Site Servicing and Stormwater Management Report 1158 Old Second Line Road Ottawa, Ontario

Type of Document:
Zoning By-law Amendment

Client:
SLK Limited Partnership

Developer:
Theberge Homes

Project Number:
OTT-00245003-A0

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Legal Notification

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Table of Contents

List of Figures

List of Tables

List of Appendices

1 Introduction

1.1 Site Description and Proposed Development

SLK Limited Partnership retained EXP Services Inc. (EXP) to undertake a site servicing and stormwater management study in support of the development applications at 1158 Old Second Line Road in the City of Ottawa. The property is situated on Old Second Line Road, 270m south of Old Carp Road as shown on Figure A1 in Appendix A.

The existing property consists of two (2) parcels. The northern parcel (PIN 045261418) consists of Parts 1 & 2 on Plan 4R-26462, whereas the southern parcel (PIN 045260207) consists of Parts 1 & 2 on Plan 5R-1175 and Part 1 on Plan 5R-8154. The two parcels combine for a total of 1.229 hectares, of which, a 0.029-hectare portion along Old Second Line Road will be reserved for a 3.0m road widening. The total site area being developed will be 1.20 hectares.

The development is comprised of one hundred (100) 3.5 storey stacked units. The 1.20-hectare development being proposed by SLK Limited Partnership will consist of eight (8) 3.5 storey stacked unit blocks ranging from 10 to 14 units each, a private roadway with adjacent parking stalls and a shared amenity space. The proposed site is bounded to the south and north by Phases 11 & 12D of the Morgan's Grant Development respectively, to the west by Old Second Line Road, and east by City of Ottawa owned land which is subject to an easement in favor of Hydro One.

A private roadway is proposed with one connection onto Old Second Line Road. All utilities will be located within the common roadway block. Sanitary and storm sewers and water infrastructure will require an 11m easement extending north from the site to Goward Drive and a 6m easement southerly to Whernside Terrace is required for a second watermain connection.

This report will discuss the adequacy of the adjacent municipal storm sewers, sanitary sewers and watermains to convey the storm runoff, sewage flows and provide the water demands that will result from the proposed development. It will identify any sanitary, storm or watermain servicing requirements, and provide a design brief for submission, along with the engineering drawings, for City of Ottawa approval.

1.2 Background Documents

Various design guidelines were referred to in preparing the current report including:

- Sewer Design Guidelines, Second Edition, Document SDG002, October 2012, City of Ottawa including:
- Technical Bulletin ISDTB-2012-4 (20 June 2012)
- Technical Bulletin ISDTB-2014-01 (05 February 2014)
- Technical Bulletin PIEDTB-2016-01 (September 6, 2016)
- Technical Bulletin ISDTB-2018-01 (21 March 2018)
- Technical Bulletin ISDTB-2018-04 (27 June 2018)
- Ottawa Design Guidelines – Water Distribution, July 2010 (WDG001), including:
- Technical Bulletin ISDTB-2014-02 (27 May 2014)
- Technical Bulletin ISTB-2018-02 (21 March 2018)

- Technical Bulletin ISTB-2021-03 (18th August 2021)
- Ontario Ministry of Transportation (MTO) Drainage Manual, 1995-1997
- Stormwater Management Planning and Design Manual, Ontario Ministry of the Environment and Climate Change, March 2003 (SMPDM)
- Design Guidelines for Drinking-Water Systems, Ontario Ministry of the Environment and Climate Change, 2008 (GDWS)
- Fire Underwriters Survey, Water Supply for Public Fire Protection (FUS), 2020
- Ontario Building Code 2012, Ministry of Municipal Affairs and Housing.

As the proposed site is within the Morgan's Grant Development, various Master Servicing and Stormwater Management Reports were reviewed in preparation of this report. The following reports, which were provided by City staff, are identified below:

- Master Servicing Study for the Morgan's; Grant Subdivision. J.L. Richards & Associates Limited, February 2001. City Report No: R-2168.
- Morgan's Grant Subdivision, Phase 12D Stormwater Management Report, J.L. Richards & Associates Limited, Sept 22, 2005. City Report No: R-1591-B.
- Morgan's Grant, Phase 12D Subdivision, Stormwater Site Management Plan, J.L. Richards & Associates Limited, August 2005. City Report No: R-1591-A.

The first document above provides the sanitary and storm sewer designs for Phases 1 – 9 of Morgan's Grant along with lands west of the Hydro Corridor and east of Old Second Line Road. This Master Servicing Study also makes an allowance for sanitary flows from Phases 12A-12D, which includes the proposed 1.2-hectare property at 1158 Old Second Line Road.

The second and third document noted above, provide stormwater design information specifically for the latest Phase of Morgan's Grant (Phase 12D), however the documents include background information for all Phase 12 stages (12A – 12D), since the entire Phase 12 area is serviced by a downstream stormwater management facility.

Additional information on the sanitary, storm and water system designs taken from each noted report, is provided in subsequent sections of this report.

1.3 Existing Infrastructure

The current 1.2-hectare site contains a single-family home that is serviced by a groundwater well and a septic tank and tile field bed. The septic tank and tile field is located between the building and Old Second Line Road, and a drilled well is located behind the home. The site is almost entirely sloped towards the hydro corridor; however, with a small percentage of the site sloped to Old Second Line Road. Runoff to Old Second Line Road is collected and conveyed in the existing roadside ditch.

There are no available municipal services located within Old Second Line Road (except for a 300mm sewage forcemain servicing Carp). As the site topography slopes easterly to the Hydro corridor with an almost ±4m grade change, the services will be required to connect to the municipal sanitary, storm and water infrastructure within Goward Drive. In addition, a second watermain connection within Whernside

Terrace is necessary. Additional information on the water supply requirements is provided later in this report.

An 11.0m wide easement from the site to Goward Drive will be required for the proposed 200mm sanitary sewer, 450mm storm sewer and 200mm watermain. The second 6.0-metre-wide easement extending south towards Whernside Terrace will be necessary for a 200mm watermain. These easements are in accordance with 3.3.1.2 of the City of Ottawa Sewer Design Guidelines, and 3.3.1.2 of the City of Ottawa Water Distribution Design Guidelines.

1.4 Consultation and Permits

Consultation meetings were held between SLK Limited Partnership and the City of Ottawa prior to design commencement. These meetings outlined the submission requirements and provided information to assist with the development proposal.

The storm and sanitary sewers will require Environmental Compliance Approvals (ECA's), filed through a direct submission with the MECP. The following summarizes the anticipated Environment Compliance Approvals (ECA's) required by the Ministry of Conservation and Parks (MECP), formerly the Ministry of the Environment and Climate Change (MOECC):

- Municipal and Private Sewage Works for **Sanitary and Storm Sewers**.
- Municipal and Private Sewage Works for the establishment of the **Stormwater Management Works** (SWM) which will include the onsite flow control methods and associated stormwater detention.

Prior to completion of the ECA application, City signoff on the infrastructure design will be necessary.

The proposed site is located within the Mississippi Valley Conservation Authority (MVCA) jurisdiction, therefore signoff from the MVCA will be required prior to subdivision and ECA approval. As the proposed site is located within the catchment area tributary to the Morgan's grant SWM Facility (City SWMF-1227), no additional onsite quality control requirements are expected.

2 Geotechnical Considerations

A geotechnical investigation was completed by EXP Services Inc, on April 12, 2018, and was prepared to establish the subsurface and groundwater conditions onsite, and to provide and discuss excavation, dewatering, and backfilling requirements. It also provides grade-raise, pavement and foundation design requirements.

In general, the site is treed and contains 150mm to 300mm of topsoil overlaid with sandy silt and silty sand. Below the ground surface, rock refusal depth varied between 0.3m to 1.7m, based on eleven (11) test pits and boreholes.

A maximum grade raise requirement of 2.0m was established for the site.

An additional geotechnical investigation was completed on January 2020, following the tree clearing to establish additional rock elevations with the site. This information has been added to the engineering drawings. The additional test pit investigation was completed to provide additional information on the depth to rock. An Additional Test Pit Investigation letter dated March 20, 2020, was prepared for the additional thirty-four (34) test pits excavated onsite. A June 9, 2023, letter confirmed these two reports remain valid for the proposed development.

3 Watermain Servicing

3.1 Methodology

The water distribution system proposed for this development is designed in accordance with the City of Ottawa Design Guidelines (July 2010). The following steps indicate the basic methodology that was used in the hydraulic analysis:

- A water distribution model was created by adding junction nodes at intersections and creating watermains between the junctions.
- For each junction node the water demand was determined based on the number of contributing homes and the corresponding population.
- The water consumption rates were calculated for the maximum day and maximum hour conditions.
- Hydraulic boundary conditions were set from the information obtained from the City of Ottawa.
- The required fire flow was determined, and
- The proposed water distribution model was simulated in and the results compared with the City of Ottawa criteria.

3.2 Design Criteria

A summary of design parameters used in the water distribution model were taken from Section 4.0 of the City's Guidelines, and are as follows:

- Population Density (2-bedroom apartment) 2.1 person/unit
- Average daily water consumption (Residential) 280 L/cap/day
- Maximum Day Factor (2.5 x Avg. Day)
- Maximum Hour Factor (2.2 x Max. Day)
- C factor
  - 150 mm 100
  - 200 mm & 250 mm 110
- Minimum Allowable Pressure 275 kPa (40 psi)
- Maximum Allowable Pressure 552 kPa (80 psi)
- Minimum Static Pressure (Under Fire Flow Conditions) 140 kPa (20 psi)

3.3 Water Demands

The domestic water demands are estimated below, utilizing parameters from the SDG002 and the GDWS. The following summarizes the parameters used.

<u>Population:</u>

- 100 - 2 Bedroom Apartment x 2.1 person/unit = 210 persons
- Average daily water consumption = 280 L/person/day
- Maximum Day Factor = 2.5 x Avg. Day
- Maximum Hour Factor = 2.2 x Max. Day

The average, maximum day and peak hour domestic (residential) demands for the building are as follows:

- Average Day = 280 x 210 / 86,400 = 0.68 L/sec
- Maximum Day = 2.5 x 0.68 = 1.70 L/sec
- Peak Hour = 2.2 x 1.70 = 3.74 L/sec

Detailed calculations of the domestic water demands are provided in Table B1 of Appendix B.

3.4 Fire Flow Requirements

Water for fire protection will be available utilizing the proposed fire hydrants located along the proposed private roadway. The required fire flows for the proposed site were calculated based on typical values as established by the Fire Underwriters Survey 2020 (FUS). The fire flow requirements were calculated for all blocks. It was determined the required fire flows range from 100 L/sec (6,000 L/min) to 117 L/sec (7,000 L/min).

The following equation from the Fire Underwriters document "Water Supply for Public Fire Protection", 2020, was used for calculation of the on-site supply rates required to be supplied by the hydrants:

$F = 200 * C * \sqrt{(A)}$

where

F = Required Fire flow in Litres per minute
C = Coefficient related to type of Construction
A = Total Floor Area in square metres

A reduction for low hazard occupancy of -15% for residential dwellings, and an increase for fire area exposure ranging from +26% (min) to +60% (max) was used. Below is a sample calculation of the fire flow requirements for Block 8 (the most critical) residential building.

<u>Required Fire Flow Calculation for Block 8</u>

Type of Construction	= Wood Frame
Coeff Related to Construction	= 1.5
Ground Floor Area	= 174 m^2
Number of Floors	= 3
Fire Flow Requirement, FF	$= 200 * 1.5 * \sqrt{(A)}$
	$= 200 * 1.5 * \sqrt{(174 * 3)}$
	= 7,540 L/min or 8,000 L/min (rounded)

Occupancy Class	= Limited Combustible
Occupancy Charge	= -15%
Fire Flow Requirement, FF	= 8,000 *-15% = -1,200 L/min = 6,800 L/min
Sprinkler Protection Credit	= 0%
Charges Due to Exposures	= sum for all sides = 4% + 0% + 0% + 4% = 8%
Required Fire Flow (RFF)	= 6,800 L/min + 544 L/min = 7,344 L/min = 7,000 L/min (rounded to closest 1,000) = 117 L/sec

The following table summarizes the required fire flows for each residential townhome block.

Table 3-1: Summary of Calculated Fire Flow for Each Block

Apartment Block #	Calculated Fire Flow (L/sec)
Block 1	100
Block 2	117
Block 3	100
Block 4	100
Block 5	100
Block 6	100
Block 7	100
Block 8	117

The fire flow requirements for all proposed buildings range from **100 L/sec (6,000 L/min)** to **117 L/sec (7,000 L/min)** based on the FUS. Please refer to tables in Appendix B for detailed calculations using the FUS.

3.5 Boundary Conditions

The development site is in Morgan's Grant pressure zone. Boundary conditions were provided for modelling purposes. Bentley OpenFlows WaterGEMS (CONNECT Edition Update 3) modelling software was used to simulate pressures and flows under maximum day plus fire flow and peak hour conditions.

Boundary conditions were obtained from City of Ottawa personnel for hydraulic modeling. Boundary conditions were used for the connection points at either Connection Location # 1 on Goward Drive (J-105) or Connection Location # 2 (J-170) on Whernside Terrace. Refer to Appendix I for the boundary system information provided by City of Ottawa staff.

Table 3-2: Boundary Conditions Provided by City of Ottawa

Condition	HGL in metres (psi) at Location #1 on Goward Drive (Ground Elev: 101.4m)	HGL at Location #2 on Whernside Terrace (Ground Elev: 102.2m)
Max HGL	150.2m (69.3 psi)	150.2m (68.2 psi)
Peak Hour	140.9m (56.1 psi)	140.9m (55.1 psi)
Max Day plus FF (at 7,000 L/min)	121.2 m (28.2 psi)	128.9 m (38.0 psi)

3.6 Modelling Results

The results of the modelling under the peak hourly condition based on the boundary condition at Location #1, is summarized in Table 3-3 below. Results for both locations #1 and # 2 are included in Appendix D.

Table 3-3: Summary of Results for Peak Hour (Boundary Location #2)

Label	Demand (L/s)	Elevation (m)	Hydraulic Grade (m)	Pressure (psi)
J-100	0.00	100.76	140.87	57
J-105	0.42	101.19	140.87	56
J-106	0.48	101.19	140.87	56
J-110	0.00	101.70	140.86	56
J-115	0.52	102.60	140.86	54
J-120	1.05	103.00	140.86	54
J-125	0.37	103.40	140.86	53
J-130	0.00	103.90	140.86	52
J-135	0.45	104.20	140.86	52
J-140	0.00	103.50	140.86	53
J-145	0.45	102.60	140.86	54
J-150	0.00	102.60	140.86	54
J-155	0.37	102.50	140.86	54
J-160	0.00	102.60	140.86	54
J-165	0.00	101.70	140.87	56
J-170	0.00	101.19	140.87	55
J-175	0.00	101.19	140.87	56
J-180	0.52	103.50	140.51	53
J-185	0.00	101.19	140.87	56

Table 3-4: Summary Results for Maximum Day Plus Fire Flow (Boundary Location #2)

Hydrant Label	Fire Flow (Needed), (L/sec)	Modeled Flow (L/sec)
J-125 (FH-1)	117.0	120.0
J-135 (FH-2)	100.0	117.0
J-145 (FH-3)	100.0	121.5
J-155 (FH-4)	117.0	124.6

The modeled minimum and maximum working pressures anticipated within the development are 52 psi and 56 psi under peak hour conditions. And modeled available fire flows under the maximum day demand conditions range from 117.0 L/sec to 124.6 L/sec.

3.7 Hydrant Spacing

A review of the hydrant spacing was completed to ensure compliance with Appendix I of Technical Bulletin ISTB-2018-02. All hydrants within 150 m were reviewed to assess the total possible contribution of flow. For each hydrant the distance to the proposed building was determined to arrive at the contribution of fire flow from each. All hydrants are expected to be of Class AA as per Section 5.1 of Appendix I.

Table 3-5 below summarizes all fire hydrants within a 150 m distance from each of the residential blocks. For each hydrant the distance measured along a fire route or roadway was used and its contribution to the required fire flow. A detailed table showing the distances and fire flow from each hydrant to each block can be found in Table B11 of Appendix B.

Table 3-5: Summary of Fire Flow Requirements Based on Hydrant Spacing

Hydrant #	Fire Flow Contribution (L/min)							
	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Block 7	Block 8
FH-1	5,700	5,700	5,700	5,700	5,700	3,800	3,800	5,700
FH-2	5,700	5,700	3,800	3,800	3,800	3,800	3,800	3,800
FH-3	3,800	3,800	3,800	3,800	3,800	5,700	5,700	3,800
FH-4	3,800	3,800	3,800	5,700	3,800	5,700	5,700	5,700
Total (L/min)	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000
FUS RFF in L/min or (L/sec)	6,000 (100)	7,000 (117)	6,000 (100)	6,000 (100)	6,000 (100)	6,000 (100)	6,000 (100)	7,000 (117)
Meets FF Requirement (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

From this table the total available contribution of flow from hydrants which are in proximity to each townhome block was estimated at 19,000 L/min. These values exceed the required fire flows for each residential block as identified in Appendix I of Technical Bulletin ISTB-2018-02.

3.8 Water Age Analysis

A review of the age of the water within the proposed system was completed to ensure than an appropriate size of watermain was selected, which was not unnecessarily oversized. The maximum residence time was estimated based on volume of water within the private system between the connection point on Goward Drive and the property boundary of the proposed site. It was assumed that the most conservative approach was to estimate the total volume of water within the water system assuming a dead-ended system. This analysis assumed the entire site at 1158 Old Second Line Road would be feed from the connection point at Goward Drive. This is a conservative approach, as in reality water would be feed from both connection (Goward and Whernside Terrace). The following summarizes the watermain lengths, and volumes used in this analysis:

Total length of 200mm watermains: 508 m
Total length of 50mm watermain services: 9 m
Total length of 25mm watermain services: 675 m (50 services at 13.5m avg. length each)

Volume of water within all watermains/services: 16.308 m^3 or 16,308 litres

Using the demands in Table B1, the time required for full exhaustion of the 16.3 m^3 of water was calculated based on the demands noted in Table B1. In addition, the minimum night demand of 0.068 L/sec was calculated using MOECC Table 3.3 with a minimum peaking factor of 0.10. The following water age estimates are provided in Table 3-6 below.

Table 3-6: Water Age Results

Demand Condition	Demand (L/sec)	Time Required for Full Water Volume Turnover (hours)
Minimum Night	0.068	66.6
Average Day	0.68	6.7
Maximum Day	1.70	2.7
Peak Hour	3.74	1.2

Although a time of 44.4 hours (was calculated based on a minimum demand of 0.068 L/sec), it should be noted that this demand rate would apply only during an 8-hour nighttime period. After the 8-hour nighttime period, an average rate of 0.68 L/sec would apply during the 16-hour daytime. Based on this, the time required for the full exhaustion of 10.9 m^3, would approximately 8.0+5.9 = 13.9 hours.

Similarly, there are 15 existing single-family homes on Goward Drive that are located west of the proposed connection point. For this 200mm diameter watermain, the estimated volume is 3.9 m^3 based on 10.0m long 19mm diameter services and 123m of 200mm watermain. The time required for the full exhaustion of 3.9 m^3, at a minimum night and average day demands of 0.017 and 0.17 L/sec respectively would be approximately 8.0+5.6 = 13.6 hours.

Therefore, the age of the water within the proposed development is expected to be similar to that of the adjacent existing subdivision.

4 Sanitary Sewer Design

4.1 Design Criteria

The sewage flows were calculated using City of Ottawa design criteria as follows:

- Unit Density (2-bedroom apartment) =2.1 person/unit
- Average Residential Flow Allowance = 280 L/person/day
- Peaking Factor (Harmon Formula) $=1 + 14 / (4 + (P/1000)^{0.5}) * K$
- Correction Factor, K = 0.8
- Full Flow Velocity = 0.60 m/sec to 3.0 m/sec
- Extraneous Flow Allowance = 0.33 L/ha/sec

4.2 Proposed Sanitary Servicing

The sanitary sewer system is designed based on a population flow, and an area-based infiltration allowance. Using the above noted design criteria for the sanitary sewers, the sewage flows were calculated as follows:

Population:

No of Units:	= 100
Unit Type:	= 2-bedroom apartment
Unit Density	= 2.1 person/unit
100-2-bedroom apartment x 2.1 person/unit	= 210 persons

Sanitary Flow

Average Residential Flow Allowance	= 280 L/person/day
Correction Factor, K	= 0.8
Peak Factor $= 1 + 14 / (4 + (126.9/1000)^{0.5}) * K$	= 3.51
Avg. Domestic Flow = 210 x 280 L/person/day x (1/86,400 sec/day)	= 0.68 L/sec
Peak Domestic Flow = 0.68 L/sec x 3.51	= 2.39 L/sec

Extraneous Flows

Extraneous Flow Allowance	= 0.33 L/ha/sec
Q Infiltration = 0.33 L/ha/sec x 1.229 ha	= 0.41 L/sec

Total Sewage Flow

Total Sanitary Flow = 2.39 + 0.40	**= 2.79 L/sec**

The estimated peak sanitary flow rate from the proposed property is **2.79 L/sec** based on City of Ottawa Design Guidelines.

The permitted flow velocities within the sanitary sewer system range between 0.60 m/sec and 3.0 m/sec under full-flow conditions. All new sanitary sewers within the proposed site development will be 200mm in diameter therefore a sewer slope of 0.32% is necessary to meet the minimum velocity requirement of 0.60 m/sec. Similarly, the maximum permitted slope of a 200mm sanitary sewer would be 8.1% to meet the maximum 3.0 m/sec full-flow velocity.

A sanitary sewer design sheet was prepared to confirm the sanitary sewer pipe diameters and full-flow velocities. The selected pipe slopes range from between 0.40% and 2.43%, having full flow velocities in the range of 0.66 m/sec to 1.62 m/sec. The capacities of the sanitary sewers would therefore be between 21.1 L/sec and 51.9 L/sec.

4.3 Downstream Sanitary Sewer System

The proposed sanitary sewer within the development site will discharge to a 200mm sanitary sewer on Goward Drive. This sanitary sewer was installed during the development of Phase 12D of Morgan's Grant Subdivision. The development at 1158 Old Second Line Road falls within Phase 12 of this subdivision.

A review of the sanitary sewer design provided in the 2003 Master Servicing Study, indicated that the original sanitary drainage area and sewage parameters for Phase 12 were based on the following:

Original Morgan's Grant Phase 12 Sanitary Design

Area	= 30.9 ha
Residential Density (Towns & Singles)	= 4.0 person/unit
Population	= 1896 persons
Average Residential Flow Allowance	= 350 L/person/day
Institution Flow Allowance	= 50,000 L/ha/fay
Residential Peaking Factor	= Harmon Formula
Institutional Peaking Factor	= 1.5

In Appendix B of the 2003 Master Servicing Study a sanitary sewer design sheet identifies a total peak flow from Phase 12 of **38.9 L/sec**. The sanitary sewer design sheet from the 2003 MSS is provided in Appendix I, with the specific rows highlighted.

To confirm adequate capacity is available in the downstream system a review of the as-constructed conditions was completed and the peak sewage rates were re-calculated based on current City Guidelines.

Figure A5 in Appendix A illustrates Phase 12 area of Morgan's Grant. It consists of residential, institutional and open space uses. Using the City of Ottawa's urban building GIS layer, it was determined that Phase 12 contains *244 single family*, *112 townhomes*, and one school. The entire area is 30.9 hectares and is made up of 2.90 hectares of institutional, 2.74 hectares of open space, with the remaining 25.26 hectares being residential / municipal roadways.

The sewage flows for Morgan's Grant Phase 12, based on current City Guidelines were re-calculated as follows:

2-bedroom Apartment Unit (Proposed Development)	= 100
Single Family Homes	= 244

Townhomes	= 112
Unit Density (2-bedroom apartment)	= 2.1 person/unit
Unit Density (Single Family Homes)	= 3.4 person/unit
Unit Density (Townhomes)	= 2.7 person/unit
100 - 2 bedroom apartment x 2.1 person/unit	= 210 persons
244 - Single Units x 3.4 person/unit	= 830 persons
112 Townhomes x 2.7 person/unit	= 302 persons
Residential Population = 210 + 830 + 302	= 1342 persons

Residential Sewage Flow

Residential Flow Allowance	= 280 L/person/day
Correction Factor, K	= 0.8
Peak Factor = 1 + (14 / (4 + $(P/1000)^{0.5}$)) * K	
Peak Factor = 1 + (14 / (4 + $(1342/1000)^{0.5}$)) * 0.8	
Peak Factor = 1 + (2.79) * 0.8	= 3.17
Avg. Domestic Flow = 1342 x 280 L/person/day x (1/86,400 sec/day)	= 4.35 L/sec
Peak Domestic Flow = 4.35 L/sec x 3.17	= 13.79 L/sec

Institutional Sewage Flow

Institutional Flow Allowance	= 28,000 L/day/ha
Institutional Peaking Factor	= 1.5
Peak Institutional Flow = 28,000 x 2.9 x (1/86,400 sec/day) x 1.5	= 1.41 L/sec

Extraneous Flows

Total Area	= 30.9 hectares
Extraneous Flow Allowance	= 0.33 L/ha/sec
Extraneous Flows = (0.33 x 30.9)	= 10.20 L/sec

Total Sewage Flow

Total Sanitary Flow = 13.79 + 1.41 + 10.20	= **25.40 L/sec**

The re-calculated peak sewage flows under fully developed conditions for the Phase 12 Morgan's Grant subdivision is calculated to be 25.40 L/sec, which includes 2.79 L/sec sewage flow from the proposed 100-unit (2-bedroom apartment) development at 1158 Old Second Line Road. It should be noted that the original design was completed based on a higher average wastewater flow allowance. The City of Ottawa's residential flow allowance is now 280 L/person/day as per Technical Bulletin ISTB-2018-01. Therefore, the existing infrastructure is conservatively designed in accordance with today's standard guidelines. It can be concluded that the existing sanitary sewer infrastructure in Morgan's Grants Phase 12 subdivision will be adequate to service the additional peak sanitary flows from the 1158 Old Second Line Road development.

5 Stormwater Management

5.1 Design Criteria

The stormwater system was designed in conformance with the latest version of the City of Ottawa Design Guidelines (October 2012). Section 5 "Storm and Combined Sewer Design", and Section 8 "Stormwater Management" from the design manual were referenced.

5.1.1 Minor System Design Criteria

The proposed storm sewer system includes two sections which are separated by the proposed underground storage chambers. The primary storm sewer section which is upstream of the storage chamber has been designed and sized to accommodate the peak runoffs for the 100-year design storm. The secondary storm sewer section which is downstream of the storage chamber has been designed and sized to accommodate the restricted discharge from the storage chamber plus all foundation drains from the building blocks.

The peak discharge from the development site to the existing storm sewer on Goward Drive is limited to 100 L/sec, based on the capture rate established for this site as per the Stormwater Site Management Plan for Morgan's Grant Phase 12D.

- The storm sewer within the Morgan's Grant Subdivision were designed as a minor (pipe) and major drainage (overland) system, or a dual drainage concept. The minor system was designed to convey runoff based on the 5-year storm under free-flow conditions. Inlet control devices (ICD's) are used within the Morgan's Grant Subdivision to limit the capture rate to the minor system.
- Hydraulic Grade Line (HGL) Analysis within the Morgan's Grant Subdivision was prepared based on the 100-year City of Ottawa IDF parameters. The HGL analysis was based on 100-year captured flows.

5.1.2 Major System Design Criteria

- Rear yard ponding is permitted as per City of Ottawa Guidelines, up to a maximum of 300mm in depth, however the volume cannot be accounted for.
- The maximum permitted 100-year ponding depth on the private streets is 350mm.
- The product of the depth of flow x velocity must be less than 0.6 m/sec under the 100-year storm as per City Guidelines.
- Overland Flow is permitted to be discharged to the Hydro corridor, with not more than 126 m^3 of runoff from the proposed site, as per the Morgan's Grant, Phase 12D SWM report.
- The major system (roadway) has been designed to convey surface runoff easterly to the Hydro One corridor.
- A minimum of 150mm of vertical clearance must be provided between the spill elevation on the street and the ground elevation at the building.

5.2 Runoff Coefficients

Average runoff coefficients for all catchments were calculated using PCSWMM's area weighting routine. This modelling software has a GIS engine which allows for catchment (or polygon) definition including attributes. The runoff coefficients for all catchments were area weighted to derive at average runoff coefficients based on hard surfaces (concrete or asphalt) having an imperviousness of 95%, soft surfaces (landscaping surfaces) having a percent imperviousness of 5%. The conversion from an imperviousness percent to a runoff coefficient was taken as C = (IMP*0.70) / 100 + 0.20, with the imperviousness (IMP) as a percentage.

The average runoff coefficient for the overall site area under post-development conditions was calculated as 0.63, whereas the pre-development average runoff coefficient was less than 0.10. Runoff coefficients for individual catchment ranged from 0.24 to 0.80.

5.3 Calculation of Allowable Release Rate

To control runoff from the site it will be necessary to limit post-development flows to the allowable capture based on previous Morgan's Grant, Phase 12D design.

The allowable release rate from the site was set just below the design peak flow rate for the minor system. From the original storm design sheet, the storm sewer was sized based on a 5-year level of service with a runoff coefficient of 0.50 and a time of concentration of 20 minutes. The following parameters will be used to determine the allowable release rates from the proposed site to the existing sewer on Goward Drive, using the Rational Formula.

QALL = 2.78 C I A

where:

Q_{ALL} = Peak Discharge (L/sec)
C = Runoff Coefficient (C=0.50)
I = Average Rainfall Intensity for return period (70.25 mm/hr)
= $732.951/(Tc+6.199)^{0.810}$ (5-year)
Tc = Time of concentration (20 mins)
A = Drainage Area (1.20 hectares)

Q_{ALL} = 2.78 * C * I * A
Q_{ALL} = 2.78 * 0.50 * 70.25 * 1.20
Q_{ALL} = 117.2 L/sec

The peak design flow, based on the 5-year storm, was estimated at 117.2 L/sec. This peak storm flow was taken from the third row of the original storm design sheet for the Morgan's Grant Phase 12D, and is attached for reference in Appendix I.

Although the storm sewer system was based on this peak flow, 100 L/sec (or 5 inlets at 20 L/sec/inlet) was used as the minor system capture rate. Since the captured rate of 100 L/sec was used in the Hydraulic Grade Line Analysis for the downstream storm sewers in Morgan's Grant, the allowable discharge rate to the storm sewer system from the site was limited to 100 L/sec. Runoff in excess of the 100 L/sec capture rate will be detained onsite within underground stormwater storage chambers or will overflow and be stored within the Hydro corridor.

5.4 Pre-Development Conditions

The proposed site is 1.2 hectares in area and is currently undeveloped, except for a single residential home. This home will be demolished for re-development of the site. The topography of the site is generally in an easterly direction, however a small area along Old Second Line flows westerly towards this roadway. A pre-development drainage plan for the site was prepared using PCSWMM. The watershed delineation routine was used to establish the catchment areas, based on the Digital Raster Acquisition Project of Eastern Ontario (DRAPE) 2m x 2m digital terrain models (DTM). The DTM images were loaded into PCSWMM, and the watershed delineation tool was used to establish overland flow routes and catchments. Engineering drawing C08 illustrates the pre-development catchment for the property, along with the catchment tributary to the culvert at Goward Drive. This catchment was generated to allow for sizing of new culverts under the proposed roadways, and to confirm the allowable discharge rates to Old Second Line Road. The pre-development runoff coefficient for the site was determined to be 0.23.

Using a time of concentration of 20 minutes, an average 2 & 5 -year runoff coefficient of 0.23, and an average 100-year runoff coefficient of 0.29 (increased by 25%) the pre-development release rates from the site were estimated at 40.1 L/sec, 54.2 L/sec and 115.6 L/sec for the 2-year, 5-year and 100-year storms respectively using the Rational Method. Based on drawing C08 the estimated pre-development flows to each outlet (either Old Second Line Road or Hydro Corridor) are summarized in Table 5-1 below. Runoff rates based on the Rational Method and PCSWMM compare well.

Table 5-1: Summary of Pre-Development Peak Flows from Proposed Site

Outlet Location	100-year Pre-Development Peak Flow (L/sec)	
	Rational Method	3hr Chicago Storm (PCSWMM)
To Old Second Line Road	9.3	22.9
To Hydro Corridor	106.3	81.8
Totals	115.6	104.7

5.5 Proposed Stormwater System

Due to the re-development of the site the overall post development runoff coefficient will increase over existing conditions. The increase in runoff is due to an increase in imperviousness levels (additional hard surfaces, roof areas and hard landscaping). The post-development average runoff coefficient for the site was calculated as 0.67, based on an average runoff coefficient of 0.20 for grassed areas and 0.90 for hard surfaces.

The proposed development will consist of eight (8) blocks of stacked townhomes totaling 100 units. The proposed storm sewer includes two sections. The primary storm sewer section, which is upstream of the proposed underground storage chamber, will collect runoff from the restricted onsite drainage catchment and discharge it to the underground storage chamber. The secondary storm sewer section, which is downstream to the proposed underground storage chamber, will receive the restricted discharge from the storage chamber and foundation drains from each building block, and will be directed easterly and then outlet northerly to the existing 450mm and 525mm storm sewers on Goward Drive. The roadways will be sloped easterly with low points being located at the proposed garbage enclosure. Overland flow from the roadways will be directed to this retention area and will spill out to the Hydro corridor under the major storm event beyond the 100-year storm. Engineering drawing C09 illustrates the storm drainage system and associated catchments.

5.6 Design Methodology

The methodology for the design stormwater management portion of the storm sewer system is as follows:

- Place appropriate number and the location of inlets to ensure depth of flow meets City guidelines.

- Meet allowable discharge rate to the Goward Drive Storm sewer of not more than 100 L/sec.
- Ensure no more than 126 m^3 of stormwater volume discharges to the Hydro corridor under the 100-year storm event.
- Ensure that resultant 100-year hydraulic grade line does not raise closer than 300mm from the underside of the proposed building footing (USFs).
- Develop a dynamic hydrologic/hydraulic model that provides peak flow hydrographs and water surface profiles which routes runoff from catchments to the outlet.

The site is designed using a dual drainage stormwater model. Dual drainage systems consist of two separate and distinct networks, being a) the minor (or storm sewer) system and b) the major (or street) system. Storm sewer inlets intercept runoff from catchments and links are created between the major system and the minor system.

For this analysis all minor and major system components were included in the PCSWMM model, including inlet control devices (ICDs) in catchbasins, inlet control for catchbasins in flow-by conditions, and storage for catch basins in ponding conditions.

Rating curves were developed for ICD's based on manufactures specifications, for surface and curb-inlet type catchbasins, and for surface ponding areas.

5.7 Storm Sewer Design

Average runoff coefficients were calculated for all drainage areas for sizing of the storm sewers. Post-development drainage areas are illustrated on drawing C09. Average runoff coefficients were calculated for each catchment and inlet times of 10 minutes were used as per City of Ottawa Guidelines.

A minimum 250mm diameter storm sewer is proposed for the main line storm sewer capturing surface runoff. The primary storm sewer sections were sized for the 100-year peak flow and verified in PCSWMM modeling analysis. The secondary storm sewer sections were sized for the estimated foundation drain flows, which was assumed 0.9 L/s for each building block, plus the restricted discharge from the underground storage chamber. All new storm sewers were sized for the 2-year peak flow. Design sheets for the 2-year sizing of the storm sewer system are included in Appendix E.

5.8 Hydrology

PCSWMM was used to create a dual drainage hydrologic/hydraulic model of the storm sewer system. The model accounts for both the minor system (storm sewer) and the major system (roads / swale). Catchbasins were modelled in either a flow-by condition or in a ponding condition. For catchbasins in flow-by conditions inlet capture curves were developed based on the type of curbs used (mountable curb in this case), and the inlet type (surface inlet catchbasins). Ponding areas were modelled as storage nodes with surface ponding represented by area-depth curves above the inlet control devices (ICDs) located at the outlet pipe invert. Calculations of runoff was completed based on the PCSWMM's EPA SWM 5 engine. Catchment parameters were taken from City of Ottawa's SDG002 Design parameters. The following design parameters and assumptions are noted as follows:

- Infiltration losses based on Horton Equation as per City of Ottawa SDG002.
- Impervious and pervious depression storage as per City of Ottawa SDG002.
- 5-year, 3-hour Chicago storm used to review minor system design based on Rational Method.
- 100-year, 3-hour Chicago storm used assess impact of major event and determine peak flows and depth of runoff.
- Runoff coefficient for all subcatchments were determined using area weighting routine and based on actual hard and soft surface areas. Runoff coefficients were calculated from the impervious levels using the relationship C = (IMP x 0.7) + 0.20.
- Subcatchment areas were derived tributary to each surface inlet (catchbasin).
- Subcatchment widths are determined using PCSWMM's SET FLOW LENGTH / WIDTH routine. A Flow-Path layer was created in PCSWMW and flow paths were created for each subcatchment. The software averages the flow path lengths to calculate the subcatchment widths. The width is equal to the subcatchment area divided by the overland flow path length.
- Inflows from all catchbasins were restricted with inlet control devices (ICDs) necessary to ensure allowable capture rate of not more than 100 L/sec was maintained.

