Ha)		0.050			
C =		0.90			
		Restricted Flow Q_r (L/s)= 8.00			
5-Year Ponding					
T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78Ci_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
5	141.18	17.66	8.00	9.66	2.90
7	123.30	15.43	8.00	7.43	3.12
8	116.11	14.53	8.00	6.53	3.13
9	109.79	13.74	8.00	5.74	3.10
11	99.19	12.41	8.00	4.41	2.91

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	3.13	13.50	0.00	0.00

Drainage Area		RD				
Area (Ha)		0.050				
C =		0.90	Restricted Flow Q_r (L/s)=		8.00	
5-Year Ponding						
T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)	
5	141.18	17.66	8.00	9.66	2.90	
7	123.30	15.43	8.00	7.43	3.12	
8	116.11	14.53	8.00	6.53	3.13	
9	109.79	13.74	8.00	5.74	3.10	
11	99.19	12.41	8.00	4.41	2.91	

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	3.13	11.25	0.00	0.00

Drainage Area		EXTERNAL			
Area (Ha)	1.550				
C =	0.80	Restricted Flow Q_r (L/s)= 291.58			
5-Year Ponding					
T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
2	182.69	629.76	291.58	338.18	40.58
4	152.51	525.73	291.58	234.15	56.19
5	141.18	486.67	291.58	195.09	58.53
6	131.57	453.54	291.58	161.96	58.31
8	116.11	400.26	291.58	108.68	52.17

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	58.53	270.00	0.00	0.00

Drainage Area		RB			
Area (Ha)		0.220			
C =	0.90	Restricted Flow Q _r (L/s)= 20.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p = 2.78 x Ci _{2yr} A (L/s)	Q _r (L/s)	Q _p - Q _r (L/s)	Volume 2yr (m ³)
8	85.46	47.04	20.00	27.04	12.98
10	76.81	42.28	20.00	22.28	13.37
11	73.17	40.27	20.00	20.27	13.38
12	69.89	38.47	20.00	18.47	13.30
14	64.23	35.36	20.00	15.36	12.90

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	13.38	66.00	0.00	0.00

Drainage Area		RC			
Area (Ha)		0.050			
C =	0.90	Restricted Flow Q _r (L/s)= 8.00			
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
2	133.33	16.68	8.00	8.68	1.04
4	111.72	13.98	8.00	5.98	1.43
5	103.57	12.96	8.00	4.96	1.49
6	96.64	12.09	8.00	4.09	1.47
8	85.46	10.69	8.00	2.69	1.29

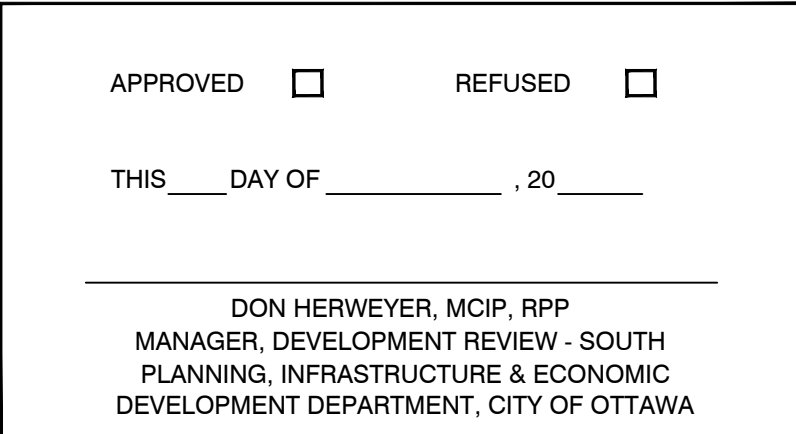
Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	1.49	13.50	0.00	0.00

Drainage Area		RD			
Area (Ha)		0.050			
C =		0.90		Restricted Flow Q _r (L/s)= 8.00	
2-Year Ponding					
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)
2	133.33	16.68	8.00	8.68	1.04
4	111.72	13.98	8.00	5.98	1.43
5	103.57	12.96	8.00	4.96	1.49
6	96.64	12.09	8.00	4.09	1.47
8	85.46	10.69	8.00	2.69	1.29

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	1.49	11.25	0.00	0.00

Drainage Area		EXTERNAL				
Area (Ha)		1.550				
C =		0.80	Restricted Flow Q _r (L/s)= 291.58			
2-Year Ponding						
T _c Variable (min)	i _{2yr} (mm/hour)	Peak Flow Q _p =2.78xCi _{2yr} A (L/s)	Q _r (L/s)	Q _p -Q _r (L/s)	Volume 2yr (m ³)	
0	167.22	576.45	291.58	284.87	0.00	
2	133.33	459.62	291.58	168.04	20.16	
3	121.46	418.71	291.58	127.13	22.88	
4	111.72	385.13	291.58	93.55	22.45	
6	96.64	333.13	291.58	41.55	14.96	