5.8.1 Catchment Parameters

Drawing C09 illustrates the post-development storm drainage system. Flow path lengths for each subcatchment were determined based on the average overland flow path length, with the catchment width being the area/length. All subcatchment slopes were set at an average of 4% for front and rear yards. The following summarizes the general subcatchment parameters used:

Table 5-2: General Subcatchment Parameters

Parameter	PCSWMM Parameter	Value
Infiltration Loss Method		Horton
Maximum Infiltration Rate	Max. Infil. Rate	76 mm/hr
Minimum Infiltration Rate	Min. Infil. Rate	13.2 mm/hr
Decay Constant (1/hr)	Decay Constant	4.14
Manning N (Impervious)	N Impev	0.013
Manning N (Pervious)	N Perv	0.25
Depression Storage – Pervious Surfaces	Dstore Imperv	1.57 mm
Depression Storage – Impervious Surfaces	Dstore Perv	4.67 mm
Zero Percent Impervious	Zero Imper	25%
Subcatchment Slopes	Slope	2% - 4% front yards & back yards

Figure 1 and Table 5.3 below presents the individual subcatchment parameters that were developed and used in the PCSWMM model.

Figure 1 - Post Development Catchments

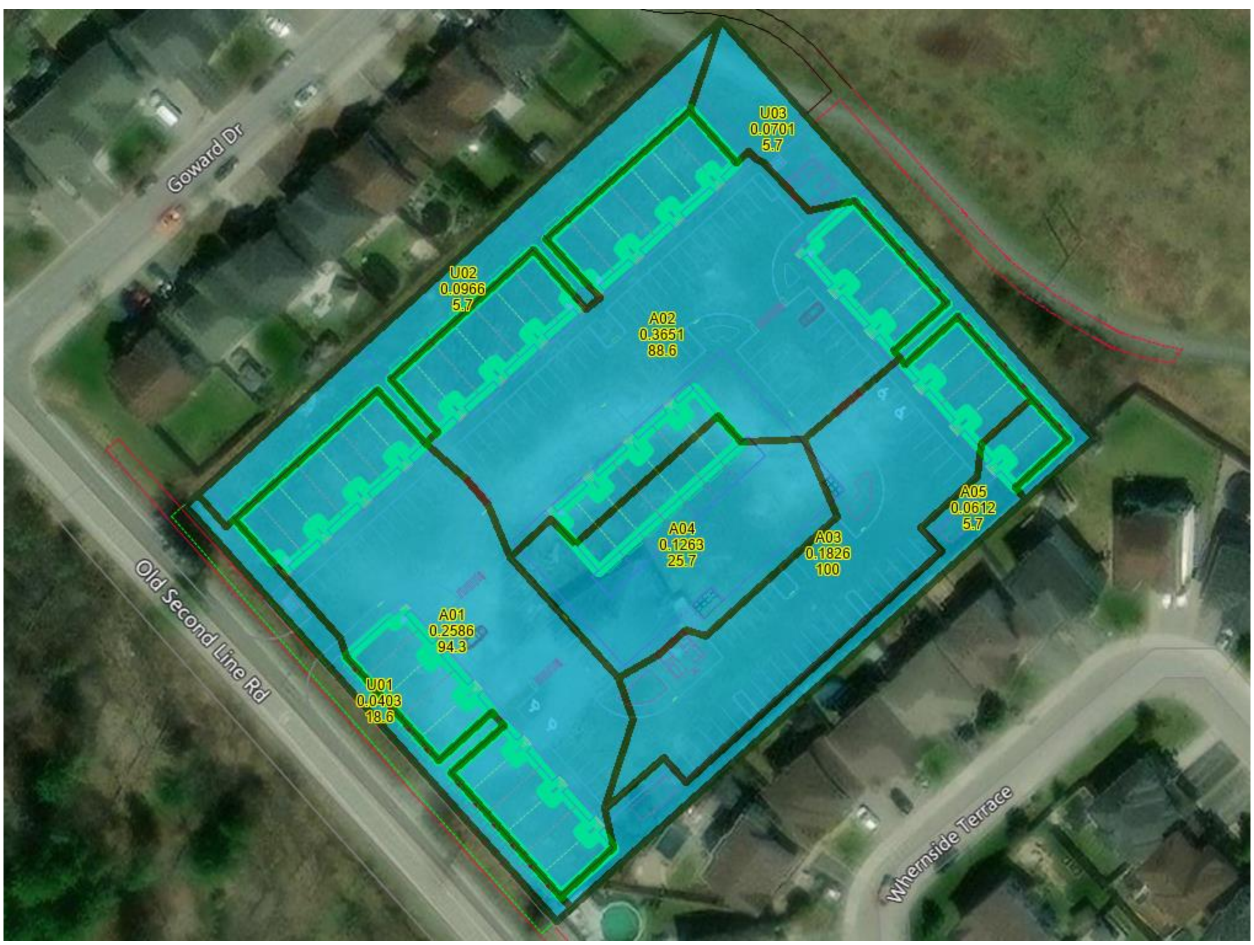


Table 5-3: Post-Development Subcatchment Parameters

Name	Area (ha)	Flow Length (m)	Width (m)	Slope (%)	Imperv. (%)	CAVG	Outlet
U01	0.0403	108.8	3.7	3.8	18.6	0.33	Outfall_Second_Line
U02	0.0966	123.8	7.8	4	5.7	0.24	CB01
U03	0.0701	89.9	7.8	5.8	5.7	0.24	Outfall_Hydro_Corridor
A01	0.2586	80.3	32.2	3.2	94.3	0.86	CB03
A02	0.3651	74.9	48.7	3.5	88.6	0.82	CB02
A03	0.1826	110.7	16.5	1.8	100	0.90	CB08
A04	0.1263	47.5	26.6	3.7	25.7	0.38	CB06
A05	0.0612	153	4	2.6	5.7	0.24	CB10

5.8.2 Storage Node Parameters

All catchbasins will be equipped with (ICDs) to ensure that captured flows do not exceed the allowable rate at the outfall, and as a result ponding will occur. All catchbasins were established as storage nodes. All storage nodes use a stage-volume relationship which was assigned based on the maximum depth and area of ponding. For catchbasins in flow-by conditions no storage was assigned above the inlet lid elevation. Rating curves at ponding locations are provided in Table E8 of Appendix E.

Table 5-4: Storage Node Parameters

Name	Invert (m)	Rim* (m)	Depth (m)	Storage Curve	Coeff	Exp	Constant (m²)	Curve Name
CB01	99.8	101.35	1.55	TABULAR	1000	0	0	CB01_NO_PONDING
CB02	101.09	102.55	1.46	TABULAR	1000	0	0	CB02Ponding
CB03	101.45	103.5	2.05	TABULAR	1000	0	0	CB03Ponding
CB06	101.5	102.78	1.28	TABULAR	1000	0	0	CB06_PONDING
CB08	101.16	102.6	1.44	TABULAR	1000	0	0	CB08_PONDING
CB10	101.4	102.55	1.15	TABULAR	1000	0	0	CB10_PONDING
CB13	99.7	101.25	1.88	TABULAR	1000	0	0	CB13_PONDING
Outfall_Hydro_ Corridor	100.8	101	0.2	TABULAR	1000	0	0	PARK-STORAGE

5.8.3 ADS Underground Storage Chamber

An underground storage chamber system is proposed at the middle part of the development site, south of building Block 8, and will collect and detain stormwater runoff conveyed from the primary storm sewers. The size of the underground chambers is large enough to contain the 100-year, 100-year plus 20%, and Historical storm events. The maximum volume of the underground chambers is 361.8 m^3 at its maximum spill elevation of 101.86 m, and 509.3 m^3 at the top of granular layer elevation of 102.44 m. during the 100-year storm event, the maximum modeled storage volume is ±290 m^3 at a depth of 0.884 m, and during the 100-year plus 20% (stress test), the storage would be ±362 m^3 at a depth of 1.10 m.

The following summarizes the underground chamber parameters used, with the volumes noted to only include the area above the pond bottom.

- Chamber model: ADS MC-3500
- Number of Chambers: 56
- Number of end of caps: 10

- Voids in the stones (porosity): 40%
- Amount of stone above chambers: 305 mm
- Elevation and area at top of chamber (spill to manhole) = 313.81 m^2 @ 101.86m
- Amount of stone below chambers: 229 mm
- Elevation and area at base of granular / stone = 239.88 m^2 @ 100.76m

Table 5-5: Underground Chamber Stage-Storage Data

Depth (m)	Incr Depth (m)	Elevation (m)	Area (m^2)	Incr Vol (m^3)	Cumul Vol (m^3)	Desc
1.676	0.306	102.44	239.88	73.1	509.28	Top of above stone
1.37	0.26	102.13	242.06	120.13	436.18	Top of chamber
1.10	0.871	101.86	313.81	316.05	361.8	Spill Elev
0.229	0.229	100.99	239.88	45.75	54.84	Top of base stone
0.00	0.00	100.76	239.88	6.09	6.09	Bottom Elev

The design information sheet and the modeled stage-storage curve for the underground chambers are included in Appendix E.

The underground storage chambers will not be designed for quality treatment of runoff. Runoff from the storm sewer system will be discharged to the downstream stormwater facility within Phase 12 of Morgan's Grant. The facility was designed for a normal level of water protection (70% TSS).

A copy of certificate of Approval for this stormwater facility is provided in Appendix I for reference. Additionally, the Operation and Maintenance Manual for this stormwater facility was provided by the City of Ottawa, which indicated that water quality sampling performed in 2008, 2009 and 2010, resulting the average TSS removal efficiencies of 91%, 87% and 75 % respectively.

5.8.4 Outlet Node Parameters

The proposed catchbasins and stormwater manholes will not be equipped with no inlet control devices as the design purpose of the primary storm sewer system is to accommodate the peak runoff from the 100-year storm event. There is one exception to this, which is a rear yard catchbasin (CB01) located near the outlet sewer easement, in which the catchbasin (CB01) is equipped with an IPEX Tempest inlet control device (ICD-IPEX-LMF80) which restricts a maximum flow of 3.84 L/s under the 100-year storm event.

A 215 mm diameter orifice plate will be installed in the stormwater manhole (206A) which is downstream of the underground storage chamber, to ensure that the peak discharge rate entering the Goward Drive storm sewer is less than the allowable rate of 100 L/s.

5.9 Dual Drainage Modelling Methodology

5.9.1 Model Development

The subcatchment (or storm drainage areas) were developed in Autodesk CIVIL 3D and imported into PCSWMM. PCSWMM was then used to generate impervious levels for each subcatchment with the area-weighting command. Storm sewers and manholes were imported from CIVIL 3D as GIS shape files and the node and conduit elevations and sizes were inputted based on the preliminary sizing completed with the Rational Method analysis. Connections between the catchbasin nodes and the sewer main were converted to OUTLETS to represent the ICDs. Once all the minor system components were inputted, the major system was defined connecting inlets.

The major system was represented as irregular conduits based on a half-street cross-section. The transect editor in PCSWMM was used to establish this transect, which was applied to the majority of the major system. In addition, swale and roadway spill irregular transects were used to represent the overland flows. In flow-by conditions all subcatchments were linked to major system nodes place just upstream (u/s) of the catchbasin storage nodes. Between the u/s node and the catchbasins were represented by a PCSWMM OUTLET. These outlets were established with rating curves to represent the approach-flow and depth, and the inlet capture rate. Additional information on the rating curves under flow-by and ponding conditions is provided in proceeding sections of this report.

Figure 2 – Model Schematic Showing Minor and Major System Components

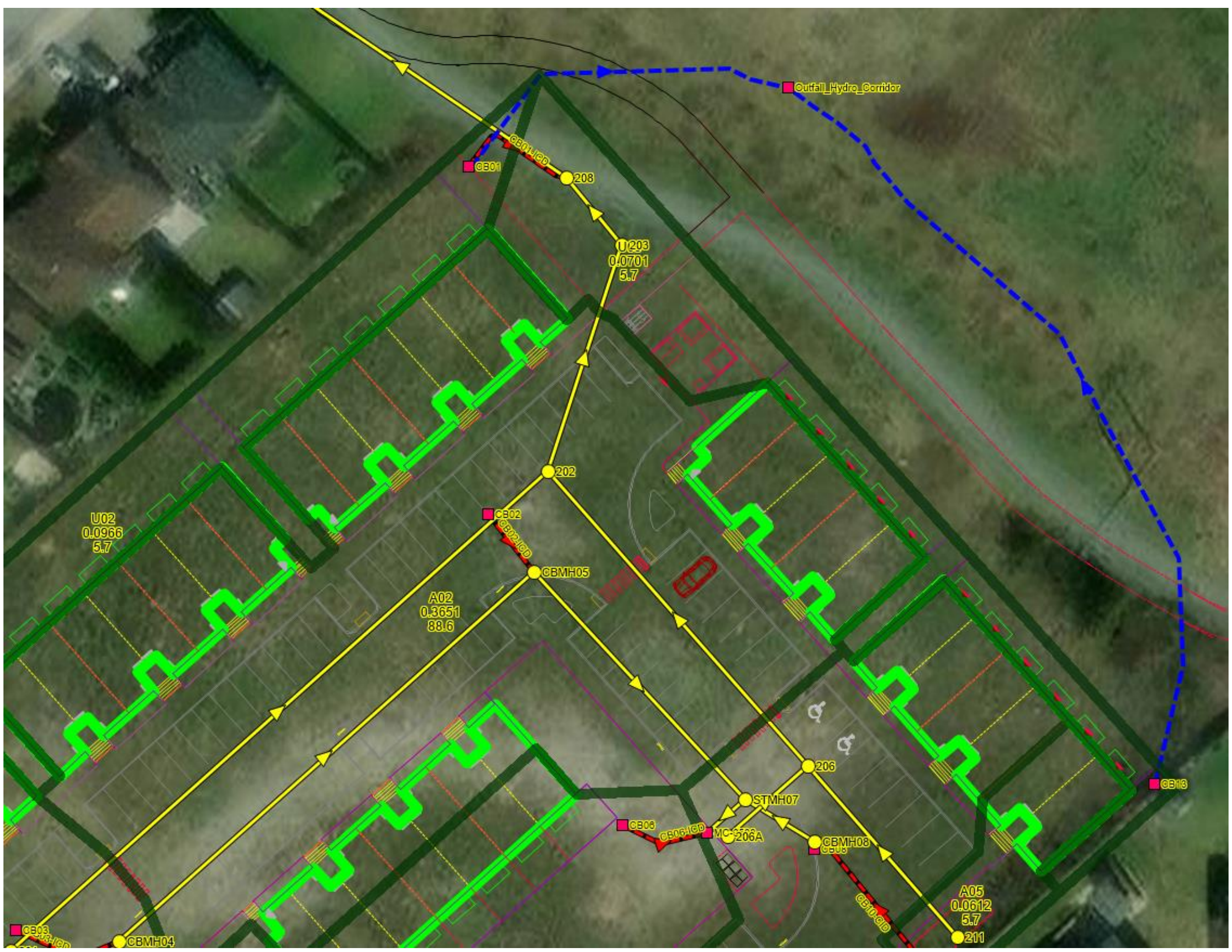
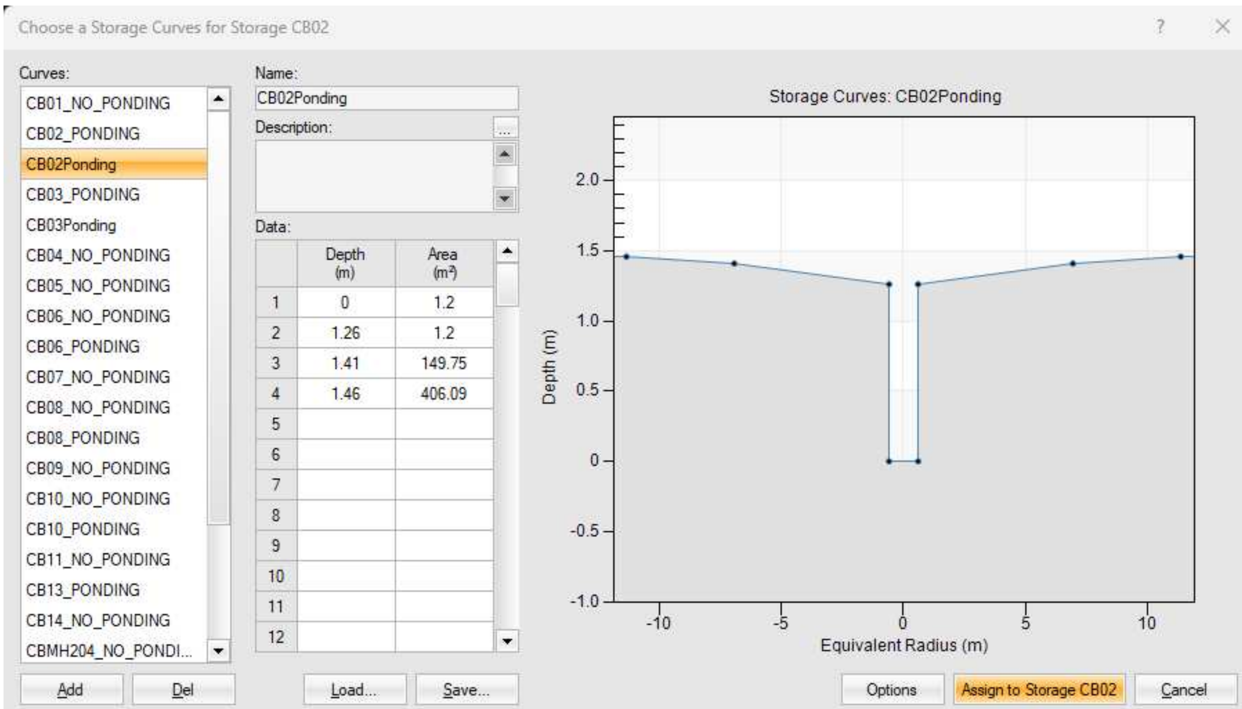


Figure 2 above presents a portion of the PCSWMM model which demonstrates the object connectivity. The subcatchment are illustrates as white polygons, with their area number, area in hectares and percent imperviousness labelled. The yellow lines and circles represent the storm sewer system and manholes, with red dashed lines representing the OUTLET links (or ICDs). The dashed blue lines represent the major system and irregular channels. Catch basins are shown as red squares and looking closely you can see two OUTLETS connecting the CBs to the storm sewer and the major system nodes. Downstream of each CB represent the ICD, whereas upstream of the CB storage nodes the OUTLET represents the inlet capacity. At ponding locations, the storage nodes were defined based on the depth to the ICD. The storage rating curves at each catchbasin was modeled similar to the illustration in Figure 3 below.

Figure 3 – Representation of Rating Curves for Modelling of Storage at Ponding Locations



5.9.2 Storm Events Modelled

A total of seven (7) storm events were modelled, which includes the following:

- 3-hour 2-year Chicago storm (timestep 10 mins)
- 3-hour 5-year Chicago storm (timestep 10 mins)
- 3-hour 100-year Chicago storm (timestep 10 mins)
- 3-hour 100-year + 20% Chicago storm (timestep 10 mins)
- Historical storms occurring July 1, 1979, Aug 4, 1988, August 08, 1996

5.9.3 Inlet Control at Ponding Conditions (Road Sag)

The ponding capture curves are used when an inlet is located in a ponding area. The inlet capacities of the surface inlet catchbasins was derived from Appendix 7-A.9. The design chart provides the capture rates (Qc) of the inlets at various ponding depths. Rating curves for these surface type inlets are based on a standard catchbasin cover openings as per OPSD 400.01 & 400.03.

5.10 Modelling Results

The following summarizes the results of various storm events to ensure the design criteria is met. This includes: 1) total discharge rate to Goward Drive storm sewer is less than 100 L/sec, 2) Total overland flow discharge to Old Second Line Road is less than pre-development levels, and 3) Maximum permitted overflow volume to Hydro Corridor cannot exceed 126 m^3. 4) Maximum ponding depth of 300mm.

The results of the PCSWMM model runs are provided in proceeding sections. Table 5-7 below summarizes the peak flows at the storm sewer outfall on Goward Street (City storm manhole no: MHST48926), and to the Old Second Line Road right-of-way.

Table 5-7: Peak Flows at Outfalls

Storm Event	Outfall_Second_Line - Max. Flow (L/sec)	Outfall_Goward_Storm - Max. Flow (L/sec)	Overflow to Hydro Corridor (m^3)
Chicago_3h_2yr	1.63	57.04	0
Chicago_3h_5yr	2.78	69.81	2.1
Chicago_3h_100yr	7.61	97.16	23
Chicago_3h_100yr + 20%	10.52	107.70	38.3
Historic_Jul1-79	6.35	103.00	35.5
Historic_Aug4-88	8.75	96.74	22.5
Historic_Aug8-96	3.73	78.45	10.8

The maximum ponding depths at the catchbasins under the 100-year storm event are presented in Table 5-8.

Table 5-8: Maximum Ponding Depths

Catchbasins	Max Ponding Depth (m) under 100-year
CB01	0.05
CB02	0.14
CB03	0.10
CB06	0.08
CB08	0.07
CB10	0.04
CB13	0.01

5.11 Hydraulics

5.11.1 Hydraulic Grade Line Analysis

A hydraulic grade line (HGL) analysis was completed to confirm the 100-year water surface profile will be at least 300mm below the proposed underside of footing elevations of the units. In addition, the HGL of the 100-year plus 20% (rare event) was completed to ensure that the water surface profile was below the building footings.

The downstream boundary condition within the Goward Drive storm sewer was taken from the "Morgan's Grant – Stage 12" Master Design Sheet, which is included in Appendix I. An additional boundary condition was provided by the City of Ottawa, which was to be used to review that the HGL was below the USFs of the proposed building using a higher boundary condition. This boundary condition was approximately 1.0m higher than the boundary condition from the Master Design Sheet noted above. The City, based on their own review, estimates the actual HGL to be the higher values due to downstream storm sewer issues. The following summarizes the boundary conditions used.

- 100-yr HGL elevation at STMH 907 (connecting manhole) = 98.22m
- 100-yr + 20% HGL elevation at STMH 907 (connecting manhole) = 99.26m

A steady-state HGL analysis was completed based on free-flow conditions. Free-flow conditions would be a more conservative approach to ensure that the 100-year levels due to surcharging would still have the appropriate clearance to the underside of footing elevations. The steady state analysis was based on the 100-year HGL boundary condition.

Based on this analysis, we can confirm the maximum 100-yr HGL meet the City's clearance requirements. Using captured flows rather than free-flow conditions would result in the HGL being within the storm sewer pipe and not raise above the obvert of the storm sewer system

The HGLs was plotted from PCSWMM, based on 1) the fixed boundary condition of 98.22m for the 100-year storm, and 2) the fixed boundary condition of 99.26m for the 100-year + 20% storm.

A profile from storm manhole 200 through to the outfall on Goward Street is shown below in Figure 4 and Figure 5. It is shown that during the 100-yr event the maximum water surface elevations will remain below the underside of footing (USFs) with at least 300mm clearance, and for the 100-year Plus 20%, the HGL is below the USFs.

Figure 4 – 100-yr HGL Profile West Antelope Private (Boundary HGL 98.22m)

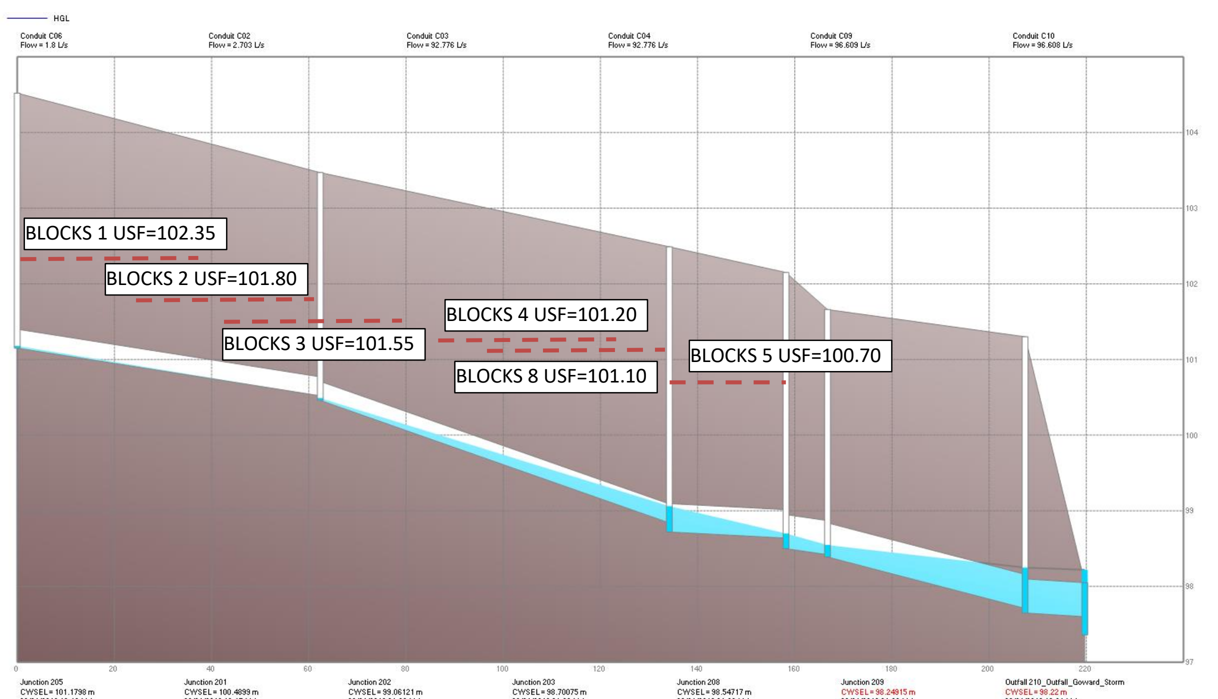


Figure 5 – 100-yr HGL Profile East Antelope Private (Boundary HGL 98.22m)

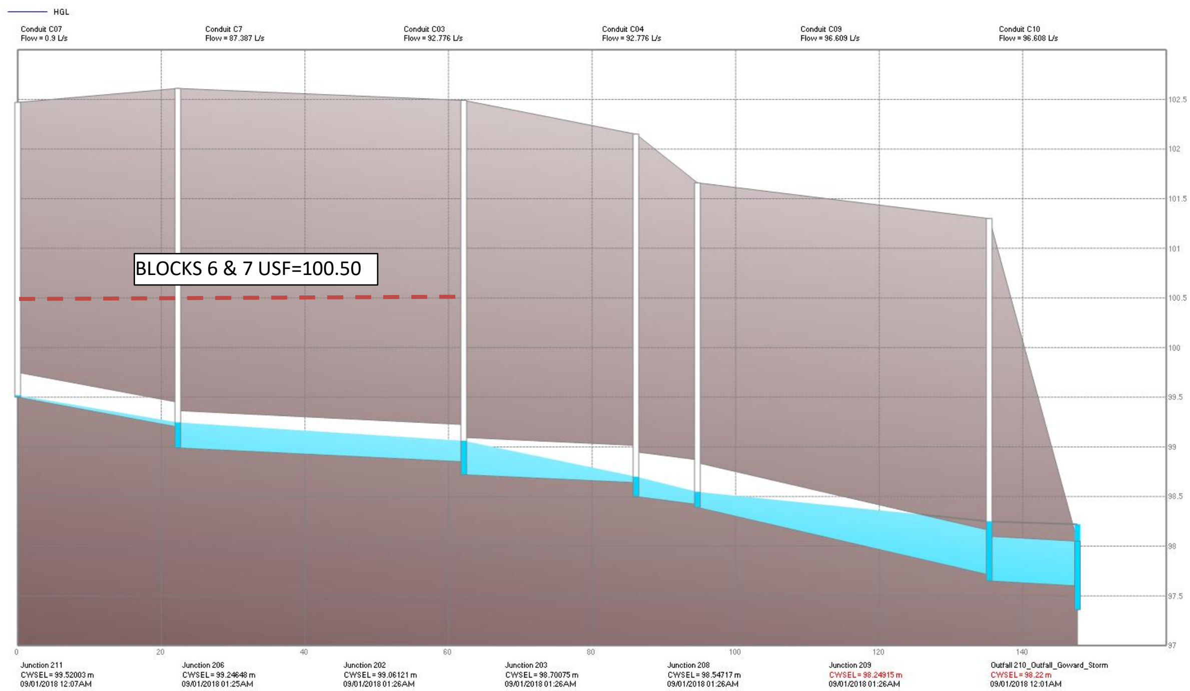


Figure 6 – 100-yr + 20% HGL Profile West Antelope Private (Boundary HGL 99.26m)

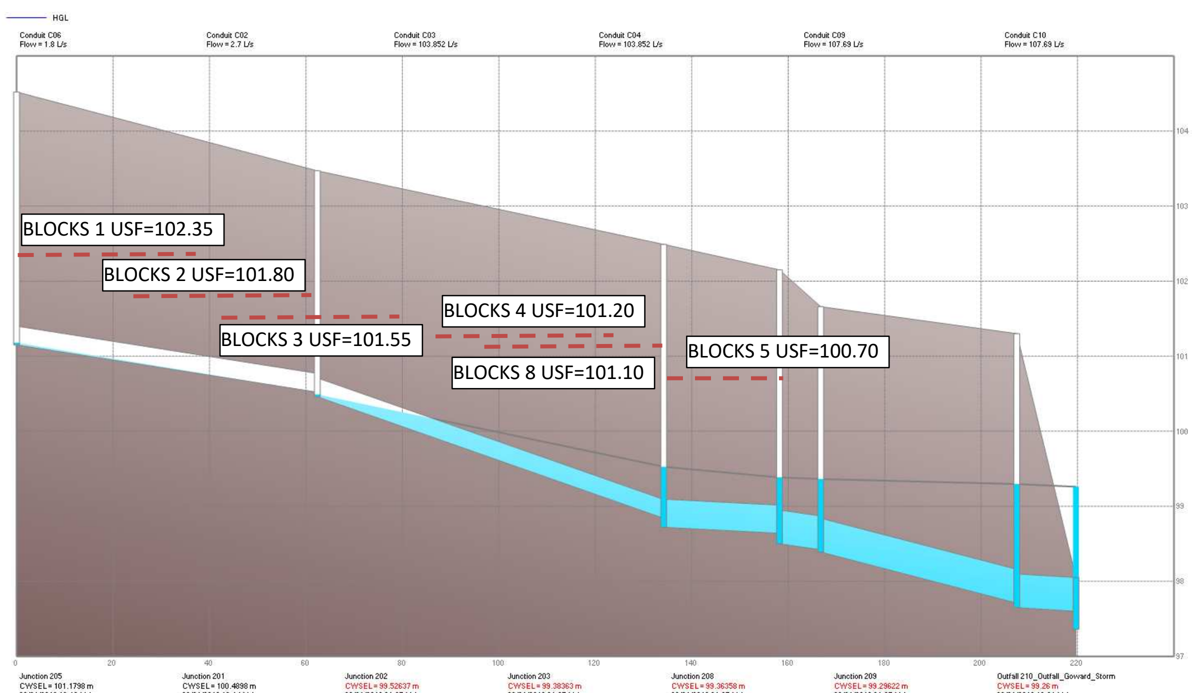
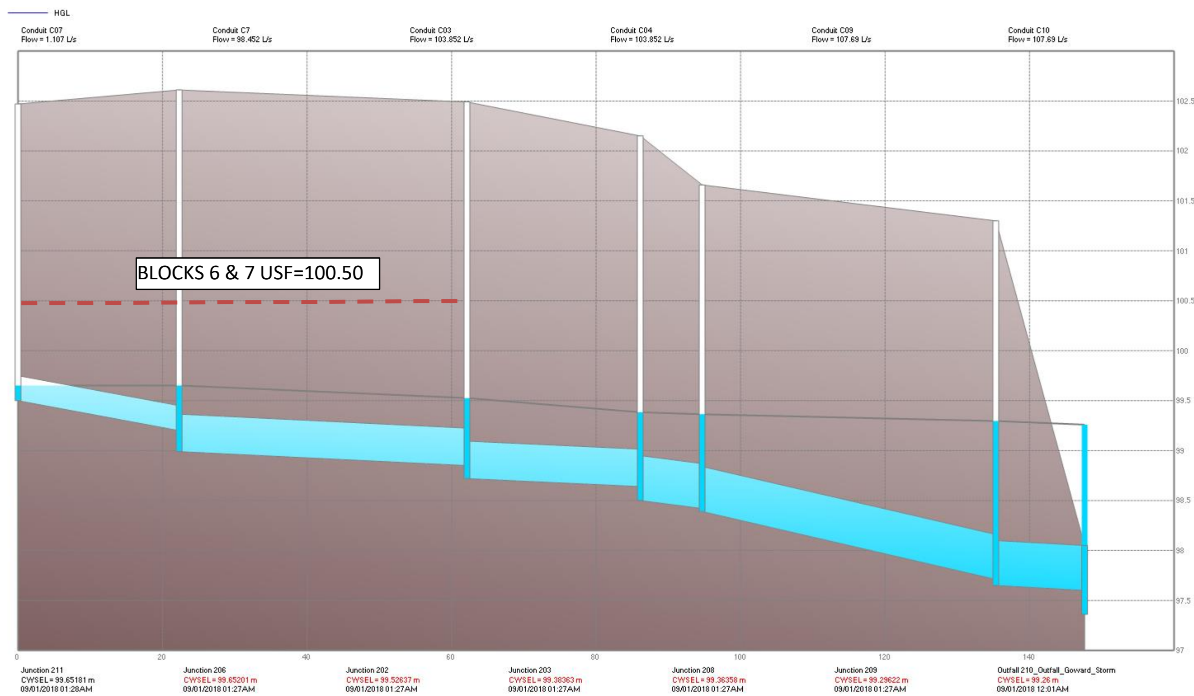


Figure 7 – 100-yr + 20% HGL Profile East Antelope Private (Boundary HGL 99.26m)



5.12 Culvert Sizing

The entrance culvert on Old Second Line Road was designed in accordance with Section 6.4.2 of the City of Ottawa's Design Guidelines, which states culverts shall be a minimum diameter of 500mm. For the culverts crossing these roadways, any culvert greater than 6 metres in length shall be designed for the 50-year return period for local urban roadways. The culvert is 21 metres in length; therefore, the following summarizes the culvert design requirements:

Peak flows in the ditches under a various storm events were calculated using the pre-development subcatchments that were derived in PPCSWMM and adjusted for post-development conditions. Figure 6 below shows the drainage areas tributary to the proposed culverts and the existing culvert crossing Goward street.

Figure 8 – Subcatchments Used for Sizing Entrance Culverts

Upstream of the proposed culverts under Antelope Private, a ditch inlet structure (City # IN58746) is located on the east side of Old Second Line Road approximately 135 metres south of Antelope Private (south leg). This DICB is equipped with an inlet control device (197mm DIA orifice) with a 300mm outlet pipe discharging to Whernside Terrace storm sewer. The existing ditch south of the subject property is sloped southerly back to the DICB, therefore surface ponding will occur within the ditch. A PCSWMM model was completed to derive peak flows within the east ditch between Klondike Road and Goward Street. Peak flows for the 2yr through 100yr, along with the 100-yr plus 20% and stress test events were run. Existing culvert elevations were taken from documents noted in the Section 1.2. The following summarizes the existing culvert data used.

<u>Culvert Crossing at Goward Street</u>

- U/S Invert = 101.32 m
- D/S Invert = 101.10 m
- Pipe Type = CSP
- Pipe Dia = 400mm

The flowing summarizes the peak flows at three critical locations: 1) Upstream end of proposed 500mm culvert #1 - North leg of Antelope Private, 2) Upstream end of proposed 500mm Culvert #2 - South leg of Antelope Private, and 3) Upstream end of existing 400mm Culvert #3 – crossing Goward Street.

Table 5-6: Peak Flows in East Ditch Along Old Second Line Road.

Storm Event	[1] Peak Flows at Upstream End of Proposed Culvert at Antelope Private – South Leg (L/sec)	[2] Peak Flows at Upstream End of Proposed Culvert at Antelope Private – North Leg (L/sec)	[3] Peak Flows at Downstream End of Proposed Culvert at Goward Street (L/sec)
Chicago_3h_2yr	6.2	18.6	33.2
Chicago_3h_5yr	10.5	31.7	59.9
Chicago_3h_10yr	12.7	38.4	74.6
Chicago_3h_25yr	29.6	46.7	91.8
Chicago_3h_50yr	117.3	112.6	119.6
Chicago_3h_100yr	149.8	169.0	180.5
Chicago_3h_100yr + 20%	224.5	266.8	298.2
Historic_Jul1-79	43.9	58.6	76.6
Historic_Aug4-88	105.6	66.4	103.1
Historic_Aug8-96	12.9	38.6	73.7

1 - Peak flows at Junction J5 of Conduit C1
2 - Peak flows at Junction J3 of Conduit C2
3 – Peak Flows at Junction J1 of Conduit C3

The 50-year peak flows at proposed Culvert #1, proposed Culvert #2, and existing Culvert #3 were estimated at 117.3 L/sec, 112.6 L/sec and 119.6 L/sec respectively.

Each culvert will convey the 50-year peak flow based on an assumed free boundary condition outfall. Figure below illustrates the HGL within the ditch. One can see that the 50-year and 100-year HGL's are slightly lower than the Historical storm events, however all conveyed within the culverts.

Figure 9 – 50-year and 100-year HGL within East Ditch Along Old Second Line Road.

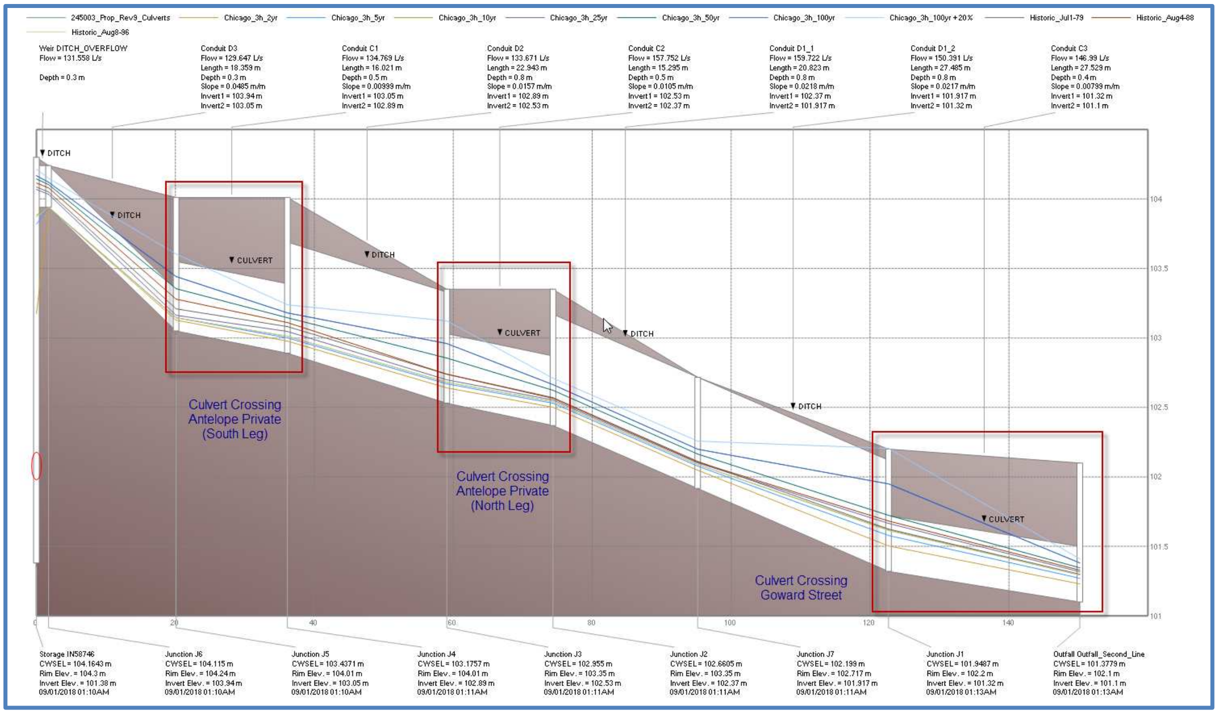
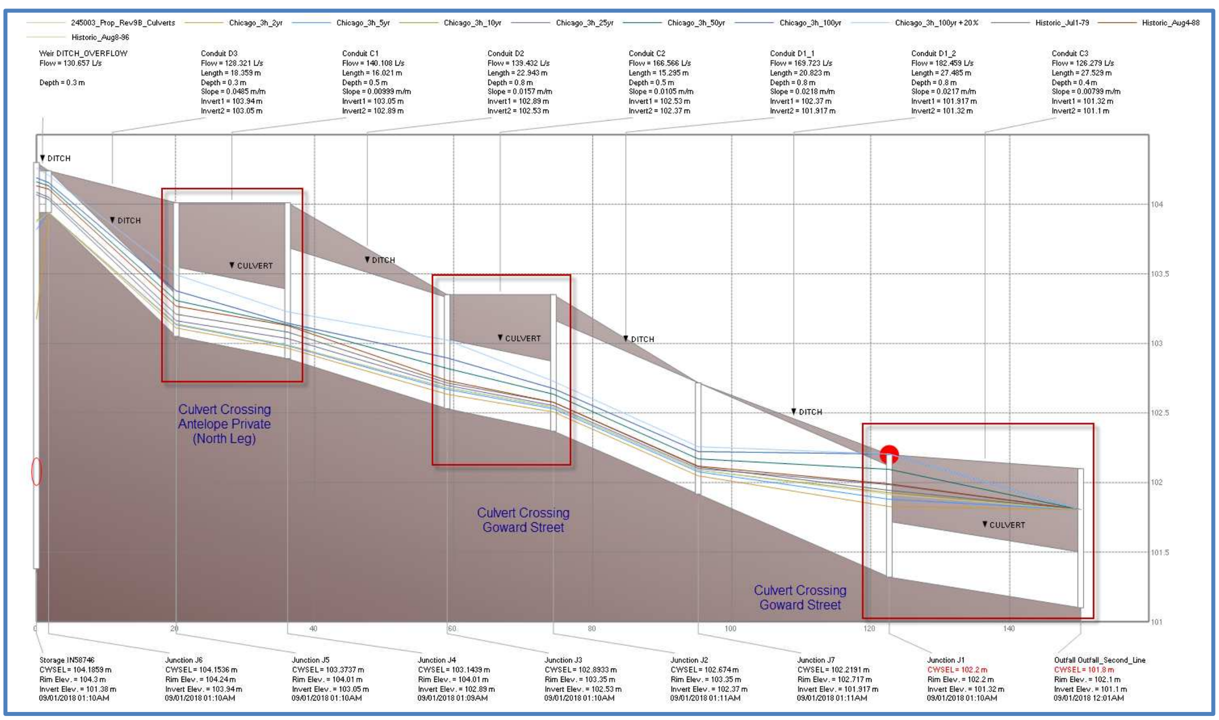


Figure 10 –100-year HGL within East Ditch Using Raised Boundary Condition (0.3m above Obvert)



A secondary review of 100-year HGL within ditch using a fixed outfall of 0.30m above the top of the existing culvert (101.8m) culvert was completed, and illustrated in Figure . Even with culvert at Goward Street modelled having a tailwater condition 0.3m above the top of the outlet pipe, the new proposed culverts will have capacity to convey the peak flows. It should be noted that during the stress test event, the anticipated WSEL will be just at the ground surface (for free outlet conditions) and in a spill condition on the upstream end of the culvert crossing Goward Street. This is a typical condition for culverts sized for storm events less that the 100yr plus 20%.

Due to the minimal cover and shallow depth of the existing ditch, the 500mm culverts were selected. It should be noted that the existing culvert crossing the current residential home on the property is only 400mm in diameter and the downstream culvert crossing Goward Street is also a 400mm diameter.

6 Erosion and Sediment Control

During all construction activities, erosion and sedimentation shall be controlled by the following techniques:

- extent of exposed soils shall be limited at any given time,
- exposed areas shall be re-vegetated as soon as possible,
- filter cloth shall be installed between frame and cover of all new catch basins and catch basin manholes,
- filter cloth shall be installed between frame and cover of the existing catch basins and catch basin manholes as identified on the site grading and erosion control plan,
- light duty silt fencing will be used to control runoff around the construction area. Silt fencing locations are identified on the site grading and erosion control plan.
- visual inspection shall be completed daily on sediment control barriers and any damage repaired immediately. Care will be taken to prevent damage during construction operations,
- In some cases barriers may be removed temporarily to accommodate the construction operations. The affected barriers will be reinstated at night when construction is completed,
- Sediment control devices will be cleaned of accumulated silt as required. The deposits will be disposed of as per the requirements of the contract,
- during the course of construction, if the engineer believes that additional prevention methods are required to control erosion and sedimentation, the contractor will install additional silt fences or other methods as required to the satisfaction of the engineer, and
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) OPSS 805, and City of Ottawa specifications.

7 Conclusions

The proposed 1.2-hectare development by Theberge Homes is comprised of one hundred (100), 3.5 storey stacked units. The following summarizes the servicing and stormwater requirements for the site:

- The allowable capture rate from the proposed site was based on the minor system capture rate established as part of the Morgan's Grant Subdivision Phase 12D which was set at 100 L/sec. This capture rate was set just below the 5-year rate for the 1.2-hectare site using a time of concentration of 20 minutes and a runoff coefficient of 0.50, which was calculated at 117.2 L/sec.
- The 100-year pre-development peak flow rate based on the Rational Method was estimated at 9.3 L/sec and 106.3 L/sec to the Old Second Line ditch and the Hydro Corridor respectively. Dynamic modelling of pre-development flows resulted in peak flows of 22.9 L/sec & 81.8 L/sec for the same storm events.
- A 215 mm diameter orifice plate will be installed at the stormwater manhole downstream of the underground chambers to control runoff to the allowable discharge rate of 86.13 L/s under the 100-year storm. An IPEX Tempest inlet control device (ICD-IPEX-LMF80) will be installed at CB01 to restrict a maximum flow of 3.84 L/s under the 100-year storm event. The peak discharge to the exiting storm sewer on Goward Street (City storm manhole no: MHST48926) is 97.2 L/s, which includes 7.2 L/s foundation flows.
- Based on the dynamic modelling, the total minor system capture rate to the Goward Drive Storm sewer is 57.0 L/sec, 69.8 L/sec and 97.2 L/sec for the 2-year, 5-year and 100-year storm events.
- Underground chambers for stormwater will be used to detain runoff. The underground chambers will be used for quantity control of runoff only and have a volume of 509.3 m^3 at a depth of 1.67 metres. The 100-year elevation & volume was calculated at 101.655m and 293.4 $m^{3,}$ whereas the 100-year +20% depth and volume are 101.892 m and 370.5 m^3.
- All units have an underside of footing elevation a minimum of 0.30 metres above the storm sewer hydraulic grade line. An overland flow route is provided for the major storm event.
- The proposed development has an estimated peak sewage flow of 2.79 L/sec based on City of Ottawa Guidelines. A new 200mm sewer will be installed with a minimum slope of 0.40% having a full flow capacity of 21.6 L/sec, and full flow velocity of 0.67 m/sec. The sanitary sewer will be connected into the existing municipal sanitary sewer on Goward Drive. A review of the downstream capacity in the sanitary sewers in Morgan's Grant indicate adequate capacity is available.
- A hydraulic water model was developed to determine the pressures available under peak hour and maximum day plus fire flow conditions. Two boundary conditions were provided by City staff for modelling. Two connections to the existing city water distribution system are necessary as there will be more that 50 residential units.
- The calculated minimum and maximum working pressures anticipated within the development is between 52 psi and 56.0 psi under peak hourly conditions. Fire walls are proposed to divide the blocks. The maximum estimated fire flow requirement based on the FUS was calculated at 117 L/sec. townhome block. And modeled available fire flows under the maximum day demand conditions range from 117.0 L/sec to 124.6 L/sec.
- An overland flow route is provided for the major storm event.

Appendix A – Figures

Figure A1: Site Location Plan

Figure A3: Water Model Layout, Boundary Condition #1

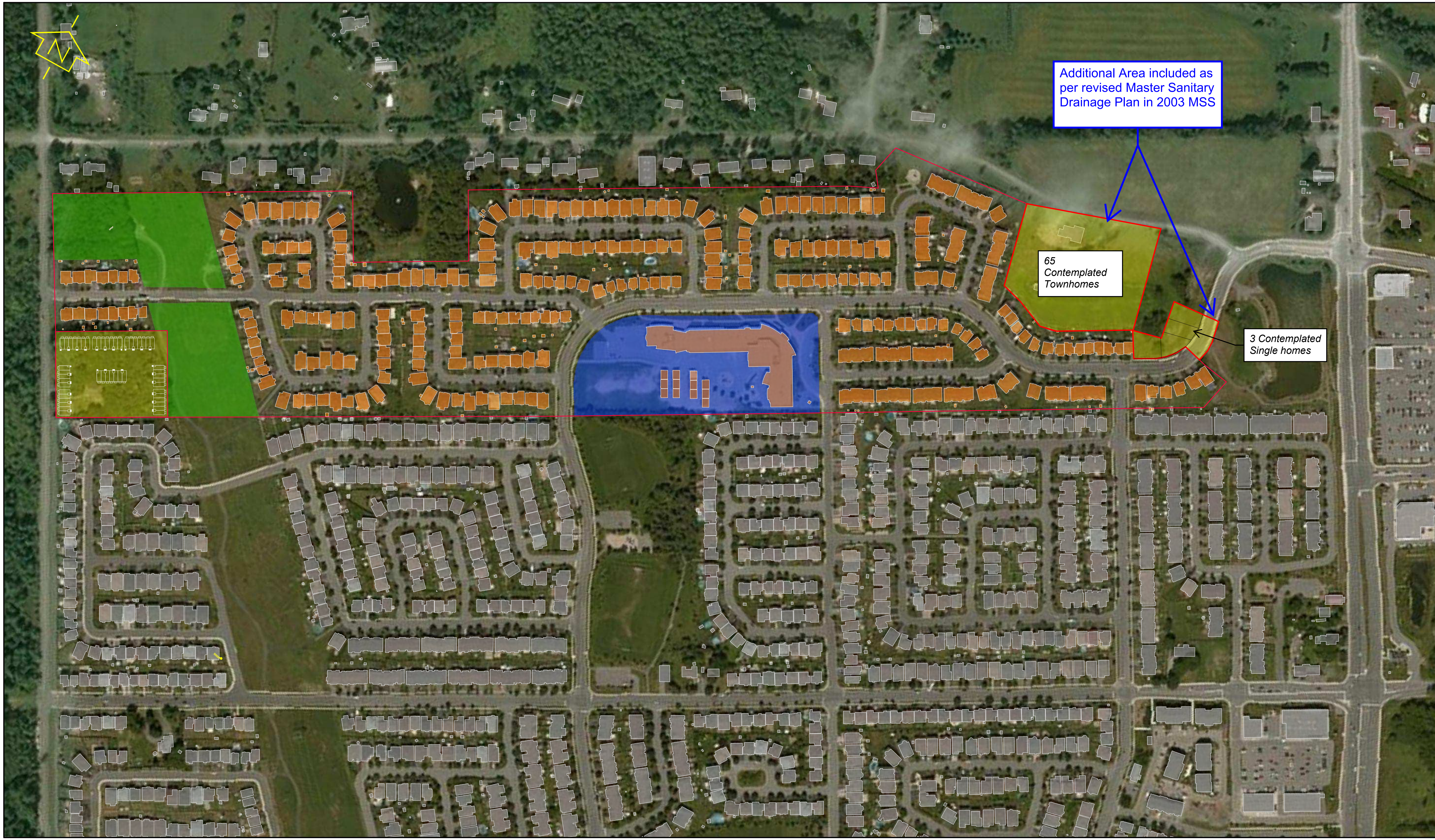
Figure A4: Water Model Layout, Boundary Condition #2

Figure A5: Offsite Sanitary Drainage – Morgan's Grant Phase 12

exp Services Inc. 100-2650 Queensview Drive Ottawa, ON K2B 8H6 **www.exp.com**	DESIGN JLF DRAWN SAB	1158 OLD SECOND LINE ROAD THEBERGE HOMES	SCALE 1:10000
	DATE JAN 2020 FILE NO 245003	SITE LOCATION PLAN	SKETCH NO FIG A1

exp Services Inc. 100-2650 Queensview Drive Ottawa, ON K2B 8H6 www.exp.com	exp.	DESIGN ZP DRAWN ZP	1158 OLD SECOND LINE RD THEBERGE HOMES	SCALE 1:1250
		DATE OCT 2023 FILE NO 245003	WATER MODEL LAYOUT BOUNDARY CONDITION #1	SKETCH NO FIG A3

exp Services Inc. 100-2650 Queensview Drive Ottawa, ON K2B 8H6 www.exp.com	DESIGN ZP	1158 OLD SECOND LINE RD THEBERGE HOMES	SCALE 1:1250	
	DRAWN ZP		SKETCH NO	
	DATE Oct 2023	WATER MODEL LAYOUT BOUNDARY CONDITION #2	FIG A4	
	FILE NO 245003			



exp Services Inc.
100, 2650 Queensview Drive
Ottawa, ON K2B 8H6
www.exp.com

DESIGN JLF	1158 OLD SECOND LINE ROAD THEBERGE HOMES	SCALE 1:4000	
DRAWN SAB			
DATE JAN 2020	OFFSITE SANITARY DRIANAGE MORGAN'S GRANT PHASE 12	FIGURE NO FIG A5	
FILE NO 245003			

Appendix B – Water Tables

Table B1: Water Demand Chart

Table B2: Summary of Required Fire Flows (RFFs)

Table B3: to B27 Calculation of Fire Flow Requirements for Buildings

TABLE B1
WATER DEMAND CHART

Location: 1158 Old Second Line
Project No: OTT-00245003
Designed by: Z. Pan
Checked By: B. Thomas
Date Revised: June 08, 2023

Water Consumption
Residential = **280** L/cap/day

Population Densities

Single Family	3.4	person/unit
Semi-Detahced	2.7	person/unit
Duplex	2.3	person/unit
Townhome (Row)	2.7	person/unit
Bachelor Apartment	1.4	person/unit
1 Bedroom Apartment	1.4	person/unit
2 Bedroom Apartment	2.1	person/unit
3 Bedroom Apartment	3.1	person/unit
Avg. Aptartment	1.8	person/unit

Junction	No. of Units										Demands in (L/sec)					
	Singles/Semis/Towns				Apartments							Maximum Demand (L/day)	Peak Hourly Demand (L/day)			
	Single Familty	Semi-Detached	Duplexz	Townhome	Bachelor	1 Bedroom	2 Bedroom	4 Bedroom	Avg Apt.	Total Persons (pop)	Average Demand (L/day)	2.50 x Avg Day	2.20 x Max Day	Avg Day (L/s)	Max Day (L/s)	Max Hour (L/s)
Proposed Buildings																
J-115							14			29.4	8232	20,580	45,276	0.10	0.24	0.52
J-120							28			58.8	16464	41,160	90,552	0.19	0.48	1.05
J-125							10			21.0	5880	14,700	32,340	0.07	0.17	0.37
J-135							12			25.2	7056	17,640	38,808	0.08	0.20	0.45
J-145							12			25.2	7056	17,640	38,808	0.08	0.20	0.45
J-155							10			21.0	5880	14,700	32,340	0.07	0.17	0.37
J-180							14			29.4	8232	20,580	45,276	0.10	0.24	0.52
Subtotal							100			210.0	58,800	147,000	323,400	0.68	1.70	3.74
Existing Homes																
J-105	7									23.8	6664	16,660	36,652	0.08	0.19	0.42
J-106	8									27.2	7616	19,040	41,888	0.09	0.22	0.48
Subtotal										51.0	14280	35,700	78,540	0.17	0.41	0.91
Totals =	15									261.0	73,080	182,700	401,940	0.85	2.11	4.65

Summary

SUMMARY OF REQUIRED FIREFLOWS (RFFs)

Building #	Fire Flow, F (L/min)	[2]Type of Constr. Coeff, C	[3]Reduction Due to Occupancy (%)	[4]Reduction Due to Sprinklers (%)	[5]Total Increase due to Exposures (%)	[6]Required Fire Flow in (L/min)	(L/sec)
BLOCK 1. Two (2) Northern units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-25%	6,000	100
BLOCK 1. Two (2) Central units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	0%	5,000	83
BLOCK 1. Two (2) Southern units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-4%	5,000	83
BLOCK 2. Two (2) Southern units of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-22%	6,000	100
BLOCK 2. Two (2) Central units of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	8,000	1.5	-15%	0%	-2%	7,000	117
BLOCK 2. One (1) Northern unit of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.	4,000	1.5	-15%	0%	-14%	4,000	67
BLOCK 3. One (1) Western unit of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	4,000	1.5	-15%	0%	-10%	4,000	67
BLOCK 3. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-11%	6,000	100
BLOCK 3. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-11%	6,000	100
BLOCK 3. Two (2) Eastern unit of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-24%	6,000	100
BLOCK 4. Two (2) Western units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-24%	6,000	100
BLOCK 4. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-2%	5,000	83
BLOCK 4. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-2%	5,000	83
BLOCK 4. One (1) Eastern unit of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	4,000	1.5	-15%	0%	-25%	4,000	67
BLOCK 5. One (1) Western unit of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	4,000	1.5	-15%	0%	-22%	4,000	67
BLOCK 5. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	0%	5,000	83
BLOCK 5. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	0%	5,000	83
BLOCK 5. Two (2) Eastern unit of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-10%	6,000	100
BLOCK 6. Two (2) Central units of 5 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-4%	5,000	83
BLOCK 6. One (1) Northern unit of 5 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.	4,000	1.5	-15%	0%	-10%	4,000	67
BLOCK 6. Two (2) Southern units of 5 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-22%	6,000	100
BLOCK 7. Two (2) Northern units of 6 unit block. 3.5-storeys. (1 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-22%	6,000	100
BLOCK 7. Two (2) Northern units of 6 unit block. 3.5-storeys. (1 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	0%	5,000	83
BLOCK 7. Two (2) Southern units of 6 unit block. 3.5-storeys. (1 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-11%	6,000	100
BLOCK 8. Three (3) Western unit of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.	8,000	1.5	-15%	0%	-8%	7,000	117
BLOCK 8. Two (2) Central unit of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-2%	5,000	83
BLOCK 8. Two (2) Eastern units of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.	6,000	1.5	-15%	0%	-6%	5,000	83

Notes

1 - If basements are included (<50% below grade) then denoted as +.

2 -Types of constructions: 0.8 for non-combustible, 1.0 for ordinary construction,1.5 for wood frame construction.

3 - Reductions due to Occupancy are -25% for non-combustible or -15% for limited combustible.

4 - Reductions due to Sprinkler Systems

5 – Increase due to exposures were calculated based on FUS 2020.

6 – Required Fire Flows are rounded to nearest 1,000 L/min.

Min = **67**

Max = **117**

BLOCK 1-north

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 1. Two (2) Northern units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input			Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible			-15%	-900	5,100
	Limited Combustible	-15%						
	Combustible	0%						
	Free Burning	15%						
	Rapid Burning	25%						
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler	Min =	0	0%	0	5,100
	No Sprinkler	0%		Max =	0			
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable			0%	0	5,100
	Not Standard Water Supply or Unavailable	0%						
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised			0%	0	5,100
	Not Fully Supervised or N/A	0%						
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers			0%	0	5,100

Task	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
Choose Structure Exposure Distance	North	3	1	0 to 3	Type V	29	3.5	101.5	1F	25%	25%	1,275	6,375
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**6,000**
	Total Required Fire Flow, L/s =												**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 1-central
FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 1. Two (2) Central units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	0%	0	5,100
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 1-south

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 1. Two (2) Southern units of 6 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	4%	204	5,304
	South	22	4	20.1 to 30	Type V	29	2	58	4C	4%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 2-south

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 2. Two (2) Southern units of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:

F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	351.6 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,188
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	22%	1,122	6,222
	South	3	1	0 to 3	Type V	12.6	3.5	44.1	1C	22%			
	East	30	4	20.1 to 30	Type V	4	3.5	14	4A	0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**6,000**
	Total Required Fire Flow, L/s =												**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 2-central

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 2. Two (2) Central units of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:

F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	527.4 m²	
	Floor 3 and above		176	100%	176			
	Floor 2		176	100%	176			
	Floor 1 (Main Level)		176	100%	176			
	Basement (At least 50% below grade, not included)		176	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,579
Fire Flow (F)	Rounded to nearest 1,000							**8,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-1,200	6,800
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	6,800
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	6,800
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	6,800
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	6,800
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	2%	136	6,936
	South	FW	0	Firewall						0%			
	East	30	4	20.1 to 30	Type V	9.0	3.5	31.5	4B	2%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**7,000**
	Total Required Fire Flow, L/s =												**117**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 2-north

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 2. One (1) Northern unit of 5 unit block. 3-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:

F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	175.8 m²	
	Floor 3 and above		59	100%	59			
	Floor 2		59	100%	59			
	Floor 1 (Main Level)		59	100%	59			
	Basement (At least 50% below grade, not included)		59	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							4,375
Fire Flow (F)	Rounded to nearest 1,000							**4,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-600	3,400
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler; Min = 0	0%	0	3,400
	No Sprinkler	0%	Max = 0			
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	3,400
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised	0%	0	3,400
	Not Fully Supervised or N/A	0%				
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers	0%	0	3,400

Task	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	Fire Flow Total (L/min)
Choose Structure Exposure Distance	North	18.3	3	10.1 to 20	Type V	12.6	3.5	44.1	3C	12%	14%	476	3,876
	South	FW	0	Firewall						0%			
	East	30	4	20.1 to 30	Type V	8.1	3.5	28.35	4B	2%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**4,000**
	Total Required Fire Flow, L/s =												**67**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 3-west

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 3. One (1) Western unit of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	174.9 m²	
	Floor 3 and above		58	100%	58			
	Floor 2		58	100%	58			
	Floor 1 (Main Level)		58	100%	58			
	Basement (At least 50% below grade, not included)		58	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							4,364
Fire Flow (F)	Rounded to nearest 1,000							**4,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-600	3,400
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	3,400
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	3,400
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	3,400
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	3,400
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	4.8	2	9.6	4A	0%	10%	340	3,740
	South	18.3	3	10.1 to 20	Type V	4.8	3.5	16.8	3A	10%			
	East	FW	0	Firewall						0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**4,000**
	Total Required Fire Flow, L/s =												**67**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 3-central-1

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 3. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

$F = 220 * C * SQRT(A)$

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	349.7 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,171
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input	Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible	-15%	-900	5,100
	Limited Combustible	-15%				
	Combustible	0%				
	Free Burning	15%				
	Rapid Burning	25%				
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler; Min = 0	0%	0	5,100
	No Sprinkler	0%	Max = 0			
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable	0%	0	5,100
	Not Standard Water Supply or Unavailable	0%				
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised	0%	0	5,100
	Not Fully Supervised or N/A	0%				
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers	0%	0	5,100

Task	Exposures	Separation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	Fire Flow Total (L/min)
Choose Structure Exposure Distance	North	21.0	4	20.1 to 30	Type V	9.8	2	19.6	4A	0%	11%	561	5,661
	South	18.3	3	10.1 to 20	Type V	9.8	3.5	34.3	3B	11%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**6,000**
	Total Required Fire Flow, L/s =												**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 3-central-2

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 3. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	349.7 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,171
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.8	2	19.6	4A	0%	11%	561	5,661
	South	19.2	3	10.1 to 20	Type V	9.8	3.5	34.3	3B	11%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**6,000**
	Total Required Fire Flow, L/s =												**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 3-east

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 3. Two (2) Eastern unit of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	349.7 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,171
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.8	2	19.6	4A	0%	24%	1,224	6,324
	South	23.5	4	20.1 to 30	Type V	9.8	3.5	34.3	4B	2%			
	East	3	1	0 to 3	Type V	12.2	3.5	42.7	1C	22%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**6,000**
	Total Required Fire Flow, L/s =												**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 4-west

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 4. Two (2) Western units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	349.7 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,171
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier	Input			Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%	Limited Combustible			-15%	-900	5,100
	Limited Combustible	-15%						
	Combustible	0%						
	Free Burning	15%						
	Rapid Burning	25%						
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%	No Sprinkler	Min =	0	0%	0	5,100
	No Sprinkler	0%		Max =	0			
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%	Not Standard Water Supply or Unavailable			0%	0	5,100
	Not Standard Water Supply or Unavailable	0%						
	Fully Supervised Sprinkler System	-10%	Not Fully Supervised			0%	0	5,100
	Not Fully Supervised or N/A	0%						
	Reduction for Community Sprinklers	-25%	Reduction due to Community Sprinklers			0%	0	5,100

Choose Structure Exposure Distance

Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
North	21.0	4	20.1 to 30	Type V	9.5	2	19	4A	0%	24%	1,224	6,324
South	23.8	4	20.1 to 30	Type V	9.5	3.5	33.25	4B	2%			
East	FW	0	Firewall						0%			
West	3	1	0 to 3	Type V	12.2	3.5	42.7	1C	22%			

Exposed Wall Length: Length (m), No of Storeys, Length-Height Factor, Sub-Conditon, Charge (%)

Obtain Required Fire Flow	
Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =	**6,000**
Total Required Fire Flow, L/s =	**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 4-central-1

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 4. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:

F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	349.7 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,171
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.5	2	19	4A	0%	2%	102	5,202
	South	23.8	4	20.1 to 30	Type V	9.5	3.5	33.25	4B	2%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 4-central-2

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 4. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	349.7 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,171
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.5	2	19	4A	0%	2%	102	5,202
	South	23.8	4	20.1 to 30	Type V	9.5	3.5	33.25	4B	2%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 4-east

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 4. One (1) Eastern unit of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:

F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	174.9 m²	
	Floor 3 and above		58	100%	58			
	Floor 2		58	100%	58			
	Floor 1 (Main Level)		58	100%	58			
	Basement (At least 50% below grade, not included)		58	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							4,364
Fire Flow (F)	Rounded to nearest 1,000							**4,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-600	3,400
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	3,400
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	3,400
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	3,400
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	3,400
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	4.8	2	9.6	4A	0%	25%	850	4,250
	South	23.8	4	20.1 to 30	Type V	4.8	3.5	16.8	4A	0%			
	East	3	1	0 to 3	Type V	29	3.5	101.5	1F	25%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**4,000**
	Total Required Fire Flow, L/s =												**67**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 5-west
FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 5. One (1) Western unit of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	174.9 m²	
	Floor 3 and above		58	100%	58			
	Floor 2		58	100%	58			
	Floor 1 (Main Level)		58	100%	58			
	Basement (At least 50% below grade, not included)		58	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							4,364
Fire Flow (F)	Rounded to nearest 1,000							**4,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input							Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible							-15%	-600	3,400
	Limited Combustible	-15%												
	Combustible	0%												
	Free Burning	15%												
	Rapid Burning	25%												
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0				0%	0	3,400
	No Sprinkler	0%					Max =	0						
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable							0%	0	3,400
	Not Standard Water Supply or Unavailable	0%												
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised							0%	0	3,400
	Not Fully Supervised or N/A	0%												
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers							0%	0	3,400
Choose Structure Exposure Distance						Exposed Wall Length								
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)		Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	4.8	2	9.6	4A	0%		22%	748	4,148
	South	23.8	4	20.1 to 30	Type V	4.8	3.5	16.8	4A	0%				
	East	FW	0	Firewall						0%				
	West	3	1	0 to 3	Type V	12.2	3.5	42.7	1C	22%				
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =													**4,000**
	Total Required Fire Flow, L/s =													**67**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 5-central-1
FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 5. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	349.7 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,171
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.6	2	19.2	4A	0%	0%	0	5,100
	South	50	6	>45m	Type V	23.8	3.5	83.3	6	0%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 5-central-2

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 5. Two (2) Central units of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	349.7 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,171
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.6	2	19.2	4A	0%	0%	0	5,100
	South	50	6	>45m						0%			
	East	FW	0	Firewall						0%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 5-east

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 5. Two (2) Eastern unit of 7 unit block. 3.5-storeys. (3 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:

F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	349.7 m²	
	Floor 3 and above		117	100%	117			
	Floor 2		117	100%	117			
	Floor 1 (Main Level)		117	100%	117			
	Basement (At least 50% below grade, not included)		117	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,171
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	21.0	4	20.1 to 30	Type V	9.6	2	19.2	4A	0%	10%	510	5,610
	South	18.2	3	10.1 to 20	Type V	4.8	3.5	16.8	3A	10%			
	East	50	6	>45m						0%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**6,000**
	Total Required Fire Flow, L/s =												**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 6-north

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 6. One (1) Northern unit of 5 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	174.0 m²	
	Floor 3 and above		58	100%	58			
	Floor 2		58	100%	58			
	Floor 1 (Main Level)		58	100%	58			
	Basement (At least 50% below grade, not included)		58	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							4,353
Fire Flow (F)	Rounded to nearest 1,000							**4,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-600	3,400
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	3,400
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	3,400
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	3,400
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	3,400
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	18.3	3	10.1 to 20	Type V	2	3.5	7	3A	10%	10%	340	3,740
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**4,000**
	Total Required Fire Flow, L/s =												**67**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 6-central

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 6. Two (2) Central units of 5 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:

F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	4%	204	5,304
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	30	4	20.1 to 30	Type V	12.4	3.5	43.4	4C	4%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 6-south

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 6. Two (2) Southern units of 5 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:

F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input							Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible							-15%	-900	5,100
	Limited Combustible	-15%												
	Combustible	0%												
	Free Burning	15%												
	Rapid Burning	25%												
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0				0%	0	5,100
	No Sprinkler	0%					Max =	0						
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable							0%	0	5,100
	Not Standard Water Supply or Unavailable	0%												
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised							0%	0	5,100
	Not Fully Supervised or N/A	0%												
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers							0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length								
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)		Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%		22%	1,122	6,222
	South	3	1	0 to 3	Type V	12.3	3.5	43.05	1C	22%				
	East	50	6	>45m						0%				
	West	30	4	20.1 to 30	Type V	2.4	3.5	8.4	4A	0%				
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =													**6,000**
	Total Required Fire Flow, L/s =													**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 7-north

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 7. Two (2) Northern units of 6 unit block. 3.5-storeys. (1 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	3	1	0 to 3	Type V	12.3	3.5	43.05	1C	22%	22%	1,122	6,222
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**6,000**
	Total Required Fire Flow, L/s =												**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 7-central
FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 7. Two (2) Central units of 6 unit block. 3.5-storeys. (1 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:
F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	0%	0	5,100
	South	FW	0	Firewall						0%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 7-south

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 7. Two (2) Southern units of 6 unit block. 3.5-storeys. (1 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:

F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	FW	0	Firewall						0%	11%	561	5,661
	South	12	3	10.1 to 20	Type V	12.3	2	24.6	3B	11%			
	East	50	6	>45m						0%			
	West	50	6	>45m						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**6,000**
	Total Required Fire Flow, L/s =												**100**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 8-west

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 8. Three (3) Western unit of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	522.0 m²	
	Floor 3 and above		174	100%	174			
	Floor 2		174	100%	174			
	Floor 1 (Main Level)		174	100%	174			
	Basement (At least 50% below grade, not included)		174	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							7,540
Fire Flow (F)	Rounded to nearest 1,000							**8,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-1,200	6,800
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	6,800
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	6,800
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	6,800
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	6,800
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	23.8	4	20.1 to 30	Type V	14.2	4	56.8	4C	4%	8%	544	7,344
	South	48	6	>45m	Type V	14.2	2	28.4	6	0%			
	East	FW	0	Firewall						0%			
	West	29.9	4	20.1 to 30	Type V	12.2	3.5	42.7	4C	4%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**7,000**
	Total Required Fire Flow, L/s =												**117**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 8-central

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 8. Two (2) Central unit of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where:

F = required fire flow in litres per minute
A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input							Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible							-15%	-900	5,100
	Limited Combustible	-15%												
	Combustible	0%												
	Free Burning	15%												
	Rapid Burning	25%												
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0				0%	0	5,100
	No Sprinkler	0%					Max =	0						
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable							0%	0	5,100
	Not Standard Water Supply or Unavailable	0%												
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised							0%	0	5,100
	Not Fully Supervised or N/A	0%												
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers							0%	0	5,100
Choose Structure Exposure Distance	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Exposed Wall Length: Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)		Total Charge (%)	Total Exposure Charge (L/min)	
	North	23.8	4	20.1 to 30	Type V	9.6	3.5	33.6	4B	2%		2%	102	5,202
	South	50	6	>45m	Type V	9.6	2	19.2	6	0%				
	East	FW	0	Firewall						0%				
	West	FW	0	Firewall						0%				
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =													**5,000**
	Total Required Fire Flow, L/s =													**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

BLOCK 8-east

FIRE FLOW REQURIEMENTS BASED ON FIRE UNDERWRITERS SURVEY(FUS) 2020

Building No: **BLOCK 8. Two (2) Eastern units of 7 unit block. 3.5-storeys. (2 Firewall added), NO sprinklers.**

An estimate of the Fire Flow required for a given fire area may be estimated by:

F = 220 * C * SQRT(A)

where: F = required fire flow in litres per minute
A = total floor area in m² (including all storeys, but excluding basements at least 50% below grade)
C = coefficient related to the type of construction

Task	Options	Multiplier	Input				Value Used	Fire Flow Total (L/min)
Choose Building Frame (C)	Wood Frame	1.5	Wood Frame				1.5	
	Ordinary Construction	1						
	Non-combustible Construction	0.8						
	Fire Resistive Construction	0.6						
Input Building Floor Areas (A)			Area	% Used	Area Used	Comment	348.0 m²	
	Floor 3 and above		116	100%	116			
	Floor 2		116	100%	116			
	Floor 1 (Main Level)		116	100%	116			
	Basement (At least 50% below grade, not included)		116	0%	0			
Fire Flow (F)	F = 220 * C * SQRT(A)							6,156
Fire Flow (F)	Rounded to nearest 1,000							**6,000**

Reductions/Increases Due to Factors Effecting Burning

Task	Options	Multiplier			Input						Value Used	Fire Flow Change (L/min)	Fire Flow Total (L/min)
Choose Combustibility of Building Contents	Non-combustible	-25%			Limited Combustible						-15%	-900	5,100
	Limited Combustible	-15%											
	Combustible	0%											
	Free Burning	15%											
	Rapid Burning	25%											
Choose Reduction Due to Sprinkler System	**Adequate** Sprinkler Conforms to NFPA13	-30%			No Sprinkler		Min =	0			0%	0	5,100
	No Sprinkler	0%					Max =	0					
	Standard Water Supply for Fire Department Hose Line and for Sprinkler System	-10%			Not Standard Water Supply or Unavailable						0%	0	5,100
	Not Standard Water Supply or Unavailable	0%											
	Fully Supervised Sprinkler System	-10%			Not Fully Supervised						0%	0	5,100
	Not Fully Supervised or N/A	0%											
	Reduction for Community Sprinklers	-25%			Reduction due to Community Sprinklers						0%	0	5,100
Choose Structure Exposure Distance						Exposed Wall Length							
	Exposures	Separ-ation Dist (m)	Cond	Separation Conditon	Exposed Wall type	Length (m)	No of Storeys	Length-Height Factor	Sub-Conditon	Charge (%)	Total Charge (%)	Total Exposure Charge (L/min)	
	North	23.8	4	20.1 to 30	Type V	9.6	4	38.4	4B	2%	6%	306	5,406
	South	50	6	>45m	Type V	9.6	2	19.2	6	0%			
	East	30	4	20.1 to 30	Type V	12.4	4	49.6	4C	4%			
	West	FW	0	Firewall						0%			
Obtain Required Fire Flow	Total Required Fire Flow, Rounded to the Nearest 1,000 L/min =												**5,000**
	Total Required Fire Flow, L/s =												**83**

Exposure Charges for Exposing Walls of Wood Frame Construciton (from Table G5)

Type V	Wood Frame
Type IV-III (U)	Mass Timber or Ordinary with Unprotected Openings
Type IV-III (P)	Mass Timber or Ordinary with Protected Openings
Type II-I (U)	Noncombustible or Fire Resistive with Unprotected Openings
Type II-I (P)	Noncombustible or Fire Resistive with Protected Openings
Firewall	Firewall

Conditons for Separation

Separation Dist	Condition
0m to 3m	1
3.1m to 10m	2
10.1m to 20m	3
20.1m to 30m	4
> 30.1m	5

LOOKUP CHART - don't erase

Separation Distance (m)	Condition	Separation (metres)		Length-height Factor of exposed wall of adjacent strucure (m.storey)		Sub-Condition	Charge				
							Costruction of exposed wall of adjacent structure				
							Wood Frame	Mass Timber or Ordinary with Unprotected Openings	Mass Timber or Ordinary with Protected Openings	Noncombustible or Fire Resistive with Unprotected Openings	Noncombustible or Fire Resistive with Protected Openings
							Type V	Type IV-III (U)	Type IV-III (P)	Type II-I (U)	Type II-I (P)
0 to 3	1	0m to	3.0m	0 to	20	1A	20%	15%	5%	10%	0%
				21 to	40	1B	21%	16%	6%	11%	1%
				41 to	60	1C	22%	17%	7%	12%	2%
				61 to	80	1D	23%	18%	8%	13%	3%
				81 to	100	1E	24%	19%	9%	14%	4%
				101 to	500	1F	25%	20%	10%	15%	5%
3.1 to 10	2	3m to	10.0m	0 to	20	2A	15%	10%	3%	6%	0%
				21 to	40	2B	16%	11%	4%	7%	0%
				41 to	60	2C	17%	12%	5%	8%	1%
				61 to	80	2D	18%	13%	6%	9%	2%
				81 to	100	2E	19%	14%	7%	10%	3%
				101 to	500	2F	20%	15%	8%	11%	4%
10.1 to 20	3	10m to	20.0m	0 to	20	3A	10%	5%	0%	3%	0%
				21 to	40	3B	11%	6%	1%	4%	0%
				41 to	60	3C	12%	7%	2%	5%	0%
				61 to	80	3D	13%	8%	3%	6%	1%
				81 to	100	3E	14%	9%	4%	7%	2%
				101 to	500	3F	15%	10%	5%	8%	3%
20.1 to 30	4	20m to	30m to	0 to	20	4A	0%	0%	0%	0%	0%
				21 to	40	4B	2%	1%	0%	0%	0%
				41 to	60	4C	4%	2%	0%	1%	0%
				61 to	80	4D	6%	3%	1%	2%	0%
				81 to	100	4E	8%	4%	2%	3%	0%
				101 to	500	4F	10%	5%	3%	4%	0%
> 30.0	5	30.1m to	up	0 to	500	6	0%	0%	0%	0%	0%

Appendix C – Water Distribution Modelling Results

Boundary Condition 1 Result Tables

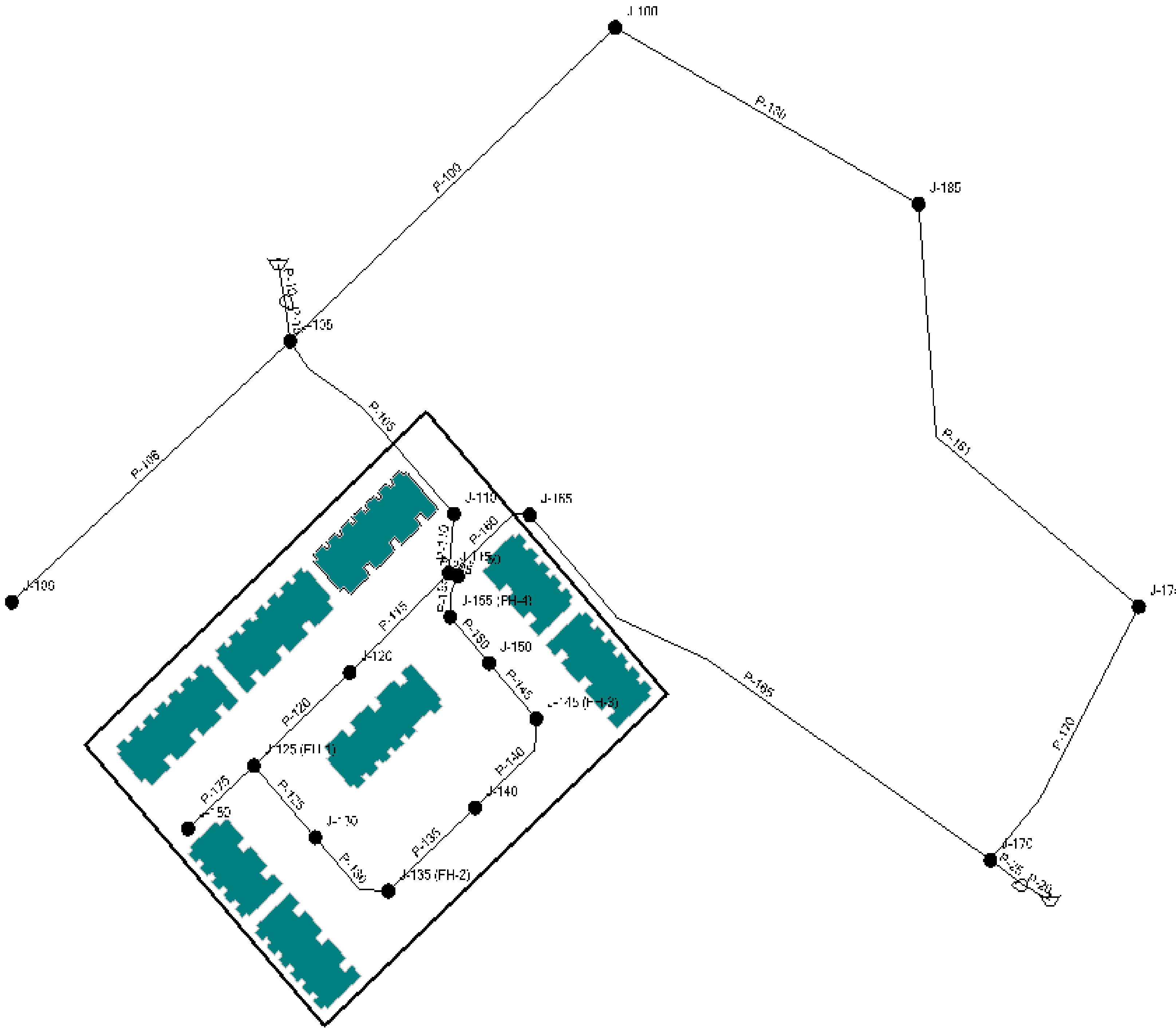
- Peak Hour Scenario
  - Junction Table
  - Pipe Table
  - Reservoir Table

- Max Day Plus Fireflow Scenario
  - Junction Table
  - Pipe Table
  - Fire Flow Report
  - Reservoir Table

Boundary Condition 2 Result Tables

- Peak Hour Scenario
  - Junction Table
  - Pipe Table
  - Reservoir Table

- Max Day Plus Fireflow Scenario
  - Junction Table
  - Pipe Table
  - Fire Flow Report
  - Reservoir Table


J-100
P-100
P-180
J-185
J-105
P-106
P-105
J-190
P-181
J-110
J-165
P-160
J-175
J-155 (FH-4)
P-115
P-150
J-150
J-120
P-145
P-165
P-120
P-170
J-125 (FH-1)
P-140
J-140
P-175
P-125
J-130
P-135
J-135 (FH-2)
J-170

Hydraulic Model Inventory: WaterGEMS Model_1158 Old Second Line_2023-09-26_New Boundary.wtg

Title	
Engineer	
Company	
Date	6/6/2023
Notes	

Scenario Summary

ID	1
Label	Base
Notes	
Active Topology	Base Active Topology
Physical	Base Physical
Demand	Base Demand
Initial Settings	Base Initial Settings
Operational	Base Operational
Age	Base Age
Constituent	Base Constituent
Trace	Base Trace
Fire Flow	Base Fire Flow
Energy Cost	Base Energy Cost
Transient	Base Transient
Pressure Dependent Demand	Base Pressure Dependent Demand
Failure History	Base Failure History
SCADA	Base SCADA
User Data Extensions	Base User Data Extensions
Steady State/EPS Solver Calculation Options	Base Calculation Options
Transient Solver Calculation Options	Base Calculation Options

Network Inventory

Pipes	24	<None>	1
Laterals	0	-Constant Speed - Four-Quadrant Characteristics	2
Junctions	19	-Constant Speed - Pump Definition	0
Hydrants	0	-Shut Down After Time Delay	0
Tanks	0	-Variable Speed/Torque	0
Reservoirs	2	-Pump Start - Variable Speed/Torque	0
Customer Meters	0	Pump Stations	0
Taps	0	Variable Speed Pump Batteries	0
SCADA Elements	0	PRV's	0
Pumps	2	PSV's	0
-Constant Power	0	PBV's	0
-Custom Extended	0	FCV's	0
-Design Point (1 Point)	1	TCV's	0
-Multiple Point	0	GPV's	0
-Standard (3 Point)	0	Isolation Valves	0
-Standard Extended	0	Spot Elevations	0

Hydraulic Model Inventory: WaterGEMS Model_1158 Old Second Line_2023-09-26_New Boundary.wtg

Transient Network Inventory

Turbines	0	Rupture Disks	0
Periodic Head-Flows	0	Discharges to Atmosphere	0
Air Valves	0	Orifices Between Pipes	0
Hydropneumatic Tanks	0	Valves With Linear Area Change	0
Surge Valves	0	Surge Tanks	0
Check Valves	0		

Pressure Pipes Inventory

100.0 (mm)	24 m	350.0 (mm)	222 m
203.0 (mm)	706 m	1,000.0 (mm)	8 m
282.9 (mm)	76 m	All Diameters	1,035 m

FlexTable: Junction Table

Label	Elevation (m)	Unit Demand Collection
J-100	100.76	<Collection: 0 items>
J-105	101.40	<Collection: 1 items>
J-106	101.19	<Collection: 1 items>
J-110	101.70	<Collection: 0 items>
J-115	102.60	<Collection: 1 items>
J-120	103.00	<Collection: 1 items>
J-125 (FH-1)	103.40	<Collection: 1 items>
J-130	103.90	<Collection: 0 items>
J-135 (FH-2)	104.20	<Collection: 1 items>
J-140	103.50	<Collection: 0 items>
J-145 (FH-3)	102.60	<Collection: 1 items>
J-150	102.60	<Collection: 0 items>
J-155 (FH-4)	102.50	<Collection: 1 items>
J-160	102.60	<Collection: 0 items>
J-165	101.70	<Collection: 0 items>
J-170	102.20	<Collection: 0 items>
J-175	101.19	<Collection: 0 items>
J-180	103.50	<Collection: 1 items>
J-185	101.19	<Collection: 0 items>

FlexTable: Pipe Table

Label	Length (Scaled) (m)	Start Node	Stop Node	Diameter (mm)	Material	Hazen-Williams C	Has User Defined Length?	Length (User Defined) (m)
P-175	24	J-125 (FH-1)	J-180	50.0	PVC	100.0	False	0
P-100	118	J-100	J-105	203.0	PVC	110.0	False	0
P-105	63	J-105	J-110	203.0	PVC	110.0	False	0
P-110	15	J-110	J-115	203.0	PVC	110.0	False	0
P-115	37	J-115	J-120	203.0	PVC	110.0	False	0
P-120	35	J-120	J-125 (FH-1)	203.0	PVC	110.0	False	0
P-125	25	J-125 (FH-1)	J-130	203.0	PVC	110.0	False	0
P-130	26	J-130	J-135 (FH-2)	203.0	PVC	110.0	False	0
P-135	31	J-135 (FH-2)	J-140	203.0	PVC	110.0	False	0
P-140	30	J-140	J-145 (FH-3)	203.0	PVC	110.0	False	0
P-145	19	J-145 (FH-3)	J-150	203.0	PVC	110.0	False	0
P-150	16	J-150	J-155 (FH-4)	203.0	PVC	110.0	False	0
P-155	11	J-155 (FH-4)	J-160	203.0	PVC	110.0	False	0
P-160	26	J-160	J-165	203.0	PVC	110.0	False	0
P-165	153	J-165	J-170	203.0	PVC	110.0	False	0
P-205	3	J-115	J-160	203.0	PVC	110.0	False	0
P-106	100	J-105	J-106	203.0	PVC	110.0	False	0
P-170	76	J-170	J-175	282.9	PVC	110.0	False	0
P-180	93	J-100	J-185	350.0	PVC	130.0	False	0
P-181	128	J-185	J-175	350.0	PVC	130.0	False	0
P-10	10	R-1	PMP-1	1,000.0	Ductile Iron	130.0	True	2
P-20	9	R-2	PMP-2	1,000.0	Ductile Iron	130.0	True	2
P-15	10	PMP-1	J-105	1,000.0	Ductile Iron	130.0	True	2
P-25	10	PMP-2	J-170	1,000.0	Ductile Iron	130.0	True	2

FlexTable: Junction Table

Boundary Connection
#1 - PHD Scenario

Label	Elevation (m)	Demand (L/s)	Pressure (psi)
J-100	100.76	0.00	57
J-105	101.40	0.42	56
J-106	101.19	0.48	56
J-110	101.70	0.00	56
J-115	102.60	0.52	54
J-120	103.00	1.05	54
J-125 (FH-1)	103.40	0.37	53
J-130	103.90	0.00	52
J-135 (FH-2)	104.20	0.45	52
J-140	103.50	0.00	53
J-145 (FH-3)	102.60	0.45	54
J-150	102.60	0.00	54
J-155 (FH-4)	102.50	0.37	54
J-160	102.60	0.00	54
J-165	101.70	0.00	56
J-170	102.20	0.00	55
J-175	101.19	0.00	56
J-180	103.50	0.52	53
J-185	101.19	0.00	56

FlexTable: Junction Table

Label	Elevation (m)	Demand (L/s)	Fire Flow (Available) (L/s)
J-100	100.76	0.00	(N/A)
J-105	101.40	0.19	(N/A)
J-106	101.19	0.22	(N/A)
J-110	101.70	0.00	(N/A)
J-115	102.60	0.24	107.29
J-120	103.00	0.48	103.03
J-125 (FH-1)	103.40	0.17	100.10
J-130	103.90	0.00	97.95
J-135 (FH-2)	104.20	0.20	96.16
J-140	103.50	0.00	98.88
J-145 (FH-3)	102.60	0.20	101.56
J-150	102.60	0.00	103.50
J-155 (FH-4)	102.50	0.17	105.40
J-160	102.60	0.00	107.06
J-165	101.70	0.00	(N/A)
J-170	102.20	0.00	(N/A)
J-175	101.19	0.00	(N/A)
J-180	103.50	0.24	(N/A)
J-185	101.19	0.00	(N/A)

Boundary Connection
#1 - Fire Flow Analysis

FlexTable: Junction Table

Label	Elevation (m)	Demand (L/s)	Pressure (psi)
J-100	100.76	0.00	57
J-105	101.40	0.42	56
J-106	101.19	0.48	56
J-110	101.70	0.00	56
J-115	102.60	0.52	54
J-120	103.00	1.05	54
J-125 (FH-1)	103.40	0.37	53
J-130	103.90	0.00	52
J-135 (FH-2)	104.20	0.45	52
J-140	103.50	0.00	53
J-145 (FH-3)	102.60	0.45	54
J-150	102.60	0.00	54
J-155 (FH-4)	102.50	0.37	54
J-160	102.60	0.00	54
J-165	101.70	0.00	56
J-170	102.20	0.00	55
J-175	101.19	0.00	56
J-180	103.50	0.52	53
J-185	101.19	0.00	56

Boundary Connection
#2 - PHD Scenario

FlexTable: Junction Table

Label	Elevation (m)	Demand (L/s)	Fire Flow (Available) (L/s)
J-100	100.76	0.00	(N/A)
J-105	101.40	0.19	(N/A)
J-106	101.19	0.22	(N/A)
J-110	101.70	0.00	(N/A)
J-115	102.60	0.24	125.88
J-120	103.00	0.48	122.64
J-125 (FH-1)	103.40	0.17	120.02
J-130	103.90	0.00	118.12
J-135 (FH-2)	104.20	0.20	117.04
J-140	103.50	0.00	119.31
J-145 (FH-3)	102.60	0.20	121.53
J-150	102.60	0.00	123.09
J-155 (FH-4)	102.50	0.17	124.60
J-160	102.60	0.00	125.95
J-165	101.70	0.00	(N/A)
J-170	102.20	0.00	(N/A)
J-175	101.19	0.00	(N/A)
J-180	103.50	0.24	(N/A)
J-185	101.19	0.00	(N/A)

Boundary Connection
#2 - Fire Flow Analysis

Appendix D – Sanitary Design Sheet

Table D1: Sanitary Design Sheet

TABLE D1

SANITARY SEWER CALCULATION SHEET

LOCATION				RESIDENTIAL AREAS AND POPULATIONS												COMMERCIAL			INFILTRATION				SEWER DATA								
					NUMBER OF UNITS							POPULATION				AREA (ha)			AREA (ha)												
Street	U/S MH	D/S MH	Area Number	Area (ha)	Singles	Semis	Towns	Batch or 1-Bed Apt.	2-Bed Apt.	3-Bed Apt.	Total Units	INDIV	ACCU	Peak Factor	Peak Flow (L/sec)	INDIV	ACCU	Peak Flow (L/sec)	INDIV	ACCU	INFILT FLOW (L/s)	TOTAL FLOW (L/s)	Nom Dia (mm)	Actual Dia (mm)	Slope (%)	Length (m)	Capacity (L/sec)	Q/Q_{CAP} (%)	Full Velocity (m/s)	V/V_{FULL}	V_{ACT} (m/s)
Antelope Priv	SANMH105	SANMH101	1	0.2323					22		22	46.2	46.2	3.66	0.55				0.2323	0.2323	0.08	0.62	200	203.2	1.05	57.01	35.06	0.02	1.07	0.30	0.32
Antelope Priv	SANMH100	SANMH101	2	0.0941					8		8	16.8	16.8	3.71	0.20				0.0941	0.0941	0.03	0.23	200	203.2	2.09	21.32	49.47	0.00	1.51	0.30	0.45
Antelope Priv	SANMH101	SANMH102	3	0.3970					42		42	88.2	151.2	3.55	1.74				0.3970	0.7234	0.24	1.98	200	203.2	2.23	71.84	51.10	0.04	1.56	0.46	0.72
Antelope Priv	SANMH106	SANMH102	4	0.4072					22		22	46.2	46.2	3.66	0.55				0.4072	0.4072	0.13	0.68	200	203.2	1.09	57.00	35.72	0.02	1.09	0.30	0.33
Antelope Priv	SANMH102	SANMH103	5	0.0982					6		6	12.6	210	3.51	2.39				0.0982	1.2288	0.41	2.79	200	203.2	0.90	25.63	32.46	0.09	0.99	0.61	0.60
Antelope Priv	SANMH103	SANMH108											210	3.51	2.39					1.2288	0.41	2.79	200	203.2	0.92	9.75	32.82	0.09	1.00	0.61	0.61
	SANMH108	SANMH109											210	3.51	2.39					1.2288	0.41	2.79	200	203.2	1.68	40.46	44.35	0.06	1.35	0.55	0.74
	SANMH109	EXMH											210	3.51	2.39					1.2288	0.41	2.79	200	203.2	1.25	11.20	38.26	0.07	1.17	0.59	0.69
				1.229					**100**		**100**	**210.0**							**1.229**							**294.21**					

Residential Avg. Daily Flow, q (L/p/day) = 280
Commercial Avg. Daily Flow (L/gross ha/day) = 28,000
or L/gross ha/sec = 0.324
Institutianal Avg. Daily Flow (L/day/ha) = 28,000
or L/gross ha/day = 0.324
Light Industrial Flow (L/gross ha/day) = 35,000
or L/gross ha/sec = 0.40509
Light Industrial Flow (L/gross ha/day) = 55,000
or L/gross ha/sec = 0.637

Commercial Peak Factor = 1.5 (when area >20%)
1.0 (when area <20%)
Institutional Peak Factor = 1.5 (when area >20%)
1.0 (when area <20%)
Residential Correction Factor, K = 0.80
Manning N = 0.013
Peak extraneous flow, I (L/s/ha) = 0.33 (Total I/I)

Peak Population Flow, (L/sec) =
Peak Extraneous Flow, (L/sec) =
Residential Peaking Factor, M =
A_c = Cumulative Area (hectares)
P = Population (thousands)

Sewer Capacity, Qcap (L/sec) =
(Manning's Equation)

Persons/Unit
3.4
2.7
2.7
1.4
2.1
3.1
3.8

Designed:	Project:
A. Salem, P.Eng.	1158 Second Line
Checked:	Location:
B. Thomas, P.Eng.	Ottawa, Ontario
File Reference:	Page No:
245003 Sanitary Design Sheet, Nov 14 2023.xlsx	**1 of 1**

Appendix E – Stormwater Design Sheets

Table E1: 2-year Storm Sewer Calculation Sheet

Table E2: 100-year HGL Storm Sewer Calculation Sheet

Table E3: Average Runoff Coefficients (Pre-Development)

Table E4: Pre-Development Runoff Calculations

Table E5: Allowable Runoff Calculations

Table E6: Average Runoff Coefficients (Post-Development)

Table E7: Summary of Post Development Runoff (Uncontrolled and Controlled)

Table E9: Storage Volumes for 2-year, 5-Year and 100-Year Storms (MRM)

TABLE E1: 2-YEAR STORM SEWER CALCULATION SHEET

Return Period Storm = **2-year** (2-year, 5-year, 100-year)
Default Inlet Time= 10 (minutes)
Manning Coefficient = 0.013 (dimensionless)

From Node	To Node	AREA INFO				FLOW (UNRESTRICTED)							INDIV CAP FLOW (L/s)	CUMUL CAP FLOW (L/s)	SEWER DATA										
		Area No.	Area (ha)	∑ Area (ha)	Average R	Indiv. 2.78*A*R	Accum. 2.78*A*R	Tc (mins)	I (mm/h)	Indiv. Flow	Return Period	Q (L/s)			Dia (mm) Actual	Dia (mm) Nominal	Type	Slope (%)	Length (m)	Capacity, Q_{CAP} (L/sec)	Velocity (m/s) Vf	Velocity (m/s) Va	Time in Pipe, Tt (min)	Hydraulic Ratios Q/Q_{CAP}	Hydraulic Ratios Va/Vf
CBMH04	CBMH05	A1	0.2590	0.2590	0.86	0.619	0.6192	10.00	76.81	47.56	2-year	47.6	47.56	47.56	381.0	375	CONC	0.53	56.85	133.16	1.16	0.81	1.17	0.36	0.70
CBMH05	STMMH07	A2	0.3650	0.6240	0.82	0.832	0.8321	10.00	76.81	63.91	2-year	63.9	63.91	63.91	457.0	450	CONC	0.52	30.68	214.23	1.29	0.90	0.57	0.30	0.70
CB10	CBMH08	A5	0.0610	0.0610	0.24	0.041	0.0407	10.00	76.81	3.13	2-year	3.1	3.13	3.13	254.0	250	PVC	1.39	17.23	73.22	1.43	0.44	0.65	0.04	0.31
CBMH08	STMMH07	A3	0.1820	0.2430	0.90	0.455	0.4961	10.00	76.81	34.97	2-year	38.1	38.10	38.10	381.0	375	CONC	2.74	9.49	302.77	2.63	1.50	0.11	0.13	0.57
STMMH07	CHAMBERS			0.8670			1.3281	10.00	76.81		2-year	102.0	102.01	102.01	610.0	600	CONC	1.57	6.37	804.02	2.72	1.55	0.07	0.13	0.57
CB06	CHAMBERS	A4	0.1260	0.1260	0.38	0.133	0.133	10.00	76.81	10.22	2-year	10.2	10.2	10.22	254.0	250	PVC	1.84	5.00	84.15	1.64	0.94	0.09	0.12	0.57
STMMH205	STMMH201							10.00	76.81		2-year	1.8	1.8	1.80	254.0	250	PVC	1.02	62.35	62.66	1.22	0.38	2.74	0.03	0.31
STMMH200	STMMH201							10.00	76.81		2-year	0.45	0.45	2.25	254.0	250	PVC	1.84	24.10	84.15	1.64	0.51	0.79	0.03	0.31
STMMH201	STMMH202							10.00	76.81		2-year	2.25	2.25	4.50	254.0	250	PVC	2.26	71.84	93.26	1.82	0.56	2.12	0.02	0.31
STMMH211	STMMH206							10.00	76.81		2-year	0.90	0.9	0.90	254.0	250	PVC	1.12	22.29	65.66	1.28	0.40	0.93	0.01	0.31
CHAMBERS	STMMH206A			0.9930				10.00	76.81		2-year	49.82	49.8	49.82	305.0	300	PVC	1.94	1.55	140.76	1.91	1.33	0.02	0.35	0.70
STMMH206A	STMMH206			0.9930				10.00	76.81		2-year			49.82	305.0	300	PVC	1.53	11.10	125.00	1.69	1.20	0.15	0.40	0.71
STMMH206	STMMH202			0.9930				10.00	76.81		2-year	0.90	0.9	51.62	381.0	375	CONC	0.40	39.84	115.68	1.00	0.71	0.94	0.45	0.71
STMMH202	STMMH203			0.9930				10.00	76.81		2-year			51.62	457.0	450	CONC	0.33	25.02	170.66	1.03	0.72	0.58	0.30	0.70
STMMH203	STMMH208			0.9930				10.00	76.81		2-year			51.62	457.0	450	CONC	0.98	8.56	294.10	1.77	1.12	0.13	0.18	0.63
STMMH208	STMMH209	U2	0.0970	1.0900	0.24	0.065	0.065	10.00	76.81	4.97	2-year	5.0	1.14	52.76	457.0	450	CONC	1.67	40.65	383.92	2.32	1.34	0.50	0.14	0.58
STMMH209	STMMH210			1.0900				10.00	76.81		2-year			52.76	457.0	450	CONC	0.40	12.28	187.89	1.13	0.79	0.26	0.28	0.70
TOTALS =			**1.0900**			**2.145**																			

Definitions:
Q = 2.78*AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Watershed Area (hectares)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficients (dimensionless)

Ottawa Rainfall Intensity Values from Sewer Design Guidelines, SDG002

	a	b	c
2-year	732.951	6.199	0.810
5-year	998.071	6.053	0.814
100-year	1735.688	6.014	0.820

Designed:	Project:	
Zhidong Pan, P.Eng.	THEBERGE HOMES	
Checked:	Location:	
B. Thomas, P.Eng.	1158 OLD SECOND LINE ROAD	
Dwg Reference:	File Ref:	Sheet No:
Drawing C09	245003 Storm Design Sheets_2023-11-0.xlsx	1 of 1

TABLE E2: 100-YEAR STORM SEWER CALCULATION SHEET

Return Period Storm = **100-year** (2-year, 5-year, 100-year)
Default Inlet Time= 10 (minutes)
Manning Coefficient = 0.013 (dimensionless)

From Node	To Node	AREA INFO				FLOW (UNRESTRICTED)							INDIV CAP FLOW (L/s)	CUMUL CAP FLOW (L/s)	SEWER DATA										
		Area No.	Area (ha)	∑ Area (ha)	Average R	Indiv. 2.78*A*R	Accum. 2.78*A*R	Tc (mins)	I (mm/h)	Indiv. Flow	Return Period	Q (L/s)			Dia (mm) Actual	Dia (mm) Nominal	Type	Slope (%)	Length (m)	Capacity, Q_{CAP} (L/sec)	Velocity (m/s) Vf	Velocity (m/s) Va	Time in Pipe, Tt (min)	Hydraulic Ratios Q/Q_{CAP}	Hydraulic Ratios Va/Vf
CBMH04	CBMH05	A1	0.2590	0.2590	0.86	0.619	0.6192	10.00	178.56	110.57	100-year	110.6	110.57	110.57	381.0	375	CONC	0.53	56.85	133.16	1.16	1.16	0.82	0.83	1.00
CBMH05	STMMH07	A2	0.3650	0.6240	0.82	0.832	0.8321	10.00	178.56	148.57	100-year	148.6	148.57	148.57	457.0	450	CONC	0.52	30.68	214.23	1.29	1.23	0.42	0.69	0.95
CB10	CBMH08	A5	0.0610	0.0610	0.24	0.041	0.0407	10.00	178.56	7.27	100-year	7.3	7.27	7.27	254.0	250	PVC	1.39	17.23	73.22	1.43	0.76	0.38	0.10	0.53
CBMH08	STMMH07	A3	0.1820	0.2430	0.90	0.455	0.4961	10.00	178.56	81.31	100-year	88.6	88.58	88.58	381.0	375	CONC	2.74	9.49	302.77	2.63	1.84	0.09	0.29	0.70
STMMH07	CHAMBERS			0.8670			1.3281	10.00	178.56		100-year	237.1	237.15	237.15	610.0	600	CONC	1.57	6.37	804.02	2.72	1.90	0.06	0.29	0.70
CB06	CHAMBERS	A4	0.1260	0.1260	0.38	0.133	0.133	10.00	178.56	23.77	100-year	23.8	23.8	23.77	254.0	250	PVC	1.84	5.00	84.15	1.64	1.15	0.07	0.28	0.70
STMMH205	STMMH201							10.00	178.56		100-year	1.8	1.8	1.80	254.0	250	PVC	1.02	62.35	62.66	1.22	0.38	2.74	0.03	0.31
STMMH200	STMMH201							10.00	178.56		100-year	0.45	0.45	2.25	254.0	250	PVC	1.84	24.10	84.15	1.64	0.51	0.79	0.03	0.31
STMMH201	STMMH202							10.00	178.56		100-year	2.25	2.25	4.50	254.0	250	PVC	2.26	71.84	93.26	1.82	0.56	2.12	0.02	0.31
STMMH211	STMMH206							10.00	178.56		100-year	0.90	0.9	0.90	254.0	250	PVC	1.12	22.29	65.66	1.28	0.40	0.93	0.01	0.31
CHAMBERS	STMMH206A			0.9930				10.00	178.56		100-year	86.68	86.7	86.68	305.0	300	PVC	1.94	1.55	140.76	1.91	1.73	0.01	0.62	0.91
STMMH206A	STMMH206			0.9930				10.00	178.56		100-year			86.68	305.0	300	PVC	1.53	11.10	125.00	1.69	1.61	0.12	0.69	0.95
STMMH206	STMMH202			0.9930				10.00	178.56		100-year	0.90	0.9	88.48	381.0	375	CONC	0.40	39.84	115.68	1.00	0.98	0.67	0.76	0.98
STMMH202	STMMH203			0.9930				10.00	178.56		100-year			88.48	457.0	450	CONC	0.33	25.02	170.66	1.03	0.73	0.57	0.52	0.71
STMMH203	STMMH208			0.9930				10.00	178.56		100-year			88.48	457.0	450	CONC	0.98	8.56	294.10	1.77	1.24	0.11	0.30	0.70
STMMH208	STMMH209	U2	0.0970	1.0900	0.24	0.065	0.065	10.00	178.56	11.56	100-year	11.6	3.84	92.32	457.0	450	CONC	1.67	40.65	383.92	2.32	1.55	0.44	0.24	0.67
STMMH209	STMMH210			1.0900				10.00	178.56		100-year			92.32	457.0	450	CONC	0.40	12.28	187.89	1.13	0.80	0.26	0.49	0.71
TOTALS =			**1.0900**			**2.145**																			

Definitions:
Q = 2.78*AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Watershed Area (hectares)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficients (dimensionless)

Ottawa Rainfall Intensity Values from Sewer Design Guidelines, SDG002

	a	b	c
2-year	732.951	6.199	0.810
5-year	998.071	6.053	0.814
100-year	1735.688	6.014	0.820

Designed:	Project:	
Zhidong Pan, P.Eng.	THEBERGE HOMES	
Checked:	Location:	
B. Thomas, P.Eng.	1158 OLD SECOND LINE ROAD	
Dwg Reference:	File Ref:	Sheet No:
Drawing C09	245003 Storm Design Sheets_2023-11-0.xlsx	1 of 1

Project: **1158 Old Second Line**

Chamber Model -	MC-3500	
Units -	**Metric**	
Number of Chambers -	56	
Number of End Caps -	10	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	100.76	m
Amount of Stone Above Chambers -	305	mm
Amount of Stone Below Chambers -	229	mm
	600	sq.meters