Storage (m^3)				
Overflow	Required	Surface	Sub-surface	Balance
0.00	22.88	270.00	0.00	0.00



LEGEND:

	AREA ID
	RUNOFF COEFFICIENT
	AREA IN HECTARES
	EXISTING AREA ID
	EXISTING RUNOFF COEFFICIENT
	EXISTING AREA IN HECTARES

14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4	ADD PHASING	JIM	2020/06/21
3	REVISED AS PER CITY COMMENTS	JIM	2019/12/09
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	JIM	2019/10/11
1	ISSUED FOR SPA	JIM	2019/04/11
No.	REVISIONS	By	Date

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

BANK STREET DEVELOPMENT

4836 BANK STREET



The seal is circular with the text "LICENSED PROFESSIONAL ENGINEER" around the top and "PROVINCE OF ONTARIO" around the bottom. In the center, it says "J. I. MOFFATT" and "2020/06/23". A signature is written across the seal. To the right of the seal is a north arrow pointing towards the top right, labeled with an "N".

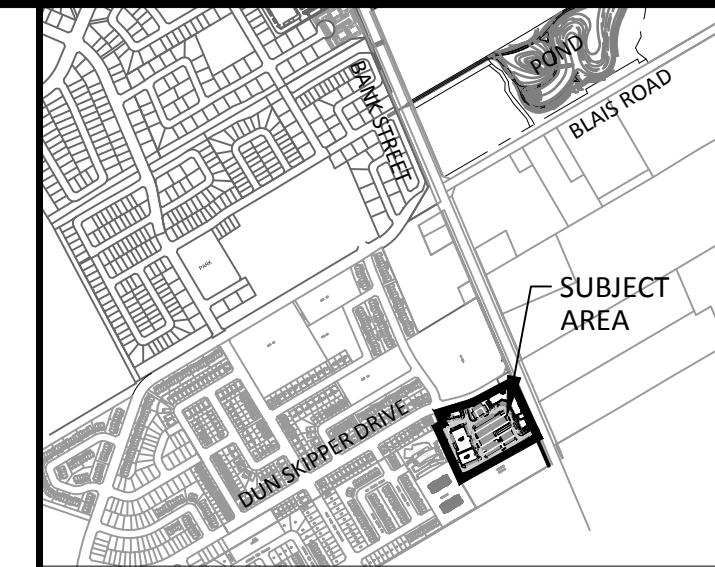
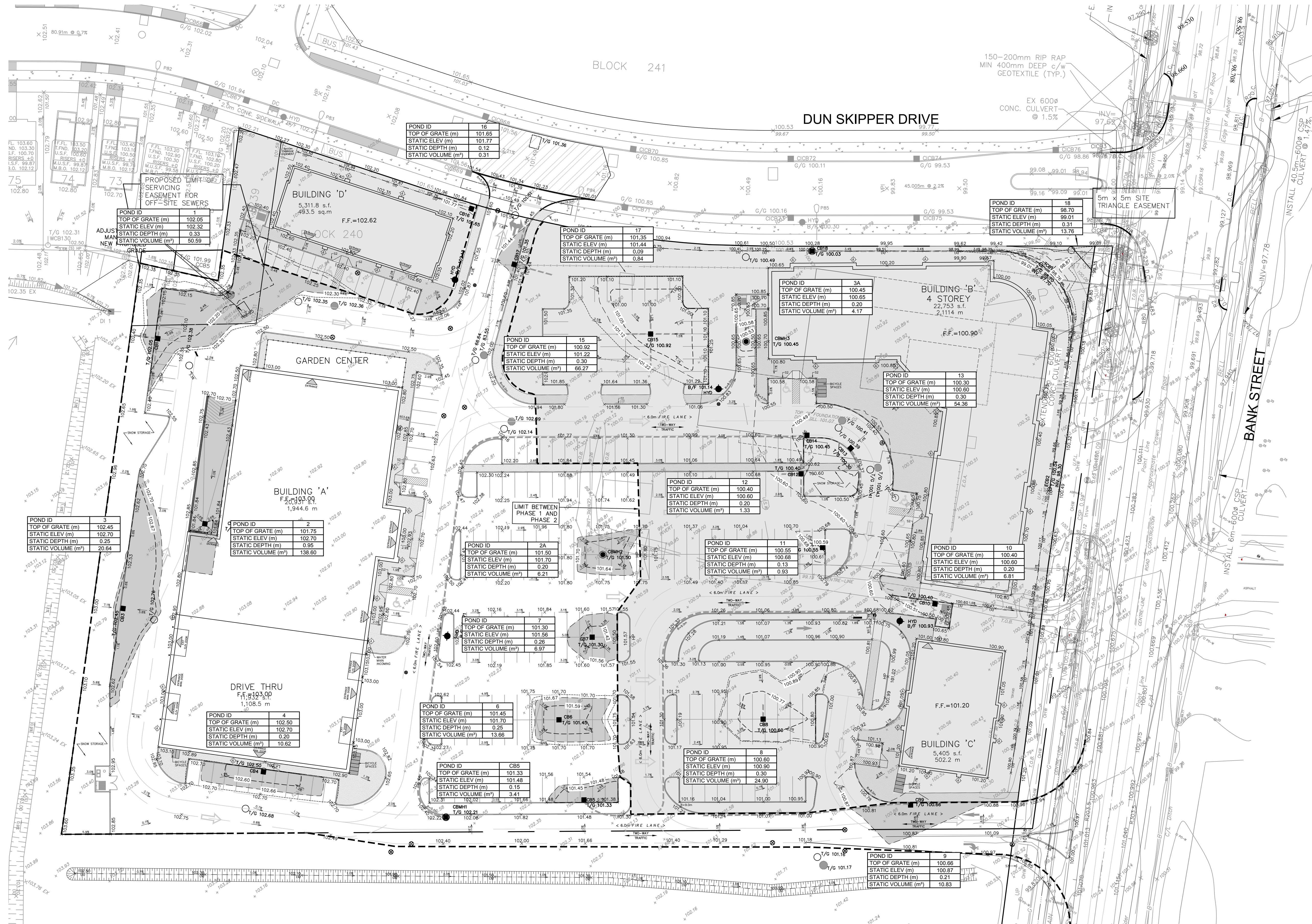
Drawing Title