Min. Area - 272.91 sq.meters

ADS StormTech

☑ Include Perimeter Stone in Calculations

☑ Click for Stage Area Data

☑ Click to Invert Stage Area Data

Click Here for Imperial

StormTech MC-3500 Cumulative Storage Volumes

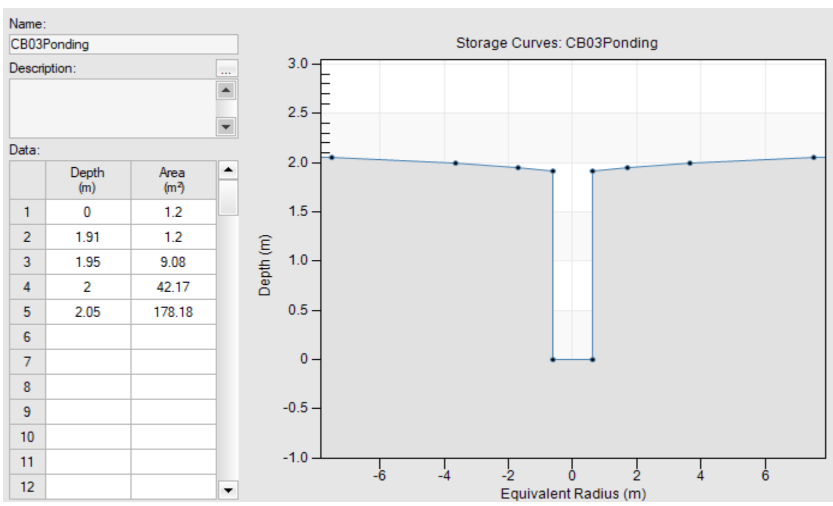
Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Single End Cap *(cubic meters)*	Incremental Chambers *(cubic meters)*	Incremental End Cap *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Ch, EC and Stone *(cubic meters)*	Cumulative System *(cubic meters)*	Elevation *(meters)*
1676	0.00	0.00	0.00	0.00	6.093	6.09	509.28	102.44
1651	0.00	0.00	0.00	0.00	6.093	6.09	503.19	102.41
1626	0.00	0.00	0.00	0.00	6.093	6.09	497.10	102.39
1600	0.00	0.00	0.00	0.00	6.093	6.09	491.01	102.36
1575	0.00	0.00	0.00	0.00	6.093	6.09	484.91	102.33
1549	0.00	0.00	0.00	0.00	6.093	6.09	478.82	102.31
1524	0.00	0.00	0.00	0.00	6.093	6.09	472.73	102.28
1499	0.00	0.00	0.00	0.00	6.093	6.09	466.63	102.26
1473	0.00	0.00	0.00	0.00	6.093	6.09	460.54	102.23
1448	0.00	0.00	0.00	0.00	6.093	6.09	454.45	102.21
1422	0.00	0.00	0.00	0.00	6.093	6.09	448.36	102.18
1397	0.00	0.00	0.00	0.00	6.093	6.09	442.26	102.16
1372	0.00	0.00	0.09	0.00	6.056	6.15	436.17	102.13
1346	0.01	0.00	0.31	0.01	5.967	6.28	430.02	102.11
1321	0.01	0.00	0.47	0.01	5.902	6.38	423.74	102.08
1295	0.01	0.00	0.64	0.01	5.831	6.49	417.36	102.06
1270	0.02	0.00	1.09	0.02	5.649	6.76	410.87	102.03
1245	0.03	0.00	1.63	0.02	5.431	7.09	404.12	102.00
1219	0.04	0.00	1.98	0.03	5.288	7.30	397.03	101.98
1194	0.04	0.00	2.26	0.04	5.176	7.47	389.73	101.95
1168	0.04	0.00	2.49	0.04	5.079	7.61	382.26	101.93
1143	0.05	0.00	2.71	0.05	4.992	7.74	374.65	101.90
1118	0.05	0.01	2.90	0.05	4.913	7.86	366.90	101.88
1092	0.05	0.01	3.07	0.06	4.841	7.97	359.04	101.85
1067	0.06	0.01	3.24	0.06	4.774	8.07	351.07	101.83
1041	0.06	0.01	3.39	0.07	4.712	8.16	343.00	101.80
1016	0.06	0.01	3.53	0.07	4.654	8.25	334.83	101.78
991	0.07	0.01	3.66	0.08	4.600	8.33	326.58	101.75
965	0.07	0.01	3.78	0.08	4.549	8.41	318.25	101.73
940	0.07	0.01	3.90	0.08	4.500	8.48	309.84	101.70
914	0.07	0.01	4.01	0.09	4.454	8.55	301.36	101.67
889	0.07	0.01	4.11	0.09	4.411	8.62	292.81	101.65
864	0.08	0.01	4.21	0.09	4.370	8.68	284.19	101.62
838	0.08	0.01	4.31	0.10	4.331	8.74	275.51	101.60
813	0.08	0.01	4.39	0.10	4.294	8.79	266.78	101.57
787	0.08	0.01	4.48	0.11	4.259	8.84	257.99	101.55
762	0.08	0.01	4.56	0.11	4.225	8.89	249.14	101.52
737	0.08	0.01	4.64	0.11	4.193	8.94	240.25	101.50
711	0.08	0.01	4.71	0.12	4.163	8.99	231.31	101.47
686	0.09	0.01	4.78	0.12	4.135	9.03	222.32	101.45
660	0.09	0.01	4.84	0.12	4.108	9.07	213.29	101.42
635	0.09	0.01	4.91	0.12	4.080	9.11	204.22	101.40
610	0.09	0.01	4.96	0.13	4.056	9.15	195.11	101.37
584	0.09	0.01	5.02	0.13	4.033	9.18	185.96	101.34
559	0.09	0.01	5.07	0.13	4.010	9.22	176.78	101.32
533	0.09	0.01	5.12	0.14	3.989	9.25	167.56	101.29
508	0.09	0.01	5.17	0.14	3.969	9.28	158.31	101.27
483	0.09	0.01	5.22	0.14	3.950	9.31	149.03	101.24
457	0.09	0.01	5.26	0.14	3.931	9.34	139.72	101.22
432	0.09	0.01	5.30	0.15	3.913	9.36	130.39	101.19
406	0.10	0.01	5.34	0.15	3.897	9.39	121.02	101.17
381	0.10	0.01	5.38	0.15	3.881	9.41	111.64	101.14
356	0.10	0.02	5.41	0.15	3.866	9.43	102.23	101.12
330	0.10	0.02	5.45	0.15	3.851	9.46	92.79	101.09
305	0.10	0.02	5.48	0.16	3.837	9.48	83.34	101.06
279	0.10	0.02	5.52	0.16	3.823	9.50	73.86	101.04
254	0.10	0.02	5.56	0.17	3.802	9.53	64.37	101.01
229	0.00	0.00	0.00	0.00	6.093	6.09	54.84	100.99
203	0.00	0.00	0.00	0.00	6.093	6.09	48.74	100.96
178	0.00	0.00	0.00	0.00	6.093	6.09	42.65	100.94
152	0.00	0.00	0.00	0.00	6.093	6.09	36.56	100.91
127	0.00	0.00	0.00	0.00	6.093	6.09	30.46	100.89
102	0.00	0.00	0.00	0.00	6.093	6.09	24.37	100.86
76	0.00	0.00	0.00	0.00	6.093	6.09	18.28	100.84
51	0.00	0.00	0.00	0.00	6.093	6.09	12.19	100.81
25	0.00	0.00	0.00	0.00	6.093	6.09	6.09	100.79

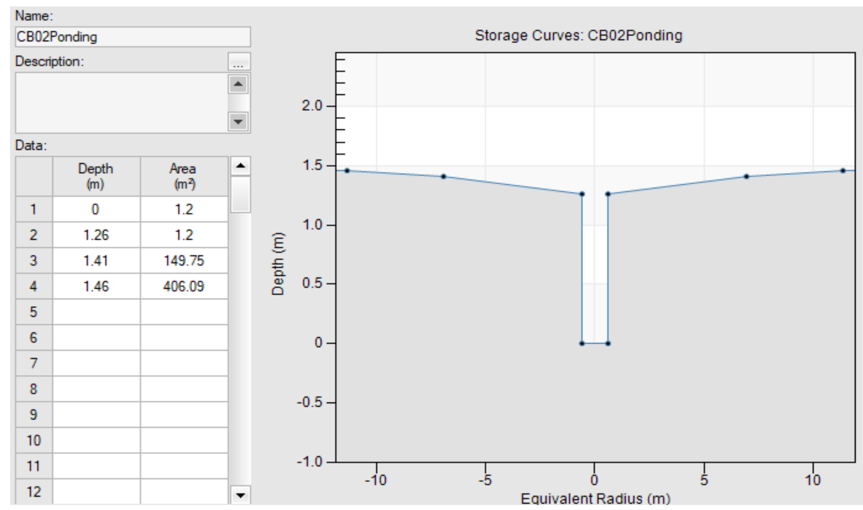
Stage Area Data

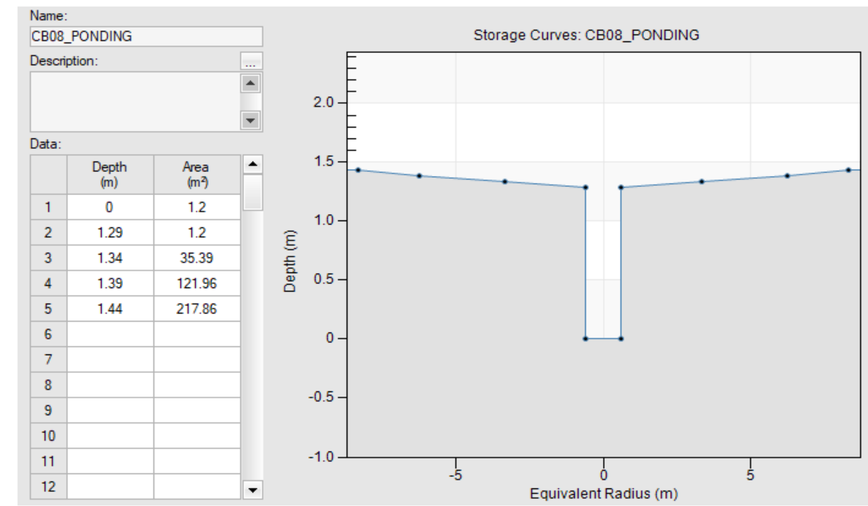
Depth (meter)	Elevation (meter)	Area (m²)	Area (hectare)
1.68	102.44	239.88	0.0240
1.65	102.41	239.88	0.0240
1.63	102.39	239.88	0.0240
1.60	102.36	239.88	0.0240
1.57	102.33	239.88	0.0240
1.55	102.31	239.88	0.0240
1.52	102.28	239.88	0.0240
1.50	102.26	239.88	0.0240
1.47	102.23	239.88	0.0240
1.45	102.21	239.88	0.0240
1.42	102.18	239.88	0.0240
1.40	102.16	239.88	0.0240
1.37	102.13	242.06	0.0242
1.35	102.11	247.31	0.0247
1.32	102.08	251.14	0.0251
1.30	102.06	255.34	0.0255
1.27	102.03	266.07	0.0266
1.24	102.00	278.99	0.0279
1.22	101.98	287.40	0.0287
1.19	101.95	294.00	0.0294
1.17	101.93	299.77	0.0300
1.14	101.90	304.92	0.0305
1.12	101.88	309.59	0.0310
1.09	101.85	313.81	0.0314
1.07	101.83	317.79	0.0318
1.04	101.80	321.41	0.0321
1.02	101.78	324.87	0.0325
0.99	101.75	328.07	0.0328
0.97	101.73	331.08	0.0331
0.94	101.70	333.96	0.0334
0.91	101.67	336.64	0.0337
0.89	101.65	339.19	0.0339
0.86	101.62	341.61	0.0342
0.84	101.60	343.91	0.0344
0.81	101.57	346.10	0.0346
0.79	101.55	348.18	0.0348
0.76	101.52	350.16	0.0350
0.74	101.50	352.06	0.0352
0.71	101.47	353.85	0.0354
0.69	101.45	355.52	0.0356
0.66	101.42	357.12	0.0357
0.63	101.40	358.73	0.0359
0.61	101.37	360.16	0.0360
0.58	101.34	361.54	0.0362
0.56	101.32	362.88	0.0363
0.53	101.29	364.12	0.0364
0.51	101.27	365.32	0.0365
0.48	101.24	366.46	0.0366
0.46	101.22	367.55	0.0368
0.43	101.19	368.59	0.0369
0.41	101.17	369.56	0.0370
0.38	101.14	370.50	0.0371
0.36	101.12	371.37	0.0371
0.33	101.09	372.26	0.0372
0.30	101.06	373.08	0.0373
0.28	101.04	373.90	0.0374
0.25	101.01	375.16	0.0375
0.23	100.99	239.88	0.0240
0.20	100.96	239.88	0.0240
0.18	100.94	239.88	0.0240
0.15	100.91	239.88	0.0240
0.13	100.89	239.88	0.0240
0.10	100.86	239.88	0.0240
0.08	100.84	239.88	0.0240
0.05	100.81	239.88	0.0240
0.03	100.79	239.88	0.0240

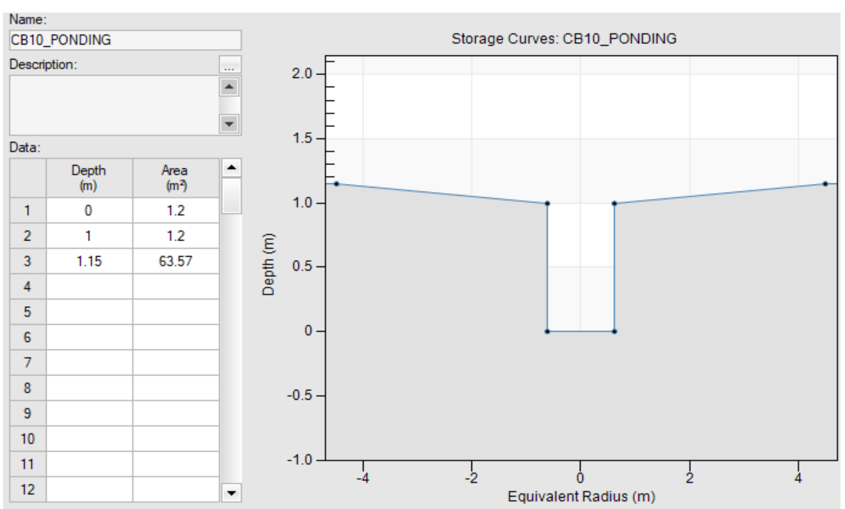
E4 - Catchbasin Ponding Area-Depth Stage Curves

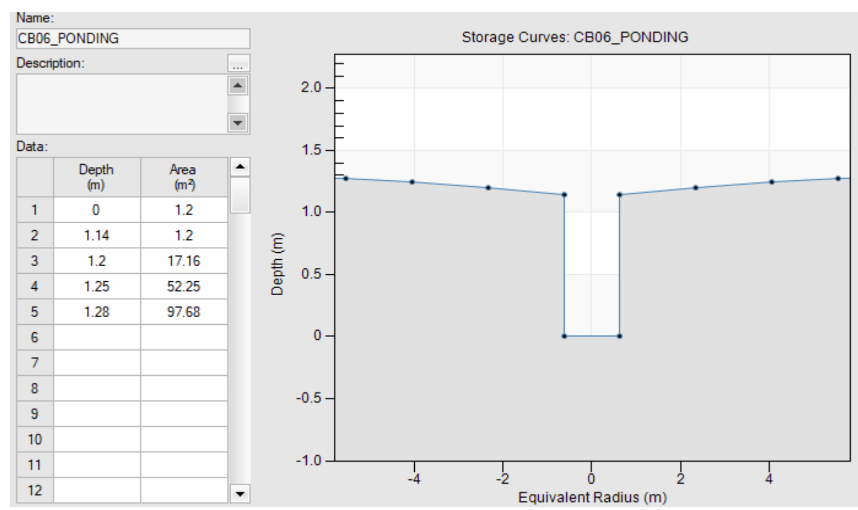
CB	CB03	**CBMH04**		CB02	**CBMH05**			**CBMH08**			**CB10**			**CB06**
RIM (m)	103.43	**103.36**		102.43	**102.35**			**102.45**			**102.4**			**102.64**
INV (m)		**101.45**			**101.09**			**101.16**			**101.4**			**101.5**
CB Depth (m)		**1.91**			**1.26**			**1.29**			**1**			**1.14**
Modeled Depth (m)		**2.05**			**1.46**			**1.44**			**1.15**			**1.28**
Spill elevation (m)		**103.5**			**102.55**			**102.6**			**102.55**			**102.78**
Ponding Elevation (m)	Ponding depth (m)	Area (m2)		Ponding depth (m)	Area (m2)		Ponding depth (m)	Area (m2)		Ponding depth (m)	Area (m2)		Ponding depth (m)	Area (m2)
101.45	0	1.2	101.09	0	1.2	101.16	0	1.2	101.4	0	1.2	101.5	0	1.2
103.36	1.91	1.2	102.35	1.26	1.2	102.45	1.29	1.2	102.4	1	1.2	102.64	1.14	1.2
103.4	1.95	9.08	102.5	1.41	149.75	102.5	1.34	35.39	102.55	1.15	63.57	102.7	1.2	17.16
103.45	2	42.17	102.55	1.46	406.09	102.55	1.39	121.96				102.75	1.25	52.25
103.5	2.05	178.18				102.6	1.44	217.86				102.78	1.28	97.68





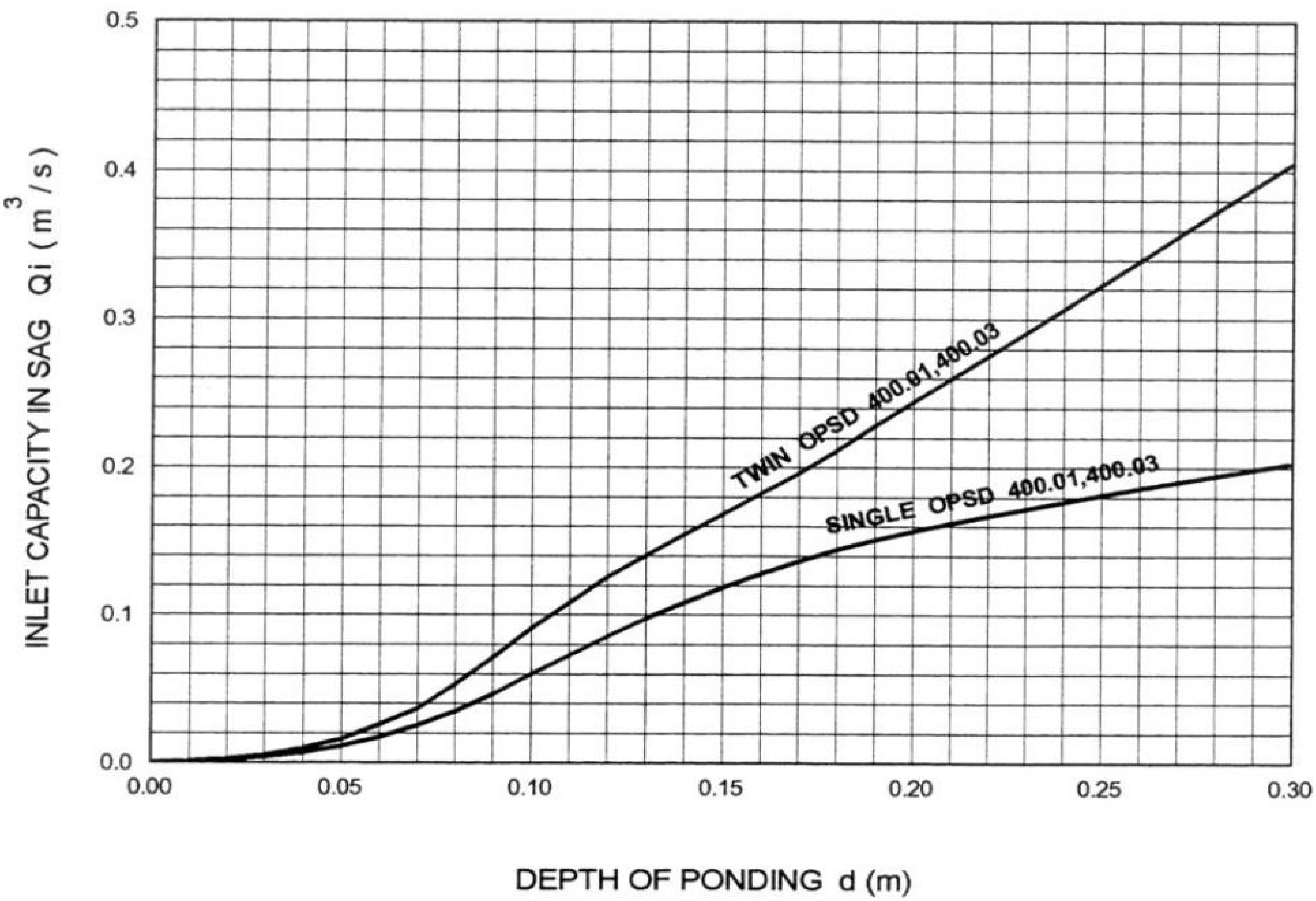






E5 - Sag Inlet Capacity Curves

DEPTH OF PONDING (m)	INLET CAPACITY IN SAG (L/s)	DEPTH OF PONDING (m)	INLET CAPACITY IN SAG (L/s)	DEPTH OF PONDING (m)	INLET CAPACITY IN SAG (L/s)
0	0	0	0	0	0
0.022	1	0.022	2	0.022	2
0.032	3	0.032	6	0.039	8
0.043	7	0.043	14	0.052	16
0.06	16	0.06	32	0.067	31
0.072	26	0.072	52	0.074	41
0.081	34	0.081	68	0.091	70
0.097	55	0.097	110	0.102	92
0.115	77	0.115	154	0.116	118
0.128	93	0.128	186	0.135	145
0.151	116	0.151	232	0.163	183
0.161	127	0.161	254	0.181	210
0.183	143	0.183	286	0.219	269
0.201	154	0.201	308	0.25	319
0.22	164	0.22	328	0.277	363
0.243	174	0.243	348	0.294	390
0.261	183	0.261	366	0.301	402
0.281	191	0.281	382		
0.3	198	0.3	396		



Appendix F

SWM Modelling Results

00245003_Old Second Line_PCSWMM_Post-Development_2023-10-27
Input File (Details)
Output File (Status)

245003_Prop_Cond_Rev9_Culverts

Input File (Details)
Output File (Status)

```
[TITLE]
DUAL DRAINAGE MODEL (Boundary HGL = 98.22)
REVISED DUE TO CITY REVIEW MEMO OFF AUG 28, 2023
By Zhidong Pan
October 30, 2023

[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           LPS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO

START_DATE           09/01/2018
START_TIME           00:00:00
REPORT_START_DATE    09/01/2018
REPORT_START_TIME    00:00:00
END_DATE             09/01/2018
END_TIME             09:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         1

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     1
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         1
THREADS              4

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;                    Rain      Time     Snow     Data
;;Name                Type      Intrvl   Catch    Source
;;------------------- --------- -------- -------- ----------
Chicago_3h_100yr      INTENSITY 0:10     1.0      TIMESERIES Chicago_3h_100yr
Chicago_3h_100yr_+20% INTENSITY 0:10     1.0      TIMESERIES Chicago_3h_100yr_+20%
Chicago_3h_2yr        INTENSITY 0:10     1.0      TIMESERIES Chicago_3h_2yr
```

```
Chicago_3h_5yr        INTENSITY 0:10     1.0      TIMESERIES Chicago_3h_5yr
Historic_1979-07-01   INTENSITY 0:05     1.0      TIMESERIES Historic_1979_July_01
Historic_1988-08-04   INTENSITY 0:05     1.0      TIMESERIES
Historic_1988_August_04
Historic_1996-08-08   INTENSITY 0:05     1.0      TIMESERIES
Historic_1996_August_08

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.             Pcnt.
Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope
Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -----
--- -------- --------
A01              Chicago_3h_100yr CB03             0.2586   94.3     32.2     3.2
0
A02              Chicago_3h_100yr CB02             0.3651   88.6     48.7     3.5
0
A03              Chicago_3h_100yr CB08             0.1826   100      16.5     1.8
0
A04              Chicago_3h_100yr CB06             0.1263   25.7     26.6     3.7
0
A05              Chicago_3h_100yr CB10             0.0612   5.7      4        2.6
0
U01              Chicago_3h_100yr Outfall_Second_Line 0.0403 18.6    3.7      3.8
0
U02              Chicago_3h_100yr CB01             0.0966   5.7      7.8      4
0
U03              Chicago_3h_100yr CB13             0.0701   5.7      7.8      5.8
0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ----------
----------
A01              0.013      0.25       1.57       4.67       25         OUTLET
A02              0.013      0.25       1.57       4.67       25         OUTLET
A03              0.013      0.25       1.57       4.67       25         OUTLET
A04              0.013      0.25       1.57       4.67       25         OUTLET
A05              0.013      0.25       1.57       4.67       25         OUTLET
U01              0.013      0.25       1.57       4.67       25         OUTLET
U02              0.013      0.25       1.57       4.67       25         OUTLET
U03              0.013      0.25       1.57       4.67       25         OUTLET

[INFILTRATION]
;;Subcatchment   MaxRate    MinRate    Decay      DryTime    MaxInfil
;;-------------- ---------- ---------- ---------- ---------- ----------
A01              76.2       13.2       4.14       7          0
A02              76.2       13.2       4.14       7          0
A03              76.2       13.2       4.14       7          0
A04              76.2       13.2       4.14       7          0
A05              76.2       13.2       4.14       7          0
U01              76.2       13.2       4.14       7          0
U02              76.2       13.2       4.14       7          0
U03              76.2       13.2       4.14       7          0

[JUNCTIONS]
;;               Invert     Max.       Init.      Surcharge  Ponded
```

```
;;Name           Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ----------
200              100.96     2.58       0          0          0
201              100.46     3.01       0          0          0
202              98.72      3.77       0          0          0
203              98.5       3.65       0          0          0
205              101.15     3.37       0          0          0
206              98.99      3.62       0          0          0
206A             100.72     2.09       0          0          0
208              98.39      3.27       0          0          0
209              97.65      3.65       0          0          0
211              99.5       2.97       0          0          0
CBMH04           101.45     2.05       0          0          0
CBMH05           101.09     1.46       0          0          0
CBMH08           101.16     1.54       0          0          0
STMH07           100.86     1.72       0          0          0

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate     Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
210_Outfall_Goward_Storm 97.36 FIXED   98.22            NO
Outfall_Second_Line 102.76  FREE                        NO

[STORAGE]
;;               Invert   Max.       Init.      Storage    Curve
Evap.
;;Name           Elev.    Depth      Depth      Curve      Params
Frac.    Infiltration parameters
;;-------------- -------- ---------- ---------- ---------- --------- --------- ----
---- --------- -------- -----------------------
CB01             99.8     1.55       0          TABULAR    CB01_NO_PONDING
0        0
CB02             101.09   1.46       0          TABULAR    CB02Ponding
0        0
CB03             101.45   2.05       0          TABULAR    CB03Ponding
0        0
CB06             101.5    1.28       0          TABULAR    CB06_PONDING
0        0
CB08             101.16   1.44       0          TABULAR    CB08_PONDING
0        0
CB10             101.4    1.15       0          TABULAR    CB10_PONDING
0        0
CB13             99.7     1.55       0          TABULAR    CB13_PONDING
0        0
MC-3500          100.76   1.88       0          TABULAR    MC-3500_56_Chamber
0      0
Outfall_Hydro_Corridor 100.8 0.2     0          TABULAR    PARK-STORAGE
0        0

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet
Outlet     Init.      Max.
;;Name           Node             Node             Length     N          Offset
Offset     Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ----------
---------- ---------- ----------
C01              200              201              24.1       0.013      100.96
100.52     0          0
```

```
C02              201              202              71.84      0.013      100.46
98.84      0          0
C03              202              203              23.99      0.013      98.72
98.64      0          0
C04              203              208              8.56       0.013      98.5
98.42      0          0
C06              205              201              62.35      0.013      101.15
100.52     0          0
C07              211              206              22.29      0.013      99.5
99.2       0          0
C09              208              209              40.65      0.013      98.39
97.71      0          0
C10              209              210_Outfall_Goward_Storm 12.284 0.013  97.65
97.6       0          0
C13              CBMH08           STMH07           12.94      0.013      101.16
100.9      0          0
C15              206A             206              11.1       0.013      100.72
100.55     0          0
C16              STMH07           MC-3500          6.37       0.013      100.86
100.76     0          0
;Swale
C51              CB13             Outfall_Hydro_Corridor 86.248 0.013    101.1
100.8      0          0
;Swale
C52              CB01             Outfall_Hydro_Corridor 37.415 0.013    101.2
100.83     0          0
C7               206              202              39.839     0.013      98.99
98.85      0          0
C8               CBMH04           CBMH05           56.85      0.013      101.45
101.15     0          0
C9               CBMH05           STMH07           30.68      0.013      101.09
100.9      0          0

[ORIFICES]
;;               Inlet            Outlet           Orifice      Crest      Disch.
Flap Open/Close
;;Name           Node             Node             Type         Height     Coeff.
Gate Time
;;-------------- ---------------- ---------------- ------------ ---------- --------
-- ---- ----------
C17              MC-3500          206A             SIDE         100.76     0.62
NO       0

[OUTLETS]
;;               Inlet            Outlet           Outflow    Outlet
Qcoeff/                   Flap
;;Name           Node             Node             Height     Type
QTable           Qexpon     Gate
;;-------------- ---------------- ---------------- ---------- ---------------- ----
------------ ---------- ----
CB01-ICD         CB01             208              99.8       TABULAR/DEPTH    ICD-
IPEX-LMF60                  NO
CB02-ICD         CB02             CBMH05           102.26     TABULAR/DEPTH
SignleCB_OPSD400.01               NO
CB03-ICD         CB03             CBMH04           103.36     TABULAR/DEPTH
DoubleCB_OPSD400.01               NO
CB06-ICD         CB06             MC-3500          102.64     TABULAR/DEPTH
SignleCB_OPSD400.01               NO
CB08-ICD         CB08             CBMH08           102.45     TABULAR/DEPTH
DoubleCB_OPSD400.01               NO
```

```
CB10-CID         CB10             CBMH08           102.4      TABULAR/DEPTH
SignleCB_OPSD400.01            NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---
-------
C01              CIRCULAR     0.25             0          0          0          1
C02              CIRCULAR     0.25             0          0          0          1
C03              CIRCULAR     0.375            0          0          0          1
C04              CIRCULAR     0.45             0          0          0          1
C06              CIRCULAR     0.25             0          0          0          1
C07              CIRCULAR     0.25             0          0          0          1
C09              CIRCULAR     0.45             0          0          0          1
C10              CIRCULAR     0.45             0          0          0          1
C13              CIRCULAR     0.375            0          0          0          1
C15              CIRCULAR     0.3              0          0          0          1
C16              CIRCULAR     0.6              0          0          0          1
C51              RECT_OPEN    0.15             5          0          0          1
C52              RECT_OPEN    0.15             5          0          0          1
C7               CIRCULAR     0.375            0          0          0          1
C8               CIRCULAR     0.375            0          0          0          1
C9               CIRCULAR     0.45             0          0          0          1
C17              CIRCULAR     0.215            0          0          0

[TRANSECTS]
;;Transect Data in HEC-2 format
;
;Inlet channnels to Dry Pond
;Bottom width 3.0m
;Max 0.15m depth
;3:1 side slopes
NC 0.25     0.25     0.25
X1 Dry_pond_inlet    5        0.0      0.0      0.0      0.0      0.0      0.0
0.0
GR 0.3      -2       0        -1.5     0        0        0        1.5      0.3
2
;
;Outlet Channel from Dry Pond
;Emergency Overlfow
;Bottom width of 2.0m
;Max 0.30m depth
;3:1 side slopes
NC 0.25     0.25     0.25
X1 Dry_Pond_Outlet   5        0.0      0.0      0.0      0.0      0.0      0.0
0.0
GR 0.3      -1.9     0        -1       0        0        0        1        0.3
1.9
;
;Half street, width = 3.35m, curb = 0.15m , cross-slope = 0.03m/m, bank-slope =
0.03m/m, bank-height = 0.20m.
NC 0.02     0.02     0.013
X1 Half_3.35m_Street_Barrier_Curb  4        0.0      3.35     0.0      0.0      0.0
0.0      0.0
GR 0.1      0        0        3.35     0.15     3.35     0.2      5.02
;
;Half Street Section
```

```
;Half Road Width = 3.2m (asphalt)
;Road width 3.35m (gutte to gutter)
;Mountable Curb, SC1.3
;Curb Height = 0.085m
;cross-slope = 0.03m/m
NC 0.020    0.020    0.013
X1 Half_3.35m_Street_Mountable  6        0.0      3.2      0.0      0.0      0.0
0.0      0.0
GR 0.102    0        0.006    3.2      0        3.35     0.036    3.368    0.088
3.55
GR 0.165    6.1
;
NC 0.01     0.01     0.01
X1 Half_3.35m_Street_Parking  3        0.0      0.0      0.0      0.0      0.0
0.0      0.0
GR 0.096    0        0        3.2      0.096    6.4
;
;Rear Yard Swales
;Max Depth = 0.3m
;Total wdith 2m
NC 0.01     0.01     0.01
X1 Rear_Swale        3        0.0      0.0      0.0      0.0      0.0      0.0
0.0
GR 0.3      -1       0        0        0.3      1
;
;Spill at Street 1/3 and 1/4
;3.35m at 3% and 2.94m at 3.4%
;Max depth 0.10m
NC 0.013    0.013    0.013
X1 Road-Spill-1      3        0.0      0.0      0.0      0.0      0.0      0.0
0.0
GR 0.1      0        0        3.35     0.1      6.29
;
;Spill at street intersection between
;CB3 and CB4
;3.2m at 3% and 3.12m at 3.2%
;Max depth 0.10m
NC 0.013    0.013    0.013
X1 Road-Spill-CB3-CB4  3        0        0.0      0.0      0.0      0.0      0.0
0.0
GR 0.1      0        0        3.2      0.1      6.32
;
NC 0.01     0.01     0.01
X1 Spill_CB08-CB07   3        0.0      0.0      0.0      0.0      0.0      0.0
0.0
GR 0.1      -3.4     0        0        0.1      8.77
;
;Spill over CL road and CB10 to cb11
NC 0.013    0.013    0.013
X1 Spill_CB10-CB11   4        0.0      0.0      0.0      0.0      0.0      0.0
0.0
GR 0.177    -6.299   0        0        0.027    5.4      0.177    5.425
;
NC 0.01     0.01     0.01
X1 Spill_CB6-CB7     4        0.0      0.0      0.0      0.0      0.0      0.0
0.0
GR 0.185    -10.1    0        0        0.035    3.5      0.185    3.55
;
```

```
;Major Sytem Flow in Hydro Corridor
;Assumed as sheet flow
;Max channel width 6m
;Max depth of 100mm
NC 0.01     0.01     0.01
X1 Spill_in_Hydro_Corridor  5        0.0      0.0      0.0      0.0      0.0
0.0      0.0
GR 0.15     -2.5     0        -2.5     0        0        0        2.5      0.15
2.5

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate  SeepageRate
;;-------------- ---------- ---------- ---------- ---------- ----------
C03              0          1.3        0          NO         0
C04              0          0.4        0          NO         0
C09              0          0.4        0          NO         0
C10              0          0.8        0          NO         0

[INFLOWS]
;;                                                 Param    Units    Scale
Baseline Baseline
;;Node           Parameter        Time Series      Type     Factor   Factor   Value
Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -----
--- --------
200              FLOW             ""               FLOW     1.0      1        0.45
201              FLOW             ""               FLOW     1.0      1        0.45
202              FLOW             ""               FLOW     1.0      1        2.7
205              FLOW             ""               FLOW     1.0      1        1.8
206              FLOW             ""               FLOW     1.0      1        0.9
211              FLOW             ""               FLOW     1.0      1        0.9

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;Inlet Capacity for Standard CB
;3% Crossfall
;2% Gutter Grade
CB-IC            Rating     0          0
CB-IC                       0.009      5
CB-IC                       0.017      10
CB-IC                       0.053      33
CB-IC                       0.068      45
CB-IC                       0.074      50
CB-IC                       0.079      54
CB-IC                       0.088      61
CB-IC                       0.096      61

;CICB as per S22
;3% Crossfall
;2% Gutter Grade
CICB-IC          Rating     0          0
CICB-IC                     0.022      3
CICB-IC                     0.028      5
CICB-IC                     0.052      12
CICB-IC                     0.067      16
CICB-IC                     0.073      18
CICB-IC                     0.078      20
```

CICB-IC	0.087	23
CICB-IC	0.094	26

DoubleCB_OPSD400.01 Rating	0	0
DoubleCB_OPSD400.01	0.022	2
DoubleCB_OPSD400.01	0.032	6
DoubleCB_OPSD400.01	0.043	14
DoubleCB_OPSD400.01	0.06	32
DoubleCB_OPSD400.01	0.072	52
DoubleCB_OPSD400.01	0.081	68
DoubleCB_OPSD400.01	0.097	110
DoubleCB_OPSD400.01	0.115	154
DoubleCB_OPSD400.01	0.128	186
DoubleCB_OPSD400.01	0.151	232
DoubleCB_OPSD400.01	0.161	254
DoubleCB_OPSD400.01	0.183	286
DoubleCB_OPSD400.01	0.201	308
DoubleCB_OPSD400.01	0.22	328
DoubleCB_OPSD400.01	0.243	348
DoubleCB_OPSD400.01	0.261	366
DoubleCB_OPSD400.01	0.281	382
DoubleCB_OPSD400.01	0.3	396

ICD-IPEX-LMF100 Rating	0	0
ICD-IPEX-LMF100	0.2	3.944
ICD-IPEX-LMF100	0.4	5.578
ICD-IPEX-LMF100	0.6	6.831
ICD-IPEX-LMF100	0.8	7.888
ICD-IPEX-LMF100	1	8.819
ICD-IPEX-LMF100	1.2	9.661
ICD-IPEX-LMF100	1.4	10.435
ICD-IPEX-LMF100	1.6	11.155
ICD-IPEX-LMF100	1.8	11.832
ICD-IPEX-LMF100	2	12.472
ICD-IPEX-LMF100	2.2	13.081
ICD-IPEX-LMF100	2.4	13.662
ICD-IPEX-LMF100	2.6	14.22
ICD-IPEX-LMF100	2.8	14.757
ICD-IPEX-LMF100	3	15.275
ICD-IPEX-LMF100	3.2	15.776
ICD-IPEX-LMF100	3.4	16.261
ICD-IPEX-LMF100	3.6	16.733
ICD-IPEX-LMF100	3.8	17.191

ICD-IPEX-LMF-105 Rating	0	0
ICD-IPEX-LMF-105	0.1	3.1
ICD-IPEX-LMF-105	0.2	4.38
ICD-IPEX-LMF-105	0.3	5.36
ICD-IPEX-LMF-105	0.4	6.19
ICD-IPEX-LMF-105	0.5	6.92
ICD-IPEX-LMF-105	0.6	7.58
ICD-IPEX-LMF-105	0.7	8.19
ICD-IPEX-LMF-105	0.8	8.76
ICD-IPEX-LMF-105	0.9	9.29
ICD-IPEX-LMF-105	1	9.79
ICD-IPEX-LMF-105	1.2	10.72
ICD-IPEX-LMF-105	1.4	11.58

ICD-IPEX-LMF-105		1.6	12.38
ICD-IPEX-LMF-105		1.8	13.14
ICD-IPEX-LMF-105		2	13.85
ICD-IPEX-LMF-105		2.5	15.48
ICD-IPEX-LMF-105		3	16.96

ICD-IPEX-LMF60	Rating	0	0
ICD-IPEX-LMF60		0.1	1.02
ICD-IPEX-LMF60		0.2	1.45
ICD-IPEX-LMF60		0.3	1.77
ICD-IPEX-LMF60		0.4	2.05
ICD-IPEX-LMF60		0.5	2.29
ICD-IPEX-LMF60		0.6	2.51
ICD-IPEX-LMF60		0.7	2.71
ICD-IPEX-LMF60		0.8	2.9
ICD-IPEX-LMF60		0.9	3.07
ICD-IPEX-LMF60		1	3.24
ICD-IPEX-LMF60		1.2	3.55
ICD-IPEX-LMF60		1.4	3.83
ICD-IPEX-LMF60		1.6	4.1
ICD-IPEX-LMF60		1.8	4.35
ICD-IPEX-LMF60		2	4.58
ICD-IPEX-LMF60		2.5	5.12
ICD-IPEX-LMF60		3	5.61

ICD-IPEX-LMF70	Rating	0	0
ICD-IPEX-LMF70		0.1	1.36
ICD-IPEX-LMF70		0.2	1.92
ICD-IPEX-LMF70		0.3	2.35
ICD-IPEX-LMF70		0.4	2.72
ICD-IPEX-LMF70		0.5	3.04
ICD-IPEX-LMF70		0.6	3.33
ICD-IPEX-LMF70		0.7	3.59
ICD-IPEX-LMF70		0.8	3.84
ICD-IPEX-LMF70		0.9	4.07
ICD-IPEX-LMF70		1	4.29
ICD-IPEX-LMF70		1.2	4.7
ICD-IPEX-LMF70		1.4	5.08
ICD-IPEX-LMF70		1.6	5.43
ICD-IPEX-LMF70		1.8	5.76
ICD-IPEX-LMF70		2	6.07
ICD-IPEX-LMF70		2.5	6.79
ICD-IPEX-LMF70		3	7.44

ICD-IPEX-LMF75	Rating	0	0
ICD-IPEX-LMF75		0.1	1.58
ICD-IPEX-LMF75		0.2	2.24
ICD-IPEX-LMF75		0.3	2.74
ICD-IPEX-LMF75		0.4	3.16
ICD-IPEX-LMF75		0.5	3.54
ICD-IPEX-LMF75		0.6	3.88
ICD-IPEX-LMF75		0.7	4.19
ICD-IPEX-LMF75		0.8	4.47
ICD-IPEX-LMF75		0.9	4.75
ICD-IPEX-LMF75		1	5
ICD-IPEX-LMF75		1.2	5.48
ICD-IPEX-LMF75		1.4	5.92

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ICD-IPEX-LMF75              1.6         6.33
ICD-IPEX-LMF75              1.8         6.71
ICD-IPEX-LMF75              2           7.08
ICD-IPEX-LMF75              2.5         7.91
ICD-IPEX-LMF75              3           8.67

;IPEX-LMF-80
;MAX FLOW 6 L/SEC  AT 1.3m
ICD-IPEX-LMF80   Rating     0           0
ICD-IPEX-LMF80              0.2         2.544
ICD-IPEX-LMF80              0.4         3.597
ICD-IPEX-LMF80              0.6         4.406
ICD-IPEX-LMF80              0.8         5.087
ICD-IPEX-LMF80              1           5.688
ICD-IPEX-LMF80              1.2         6.23
ICD-IPEX-LMF80              1.4         6.73
ICD-IPEX-LMF80              1.6         7.194
ICD-IPEX-LMF80              1.8         7.631
ICD-IPEX-LMF80              2           8.044
ICD-IPEX-LMF80              2.2         8.436
ICD-IPEX-LMF80              2.4         8.811
ICD-IPEX-LMF80              2.6         9.171
ICD-IPEX-LMF80              2.8         9.517
ICD-IPEX-LMF80              3           9.851
ICD-IPEX-LMF80              3.2         10.174
ICD-IPEX-LMF80              3.4         10.487
ICD-IPEX-LMF80              3.6         10.792
ICD-IPEX-LMF80              3.8         11.087

ICD-IPEX-LMF85   Rating     0           0
ICD-IPEX-LMF85              0.1         2.03
ICD-IPEX-LMF85              0.2         2.87
ICD-IPEX-LMF85              0.3         3.51
ICD-IPEX-LMF85              0.4         4.05
ICD-IPEX-LMF85              0.5         4.53
ICD-IPEX-LMF85              0.6         4.96
ICD-IPEX-LMF85              0.7         5.36
ICD-IPEX-LMF85              0.8         5.73
ICD-IPEX-LMF85              0.9         6.08
ICD-IPEX-LMF85              1           6.41
ICD-IPEX-LMF85              1.2         7.02
ICD-IPEX-LMF85              1.4         7.58
ICD-IPEX-LMF85              1.6         8.11
ICD-IPEX-LMF85              1.8         8.6
ICD-IPEX-LMF85              2           9.06
ICD-IPEX-LMF85              2.5         10.13
ICD-IPEX-LMF85              3           11.1

ICD-IPEX-LMF90   Rating     0           0
ICD-IPEX-LMF90              0.1         2.27
ICD-IPEX-LMF90              0.2         3.21
ICD-IPEX-LMF90              0.3         3.93
ICD-IPEX-LMF90              0.4         4.54
ICD-IPEX-LMF90              0.5         5.07
ICD-IPEX-LMF90              0.6         5.56
ICD-IPEX-LMF90              0.7         6
ICD-IPEX-LMF90              0.8         6.41
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ICD-IPEX-LMF90              0.9        6.8
ICD-IPEX-LMF90              1          7.17
ICD-IPEX-LMF90              1.2        7.86
ICD-IPEX-LMF90              1.4        8.49
ICD-IPEX-LMF90              1.6        9.07
ICD-IPEX-LMF90              1.8        9.62
ICD-IPEX-LMF90              2          10.14
ICD-IPEX-LMF90              2.5        11.34
ICD-IPEX-LMF90              3          12.42

ICD-IPEX-LMF95   Rating     0          0
ICD-IPEX-LMF95              0.1        2.52
ICD-IPEX-LMF95              0.2        3.57
ICD-IPEX-LMF95              0.3        4.37
ICD-IPEX-LMF95              0.4        5.05
ICD-IPEX-LMF95              0.5        5.64
ICD-IPEX-LMF95              0.6        6.18
ICD-IPEX-LMF95              0.7        6.68
ICD-IPEX-LMF95              0.8        7.14
ICD-IPEX-LMF95              0.9        7.57
ICD-IPEX-LMF95              1          7.98
ICD-IPEX-LMF95              1.2        8.74
ICD-IPEX-LMF95              1.4        9.44
ICD-IPEX-LMF95              1.6        10.1
ICD-IPEX-LMF95              1.8        10.71
ICD-IPEX-LMF95              2          11.29
ICD-IPEX-LMF95              2.5        12.62
ICD-IPEX-LMF95              3          13.82

;iPEX  tYPE A
;20 l/SEC @ 1.4
ICD-IPEX-TYPEA   Rating     0          0
ICD-IPEX-TYPEA              0.2        8.088
ICD-IPEX-TYPEA              0.4        11.438
ICD-IPEX-TYPEA              0.6        14.008
ICD-IPEX-TYPEA              0.8        16.175
ICD-IPEX-TYPEA              1          18.085
ICD-IPEX-TYPEA              1.2        19.811
ICD-IPEX-TYPEA              1.4        21.398
ICD-IPEX-TYPEA              1.6        22.875
ICD-IPEX-TYPEA              1.8        24.263
ICD-IPEX-TYPEA              2          25.575
ICD-IPEX-TYPEA              2.2        26.824
ICD-IPEX-TYPEA              2.4        28.017
ICD-IPEX-TYPEA              2.6        29.16
ICD-IPEX-TYPEA              2.8        30.261
ICD-IPEX-TYPEA              3          31.323
ICD-IPEX-TYPEA              3.2        32.351
ICD-IPEX-TYPEA              3.4        33.346
ICD-IPEX-TYPEA              3.6        34.313
ICD-IPEX-TYPEA              3.8        35.253

;MHF Type C
ICD-IPEX-TYPE-C  Rating     0          0
ICD-IPEX-TYPE-C             0.2        14.965
ICD-IPEX-TYPE-C             0.4        21.163
ICD-IPEX-TYPE-C             0.6        25.92
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ICD-IPEX-TYPE-C              0.8        29.93
ICD-IPEX-TYPE-C              1          33.462
ICD-IPEX-TYPE-C              1.2        36.656
ICD-IPEX-TYPE-C              1.4        39.593
ICD-IPEX-TYPE-C              1.6        42.327
ICD-IPEX-TYPE-C              1.8        44.895
ICD-IPEX-TYPE-C              2          47.323
ICD-IPEX-TYPE-C              2.2        49.633
ICD-IPEX-TYPE-C              2.4        51.84
ICD-IPEX-TYPE-C              2.6        53.957
ICD-IPEX-TYPE-C              2.8        55.993
ICD-IPEX-TYPE-C              3          57.959
ICD-IPEX-TYPE-C              3.2        59.859
ICD-IPEX-TYPE-C              3.4        61.702
ICD-IPEX-TYPE-C              3.6        63.49
ICD-IPEX-TYPE-C              3.8        65.23

;IPEX TYPE D
;49 L/sec AT 1m
ICD-IPEX-TYPED   Rating      0          0
ICD-IPEX-TYPED               0.2        21.883
ICD-IPEX-TYPED               0.4        30.948
ICD-IPEX-TYPED               0.6        37.903
ICD-IPEX-TYPED               0.8        43.766
ICD-IPEX-TYPED               1          48.932
ICD-IPEX-TYPED               1.2        53.603
ICD-IPEX-TYPED               1.4        57.898
ICD-IPEX-TYPED               1.6        61.895
ICD-IPEX-TYPED               1.8        65.65
ICD-IPEX-TYPED               2          69.201
ICD-IPEX-TYPED               2.2        72.578
ICD-IPEX-TYPED               2.4        75.806
ICD-IPEX-TYPED               2.6        78.901
ICD-IPEX-TYPED               2.8        81.879
ICD-IPEX-TYPED               3          84.753
ICD-IPEX-TYPED               3.2        87.533
ICD-IPEX-TYPED               3.4        90.227
ICD-IPEX-TYPED               3.6        92.843
ICD-IPEX-TYPED               3.8        95.387

;IPEX MHF Type F
ICD-IPEX-TYPE-F  Rating      0          0
ICD-IPEX-TYPE-F              0.2        28.951
ICD-IPEX-TYPE-F              0.4        40.943
ICD-IPEX-TYPE-F              0.6        50.145
ICD-IPEX-TYPE-F              0.8        57.902
ICD-IPEX-TYPE-F              1          64.737
ICD-IPEX-TYPE-F              1.2        70.916
ICD-IPEX-TYPE-F              1.4        76.598
ICD-IPEX-TYPE-F              1.6        81.886
ICD-IPEX-TYPE-F              1.8        86.854
ICD-IPEX-TYPE-F              2          91.552
ICD-IPEX-TYPE-F              2.2        96.02
ICD-IPEX-TYPE-F              2.4        100.29
ICD-IPEX-TYPE-F              2.6        104.385
ICD-IPEX-TYPE-F              2.8        108.326
ICD-IPEX-TYPE-F              3          112.128
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ICD-IPEX-TYPE-F             3.2        115.805
ICD-IPEX-TYPE-F             3.4        119.369
ICD-IPEX-TYPE-F             3.6        122.83
ICD-IPEX-TYPE-F             3.8        126.195

SignleCB_OPSD400.01 Rating     0          0
SignleCB_OPSD400.01            0.022      1
SignleCB_OPSD400.01            0.032      3
SignleCB_OPSD400.01            0.043      7
SignleCB_OPSD400.01            0.06       16
SignleCB_OPSD400.01            0.072      26
SignleCB_OPSD400.01            0.081      34
SignleCB_OPSD400.01            0.097      55
SignleCB_OPSD400.01            0.115      77
SignleCB_OPSD400.01            0.128      93
SignleCB_OPSD400.01            0.151      116
SignleCB_OPSD400.01            0.161      127
SignleCB_OPSD400.01            0.183      143
SignleCB_OPSD400.01            0.201      154
SignleCB_OPSD400.01            0.22       164
SignleCB_OPSD400.01            0.243      174
SignleCB_OPSD400.01            0.261      183
SignleCB_OPSD400.01            0.281      191
SignleCB_OPSD400.01            0.3        198

;CB IN FLOW-BY CONDITION
CB01_NO_PONDING  Storage    0          0.36
CB01_NO_PONDING             1.4        0.36
CB01_NO_PONDING             1.4001     0
CB01_NO_PONDING             1.55       0

;CB IN PONDING CONDITION
CB02_PONDING     Storage    0          0
CB02_PONDING                1.4        0.36
CB02_PONDING                1.5        30
CB02_PONDING                1.58       55.9
CB02_PONDING                1.5801     0
CB02_PONDING                1.65       0

CB02Ponding      Storage    0          1.2
CB02Ponding                 1.26       1.2
CB02Ponding                 1.41       149.75
CB02Ponding                 1.46       406.09

;CB IN PONDING CONDITION
CB03_PONDING     Storage    0          0
CB03_PONDING                1.4        0.36
CB03_PONDING                1.43       3
CB03_PONDING                1.47       16.8
CB03_PONDING                1.4701     0
CB03_PONDING                1.58       0

CB03Ponding      Storage    0          1.2
CB03Ponding                 1.91       1.2
CB03Ponding                 1.95       9.08
CB03Ponding                 2          42.17
CB03Ponding                 2.05       178.18
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;CB IN FLOW-BY CONDITION
CB04_NO_PONDING  Storage    0          0
CB04_NO_PONDING             1.4        0.36
CB04_NO_PONDING             1.4001     0
CB04_NO_PONDING             1.4002     0
CB04_NO_PONDING             1.5501     0

;CB IN FLOW-BY CONDITION
CB05_NO_PONDING  Storage    0          0
CB05_NO_PONDING             1.4        0.36
CB05_NO_PONDING             1.4001     0
CB05_NO_PONDING             1.4002     0
CB05_NO_PONDING             1.5501     0

;CB IN FLOW-BY CONDITION
CB06_NO_PONDING  Storage    0          0
CB06_NO_PONDING             1.4        0.36
CB06_NO_PONDING             1.4001     0
CB06_NO_PONDING             1.4002     0
CB06_NO_PONDING             1.5501     0

CB06_PONDING     Storage    0          1.2
CB06_PONDING                1.14       1.2
CB06_PONDING                1.2        17.16
CB06_PONDING                1.25       52.25
CB06_PONDING                1.28       97.68

;NCB IN FLOW-BY CONDITION
CB07_NO_PONDING  Storage    0          0
CB07_NO_PONDING             1.4        0.36
CB07_NO_PONDING             1.4001     0
CB07_NO_PONDING             1.4002     0
CB07_NO_PONDING             1.7001     0

;CB IN FLOW-BY CONDITION
CB08_NO_PONDING  Storage    0          0
CB08_NO_PONDING             1.4        0.36
CB08_NO_PONDING             1.4001     0
CB08_NO_PONDING             1.4002     0
CB08_NO_PONDING             1.5501     0

CB08_PONDING     Storage    0          1.2
CB08_PONDING                1.29       1.2
CB08_PONDING                1.34       35.39
CB08_PONDING                1.39       121.96
CB08_PONDING                1.44       217.86

;CB IN FLOW-BY CONDITION
CB09_NO_PONDING  Storage    0          0
CB09_NO_PONDING             1.4        0.36
CB09_NO_PONDING             1.4001     0
CB09_NO_PONDING             1.4002     0
CB09_NO_PONDING             1.5501     0

;CB IN FLOW-BY CONDITION
CB10_NO_PONDING  Storage    0          0
CB10_NO_PONDING             1.8        0.36
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CB10_NO_PONDING             1.8001     0
CB10_NO_PONDING             1.8002     0
CB10_NO_PONDING             1.9501     0

CB10_PONDING     Storage    0          1.2
CB10_PONDING                1          1.2
CB10_PONDING                1.15       63.57

;CB IN FLOW-BY CONDITION
CB11_NO_PONDING  Storage    0          0
CB11_NO_PONDING             1.4        0.36
CB11_NO_PONDING             1.4001     0
CB11_NO_PONDING             1.4002     0
CB11_NO_PONDING             1.7001     0
CB11_NO_PONDING             2.5        0

;CB IN PONDING CONDITION
CB13_PONDING     Storage    0          0
CB13_PONDING                1.4        0.36
CB13_PONDING                1.55       4.3
CB13_PONDING                1.59       8.2
CB13_PONDING                1.5901     0
CB13_PONDING                1.7        0

;CB IN FLOW-BY CONDITION
CB14_NO_PONDING  Storage    0          0
CB14_NO_PONDING             1.4        0.36
CB14_NO_PONDING             1.4001     0
CB14_NO_PONDING             1.4002     0
CB14_NO_PONDING             1.5501     0

;CBMH204
;IN FLOW-BY CONDITION
CBMH204_NO_PONDING Storage    0          0
CBMH204_NO_PONDING            2          1.131
CBMH204_NO_PONDING            2.0001     0
CBMH204_NO_PONDING            2.0002     0
CBMH204_NO_PONDING            2.1501     0

;DRY POND REVISED
DRY-POND         Storage    0          0
DRY-POND                    0.0001     0.36
DRY-POND                    0.4        0.36
DRY-POND                    0.4001     60.36
DRY-POND                    1.4        60.36
DRY-POND                    1.4001     0.36
DRY-POND                    1.6        0.36
DRY-POND                    1.6001     104.27
DRY-POND                    2.2        104.27
DRY-POND                    2.202      137.7
DRY-POND                    2.45       185.6
DRY-POND                    2.8        253.3
DRY-POND                    2.85       264.2
DRY-POND                    2.8501     0

;dry pond
DRY-POND-OBSOLETE Storage    0          0
DRY-POND-OBSOLETE            0.9        0.36
```

```
DRY-POND-OBSOLETE            1.4        45.01
DRY-POND-OBSOLETE            1.6        112.88
DRY-POND-OBSOLETE            2.2        161.13
DRY-POND-OBSOLETE            2.8        354.63
DRY-POND-OBSOLETE            2.85       4500.52
DRY-POND-OBSOLETE            2.8501     0

;ADS Underground Storage - 100 chambers
MC-3500_100_Chambers Storage    0          239.879
MC-3500_100_Chambers            0.051      239.879
MC-3500_100_Chambers            0.076      239.879
MC-3500_100_Chambers            0.102      239.879
MC-3500_100_Chambers            0.127      239.879
MC-3500_100_Chambers            0.152      239.879
MC-3500_100_Chambers            0.178      239.879
MC-3500_100_Chambers            0.203      239.879
MC-3500_100_Chambers            0.229      239.879
MC-3500_100_Chambers            0.254      478.317
MC-3500_100_Chambers            0.279      476.286
MC-3500_100_Chambers            0.305      474.843
MC-3500_100_Chambers            0.33       473.417
MC-3500_100_Chambers            0.356      471.87
MC-3500_100_Chambers            0.381      470.349
MC-3500_100_Chambers            0.406      468.702
MC-3500_100_Chambers            0.432      467.012
MC-3500_100_Chambers            0.457      465.208
MC-3500_100_Chambers            0.483      463.298
MC-3500_100_Chambers            0.508      461.31
MC-3500_100_Chambers            0.533      459.223
MC-3500_100_Chambers            0.559      457.041
MC-3500_100_Chambers            0.584      454.716
MC-3500_100_Chambers            0.61       452.3
MC-3500_100_Chambers            0.635      449.804
MC-3500_100_Chambers            0.66       446.988
MC-3500_100_Chambers            0.686      444.185
MC-3500_100_Chambers            0.711      441.264
MC-3500_100_Chambers            0.737      438.126
MC-3500_100_Chambers            0.762      434.792
MC-3500_100_Chambers            0.787      431.313
MC-3500_100_Chambers            0.813      427.661
MC-3500_100_Chambers            0.838      423.816
MC-3500_100_Chambers            0.864      419.782
MC-3500_100_Chambers            0.889      415.525
MC-3500_100_Chambers            0.914      411.05
MC-3500_100_Chambers            0.94       406.336
MC-3500_100_Chambers            0.965      401.271
MC-3500_100_Chambers            0.991      395.959
MC-3500_100_Chambers            1.016      390.335
MC-3500_100_Chambers            1.041      384.242
MC-3500_100_Chambers            1.067      377.852
MC-3500_100_Chambers            1.092      370.84
MC-3500_100_Chambers            1.118      363.404
MC-3500_100_Chambers            1.143      355.161
MC-3500_100_Chambers            1.168      346.074
MC-3500_100_Chambers            1.194      335.859
MC-3500_100_Chambers            1.219      324.178
MC-3500_100_Chambers            1.245      309.253
```

MC-3500_100_Chambers	1.27	286.297
MC-3500_100_Chambers	1.295	267.224
MC-3500_100_Chambers	1.321	259.794
MC-3500_100_Chambers	1.346	253.023
MC-3500_100_Chambers	1.372	243.765
MC-3500_100_Chambers	1.397	239.879
MC-3500_100_Chambers	1.422	239.879
MC-3500_100_Chambers	1.448	239.879
MC-3500_100_Chambers	1.473	239.879
MC-3500_100_Chambers	1.499	239.879
MC-3500_100_Chambers	1.524	239.879
MC-3500_100_Chambers	1.549	239.879
MC-3500_100_Chambers	1.575	239.879
MC-3500_100_Chambers	1.6	239.879
MC-3500_100_Chambers	1.626	239.879
MC-3500_100_Chambers	1.651	239.879
MC-3500_100_Chambers	1.676	239.879
MC-3500_100_Chambers	1.677	0
MC-3500_100_Chambers	1.88	0

;ADS Underground Storage - 56 chambers

MC-3500_56_Chamber Storage	0	239.879
MC-3500_56_Chamber	0.051	239.879
MC-3500_56_Chamber	0.076	239.879
MC-3500_56_Chamber	0.102	239.879
MC-3500_56_Chamber	0.127	239.879
MC-3500_56_Chamber	0.152	239.879
MC-3500_56_Chamber	0.178	239.879
MC-3500_56_Chamber	0.203	239.879
MC-3500_56_Chamber	0.229	239.879
MC-3500_56_Chamber	0.254	375.156
MC-3500_56_Chamber	0.279	373.901
MC-3500_56_Chamber	0.305	373.076
MC-3500_56_Chamber	0.33	372.259
MC-3500_56_Chamber	0.356	371.373
MC-3500_56_Chamber	0.381	370.501
MC-3500_56_Chamber	0.406	369.557
MC-3500_56_Chamber	0.432	368.588
MC-3500_56_Chamber	0.457	367.554
MC-3500_56_Chamber	0.483	366.46
MC-3500_56_Chamber	0.508	365.32
MC-3500_56_Chamber	0.533	364.125
MC-3500_56_Chamber	0.559	362.875
MC-3500_56_Chamber	0.584	361.544
MC-3500_56_Chamber	0.61	360.162
MC-3500_56_Chamber	0.635	358.733
MC-3500_56_Chamber	0.66	357.125
MC-3500_56_Chamber	0.686	355.523
MC-3500_56_Chamber	0.711	353.854
MC-3500_56_Chamber	0.737	352.063
MC-3500_56_Chamber	0.762	350.161
MC-3500_56_Chamber	0.787	348.178
MC-3500_56_Chamber	0.813	346.097
MC-3500_56_Chamber	0.838	343.905
MC-3500_56_Chamber	0.864	341.609
MC-3500_56_Chamber	0.889	339.186
MC-3500_56_Chamber	0.914	336.641

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MC-3500_56_Chamber            0.94       333.96
MC-3500_56_Chamber            0.965      331.083
MC-3500_56_Chamber            0.991      328.066
MC-3500_56_Chamber            1.016      324.872
MC-3500_56_Chamber            1.041      321.414
MC-3500_56_Chamber            1.067      317.786
MC-3500_56_Chamber            1.092      313.807
MC-3500_56_Chamber            1.118      309.588
MC-3500_56_Chamber            1.143      304.917
MC-3500_56_Chamber            1.168      299.773
MC-3500_56_Chamber            1.194      294
MC-3500_56_Chamber            1.219      287.402
MC-3500_56_Chamber            1.245      278.988
MC-3500_56_Chamber            1.27       266.072
MC-3500_56_Chamber            1.295      255.344
MC-3500_56_Chamber            1.321      251.142
MC-3500_56_Chamber            1.346      247.31
MC-3500_56_Chamber            1.372      242.055
MC-3500_56_Chamber            1.397      239.879
MC-3500_56_Chamber            1.422      239.879
MC-3500_56_Chamber            1.448      239.879
MC-3500_56_Chamber            1.473      239.879
MC-3500_56_Chamber            1.499      239.879
MC-3500_56_Chamber            1.524      239.879
MC-3500_56_Chamber            1.549      239.879
MC-3500_56_Chamber            1.575      239.879
MC-3500_56_Chamber            1.6        239.879
MC-3500_56_Chamber            1.626      239.879
MC-3500_56_Chamber            1.651      239.879
MC-3500_56_Chamber            1.676      239.879
MC-3500_56_Chamber            1.677      0
MC-3500_56_Chamber            1.88       0

;SURFACE PONDING
PARK-STORAGE     Storage    0          3200
PARK-STORAGE                0.1        3790

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Rainfall (mm/hr)
Chicago_3h_100yr 09/01/2018 00:00:00   5.33
Chicago_3h_100yr 09/01/2018 00:10:00   6.365
Chicago_3h_100yr 09/01/2018 00:20:00   7.963
Chicago_3h_100yr 09/01/2018 00:30:00   10.778
Chicago_3h_100yr 09/01/2018 00:40:00   17.106
Chicago_3h_100yr 09/01/2018 00:50:00   44.599
Chicago_3h_100yr 09/01/2018 01:00:00   178.25
Chicago_3h_100yr 09/01/2018 01:10:00   50.968
Chicago_3h_100yr 09/01/2018 01:20:00   26.118
Chicago_3h_100yr 09/01/2018 01:30:00   17.541
Chicago_3h_100yr 09/01/2018 01:40:00   13.254
Chicago_3h_100yr 09/01/2018 01:50:00   10.693
Chicago_3h_100yr 09/01/2018 02:00:00   8.992
Chicago_3h_100yr 09/01/2018 02:10:00   7.78
Chicago_3h_100yr 09/01/2018 02:20:00   6.871
Chicago_3h_100yr 09/01/2018 02:30:00   6.164
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Chicago_3h_100yr 09/01/2018 02:40:00   5.597
Chicago_3h_100yr 09/01/2018 02:50:00   5.133
Chicago_3h_100yr 09/01/2018 03:00:00   0

;Rainfall (mm/hr)
Chicago_3h_100yr_+20% 09/01/2018 0:00:00    6.396
Chicago_3h_100yr_+20% 09/01/2018 0:20:00    9.5556
Chicago_3h_100yr_+20% 09/01/2018 0:30:00    12.9336
Chicago_3h_100yr_+20% 09/01/2018 0:40:00    20.5272
Chicago_3h_100yr_+20% 09/01/2018 0:50:00    53.5188
Chicago_3h_100yr_+20% 09/01/2018 1:00:00    213.9
Chicago_3h_100yr_+20% 09/01/2018 1:10:00    61.1616
Chicago_3h_100yr_+20% 09/01/2018 1:20:00    31.3416
Chicago_3h_100yr_+20% 09/01/2018 1:30:00    21.0492
Chicago_3h_100yr_+20% 09/01/2018 1:40:00    15.9048
Chicago_3h_100yr_+20% 09/01/2018 1:50:00    12.8316
Chicago_3h_100yr_+20% 09/01/2018 2:00:00    10.7904
Chicago_3h_100yr_+20% 09/01/2018 2:10:00    9.336
Chicago_3h_100yr_+20% 09/01/2018 2:20:00    8.2452
Chicago_3h_100yr_+20% 09/01/2018 2:30:00    7.396801
Chicago_3h_100yr_+20% 09/01/2018 2:40:00    6.716401
Chicago_3h_100yr_+20% 09/01/2018 2:50:00    6.1596
Chicago_3h_100yr_+20% 09/01/2018 3:00:00    0

;Rainfall (mm/hr)
Chicago_3h_2yr   09/01/2018 00:00:00   2.491
Chicago_3h_2yr   09/01/2018 00:10:00   2.966
Chicago_3h_2yr   09/01/2018 00:20:00   3.696
Chicago_3h_2yr   09/01/2018 00:30:00   4.976
Chicago_3h_2yr   09/01/2018 00:40:00   7.828
Chicago_3h_2yr   09/01/2018 00:50:00   19.966
Chicago_3h_2yr   09/01/2018 01:00:00   76.805
Chicago_3h_2yr   09/01/2018 01:10:00   22.777
Chicago_3h_2yr   09/01/2018 01:20:00   11.852
Chicago_3h_2yr   09/01/2018 01:30:00   8.025
Chicago_3h_2yr   09/01/2018 01:40:00   6.096
Chicago_3h_2yr   09/01/2018 01:50:00   4.938
Chicago_3h_2yr   09/01/2018 02:00:00   4.165
Chicago_3h_2yr   09/01/2018 02:10:00   3.613
Chicago_3h_2yr   09/01/2018 02:20:00   3.197
Chicago_3h_2yr   09/01/2018 02:30:00   2.873
Chicago_3h_2yr   09/01/2018 02:40:00   2.613
Chicago_3h_2yr   09/01/2018 02:50:00   2.4
Chicago_3h_2yr   09/01/2018 03:00:00   0

;Rainfall (mm/hr)
Chicago_3h_5yr   09/01/2018 00:00:00   3.256
Chicago_3h_5yr   09/01/2018 00:10:00   3.881
Chicago_3h_5yr   09/01/2018 00:20:00   4.844
Chicago_3h_5yr   09/01/2018 00:30:00   6.532
Chicago_3h_5yr   09/01/2018 00:40:00   10.308
Chicago_3h_5yr   09/01/2018 00:50:00   26.529
Chicago_3h_5yr   09/01/2018 01:00:00   104.193
Chicago_3h_5yr   09/01/2018 01:10:00   30.286
Chicago_3h_5yr   09/01/2018 01:20:00   15.655
Chicago_3h_5yr   09/01/2018 01:30:00   10.568
Chicago_3h_5yr   09/01/2018 01:40:00   8.013
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Chicago_3h_5yr	09/01/2018	01:50:00	6.482
Chicago_3h_5yr	09/01/2018	02:00:00	5.462
Chicago_3h_5yr	09/01/2018	02:10:00	4.733
Chicago_3h_5yr	09/01/2018	02:20:00	4.186
Chicago_3h_5yr	09/01/2018	02:30:00	3.76
Chicago_3h_5yr	09/01/2018	02:40:00	3.418
Chicago_3h_5yr	09/01/2018	02:50:00	3.137
Chicago_3h_5yr	09/01/2018	03:00:00	0

Historic_1979_July_01	0:00:00	0
Historic_1979_July_01	0:05:00	2.3
Historic_1979_July_01	0:10:00	2.3
Historic_1979_July_01	0:15:00	8.89
Historic_1979_July_01	0:20:00	8.89
Historic_1979_July_01	0:25:00	8.89
Historic_1979_July_01	0:30:00	8.89
Historic_1979_July_01	0:35:00	38.1
Historic_1979_July_01	0:40:00	38.1
Historic_1979_July_01	0:45:00	38.1
Historic_1979_July_01	0:50:00	38.1
Historic_1979_July_01	0:55:00	38.1
Historic_1979_July_01	1:00:00	38.1
Historic_1979_July_01	1:05:00	38.1
Historic_1979_July_01	1:10:00	50.8
Historic_1979_July_01	1:15:00	50.8
Historic_1979_July_01	1:20:00	76.2
Historic_1979_July_01	1:25:00	106.7
Historic_1979_July_01	1:30:00	106.7
Historic_1979_July_01	1:35:00	71.1
Historic_1979_July_01	1:40:00	71.1
Historic_1979_July_01	1:45:00	30.5
Historic_1979_July_01	1:50:00	30.5
Historic_1979_July_01	1:55:00	30.5
Historic_1979_July_01	2:00:00	30.5
Historic_1979_July_01	2:05:00	3.8
Historic_1979_July_01	2:10:00	3.8
Historic_1979_July_01	2:15:00	3.8
Historic_1979_July_01	2:20:00	3.8
Historic_1979_July_01	2:25:00	3.8
Historic_1979_July_01	2:30:00	3.8
Historic_1979_July_01	2:35:00	3.8
Historic_1979_July_01	2:40:00	3.8
Historic_1979_July_01	2:45:00	3.8
Historic_1979_July_01	2:50:00	3.8
Historic_1979_July_01	2:55:00	3.8
Historic_1979_July_01	3:00:00	3.8

Historic_1988_August_04	0:00:00	0
Historic_1988_August_04	0:05:00	0.1
Historic_1988_August_04	0:10:00	0.1
Historic_1988_August_04	0:15:00	0
Historic_1988_August_04	0:20:00	3.7
Historic_1988_August_04	0:25:00	6.2
Historic_1988_August_04	0:30:00	101.5
Historic_1988_August_04	0:35:00	15.5
Historic_1988_August_04	0:40:00	29.3
Historic_1988_August_04	0:45:00	19.8

Historic_1988_August_04	0:50:00	1.5
Historic_1988_August_04	0:55:00	1.7
Historic_1988_August_04	1:00:00	5.4
Historic_1988_August_04	1:05:00	24.6
Historic_1988_August_04	1:10:00	26.5
Historic_1988_August_04	1:15:00	34.9
Historic_1988_August_04	1:20:00	10.2
Historic_1988_August_04	1:25:00	27.1
Historic_1988_August_04	1:30:00	104.4
Historic_1988_August_04	1:35:00	27.5
Historic_1988_August_04	1:40:00	62.5
Historic_1988_August_04	1:45:00	31.8
Historic_1988_August_04	1:50:00	79.8
Historic_1988_August_04	1:55:00	67.5
Historic_1988_August_04	2:00:00	156.2
Historic_1988_August_04	2:05:00	5.1
Historic_1988_August_04	2:10:00	0.2
Historic_1988_August_04	2:15:00	0.2
Historic_1988_August_04	2:20:00	0.2
Historic_1988_August_04	2:25:00	0.2
Historic_1988_August_04	2:30:00	0.2
Historic_1988_August_04	2:35:00	0.2
Historic_1988_August_04	2:40:00	0.2
Historic_1988_August_04	2:45:00	0.2
Historic_1988_August_04	2:50:00	0.2
Historic_1988_August_04	2:55:00	0.2
Historic_1988_August_04	3:00:00	12.8
Historic_1988_August_04	3:05:00	14
Historic_1988_August_04	3:10:00	22.2
Historic_1988_August_04	3:15:00	21.8
Historic_1988_August_04	3:20:00	1.4
Historic_1988_August_04	3:25:00	0.2
Historic_1988_August_04	3:30:00	0.2
Historic_1988_August_04	3:35:00	0.2
Historic_1988_August_04	3:40:00	0.2
Historic_1988_August_04	3:45:00	0.2
Historic_1988_August_04	3:50:00	0.2
Historic_1988_August_04	3:55:00	0.2
Historic_1988_August_04	4:00:00	0.2
Historic_1988_August_04	4:05:00	0.2
Historic_1988_August_04	4:10:00	0.2
Historic_1988_August_04	4:15:00	0.2
Historic_1988_August_04	4:20:00	0.2
Historic_1988_August_04	4:25:00	0.2
Historic_1988_August_04	4:30:00	0.2
Historic_1988_August_04	4:35:00	0.2
Historic_1988_August_04	4:40:00	0.2
Historic_1988_August_04	4:45:00	0.2
Historic_1988_August_04	4:50:00	0.2
Historic_1988_August_04	4:55:00	0.2
Historic_1988_August_04	5:00:00	2.9
Historic_1988_August_04	5:05:00	7.8
Historic_1988_August_04	5:10:00	10
Historic_1988_August_04	5:15:00	6.3
Historic_1988_August_04	5:20:00	5.1
Historic_1988_August_04	5:25:00	9.8
Historic_1988_August_04	5:30:00	2.6

Historic_1988_August_04	5:35:00	1.7
Historic_1988_August_04	5:40:00	0
Historic_1988_August_04	5:45:00	0

Historic_1996_August_08	0:00:00	4
Historic_1996_August_08	0:05:00	11.9
Historic_1996_August_08	0:10:00	26.5
Historic_1996_August_08	0:15:00	13.3
Historic_1996_August_08	0:20:00	0
Historic_1996_August_08	0:25:00	2.7
Historic_1996_August_08	0:30:00	0
Historic_1996_August_08	0:35:00	8
Historic_1996_August_08	0:40:00	18.6
Historic_1996_August_08	0:45:00	10.6
Historic_1996_August_08	0:50:00	21.2
Historic_1996_August_08	0:55:00	2.7
Historic_1996_August_08	1:00:00	2.7
Historic_1996_August_08	1:05:00	15.9
Historic_1996_August_08	1:10:00	66.3
Historic_1996_August_08	1:15:00	55.7
Historic_1996_August_08	1:20:00	122
Historic_1996_August_08	1:25:00	88.9
Historic_1996_August_08	1:30:00	9.3
Historic_1996_August_08	1:35:00	8
Historic_1996_August_08	1:40:00	4
Historic_1996_August_08	1:45:00	0
Historic_1996_August_08	1:50:00	2.7
Historic_1996_August_08	1:55:00	0
Historic_1996_August_08	2:00:00	0
Historic_1996_August_08	2:05:00	0
Historic_1996_August_08	2:10:00	5.3
Historic_1996_August_08	2:15:00	0
Historic_1996_August_08	2:20:00	0
Historic_1996_August_08	2:25:00	0
Historic_1996_August_08	2:30:00	0
Historic_1996_August_08	2:35:00	0
Historic_1996_August_08	2:40:00	0
Historic_1996_August_08	2:45:00	4
Historic_1996_August_08	2:50:00	53.1
Historic_1996_August_08	2:55:00	69
Historic_1996_August_08	3:00:00	63.7
Historic_1996_August_08	3:05:00	58.4
Historic_1996_August_08	3:10:00	47.8
Historic_1996_August_08	3:15:00	15.9
Historic_1996_August_08	3:20:00	13.3
Historic_1996_August_08	3:25:00	8
Historic_1996_August_08	3:30:00	5.3
Historic_1996_August_08	3:35:00	6.6
Historic_1996_August_08	3:40:00	2.7
Historic_1996_August_08	3:45:00	4
Historic_1996_August_08	3:50:00	2.7
Historic_1996_August_08	3:55:00	4
Historic_1996_August_08	4:00:00	2.7
Historic_1996_August_08	4:05:00	5.3
Historic_1996_August_08	4:10:00	4
Historic_1996_August_08	4:15:00	2.7
Historic_1996_August_08	4:20:00	4