**STORM DRAINAGE
AREA PLAN**

Scale
1 : 500

Design SEL	Date FEB. 1919
Drawn DPS	Checked JIM
Project No. 119351	Drawing No. 500

J:\119351-4380\119351-4380\Drawings\119351-4380\119351-4380.dwg Plot Date: 2/23/2020 7:46 AM Last Saved By: diana.elliott Date: 2/23/2020



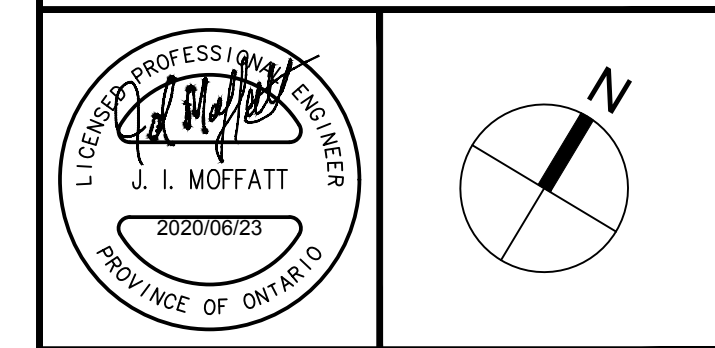
NOTES:
1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR H.A. KEN SHIPMAN SURVEYING LTD.

LEGEND:
100 YEAR PONDING VOLUME LIMIT
5 YEAR PONDING ELEVATION
SPILL OVER ELEVATION
MAJOR OVERLAND FLOW ROUTE

14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4	ADD PHASING	JIM	2020-06-23
3	REVISED AS PER CITY COMMENTS	JIM	2020-04-20
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	JIM	2019-10-11
1	ISSUED FOR SPA	JIM	2019-04-15
No.	REVISIONS	By	Date

IBI GROUP
400 - 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title
BANK STREET DEVELOPMENT
4836 BANK STREET