```
Historic_1996_August_08          4:25:00    2.7
Historic_1996_August_08          4:30:00    1.3
Historic_1996_August_08          4:35:00    1.3
Historic_1996_August_08          4:40:00    0
Historic_1996_August_08          4:45:00    0
Historic_1996_August_08          4:50:00    0
Historic_1996_August_08          4:55:00    0
Historic_1996_August_08          5:00:00    2.7
Historic_1996_August_08          5:05:00    0
Historic_1996_August_08          5:10:00    0
Historic_1996_August_08          5:15:00    0
Historic_1996_August_08          5:20:00    0
Historic_1996_August_08          5:25:00    0
Historic_1996_August_08          5:30:00    0
Historic_1996_August_08          5:35:00    0
Historic_1996_August_08          5:40:00    1.3
Historic_1996_August_08          5:45:00    0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Node       200               STMH
Node       201               STMH
Node       202               STMH
Node       203               STMH
Node       205               STMH
Node       206               STMH
Node       206A              STMH
Node       208               STMH
Node       209               STMH
Node       211               STMH
Node       CBMH04            STMH
Node       CBMH05            STMH
Node       CBMH08            STMH
Node       STMH07            STMH
Node       CB01              CB
Node       CB02              CB
Node       CB03              CB
Node       CB06              CB
Node       CB08              CB
Node       CB10              CB
Node       CB13              CB
Node       Outfall_Hydro_Corridor SURFACE
Link       C01               Minor_System
Link       C02               Minor_System
Link       C03               Minor_System
Link       C04               Minor_System
Link       C06               Minor_System
Link       C07               Minor_System
Link       C09               Minor_System
Link       C10               Minor_System
```

```
Link       C51              Major_System
Link       C52              Major_System
Link       C17              ORIFICE
Link       CB01-ICD         ICD
Link       CB02-ICD         ICD
Link       CB03-ICD         ICD
Link       CB06-ICD         ICD
Link       CB08-ICD         ICD
Link       CB10-CID         ICD

[MAP]
DIMENSIONS       347912.9211      5023308.49455    348086.0369      5023505.27245
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
200              347942.247       5023368.119
201              347959.628       5023383.746
202              348013.761       5023432.657
203              348021.014       5023455.522
205              348002.635       5023337.033
206              348040.329       5023402.974
206A             348032.225       5023395.805
208              348015.365       5023462.287
209              347981.529       5023484.819
211              348055.509       5023385.792
CBMH04           347970.499       5023384.798
CBMH05           348012.318       5023422.434
CBMH08           348040.958       5023395.339
STMH07           348033.942       5023399.596
210_Outfall_Goward_Storm 347977.136       5023496.328
Outfall_Second_Line 347946.349       5023351.695
CB01             348005.487       5023463.31
CB02             348007.658       5023428.22
CB03             347960.122       5023385.842
CB06             348021.516       5023396.893
CB08             348041.011       5023394.566
CB10             348053.11        5023380.972
CB13             348075.395       5023401.357
MC-3500          348030.168       5023396.172
Outfall_Hydro_Corridor 348037.798       5023471.547

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
C51              348078.168       5023413.519
C51              348077.723       5023424.274
C51              348070.199       5023437.801
C51              348065.43        5023446.903
C51              348049.983       5023460.005
C51              348046.567       5023464.093
C51              348045.703       5023465.677
C51              348042.829       5023468.099
C51              348040.522       5023469.531
C52              348006.07        5023463.803
C52              348012.636       5023472.817
```

```
C52              348031.808       5023473.441
C52              348034.005       5023472.384
CB01-ICD         348007.761       5023466.423
CB01-ICD         348008.441       5023466.47
CB01-ICD         348014.279       5023462.554
CB03-ICD         347966.348       5023382.995
CB06-ICD         348025.369       5023395.092
CB08-ICD         348040.844       5023394.943
CB10-CID         348052.912       5023382.206
CB10-CID         348042.276       5023394.925

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
;;-------------- ---------------- ----------------
A01              347976.883       5023380.004
A01              347995.801       5023359.302
A01              347998.299       5023352.206
A01              347993.527       5023337.069
A01              347995.104       5023330.144
A01              347986.121       5023321.762
A01              347967.036       5023342.801
A01              347976.06        5023351.084
A01              347974.051       5023353.234
A01              347964.921       5023345.092
A01              347948.898       5023362.661
A01              347947.672       5023365.765
A01              347935.864       5023379.057
A01              347929.391       5023386.192
A01              347953.905       5023408.475
A01              347962.147       5023399.429
A01              347969.308       5023393.515
A01              347973.123       5023388.99
A01              347976.883       5023380.004
A02              347976.883       5023380.004
A02              347973.123       5023388.99
A02              347969.308       5023393.515
A02              347962.147       5023399.429
A02              347964.348       5023401.484
A02              347956.12        5023410.502
A02              347980.594       5023432.771
A02              347989.781       5023422.718
A02              347992.018       5023424.703
A02              347982.803       5023434.799
A02              348007.372       5023457.01
A02              348015.495       5023447.999
A02              348017.706       5023450.012
A02              348018.795       5023448.725
A02              348020.214       5023448.098
A02              348028.1         5023439.849
A02              348035.92        5023441.763
A02              348051.875       5023424.145
A02              348042.92        5023415.873
A02              348043.872       5023414.763
A02              348027.454       5023400.538
A02              348016.754       5023400.024
A02              348012.687       5023404.571
A02              347988.184       5023382.344
```

A02	347983.972	5023386.653
A02	347976.883	5023380.004
A03	348003.795	5023345.61
A03	347993.597	5023336.76
A03	347993.527	5023337.069
A03	347998.299	5023352.206
A03	347995.801	5023359.302
A03	348002.699	5023363.516
A03	348007.402	5023367.753
A03	348010.675	5023366.683
A03	348033.361	5023387.396
A03	348027.454	5023400.538
A03	348043.872	5023414.763
A03	348044.863	5023413.633
A03	348053.959	5023421.871
A03	348066.734	5023407.813
A03	348057.956	5023399.877
A03	348057.552	5023394.462
A03	348047.834	5023385.583
A03	348051.352	5023381.481
A03	348007.622	5023341.571
A03	348003.795	5023345.61
A04	347988.184	5023382.344
A04	348012.687	5023404.571
A04	348016.754	5023400.024
A04	348027.454	5023400.538
A04	348033.361	5023387.396
A04	348010.675	5023366.683
A04	348007.402	5023367.753
A04	348002.699	5023363.516
A04	347995.801	5023359.302
A04	347976.883	5023380.004
A04	347983.972	5023386.653
A04	347988.184	5023382.344
A05	348057.956	5023399.877
A05	348066.734	5023407.813
A05	348073.067	5023400.844
A05	348063.998	5023392.612
A05	348065.838	5023390.53
A05	347987.972	5023319.761
A05	347986.121	5023321.762
A05	347995.104	5023330.144
A05	347993.597	5023336.76
A05	348003.795	5023345.61
A05	348007.622	5023341.571
A05	348051.352	5023381.481
A05	348047.834	5023385.583
A05	348057.552	5023394.462
A05	348057.956	5023399.877
U01	347920.79	5023388.49
U01	347922.904	5023390.463
U01	347927.988	5023384.952
U01	347929.391	5023386.192
U01	347935.864	5023379.057
U01	347947.672	5023365.765
U01	347948.898	5023362.661
U01	347964.921	5023345.092

```
U01              347974.051       5023353.234
U01              347976.06        5023351.084
U01              347967.036       5023342.801
U01              347986.121       5023321.762
U01              347987.972       5023319.761
U01              347985.373       5023317.439
U01              347920.79        5023388.49
U02              348012.594       5023472.69
U02              348007.372       5023457.01
U02              347982.803       5023434.799
U02              347992.018       5023424.703
U02              347989.781       5023422.718
U02              347980.594       5023432.771
U02              347956.12        5023410.502
U02              347964.348       5023401.484
U02              347962.147       5023399.429
U02              347953.905       5023408.475
U02              347929.391       5023386.192
U02              347927.988       5023384.952
U02              347922.904       5023390.463
U02              348012.594       5023472.69
U03              348077.652       5023401.231
U03              348065.838       5023390.53
U03              348063.998       5023392.612
U03              348073.067       5023400.844
U03              348053.959       5023421.871
U03              348044.863       5023413.633
U03              348043.872       5023414.763
U03              348042.92        5023415.873
U03              348051.875       5023424.145
U03              348035.92        5023441.763
U03              348028.1         5023439.849
U03              348020.214       5023448.098
U03              348018.795       5023448.725
U03              348017.706       5023450.012
U03              348015.495       5023447.999
U03              348007.372       5023457.01
U03              348012.594       5023472.69
U03              348077.652       5023401.231

[SYMBOLS]
;;Gage           X-Coord          Y-Coord
;;-------------- ---------------- ----------------

[PROFILES]
;;Name           Links
;;-------------- ----------
"Node 200 to Node 210_Outfall_Goward_Storm" C01 C02 C03 C04 C09
"Node 200 to Node 210_Outfall_Goward_Storm" C10
"Node 205 to Node 210_Outfall_Goward_Storm" C06 C02 C03 C04 C09
"Node 205 to Node 210_Outfall_Goward_Storm" C10
"Node 204 to Node 210_Outfall_Goward_Storm" C05 C07 C03 C04 C09
"Node 204 to Node 210_Outfall_Goward_Storm" C10
"Node CBE02 to Node 210_Outfall_Goward_Storm" CB10-ICD CB14-ICD C08 C07 C03
"Node CBE02 to Node 210_Outfall_Goward_Storm" C04 C09 C10
"Node CB02 to Node 210_Outfall_Goward_Storm" C13 CB05-ICD C02 C03 C04
"Node CB02 to Node 210_Outfall_Goward_Storm" C09 C10
```

```
"Node CB03 to Node Outfall_Hydro_Corridor" C59 C58 C56 POND-IN1 C61
"Node CBMH05-MAJ to Node Outfall_Hydro_Corridor" C55 POND-IN1 C61
"Node CB12-MAJ to Node Outfall_Hydro_Corridor" C53 POND-IN1 C61
"Node CB09-MAJ to Node Outfall_Hydro_Corridor" C57 POND-IN2 C61
"Node CB04-DS to Node 203" C58 CB08-IC CB08-ICD C03
"Node CB07 to Node 210_Outfall_Goward_Storm" CB07-ICD C07 C03 C04 C09
"Node CB07 to Node 210_Outfall_Goward_Storm" C10
"Node CB01 to Node 210_Outfall_Goward_Storm" CB01-ICD C09 C10
```

```
[TITLE]
OFFSITE CULVERT ANALYSIS (free outfall)
By J Fitzpatrick
Sept 17, 2020

[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           LPS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO

START_DATE           09/01/2018
START_TIME           00:00:00
REPORT_START_DATE    09/01/2018
REPORT_START_TIME    00:00:00
END_DATE             09/01/2018
END_TIME             09:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         5
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     1
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         1
THREADS              4

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;               Rain      Time     Snow     Data
;;Name           Type      Intrvl   Catch    Source
;;-------------- --------- -------- -------- ----------
Chicago_3h_100yr INTENSITY 0:10     1.0      TIMESERIES Chicago_3h_100yr
Chicago_3h_2yr   INTENSITY 0:10     1.0      TIMESERIES Chicago_3h_2yr
Chicago_3h_5yr   INTENSITY 0:10     1.0      TIMESERIES Chicago_3h_5yr

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
S01              Chicago_3h_100yr J3               0.0332   70.7     31.8     4        0
S02              Chicago_3h_100yr 210_Outfall_Goward_Storm 1.1509 61.3 104.6  3        0
S16              Chicago_3h_100yr J1               0.0087   45.1     24.9     4        0
S17              Chicago_3h_100yr J5               0.0077   41       17.8     4        0
S20              Chicago_3h_100yr IN58746          0.9373   43.7     85.2     1        0
S21              Chicago_3h_100yr J5               0.0338   64.5     42.46    33       0
S22              Chicago_3h_100yr J3               0.0488   68       42.46    33       0
S23              Chicago_3h_100yr J1               0.1175   53.6     42.46    33       0
```

```
[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
S01              0.013      0.25       1.57       4.67       25         OUTLET
S02              0.013      0.25       1.57       4.67       25         OUTLET
S16              0.013      0.25       1.57       4.67       0          OUTLET
S17              0.013      0.25       1.57       4.67       0          OUTLET
S20              0.013      0.25       1.57       4.67       0          OUTLET
S21              0.013      0.25       1.57       4.67       0          OUTLET
S22              0.013      0.25       1.57       4.67       0          OUTLET
S23              0.013      0.25       1.57       4.67       0          OUTLET

[INFILTRATION]
;;Subcatchment   MaxRate    MinRate    Decay      DryTime    MaxInfil
;;-------------- ---------- ---------- ---------- ---------- ----------
S01              76.2       13.2       4.14       7          0
S02              76.2       13.2       4.14       7          0
S16              76.2       13.2       4.14       7          0
S17              76.2       13.2       4.14       7          0
S20              76.2       13.2       4.14       7          0
S21              76.2       13.2       4.14       7          0
S22              76.2       13.2       4.14       7          0
S23              76.2       13.2       4.14       7          0

[JUNCTIONS]
;;               Invert     Max.       Init.      Surcharge  Ponded
;;Name           Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ----------
J1               101.32     0.88       0          0          0
J2               102.37     0.98       0          0          0
J3               102.53     0.82       0          0          0
J4               102.89     1.12       0          0          0
J5               103.05     0.96       0          0          0
J6               103.94     0.3        0          0          0
J7               101.917    0.733      0          0          0

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate     Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
210_Outfall_Goward_Storm 97.5 FIXED    98.22            NO
Outfall_Second_Line 101.1   FREE                        NO
Outfall_Whernside 100.56    FREE                        NO

[STORAGE]
;;               Invert   Max.       Init.      Storage    Curve                                      Evap.
;;Name           Elev.    Depth      Depth      Curve      Params                                     Frac.
;;-------------- -------- ---------- ---------- ---------- ---------- --------- --------- -------- -------
IN58746          101.38   2.92       0.6        TABULAR    IN58746_PONDING           0        0

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet      Outlet     Init.
;;Name           Node             Node             Length     N          Offset     Offset     Flow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------
C1               J5               J4               16.021     0.025      103.05     102.89     0
C2               J3               J2               15.295     0.025      102.53     102.37     0
C3               J1               Outfall_Second_Line 27.529  0.025      101.32     101.1      0
D1_1             J2               J7               20.823     0.05       102.37     101.917    0
D1_2             J7               J1               27.485     0.05       101.917    101.32     0
D2               J4               J3               22.943     0.05       102.89     102.53     0
D3               J6               J5               18.359     0.05       103.94     103.05     0

[ORIFICES]
;;               Inlet            Outlet           Orifice      Crest      Disch.     Flap Open/Close
;;Name           Node             Node             Type         Height     Coeff.     Gate Time
;;-------------- ---------------- ---------------- ------------ ---------- ---------- ---- ----------
C6               IN58746          Outfall_Whernside SIDE        101.98     0.61       NO   0

[WEIRS]
;;               Inlet            Outlet           Weir         Crest      Disch.     Flap     End
;;Name           Node             Node             Type         Height     Coeff.     Gate     Con.
```

```
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- --------
DITCH_OVERFLOW   IN58746          J6               V-NOTCH      103.94     1.35       NO       0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ----------
C1               CIRCULAR     0.5              0          0          0          1          6
C2               CIRCULAR     0.5              0          0          0          1          6
C3               CIRCULAR     0.4              0          0          0          1          6
D1_1             TRIANGULAR   0.8              4          0          0          1
D1_2             TRIANGULAR   0.8              4          0          0          1
D2               TRIANGULAR   0.8              4          0          0          1
D3               TRIANGULAR   0.3              3          0          0          1
C6               CIRCULAR     0.197            0          0          0
DITCH_OVERFLOW   TRIANGULAR   0.3              3          0.2        0.2

[TRANSECTS]
;;Transect Data in HEC-2 format
;
;Inlet channnels to Dry Pond
;Bottom width 2.0m
;Max 0.15m depth
;3:1 side slopes
NC 0.25     0.25     0.25
X1 Dry_pond_inlet    5        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.3      -1.6     0        -1       0        0        0        1        0.3      1.6
;
;Outlet Channel from Dry Pond
;Emergency Overlfow
;Bottom width of 2.0m
;Max 0.30m depth
;3:1 side slopes
NC 0.25     0.25     0.25
X1 Dry_Pond_Outlet   5        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.3      -1.9     0        -1       0        0        0        1        0.3      1.9
;
;Half street, width = 3.35m, curb = 0.15m , cross-slope = 0.03m/m, bank-slope = 0.03m/m, bank-height = (
NC 0.02     0.02     0.013
X1 Half_3.35m_Street_Barrier_Curb  4        0.0      3.35     0.0      0.0      0.0      0.0      0.0
GR 0.1      0        0        3.35     0.15     3.35     0.2      5.02
;
;Half Street Section
;Half Road Width = 3.2m (asphalt)
;Road width 3.35m (gutte to gutter)
;Mountable Curb, SC1.3
;Curb Height = 0.085m
;cross-slope = 0.03m/m
NC 0.020    0.020    0.013
X1 Half_3.35m_Street_Mountable  6        0.0      3.2      0.0      0.0      0.0      0.0      0.0
GR 0.102    0        0.006    3.2      0        3.35     0.036    3.368    0.088    3.55
GR 0.165    6.1
;
NC 0.01     0.01     0.01
X1 Half_3.35m_Street_Parking  3        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.096    0        0        3.2      0.096    6.4
;
;Rear Yard Swales
;Max Depth = 0.3m
;Total wdith 2m
NC 0.01     0.01     0.01
X1 Rear_Swale        3        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.3      -1       0        0        0.3      1
;
;Spill at Street 1/3 and 1/4
;3.35m at 3% and 2.94m at 3.4%
;Max depth 0.10m
NC 0.013    0.013    0.013
X1 Road-Spill-1      3        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.1      0        0        3.35     0.1      6.29
;
;Spill at street intersection between
;CB3 and CB4
;3.2m at 3% and 3.12m at 3.2%
;Max depth 0.10m
NC 0.013    0.013    0.013
X1 Road-Spill-CB3-CB4  3        0        0.0      0.0      0.0      0.0      0.0      0.0
GR 0.1      0        0        3.2      0.1      6.32
;
NC 0.01     0.01     0.01
X1 Spill_CB08-CB07   3        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.1      -3.4     0        0        0.1      8.77
;
;Spill over CL road and CB10 to cb11
NC 0.013    0.013    0.013
X1 Spill_CB10-CB11   4        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.177    -6.299   0        0        0.027    5.4      0.177    5.425
;
NC 0.01     0.01     0.01
X1 Spill_CB6-CB7     4        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.185    -10.1    0        0        0.035    3.5      0.185    3.55
;
;Major Sytem Flow in Hydro Corridor
;Assumed as sheet flow
;Max channel width 6m
;Max depth of 100mm
NC 0.01     0.01     0.01
X1 Spill_in_Hydro_Corridor  5        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.15     -2.5     0        -2.5     0        0        0        2.5      0.15     2.5

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate  SeepageRate
;;-------------- ---------- ---------- ---------- ---------- ----------
C1               0.5        0          0          NO         0
C2               0.5        0          0          NO         0
C3               0.5        0          0          NO         0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;PONDING CONDITION
IN58746_PONDING  Storage    0          0
IN58746_PONDING             2.37       0.36
IN58746_PONDING             2.56       280
IN58746_PONDING             2.561      0

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Rainfall (mm/hr)
Chicago_3h_100yr 09/01/2018 00:00:00   5.33
Chicago_3h_100yr 09/01/2018 00:10:00   6.365
Chicago_3h_100yr 09/01/2018 00:20:00   7.963
Chicago_3h_100yr 09/01/2018 00:30:00   10.778
Chicago_3h_100yr 09/01/2018 00:40:00   17.106
Chicago_3h_100yr 09/01/2018 00:50:00   44.599
Chicago_3h_100yr 09/01/2018 01:00:00   178.25
Chicago_3h_100yr 09/01/2018 01:10:00   50.968
Chicago_3h_100yr 09/01/2018 01:20:00   26.118
Chicago_3h_100yr 09/01/2018 01:30:00   17.541
Chicago_3h_100yr 09/01/2018 01:40:00   13.254
Chicago_3h_100yr 09/01/2018 01:50:00   10.693
Chicago_3h_100yr 09/01/2018 02:00:00   8.992
Chicago_3h_100yr 09/01/2018 02:10:00   7.78
Chicago_3h_100yr 09/01/2018 02:20:00   6.871
Chicago_3h_100yr 09/01/2018 02:30:00   6.164
Chicago_3h_100yr 09/01/2018 02:40:00   5.597
Chicago_3h_100yr 09/01/2018 02:50:00   5.133
Chicago_3h_100yr 09/01/2018 03:00:00   0

;Rainfall (mm/hr)
Chicago_3h_2yr   09/01/2018 00:00:00   2.491
Chicago_3h_2yr   09/01/2018 00:10:00   2.966
```

```
Chicago_3h_2yr   09/01/2018 00:20:00   3.696
Chicago_3h_2yr   09/01/2018 00:30:00   4.976
Chicago_3h_2yr   09/01/2018 00:40:00   7.828
Chicago_3h_2yr   09/01/2018 00:50:00   19.966
Chicago_3h_2yr   09/01/2018 01:00:00   76.805
Chicago_3h_2yr   09/01/2018 01:10:00   22.777
Chicago_3h_2yr   09/01/2018 01:20:00   11.852
Chicago_3h_2yr   09/01/2018 01:30:00   8.025
Chicago_3h_2yr   09/01/2018 01:40:00   6.096
Chicago_3h_2yr   09/01/2018 01:50:00   4.938
Chicago_3h_2yr   09/01/2018 02:00:00   4.165
Chicago_3h_2yr   09/01/2018 02:10:00   3.613
Chicago_3h_2yr   09/01/2018 02:20:00   3.197
Chicago_3h_2yr   09/01/2018 02:30:00   2.873
Chicago_3h_2yr   09/01/2018 02:40:00   2.613
Chicago_3h_2yr   09/01/2018 02:50:00   2.4
Chicago_3h_2yr   09/01/2018 03:00:00   0

;Rainfall (mm/hr)
Chicago_3h_5yr   09/01/2018 00:00:00   3.256
Chicago_3h_5yr   09/01/2018 00:10:00   3.881
Chicago_3h_5yr   09/01/2018 00:20:00   4.844
Chicago_3h_5yr   09/01/2018 00:30:00   6.532
Chicago_3h_5yr   09/01/2018 00:40:00   10.308
Chicago_3h_5yr   09/01/2018 00:50:00   26.529
Chicago_3h_5yr   09/01/2018 01:00:00   104.193
Chicago_3h_5yr   09/01/2018 01:10:00   30.286
Chicago_3h_5yr   09/01/2018 01:20:00   15.655
Chicago_3h_5yr   09/01/2018 01:30:00   10.568
Chicago_3h_5yr   09/01/2018 01:40:00   8.013
Chicago_3h_5yr   09/01/2018 01:50:00   6.482
Chicago_3h_5yr   09/01/2018 02:00:00   5.462
Chicago_3h_5yr   09/01/2018 02:10:00   4.733
Chicago_3h_5yr   09/01/2018 02:20:00   4.186
Chicago_3h_5yr   09/01/2018 02:30:00   3.76
Chicago_3h_5yr   09/01/2018 02:40:00   3.418
Chicago_3h_5yr   09/01/2018 02:50:00   3.137
Chicago_3h_5yr   09/01/2018 03:00:00   0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Subcatch   S01              INCL
Subcatch   S02              NOT_INCL
Subcatch   S16              INCL
Subcatch   S17              INCL
Subcatch   S20              INCL
Subcatch   S21              INCL
Subcatch   S22              INCL
Subcatch   S23              INCL
Link       C1               CULVERT
Link       C2               CULVERT
Link       C3               CULVERT
Link       D1_1             DITCH
Link       D1_2             DITCH
Link       D2               DITCH
Link       D3               DITCH
Link       C6               CB_LEAD
Link       DITCH_OVERFLOW   DITCH

[MAP]
DIMENSIONS       347865.830158754 5023053.25361629 348218.600449102 5023517.42628871
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
J1               347896.589       5023403.646
J2               347930.647       5023369.382
J3               347940.885       5023358.011
J4               347955.913       5023340.668
J5               347966.526       5023328.659
J6               347979.136       5023315.374
J7               347915.966       5023384.166
210_Outfall_Goward_Storm 347977.136       5023496.328
Outfall_Second_Line 347881.865       5023421.298
Outfall_Whernside 348084.105       5023260.217
IN58746          348052.125       5023235.108

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------------

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
;;-------------- ---------------- ----------------
S01              347955.691       5023367.554
S01              347967.672       5023354.462
S01              347965.128       5023346.077
S01              347964.647       5023344.753
S01              347965.883       5023343.248
S01              347968.506       5023341.283
S01              347965.8         5023338.788
S01              347963.426       5023341.39
S01              347942.433       5023364.56
S01              347940.082       5023367.153
S01              347943.522       5023370.277
S01              347947.034       5023366.408
S01              347955.691       5023367.554
S02              347978.269       5023330.265
S02              347973.455       5023335.568
S02              347970.63        5023339.204
S02              347968.506       5023341.283
S02              347965.883       5023343.248
S02              347964.647       5023344.753
S02              347965.128       5023346.077
S02              347967.672       5023354.462
S02              347955.691       5023367.554
S02              347947.034       5023366.408
S02              347943.522       5023370.277
S02              347937.784       5023376.6
S02              347937.535       5023376.374
S02              347935.975       5023378.092
S02              347935.366       5023377.539
S02              347932.935       5023380.193
S02              347928.485       5023385.457
S02              347925.711       5023382.939
S02              347920.747       5023388.487
S02              348012.622       5023472.739
S02              348022.687       5023461.647
S02              348067.661       5023412.03
S02              348077.551       5023401.287
S02              347985.263       5023317.376
S02              347983.366       5023319.465
S02              347980.178       5023322.95
S02              347982.773       5023325.305
S02              347978.269       5023330.265
S16              347932.935       5023380.193
S16              347935.366       5023377.539
S16              347935.975       5023378.092
S16              347937.535       5023376.374
S16              347937.784       5023376.6
S16              347943.522       5023370.277
S16              347940.082       5023367.153
S16              347937.732       5023369.747
S16              347930.373       5023377.866
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S16              347925.711       5023382.939
S16              347928.485       5023385.457
S16              347932.935       5023380.193
S17              347978.269       5023330.265
S17              347978.269       5023330.265
S17              347982.773       5023325.305
S17              347980.178       5023322.95
S17              347968.127       5023336.211
S17              347965.8         5023338.788
S17              347968.506       5023341.283
S17              347970.63        5023339.204
S17              347973.455       5023335.568
S17              347978.269       5023330.265
S20              347974.07        5023310.322
S20              347983.366       5023319.465
S20              347985.263       5023317.386
S20              347989.539       5023321.265
S20              347994.086       5023314.503
S20              348012.211       5023308.311
S20              348019.836       5023301.75
S20              348020.668       5023292.449
S20              348023.129       5023286.805
S20              348028.728       5023282.271
S20              348031.542       5023276.979
S20              348045.162       5023262.228
S20              348060.297       5023251.023
S20              348063.899       5023240.431
S20              348071.486       5023234.534
S20              348094.512       5023228.492
S20              348101.072       5023216.814
S20              348119.485       5023208.882
S20              348123.803       5023201.041
S20              348130.641       5023197.746
S20              348135.828       5023190.774
S20              348144.064       5023176.719
S20              348148.814       5023173.363
S20              348157.027       5023163.337
S20              348161.171       5023155.322
S20              348188.517       5023146.191
S20              348185.69        5023135.754
S20              348186.714       5023134.034
S20              348191.418       5023130.854
S20              348200.193       5023129.496
S20              348202.565       5023125.793
S20              348199.3         5023109.063
S20              348189.019       5023095.291
S20              348192.11        5023088.99
S20              348193.711       5023078.857
S20              348188.216       5023074.352
S20              348004.632       5023278.44
S20              347980.206       5023303.411
S20              347974.07        5023310.322
S21              347956.192       5023330.348
S21              347965.8         5023338.788
S21              347968.127       5023336.22
S21              347980.178       5023322.959
S21              347983.366       5023319.465
S21              347974.07        5023310.322
S21              347966.143       5023319.677
S21              347957.781       5023328.59
S21              347956.192       5023330.348
S22              347930.553       5023358.311
S22              347940.107       5023367.135
S22              347942.433       5023364.57
S22              347963.426       5023341.4
S22              347965.8         5023338.788
S22              347956.192       5023330.348
S22              347950.102       5023337.084
S22              347942.778       5023345.227
S22              347930.553       5023358.311
S23              347940.107       5023367.135
S23              347930.553       5023358.311
S23              347928.17        5023360.862
S23              347914.253       5023375.912
S23              347901.106       5023389.827
S23              347891.696       5023400.635
S23              347883.773       5023409.251
S23              347887.448       5023412.409
S23              347892.178       5023415.982
S23              347914.065       5023410.787
S23              347917.36        5023408.003
S23              347923.92        5023396.325
S23              347925.757       5023393.1
S23              347920.747       5023388.496
S23              347925.711       5023382.948
S23              347930.373       5023377.875
S23              347937.732       5023369.756
S23              347940.082       5023367.163
S23              347940.107       5023367.135

[SYMBOLS]
;;Gage           X-Coord          Y-Coord
;;-------------- ---------------- ----------------

[PROFILES]
;;Name           Links
;;-------------- ----------
"Node IN58746 to Node Outfall_Second_Line" DITCH_OVERFLOW D3 C1 D2 C2
"Node IN58746 to Node Outfall_Second_Line" D1_1 D1_2 C3
"Node J6 to Node Outfall_Second_Line" D3 C1 D2 C2 D1_1
"Node J6 to Node Outfall_Second_Line" D1_2 C3
```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

DUAL DRAINAGE MODEL (Boundary HGL = 98.22)
REVISED DUE TO CITY REVIEW MEMO OFF AUG 28, 2023
By Zhidong Pan

****
Element Count
****

Number of rain gages 7
Number of subcatchments ... 8
Number of nodes 25
Number of links 23
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_3h_100yr	Chicago_3h_100yr	INTENSITY	10 min.
Chicago_3h_100yr_+20%	Chicago_3h_100yr_+20%	INTENSITY	10 min.
Chicago_3h_2yr	Chicago_3h_2yr	INTENSITY	10 min.
Chicago_3h_5yr	Chicago_3h_5yr	INTENSITY	10 min.
Historic_1979-07-01	Historic_1979_July_01	INTENSITY	5 min.
Historic_1988-08-04	Historic_1988_August_04	INTENSITY	5 min.
Historic_1996-08-08	Historic_1996_August_08	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A01	0.26	32.20	94.30	3.2000	Chicago_3h_100yr	CB03
A02	0.37	48.70	88.60	3.5000	Chicago_3h_100yr	CB02
A03	0.18	16.50	100.00	1.8000	Chicago_3h_100yr	CB08
A04	0.13	26.60	25.70	3.7000	Chicago_3h_100yr	CB06
A05	0.06	4.00	5.70	2.6000	Chicago_3h_100yr	CB10
U01	0.04	3.70	18.60	3.8000	Chicago_3h_100yr	Outfall_Second_Line
U02	0.10	7.80	5.70	4.0000	Chicago_3h_100yr	CB01
U03	0.07	7.80	5.70	5.8000	Chicago_3h_100yr	CB13

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
200	JUNCTION	100.96	2.58	0.0	Yes
201	JUNCTION	100.46	3.01	0.0	Yes
202	JUNCTION	98.72	3.77	0.0	Yes
203	JUNCTION	98.50	3.65	0.0	
205	JUNCTION	101.15	3.37	0.0	Yes
206	JUNCTION	98.99	3.62	0.0	Yes
206A	JUNCTION	100.72	2.09	0.0	
208	JUNCTION	98.39	3.27	0.0	
209	JUNCTION	97.65	3.65	0.0	
211	JUNCTION	99.50	2.97	0.0	Yes
CBMH04	JUNCTION	101.45	2.05	0.0	
CBMH05	JUNCTION	101.09	1.46	0.0	
CBMH08	JUNCTION	101.16	1.54	0.0	
STMH07	JUNCTION	100.86	1.72	0.0	
210_Outfall_Goward_Storm	OUTFALL	97.36	0.69	0.0	
Outfall_Second_Line	OUTFALL	102.76	0.00	0.0	
CB01	STORAGE	99.80	1.55	0.0	
CB02	STORAGE	101.09	1.46	0.0	
CB03	STORAGE	101.45	2.05	0.0	
CB06	STORAGE	101.50	1.28	0.0	
CB08	STORAGE	101.16	1.44	0.0	
CB10	STORAGE	101.40	1.15	0.0	
CB13	STORAGE	99.70	1.55	0.0	
MC-3500	STORAGE	100.76	1.88	0.0	
Outfall_Hydro_Corridor	STORAGE	100.80	0.20	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	% Slope	Roughness
C01	200	201	CONDUIT	24.1	1.8260	0.0130
C02	201	202	CONDUIT	71.8	2.2556	0.0130
C03	202	203	CONDUIT	24.0	0.3335	0.0130
C04	203	208	CONDUIT	8.6	0.9346	0.0130
C06	205	201	CONDUIT	62.4	1.0105	0.0130
C07	211	206	CONDUIT	22.3	1.3460	0.0130
C09	208	209	CONDUIT	40.7	1.6731	0.0130
C10	209	210_Outfall_Goward_Storm	CONDUIT	12.3	0.4070	0.0130

C13	CBMH08	STMH07	CONDUIT	12.9	2.0097	0.0130
C15	206A	206	CONDUIT	11.1	1.5317	0.0130
C16	STMH07	MC-3500	CONDUIT	6.4	1.5701	0.0130
C51	CB13	Outfall_Hydro_Corridor	CONDUIT	86.2	0.3478	0.0130
C52	CB01	Outfall_Hydro_Corridor	CONDUIT	37.4	0.9890	0.0130
C7	206	202	CONDUIT	39.8	0.3514	0.0130
C8	CBMH04	CBMH05	CONDUIT	56.9	0.5277	0.0130
C9	CBMH05	STMH07	CONDUIT	30.7	0.6193	0.0130
C17	MC-3500	206A	ORIFICE			
CB01-ICD	CB01	208	OUTLET			
CB02-ICD	CB02	CBMH05	OUTLET			
CB03-ICD	CB03	CBMH04	OUTLET			
CB06-ICD	CB06	MC-3500	OUTLET			
CB08-ICD	CB08	CBMH08	OUTLET			
CB10-CID	CB10	CBMH08	OUTLET			

****

Cross Section Summary

****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C01	CIRCULAR	0.25	0.05	0.06	0.25	1	80.36
C02	CIRCULAR	0.25	0.05	0.06	0.25	1	89.32
C03	CIRCULAR	0.38	0.11	0.09	0.38	1	101.25
C04	CIRCULAR	0.45	0.16	0.11	0.45	1	275.65
C06	CIRCULAR	0.25	0.05	0.06	0.25	1	59.78
C07	CIRCULAR	0.25	0.05	0.06	0.25	1	69.00
C09	CIRCULAR	0.45	0.16	0.11	0.45	1	368.80
C10	CIRCULAR	0.45	0.16	0.11	0.45	1	181.91
C13	CIRCULAR	0.38	0.11	0.09	0.38	1	248.57
C15	CIRCULAR	0.30	0.07	0.07	0.30	1	119.69
C16	CIRCULAR	0.60	0.28	0.15	0.60	1	769.41
C51	RECT_OPEN	0.15	0.75	0.14	5.00	1	924.03
C52	RECT_OPEN	0.15	0.75	0.14	5.00	1	1558.08