Drawing Title
PONDING PLAN

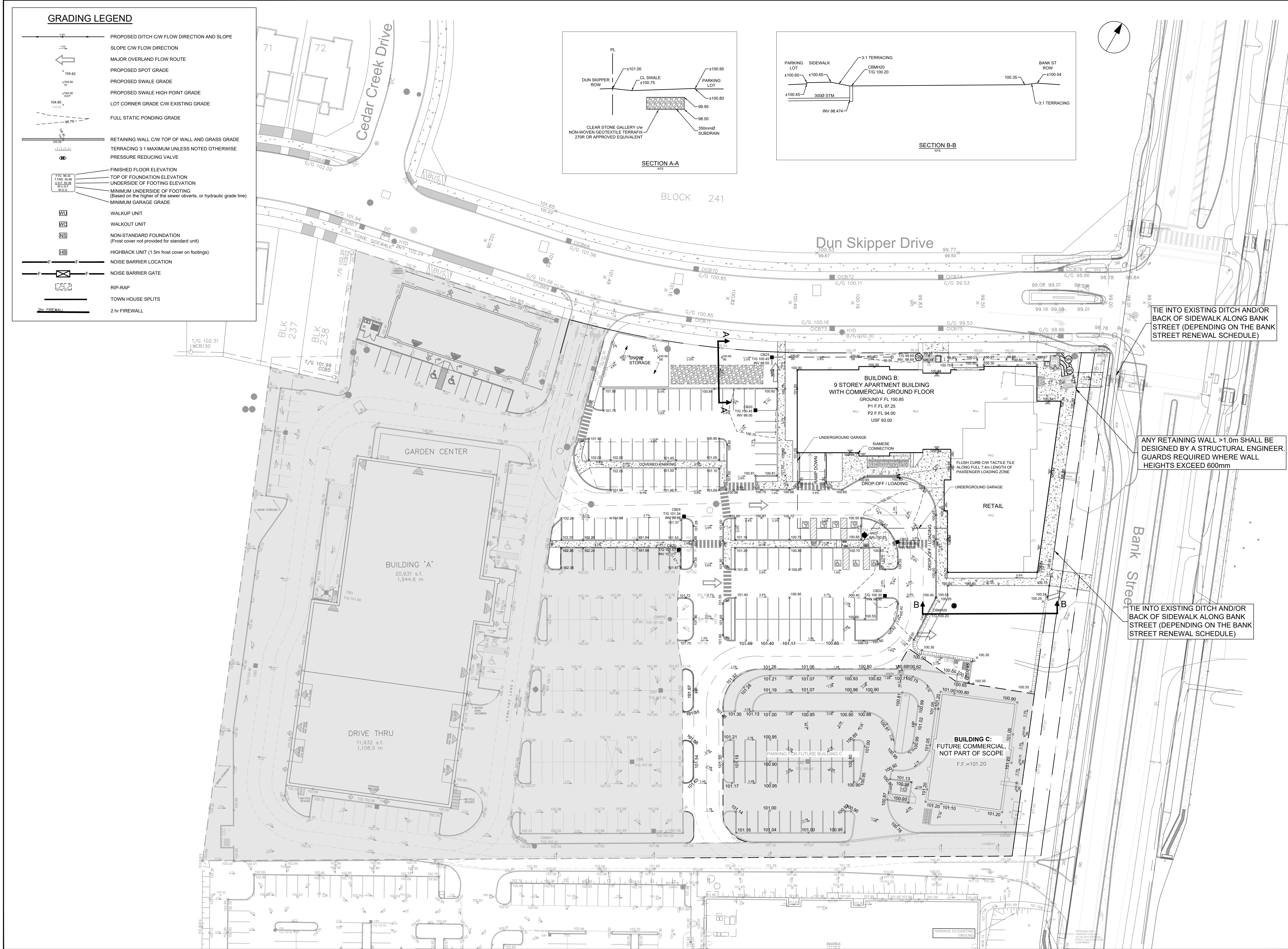
Scale
1 : 400

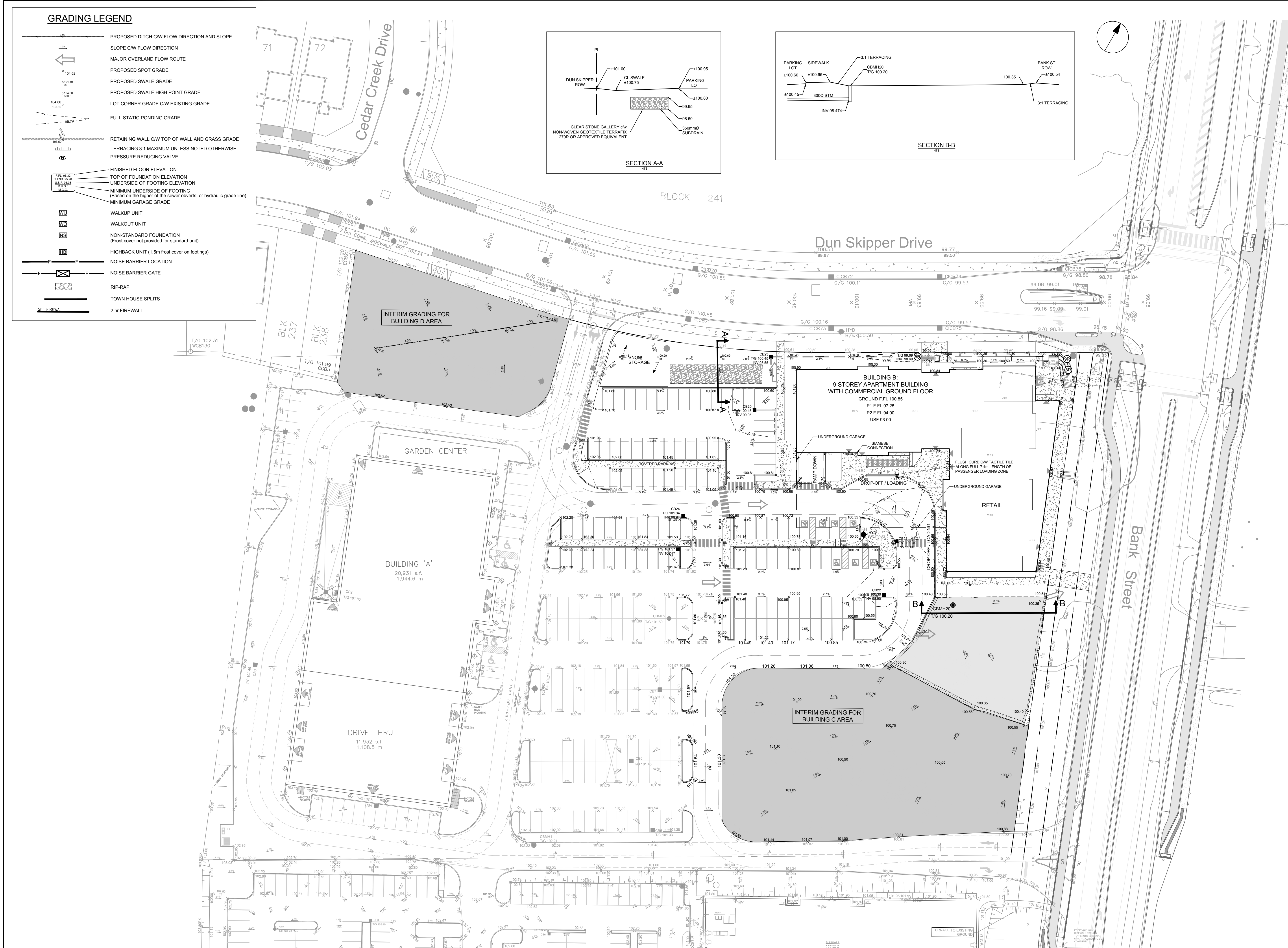
Design	SEL	Date	FEB. 2019
Drawn	DPS	Checked	JIM
Project No.	119351	Drawing No.	600

D07-12-19-0092
#17977

Appendix E

- **Grading Plan 148290-C-200**
- **Interim Grading Plan 148290-C-201**
- **Erosion and Sediment Control Plan 148290-C-900**
- **Grading Plan 119351-C-200**





CLIENT
2668867 Ontario Inc.

COPYRIGHT
This drawing has been prepared solely for the intended use, thus any reproduction or distribution for any purpose other than authorized by Arcadis is forbidden. Written dimensions shall have precedence over scaled dimensions. Contractors shall verify and be responsible for all dimensions and conditions on the job, and Arcadis shall be informed of any variations from the dimensions and conditions shown on the drawing. Shop drawings shall be submitted to Arcadis for general conformance before proceeding with fabrication.

Arcadis Professional Services (Canada) Inc.
Formerly B Group Professional Services (Canada) Inc.

ISSUES		
No.	DESCRIPTION	DATE
1	SUBMISSION NO.1 FOR CITY REVIEW	2024-11-26
2	SUBMISSION NO.2 FOR CITY REVIEW	2025-02-18
3	SUBMISSION NO.3 FOR CITY REVIEW	2025-04-22
4	REVISED PER CITY COMMENTS	2025-06-02
5	REVISED SITE PLAN	2025-08-14

SEE 010 FOR NOTES, LEGEND AND DETAILS



CONSULTANTS

SEAL



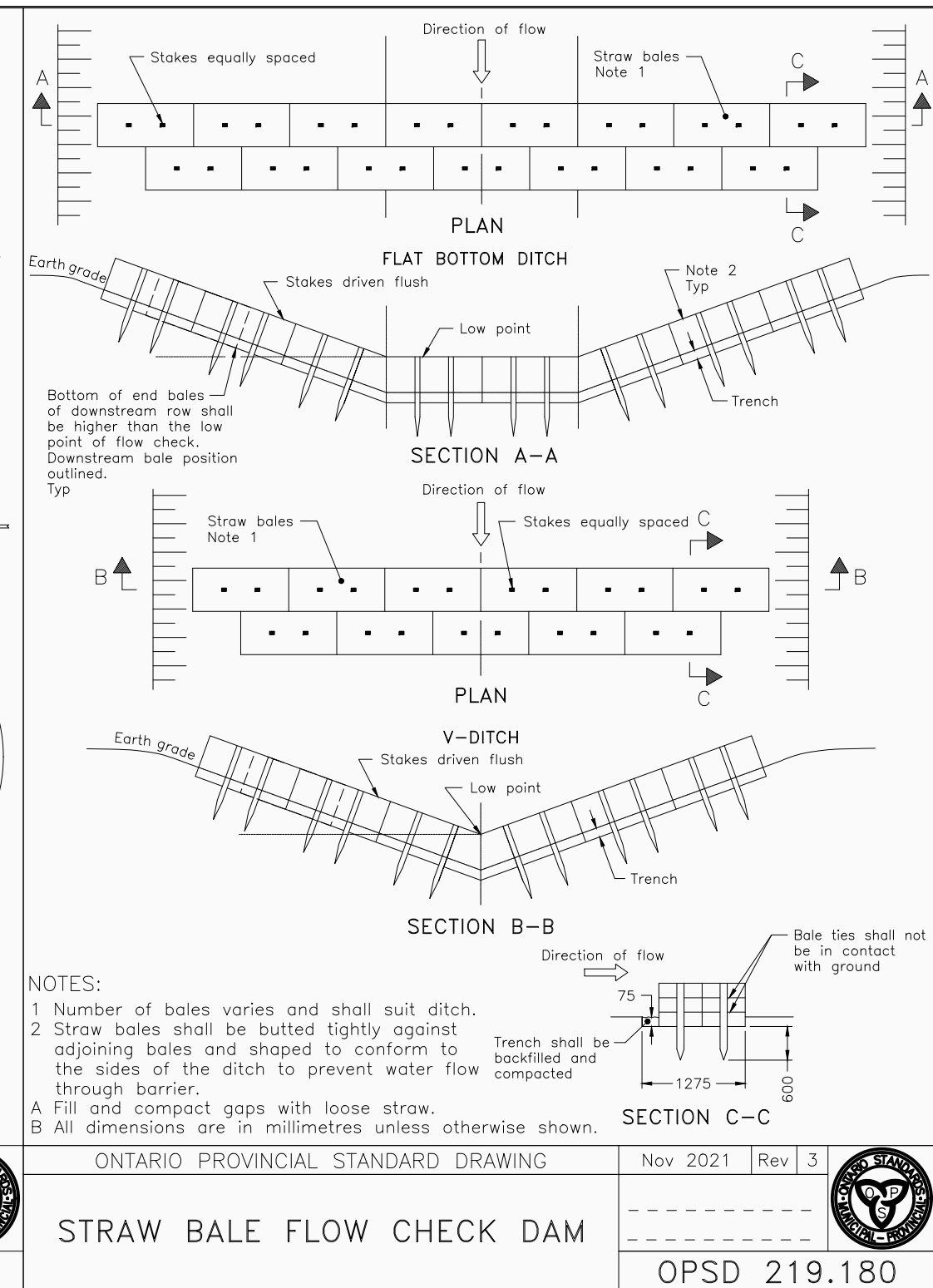
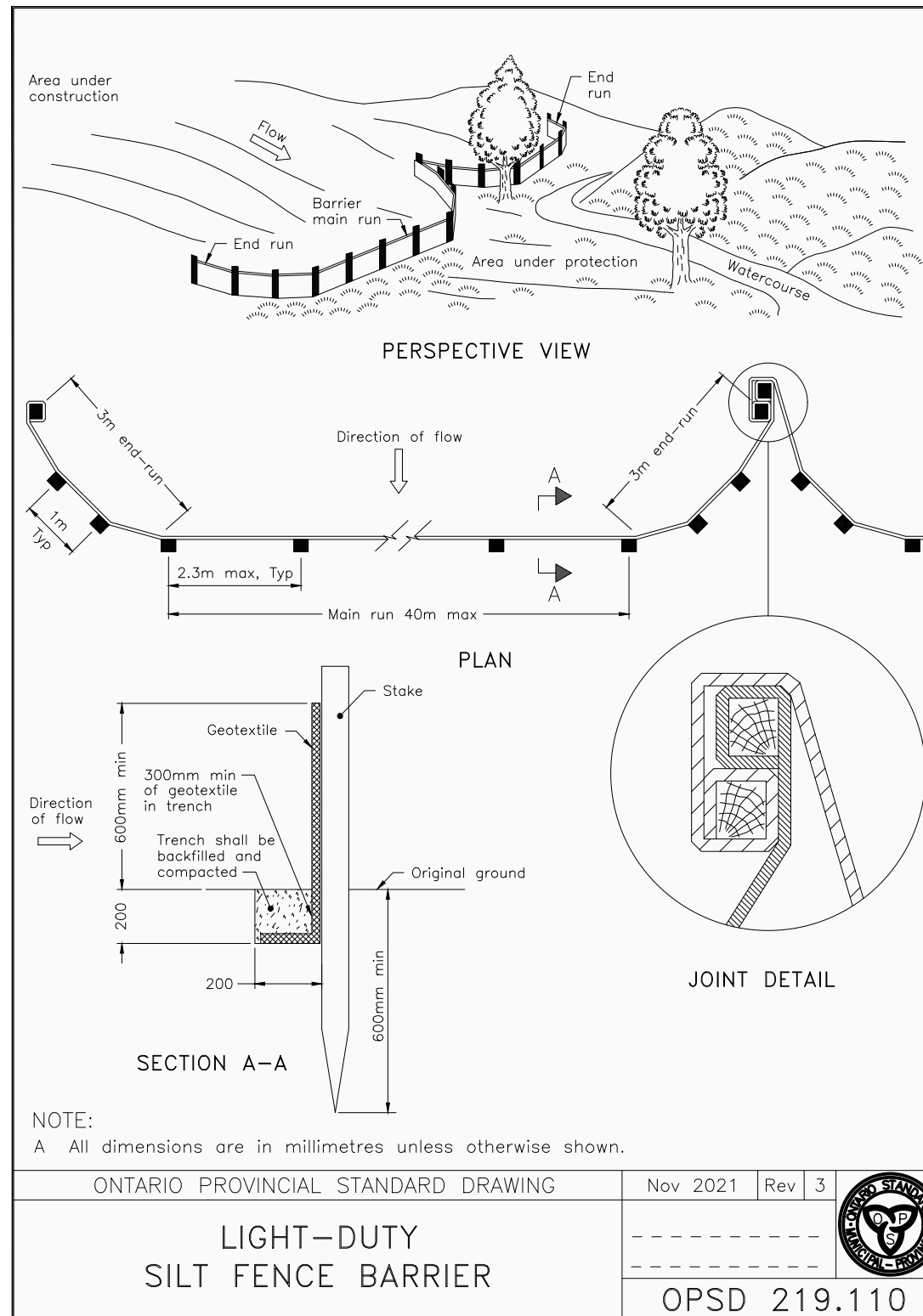
PRIME CONSULTANT
ARCADIS
333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

PROJECT
SENIORS APARTMENTS
BANK STREET AT DUN SKIPPER DRIVE

PROJECT NO:
148290
DRAWN BY:
M.M.
CHECKED BY:
R.M.
PROJECT MGR:
R.M.
APPROVED BY:
A.Z.

SHEET TITLE
INTERIM GRADING PLAN

SHEET NUMBER
C-201
ISSUE
5

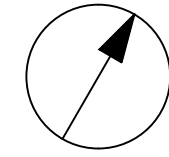


NOTES:

- THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE 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.
- SILT FENCE TO BE ERECTED PRIOR TO EARTH WORKS BEING COMMENCED. SILT FENCE TO BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED OR UNTIL START OF SUBSEQUENT PHASE.
- STRAW BALE SEDIMENT TRAPS TO BE CONSTRUCTED IN EXISTING ROAD SIDE DITCHES. TRAPS TO REMAIN AND BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED.
- SILT SACK TO BE PLACED AND MAINTAINED UNDER COVER OF ALL CATCHBASINS. GEOTEXTILE SILT SACK IN STREET CBs TO REMAIN UNTIL ALL CURBS ARE CONSTRUCTED. GEOTEXTILE FABRIC IN RYCBs TO REMAIN UNTIL VEGETATION IS ESTABLISHED. ALL CATCHBASINS TO BE REGULARLY INSPECTED AND CLEANED, AS NECESSARY, UNTIL SOD AND CURBS ARE CONSTRUCTED.
- CONTRACTOR TO PROVIDE DETAILS ON LOCATION(S) AND DESIGN OF DEWATERING TRAP(S) PRIOR TO COMMENCING WORK. CONTRACTOR ALSO RESPONSIBLE FOR MAINTAINING TRAP(S) AND ADJUSTING SIZE(S) IF DEEMED REQUIRED BY THE ENGINEER DURING CONSTRUCTION.
- CONTRACTOR TO PROTECT EXISTING CATCHBASINS WITH FILTER CLOTH UNDER THE COVERS TO TRAP SEDIMENTATION. REFER TO IDENTIFIED STRUCTURES.
- WORKS NOTED ABOVE ARE TO BE INSTALLED, INSPECTED, MAINTAINED AND ULTIMATELY REMOVED BY SERVICING CONTRACTOR.
- THIS IS A "LIVING DOCUMENT" AND MAY BE MODIFIED IN THE EVENT THE PROPOSED CONTROL MEASURES ARE INSUFFICIENT.

LEGEND:

- LIGHT DUTY SILT FENCE AS PER OPSD-219.110
- SNOW FENCE
- STRAW BALE CHECK DAM AS PER OPSD-219.180
- ROCK CHECK DAM AS PER OPSD-219.210
- SILT SACK PLACED UNDER EXISTING CB COVER
- TEMPORARY MUD MAT 0.15m THICK 50mm CLEAR STONE ON NON WOVEN FILTER CLOTH



CLIENT

2668867 Ontario Inc.

COPYRIGHT

This drawing has been prepared solely for the intended use, thus any reproduction or distribution for any purpose other than authorized by Arcadis is forbidden. Written dimensions shall have precedence over scaled dimensions. Contractors shall verify and be responsible for all dimensions and conditions on the job, and Arcadis shall be informed of any variations from the dimensions and conditions shown on the drawing. Shop drawings shall be submitted to Arcadis for general conformance before proceeding with fabrication.

Arcadis Professional Services (Canada) Inc.
formerly B Group Professional Services (Canada) Inc.

ISSUES

No.	DESCRIPTION	DATE
1	SUBMISSION NO.1 FOR CITY REVIEW	2024-11-26
2	SUBMISSION NO.2 FOR CITY REVIEW	2025-02-18
3	SUBMISSION NO.3 FOR CITY REVIEW	2025-04-22
4	REVISED PER CITY COMMENTS	2025-06-02
5	REVISED SITE PLAN	2025-08-14

SEE 010 FOR NOTES, LEGEND AND DETAILS

KEY PLAN



CONSULTANTS

SEAL



PRIME CONSULTANT

ARCADIS

333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

PROJECT

SENIORS APARTMENTS

BANK STREET AT DUN SKIPPER DRIVE

PROJECT NO:

148290

DRAWN BY:

M.M.

CHECKED BY:

R.M.

PROJECT MGR:

R.M.

APPROVED BY:

A.Z.

SHEET TITLE

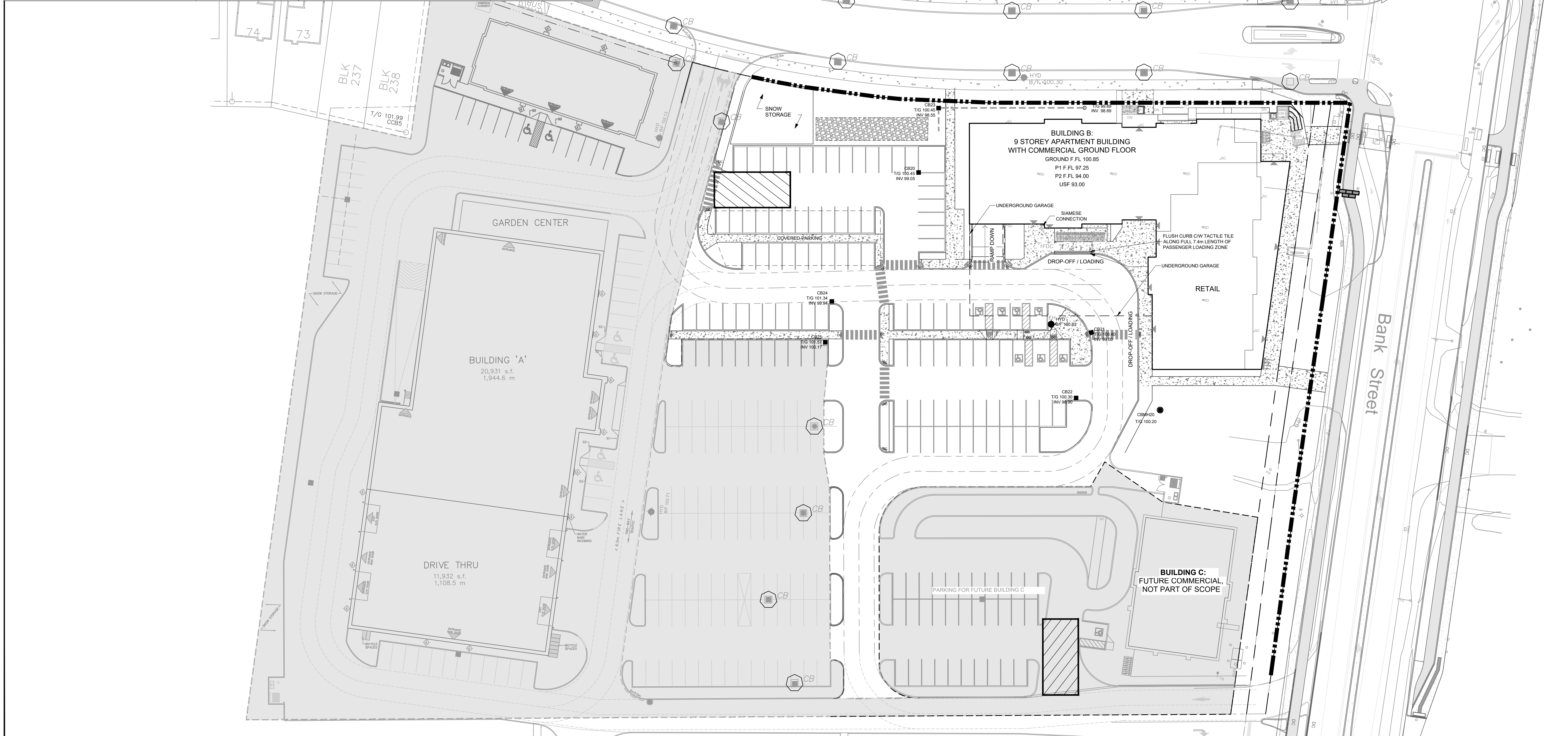
**SEDIMENT AND EROSION
CONTROL PLAN**

SHEET NUMBER

C-900

ISSUE

5



Arcadis Professional Services (Canada) Inc.
333 Preston Street, Suite 500
Ottawa, Ontario K1S 5N4
Canada
Phone: 613 241 3300
www.arcadis.com