```
  C7                CIRCULAR             0.38      0.11      0.09      0.38         1
103.94
  C8                CIRCULAR             0.38      0.11      0.09      0.38         1
127.37
  C9                CIRCULAR             0.45      0.16      0.11      0.45         1
224.38


  ****************
  Transect Summary
  ****************

  Transect Dry_pond_inlet
  Area:
             0.0172     0.0345     0.0519     0.0695     0.0871
             0.1049     0.1228     0.1408     0.1589     0.1771
             0.1955     0.2139     0.2325     0.2512     0.2700
             0.2889     0.3079     0.3271     0.3463     0.3657
             0.3852     0.4048     0.4245     0.4443     0.4643
             0.4843     0.5045     0.5248     0.5452     0.5657
             0.5863     0.6071     0.6279     0.6489     0.6700
             0.6912     0.7125     0.7339     0.7555     0.7771
             0.7989     0.8208     0.8428     0.8649     0.8871
             0.9095     0.9319     0.9545     0.9772     1.0000
  Hrad:
             0.0237     0.0472     0.0705     0.0936     0.1165
             0.1392     0.1617     0.1841     0.2063     0.2283
             0.2501     0.2718     0.2933     0.3146     0.3358
             0.3568     0.3777     0.3985     0.4191     0.4395
             0.4599     0.4800     0.5001     0.5200     0.5398
             0.5595     0.5791     0.5985     0.6178     0.6370
             0.6561     0.6751     0.6940     0.7128     0.7314
             0.7500     0.7684     0.7868     0.8051     0.8232
             0.8413     0.8593     0.8772     0.8950     0.9127
             0.9303     0.9479     0.9653     0.9827     1.0000
  Width:
             0.7550     0.7600     0.7650     0.7700     0.7750
             0.7800     0.7850     0.7900     0.7950     0.8000
             0.8050     0.8100     0.8150     0.8200     0.8250
             0.8300     0.8350     0.8400     0.8450     0.8500
             0.8550     0.8600     0.8650     0.8700     0.8750
             0.8800     0.8850     0.8900     0.8950     0.9000
             0.9050     0.9100     0.9150     0.9200     0.9250
             0.9300     0.9350     0.9400     0.9450     0.9500
             0.9550     0.9600     0.9650     0.9700     0.9750
             0.9800     0.9850     0.9900     0.9950     1.0000

  Transect Dry_Pond_Outlet
  Area:
             0.0139     0.0281     0.0425     0.0572     0.0721
             0.0872     0.1026     0.1183     0.1342     0.1503
             0.1667     0.1834     0.2003     0.2174     0.2348
             0.2525     0.2704     0.2885     0.3069     0.3255
             0.3444     0.3635     0.3829     0.4025     0.4224
             0.4425     0.4629     0.4835     0.5044     0.5255
             0.5469     0.5685     0.5904     0.6125     0.6348
```

	0.6574	0.6803	0.7034	0.7267	0.7503
	0.7742	0.7983	0.8226	0.8472	0.8721
	0.8972	0.9225	0.9481	0.9739	1.0000
Hrad:					
	0.0266	0.0527	0.0784	0.1035	0.1283
	0.1526	0.1766	0.2001	0.2234	0.2463
	0.2688	0.2911	0.3131	0.3348	0.3562
	0.3774	0.3984	0.4191	0.4396	0.4598
	0.4799	0.4998	0.5195	0.5390	0.5583
	0.5775	0.5965	0.6153	0.6340	0.6526
	0.6710	0.6893	0.7075	0.7255	0.7434
	0.7612	0.7789	0.7965	0.8139	0.8313
	0.8486	0.8657	0.8828	0.8998	0.9167
	0.9335	0.9503	0.9669	0.9835	1.0000
Width:					
	0.5358	0.5453	0.5547	0.5642	0.5737
	0.5832	0.5926	0.6021	0.6116	0.6211
	0.6305	0.6400	0.6495	0.6589	0.6684
	0.6779	0.6874	0.6968	0.7063	0.7158
	0.7253	0.7347	0.7442	0.7537	0.7632
	0.7726	0.7821	0.7916	0.8011	0.8105
	0.8200	0.8295	0.8389	0.8484	0.8579
	0.8674	0.8768	0.8863	0.8958	0.9053
	0.9147	0.9242	0.9337	0.9432	0.9526
	0.9621	0.9716	0.9811	0.9905	1.0000

Transect Half_3.35m_Street_Barrier_Curb

Area:					
	0.0005	0.0020	0.0044	0.0079	0.0123
	0.0177	0.0241	0.0315	0.0399	0.0492
	0.0596	0.0709	0.0832	0.0965	0.1108
	0.1261	0.1423	0.1595	0.1778	0.1970
	0.2172	0.2383	0.2605	0.2836	0.3078
	0.3324	0.3570	0.3816	0.4062	0.4309
	0.4555	0.4801	0.5047	0.5294	0.5540
	0.5786	0.6032	0.6280	0.6536	0.6801
	0.7077	0.7363	0.7658	0.7963	0.8278
	0.8603	0.8937	0.9282	0.9636	1.0000
Hrad:					
	0.0153	0.0306	0.0459	0.0611	0.0764
	0.0917	0.1070	0.1223	0.1376	0.1529
	0.1682	0.1834	0.1987	0.2140	0.2293
	0.2446	0.2599	0.2752	0.2905	0.3057
	0.3210	0.3363	0.3516	0.3669	0.3822
	0.4118	0.4413	0.4706	0.4998	0.5289
	0.5579	0.5867	0.6154	0.6439	0.6723
	0.7006	0.7288	0.7570	0.7842	0.8098
	0.8339	0.8567	0.8781	0.8985	0.9177
	0.9359	0.9531	0.9695	0.9851	1.0000
Width:					
	0.0267	0.0534	0.0801	0.1068	0.1335
	0.1602	0.1869	0.2135	0.2402	0.2669
	0.2936	0.3203	0.3470	0.3737	0.4004
	0.4271	0.4538	0.4805	0.5072	0.5339
	0.5606	0.5873	0.6139	0.6406	0.6673
	0.6673	0.6673	0.6673	0.6673	0.6673
	0.6673	0.6673	0.6673	0.6673	0.6673

0.6673	0.6673	0.6806	0.7073	0.7339
0.7605	0.7871	0.8137	0.8403	0.8669
0.8935	0.9202	0.9468	0.9734	1.0000

Transect Half_3.35m_Street_Mountable

Area:

0.0003	0.0011	0.0026	0.0049	0.0079
0.0116	0.0161	0.0213	0.0272	0.0339
0.0413	0.0495	0.0585	0.0683	0.0789
0.0904	0.1026	0.1156	0.1294	0.1440
0.1595	0.1757	0.1928	0.2106	0.2292
0.2487	0.2690	0.2906	0.3136	0.3381
0.3641	0.3910	0.4187	0.4471	0.4763
0.5061	0.5367	0.5680	0.6000	0.6328
0.6662	0.7004	0.7354	0.7710	0.8074
0.8444	0.8822	0.9208	0.9600	1.0000

Hrad:

0.0104	0.0224	0.0387	0.0553	0.0729
0.0909	0.1094	0.1281	0.1470	0.1660
0.1849	0.2024	0.2202	0.2383	0.2566
0.2751	0.2937	0.3125	0.3313	0.3501
0.3691	0.3881	0.4071	0.4261	0.4452
0.4643	0.4793	0.4889	0.5008	0.5139
0.5289	0.5586	0.5878	0.6165	0.6446
0.6722	0.6990	0.7253	0.7510	0.7761
0.8007	0.8247	0.8482	0.8712	0.8937
0.9158	0.9375	0.9587	0.9795	1.0000

Width:

0.0138	0.0284	0.0467	0.0650	0.0833
0.1016	0.1199	0.1382	0.1565	0.1748
0.1933	0.2132	0.2331	0.2531	0.2730
0.2929	0.3128	0.3328	0.3527	0.3726
0.3925	0.4125	0.4324	0.4523	0.4723
0.4922	0.5174	0.5534	0.5893	0.6253
0.6596	0.6775	0.6954	0.7133	0.7313
0.7492	0.7671	0.7850	0.8029	0.8208
0.8388	0.8567	0.8746	0.8925	0.9104
0.9283	0.9463	0.9642	0.9821	1.0000

Transect Half_3.35m_Street_Parking

Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000

	0.5200	0.5400	0.5600	0.5800	0.6000
	0.6200	0.6400	0.6600	0.6800	0.7000
	0.7200	0.7400	0.7600	0.7800	0.8000
	0.8200	0.8400	0.8600	0.8800	0.9000
	0.9200	0.9400	0.9600	0.9800	1.0000
Width:					
	0.0200	0.0400	0.0600	0.0800	0.1000
	0.1200	0.1400	0.1600	0.1800	0.2000
	0.2200	0.2400	0.2600	0.2800	0.3000
	0.3200	0.3400	0.3600	0.3800	0.4000
	0.4200	0.4400	0.4600	0.4800	0.5000
	0.5200	0.5400	0.5600	0.5800	0.6000
	0.6200	0.6400	0.6600	0.6800	0.7000
	0.7200	0.7400	0.7600	0.7800	0.8000
	0.8200	0.8400	0.8600	0.8800	0.9000
	0.9200	0.9400	0.9600	0.9800	1.0000

Transect Rear_Swale

Area:					
	0.0004	0.0016	0.0036	0.0064	0.0100
	0.0144	0.0196	0.0256	0.0324	0.0400
	0.0484	0.0576	0.0676	0.0784	0.0900
	0.1024	0.1156	0.1296	0.1444	0.1600
	0.1764	0.1936	0.2116	0.2304	0.2500
	0.2704	0.2916	0.3136	0.3364	0.3600
	0.3844	0.4096	0.4356	0.4624	0.4900
	0.5184	0.5476	0.5776	0.6084	0.6400
	0.6724	0.7056	0.7396	0.7744	0.8100
	0.8464	0.8836	0.9216	0.9604	1.0000
Hrad:					
	0.0200	0.0400	0.0600	0.0800	0.1000
	0.1200	0.1400	0.1600	0.1800	0.2000
	0.2200	0.2400	0.2600	0.2800	0.3000
	0.3200	0.3400	0.3600	0.3800	0.4000
	0.4200	0.4400	0.4600	0.4800	0.5000
	0.5200	0.5400	0.5600	0.5800	0.6000
	0.6200	0.6400	0.6600	0.6800	0.7000
	0.7200	0.7400	0.7600	0.7800	0.8000
	0.8200	0.8400	0.8600	0.8800	0.9000
	0.9200	0.9400	0.9600	0.9800	1.0000
Width:					
	0.0200	0.0400	0.0600	0.0800	0.1000
	0.1200	0.1400	0.1600	0.1800	0.2000
	0.2200	0.2400	0.2600	0.2800	0.3000
	0.3200	0.3400	0.3600	0.3800	0.4000
	0.4200	0.4400	0.4600	0.4800	0.5000
	0.5200	0.5400	0.5600	0.5800	0.6000
	0.6200	0.6400	0.6600	0.6800	0.7000
	0.7200	0.7400	0.7600	0.7800	0.8000
	0.8200	0.8400	0.8600	0.8800	0.9000
	0.9200	0.9400	0.9600	0.9800	1.0000

Transect Road-Spill-1

Area:					
	0.0004	0.0016	0.0036	0.0064	0.0100
	0.0144	0.0196	0.0256	0.0324	0.0400
	0.0484	0.0576	0.0676	0.0784	0.0900

	0.1024	0.1156	0.1296	0.1444	0.1600
	0.1764	0.1936	0.2116	0.2304	0.2500
	0.2704	0.2916	0.3136	0.3364	0.3600
	0.3844	0.4096	0.4356	0.4624	0.4900
	0.5184	0.5476	0.5776	0.6084	0.6400
	0.6724	0.7056	0.7396	0.7744	0.8100
	0.8464	0.8836	0.9216	0.9604	1.0000
Hrad:					
	0.0200	0.0400	0.0600	0.0800	0.1000
	0.1200	0.1400	0.1600	0.1800	0.2000
	0.2200	0.2400	0.2600	0.2800	0.3000
	0.3200	0.3400	0.3600	0.3800	0.4000
	0.4200	0.4400	0.4600	0.4800	0.5000
	0.5200	0.5400	0.5600	0.5800	0.6000
	0.6200	0.6400	0.6600	0.6800	0.7000
	0.7200	0.7400	0.7600	0.7800	0.8000
	0.8200	0.8400	0.8600	0.8800	0.9000
	0.9200	0.9400	0.9600	0.9800	1.0000
Width:					
	0.0200	0.0400	0.0600	0.0800	0.1000
	0.1200	0.1400	0.1600	0.1800	0.2000
	0.2200	0.2400	0.2600	0.2800	0.3000
	0.3200	0.3400	0.3600	0.3800	0.4000
	0.4200	0.4400	0.4600	0.4800	0.5000
	0.5200	0.5400	0.5600	0.5800	0.6000
	0.6200	0.6400	0.6600	0.6800	0.7000
	0.7200	0.7400	0.7600	0.7800	0.8000
	0.8200	0.8400	0.8600	0.8800	0.9000
	0.9200	0.9400	0.9600	0.9800	1.0000

Transect Road-Spill-CB3-CB4

Area:					
	0.0004	0.0016	0.0036	0.0064	0.0100
	0.0144	0.0196	0.0256	0.0324	0.0400
	0.0484	0.0576	0.0676	0.0784	0.0900
	0.1024	0.1156	0.1296	0.1444	0.1600
	0.1764	0.1936	0.2116	0.2304	0.2500
	0.2704	0.2916	0.3136	0.3364	0.3600
	0.3844	0.4096	0.4356	0.4624	0.4900
	0.5184	0.5476	0.5776	0.6084	0.6400
	0.6724	0.7056	0.7396	0.7744	0.8100
	0.8464	0.8836	0.9216	0.9604	1.0000
Hrad:					
	0.0200	0.0400	0.0600	0.0800	0.1000
	0.1200	0.1400	0.1600	0.1800	0.2000
	0.2200	0.2400	0.2600	0.2800	0.3000
	0.3200	0.3400	0.3600	0.3800	0.4000
	0.4200	0.4400	0.4600	0.4800	0.5000
	0.5200	0.5400	0.5600	0.5800	0.6000
	0.6200	0.6400	0.6600	0.6800	0.7000
	0.7200	0.7400	0.7600	0.7800	0.8000
	0.8200	0.8400	0.8600	0.8800	0.9000
	0.9200	0.9400	0.9600	0.9800	1.0000
Width:					
	0.0200	0.0400	0.0600	0.0800	0.1000
	0.1200	0.1400	0.1600	0.1800	0.2000
	0.2200	0.2400	0.2600	0.2800	0.3000

0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Transect Spill_CB08-CB07

Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Transect Spill_CB10-CB11

Area:

0.0010	0.0041	0.0092	0.0164	0.0256
0.0368	0.0502	0.0654	0.0813	0.0975
0.1140	0.1308	0.1479	0.1653	0.1831
0.2012	0.2195	0.2382	0.2572	0.2765
0.2961	0.3160	0.3363	0.3568	0.3777
0.3988	0.4203	0.4421	0.4642	0.4866
0.5093	0.5323	0.5557	0.5793	0.6033
0.6276	0.6522	0.6770	0.7023	0.7278
0.7536	0.7797	0.8062	0.8329	0.8600
0.8874	0.9151	0.9431	0.9714	1.0000

Hrad:

0.0145	0.0291	0.0436	0.0582	0.0727

0.0873	0.1018	0.1209	0.1473	0.1732
0.1987	0.2238	0.2484	0.2727	0.2966
0.3202	0.3435	0.3664	0.3891	0.4115
0.4336	0.4555	0.4771	0.4986	0.5197
0.5407	0.5615	0.5821	0.6026	0.6228
0.6429	0.6628	0.6826	0.7022	0.7217
0.7410	0.7602	0.7793	0.7983	0.8171
0.8359	0.8545	0.8730	0.8914	0.9097
0.9280	0.9461	0.9642	0.9821	1.0000

Width:

0.0711	0.1423	0.2134	0.2845	0.3557
0.4268	0.4979	0.5466	0.5574	0.5682
0.5790	0.5898	0.6006	0.6114	0.6221
0.6329	0.6437	0.6545	0.6653	0.6761
0.6869	0.6977	0.7085	0.7193	0.7301
0.7409	0.7517	0.7625	0.7733	0.7841
0.7949	0.8057	0.8165	0.8273	0.8381
0.8489	0.8597	0.8705	0.8812	0.8920
0.9028	0.9136	0.9244	0.9352	0.9460
0.9568	0.9676	0.9784	0.9892	1.0000

Transect Spill_CB6-CB7

Area:

0.0007	0.0028	0.0062	0.0111	0.0174
0.0250	0.0340	0.0444	0.0562	0.0693
0.0829	0.0971	0.1117	0.1268	0.1425
0.1586	0.1752	0.1923	0.2099	0.2280
0.2466	0.2656	0.2852	0.3053	0.3258
0.3469	0.3684	0.3904	0.4130	0.4360
0.4595	0.4835	0.5080	0.5330	0.5585
0.5845	0.6109	0.6379	0.6654	0.6933
0.7218	0.7507	0.7801	0.8101	0.8405
0.8714	0.9028	0.9347	0.9671	1.0000

Hrad:

0.0167	0.0334	0.0501	0.0668	0.0835
0.1002	0.1169	0.1336	0.1503	0.1726
0.1992	0.2251	0.2503	0.2750	0.2992
0.3229	0.3461	0.3690	0.3915	0.4137
0.4356	0.4572	0.4786	0.4997	0.5206
0.5413	0.5618	0.5821	0.6022	0.6222
0.6421	0.6618	0.6814	0.7008	0.7202
0.7394	0.7585	0.7776	0.7965	0.8153
0.8341	0.8528	0.8714	0.8900	0.9085
0.9269	0.9453	0.9636	0.9818	1.0000

Width:

0.0419	0.0838	0.1257	0.1676	0.2095
0.2514	0.2933	0.3352	0.3771	0.4044
0.4193	0.4342	0.4491	0.4640	0.4789
0.4938	0.5087	0.5236	0.5384	0.5533
0.5682	0.5831	0.5980	0.6129	0.6278
0.6427	0.6576	0.6724	0.6873	0.7022
0.7171	0.7320	0.7469	0.7618	0.7767
0.7916	0.8064	0.8213	0.8362	0.8511
0.8660	0.8809	0.8958	0.9107	0.9256
0.9404	0.9553	0.9702	0.9851	1.0000

Transect Spill_in_Hydro_Corridor

```
Area:
            0.0200      0.0400      0.0600      0.0800      0.1000
            0.1200      0.1400      0.1600      0.1800      0.2000
            0.2200      0.2400      0.2600      0.2800      0.3000
            0.3200      0.3400      0.3600      0.3800      0.4000
            0.4200      0.4400      0.4600      0.4800      0.5000
            0.5200      0.5400      0.5600      0.5800      0.6000
            0.6200      0.6400      0.6600      0.6800      0.7000
            0.7200      0.7400      0.7600      0.7800      0.8000
            0.8200      0.8400      0.8600      0.8800      0.9000
            0.9200      0.9400      0.9600      0.9800      1.0000
Hrad:
            0.0212      0.0423      0.0634      0.0844      0.1054
            0.1263      0.1472      0.1680      0.1888      0.2095
            0.2302      0.2508      0.2714      0.2919      0.3124
            0.3328      0.3532      0.3735      0.3938      0.4141
            0.4343      0.4544      0.4745      0.4946      0.5146
            0.5345      0.5544      0.5743      0.5941      0.6139
            0.6336      0.6533      0.6730      0.6925      0.7121
            0.7316      0.7511      0.7705      0.7898      0.8092
            0.8284      0.8477      0.8669      0.8860      0.9051
            0.9242      0.9432      0.9622      0.9811      1.0000
Width:
            1.0000      1.0000      1.0000      1.0000      1.0000
            1.0000      1.0000      1.0000      1.0000      1.0000
            1.0000      1.0000      1.0000      1.0000      1.0000
            1.0000      1.0000      1.0000      1.0000      1.0000
            1.0000      1.0000      1.0000      1.0000      1.0000
            1.0000      1.0000      1.0000      1.0000      1.0000
            1.0000      1.0000      1.0000      1.0000      1.0000
            1.0000      1.0000      1.0000      1.0000      1.0000
            1.0000      1.0000      1.0000      1.0000      1.0000
            1.0000      1.0000      1.0000      1.0000      1.0000


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Starting Date ............ 09/01/2018 00:00:00
Ending Date .............. 09/01/2018 09:00:00
```

```
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.086        71.584
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.019        15.739
Surface Runoff ...........         0.066        55.099
Final Storage ............         0.001         0.793
Continuity Error (%) .....        -0.066


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.066         0.662
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.023         0.233
External Outflow .........         0.085         0.854
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.001
Final Stored Volume ......         0.004         0.040
Continuity Error (%) .....         0.200


***************************
Time-Step Critical Elements
***************************
None


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.00 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
```

Percent in Steady State : 0.00
Average Iterations per Step : 2.00
Percent Not Converging : 0.01

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
A01	71.58	0.00	0.00	2.48	68.05	0.18	126.79	0.951
A02	71.58	0.00	0.00	4.99	65.61	0.24	176.49	0.917
A03	71.58	0.00	0.00	0.00	70.43	0.13	89.29	0.984
A04	71.58	0.00	0.00	33.82	37.51	0.05	37.60	0.524
A05	71.58	0.00	0.00	48.45	23.08	0.01	5.57	0.322
U01	71.58	0.00	0.00	39.28	32.12	0.01	7.62	0.449
U02	71.58	0.00	0.00	46.49	25.05	0.02	11.55	0.350
U03	71.58	0.00	0.00	44.62	26.92	0.02	11.63	0.376

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Meters
200	JUNCTION	0.01	0.01	100.97	0	00:26	0.01
201	JUNCTION	0.03	0.03	100.49	0	00:44	0.03
202	JUNCTION	0.14	0.34	99.06	0	01:26	0.34
203	JUNCTION	0.09	0.20	98.70	0	01:26	0.20
205	JUNCTION	0.03	0.03	101.18	0	00:43	0.03
206	JUNCTION	0.09	0.26	99.25	0	01:25	0.26
206A	JUNCTION	0.06	0.19	100.91	0	01:24	0.19
208	JUNCTION	0.07	0.16	98.55	0	01:26	0.16
209	JUNCTION	0.57	2.32	99.97	0	00:00	0.60
211	JUNCTION	0.02	0.02	99.52	0	02:20	0.02
CBMH04	JUNCTION	0.03	0.54	101.99	0	01:10	0.52
CBMH05	JUNCTION	0.08	0.67	101.76	0	01:11	0.66

CBMH08	JUNCTION	0.06	0.50	101.66	0	01:24	0.50
STMH07	JUNCTION	0.13	0.80	101.66	0	01:24	0.80
210_Outfall_Goward_Storm	OUTFALL	0.86	0.86	98.22	0	00:00	0.86
Outfall_Second_Line	OUTFALL	0.00	0.00	102.76	0	00:00	0.00
CB01	STORAGE	0.16	1.40	101.20	0	01:17	1.40
CB02	STORAGE	1.16	1.40	102.49	0	01:10	1.39
CB03	STORAGE	1.85	2.01	103.46	0	01:10	2.01
CB06	STORAGE	1.08	1.22	102.72	0	01:10	1.22
CB08	STORAGE	1.24	1.38	102.54	0	01:10	1.38
CB10	STORAGE	0.90	1.04	102.44	0	01:10	1.04
CB13	STORAGE	1.25	1.41	101.11	0	01:15	1.41
MC-3500	STORAGE	0.17	0.89	101.65	0	01:24	0.89
Outfall_Hydro_Corridor	STORAGE	0.01	0.01	100.81	0	08:50	0.01

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
200	JUNCTION	0.45	0.45	0	00:00	0.0146	0.0146	0.262
201	JUNCTION	0.45	2.70	0	00:43	0.0146	0.0872	0.307
202	JUNCTION	2.70	93.34	0	01:25	0.0875	0.829	0.054
203	JUNCTION	0.00	93.32	0	01:26	0	0.829	0.018
205	JUNCTION	1.80	1.80	0	00:00	0.0583	0.0583	0.402
206	JUNCTION	0.90	87.94	0	01:24	0.0292	0.655	0.037
206A	JUNCTION	0.00	86.14	0	01:24	0	0.597	0.000
208	JUNCTION	0.00	97.16	0	01:26	0	0.846	0.039
209	JUNCTION	0.00	277.70	0	00:00	0	0.851	0.586
211	JUNCTION	0.90	0.90	0	00:00	0.0292	0.0292	0.214
CBMH04	JUNCTION	0.00	126.62	0	01:10	0	0.174	0.421
CBMH05	JUNCTION	0.00	285.60	0	01:09	0	0.411	0.387
CBMH08	JUNCTION	0.00	93.85	0	01:10	0	0.14	0.005

```
  STMH07              JUNCTION      0.00   368.98     0  01:08           0
0.566      -0.428
  210_Outfall_Goward_Storm OUTFALL       0.00   277.70     0  00:00           0
0.851      0.000
  Outfall_Second_Line  OUTFALL       7.62     7.62     0  01:10      0.0129
0.0129      0.000
  CB01                STORAGE      11.55    11.55     0  01:10      0.0242
0.0242      -0.587
  CB02                STORAGE     176.49   176.49     0  01:10        0.24
0.24      -0.000
  CB03                STORAGE     126.79   126.79     0  01:10       0.176
0.176      0.000
  CB06                STORAGE      37.60    37.60     0  01:10      0.0474
0.0474      -0.000
  CB08                STORAGE      89.29    89.29     0  01:10       0.129
0.129      0.000
  CB10                STORAGE       5.57     5.57     0  01:10      0.0141
0.0141       0.002
  CB13                STORAGE      11.63    11.63     0  01:10      0.0189
0.0189       7.047
  MC-3500             STORAGE       0.00   395.99     0  01:08           0
0.614      -0.013
  Outfall_Hydro_Corridor STORAGE       0.00    14.33     0  01:16           0
0.0245       6.705


  **********************
  Node Surcharge Summary
  **********************

  Surcharging occurs when water rises above the top of the highest conduit.
  ---------------------------------------------------------------------
                                               Max. Height   Min. Depth
                                   Hours       Above Crown    Below Rim
  Node                Type      Surcharged        Meters       Meters
  ---------------------------------------------------------------------
  209                 JUNCTION        8.99         1.807        1.333
  STMH07              JUNCTION        0.81         0.195        0.925


  *********************
  Node Flooding Summary
  *********************

  No nodes were flooded.


  **********************
  Storage Volume Summary
  **********************

  --------------------------------------------------------------------------------
-----------------
                        Average     Avg  Evap Exfil       Maximum     Max    Time
of Max    Maximum
                         Volume    Pcnt  Pcnt  Pcnt        Volume    Pcnt
Occurrence    Outflow
  Storage Unit          1000 m3    Full  Loss  Loss       1000 m3    Full    days
hr:min        LPS
```

CB01	0.000	12	0	0	0.001	100	0	01:09	9.26
CB02	0.002	6	0	0	0.011	40	0	01:10	166.25
CB03	0.002	25	0	0	0.005	50	0	01:10	126.62
CB06	0.001	23	0	0	0.002	42	0	01:10	36.52
CB08	0.002	11	0	0	0.005	35	0	01:10	88.81
CB10	0.001	18	0	0	0.002	25	0	01:10	5.16
CB13	0.000	37	0	0	0.000	43	0	01:15	8.91
MC-3500	0.051	10	0	0	0.293	58	0	01:24	96.96
Outfall_Hydro_Corridor	0.019	3	0	0	0.023	3	0	08:50	0.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
210_Outfall_Goward_Storm	100.00	26.27	277.70	0.851
Outfall_Second_Line	32.16	1.24	7.62	0.013
System	66.08	27.51	277.70	0.864

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C01	CONDUIT	0.45	0	00:26	0.44	0.01	0.05
C02	CONDUIT	2.71	0	00:56	0.82	0.03	0.51
C03	CONDUIT	93.32	0	01:26	1.04	0.92	0.76
C04	CONDUIT	93.32	0	01:26	1.45	0.34	0.42
C06	CONDUIT	1.80	0	00:43	0.55	0.03	0.12
C07	CONDUIT	0.90	0	01:10	0.49	0.01	0.14
C09	CONDUIT	97.16	0	01:26	0.85	0.26	0.68
C10	CONDUIT	277.70	0	00:00	2.03	1.53	1.00
C13	CONDUIT	91.34	0	01:08	1.15	0.37	1.00
C15	CONDUIT	86.14	0	01:24	1.84	0.72	0.63
C16	CONDUIT	363.79	0	01:08	1.98	0.47	1.00
C51	CONDUIT	8.91	0	01:16	0.30	0.01	0.04

C52	CONDUIT	5.43	0	01:17	0.22	0.00	0.03
C7	CONDUIT	87.94	0	01:25	1.19	0.85	0.63
C8	CONDUIT	121.61	0	01:09	1.18	0.95	1.00
C9	CONDUIT	278.78	0	01:08	1.82	1.24	1.00
C17	ORIFICE	86.14	0	01:24			1.00
CB01-ICD	DUMMY	3.84	0	01:17			
CB02-ICD	DUMMY	166.25	0	01:10			
CB03-ICD	DUMMY	126.62	0	01:10			
CB06-ICD	DUMMY	36.52	0	01:10			
CB08-ICD	DUMMY	88.81	0	01:10			
CB10-CID	DUMMY	5.16	0	01:10			

****
Flow Classification Summary
****

	Adjusted	---------- Fraction of Time in Flow Class ----------								
Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C01	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C02	1.00	0.00	0.00	0.00	0.26	0.02	0.00	0.72	0.28	0.00
C03	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C04	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C06	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C07	1.00	0.00	0.00	0.00	0.09	0.01	0.00	0.90	0.10	0.00
C09	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00
C10	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C13	1.00	0.05	0.01	0.00	0.26	0.03	0.00	0.65	0.12	0.00
C15	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.96	0.00	0.00
C16	1.00	0.04	0.00	0.00	0.88	0.07	0.00	0.00	0.60	0.00
C51	1.00	0.12	0.28	0.00	0.57	0.03	0.00	0.00	0.81	0.00
C52	1.00	0.92	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.05	0.00	0.00	0.18	0.00	0.00	0.77	0.09	0.00
C9	1.00	0.04	0.00	0.00	0.25	0.00	0.00	0.71	0.07	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C09	0.01	0.01	8.99	0.01	0.01
C10	8.99	8.99	9.00	0.01	0.01
C13	0.62	0.62	1.27	0.01	0.01
C16	0.81	0.81	1.05	0.01	0.01
C8	0.06	0.06	0.75	0.01	0.01
C9	0.66	0.70	1.08	0.14	0.05

Analysis begun on: Tue Oct 31 12:44:05 2023
Analysis ended on: Tue Oct 31 12:44:06 2023
Total elapsed time: 00:00:01

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

OFFSITE CULVERT ANALYSIS (free outfall)
By J Fitzpatrick
Sept 17, 2020

WARNING 02: maximum depth increased for Node J7

****
Element Count
****

Number of rain gages 3
Number of subcatchments ... 8
Number of nodes 11
Number of links 9
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Chicago_3h_100yr	Chicago_3h_100yr	INTENSITY	10 min.
Chicago_3h_2yr	Chicago_3h_2yr	INTENSITY	10 min.
Chicago_3h_5yr	Chicago_3h_5yr	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S01	0.03	31.80	70.70	4.0000	Chicago_3h_100yr	J3
S02	1.15	104.60	61.30	3.0000	Chicago_3h_100yr	210_Outfall_Goward_
S16	0.01	24.90	45.10	4.0000	Chicago_3h_100yr	J1
S17	0.01	17.80	41.00	4.0000	Chicago_3h_100yr	J5
S20	0.94	85.20	43.70	1.0000	Chicago_3h_100yr	IN58746
S21	0.03	42.46	64.50	33.0000	Chicago_3h_100yr	J5
S22	0.05	42.46	68.00	33.0000	Chicago_3h_100yr	J3
S23	0.12	42.46	53.60	33.0000	Chicago_3h_100yr	J1

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	101.32	0.88	0.0	
J2	JUNCTION	102.37	0.98	0.0	
J3	JUNCTION	102.53	0.82	0.0	
J4	JUNCTION	102.89	1.12	0.0	
J5	JUNCTION	103.05	0.96	0.0	
J6	JUNCTION	103.94	0.30	0.0	
J7	JUNCTION	101.92	0.80	0.0	
210_Outfall_Goward_Storm	OUTFALL	97.50	0.00	0.0	
Outfall_Second_Line	OUTFALL	101.10	0.40	0.0	
Outfall_Whernside	OUTFALL	100.56	0.00	0.0	
IN58746	STORAGE	101.38	2.92	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J5	J4	CONDUIT	16.0	0.9987	0.0250
C2	J3	J2	CONDUIT	15.3	1.0462	0.0250
C3	J1	Outfall_Second_Line	CONDUIT	27.5	0.7992	0.0250
D1_1	J2	J7	CONDUIT	20.8	2.1760	0.0500
D1_2	J7	J1	CONDUIT	27.5	2.1726	0.0500
D2	J4	J3	CONDUIT	22.9	1.5693	0.0500
D3	J6	J5	CONDUIT	18.4	4.8535	0.0500
C6	IN58746	Outfall_Whernside	ORIFICE			
DITCH_OVERFLOW	IN58746	J6	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.50	0.20	0.12	0.50	1	196.24
C2	CIRCULAR	0.50	0.20	0.12	0.50	1	200.84
C3	CIRCULAR	0.40	0.13	0.10	0.40	1	96.82
D1_1	TRIANGULAR	0.80	1.60	0.37	4.00	1	2439.08
D1_2	TRIANGULAR	0.80	1.60	0.37	4.00	1	2437.18
D2	TRIANGULAR	0.80	1.60	0.37	4.00	1	2071.33
D3	TRIANGULAR	0.30	0.45	0.15	3.00	1	552.52

****
Transect Summary
****

Transect Dry_pond_inlet

Area:

0.0155	0.0311	0.0470	0.0630	0.0792
0.0956	0.1122	0.1290	0.1459	0.1631
0.1804	0.1979	0.2156	0.2335	0.2515
0.2698	0.2882	0.3068	0.3256	0.3446
0.3638	0.3831	0.4027	0.4224	0.4423
0.4624	0.4827	0.5031	0.5238	0.5446
0.5656	0.5868	0.6082	0.6298	0.6515
0.6735	0.6956	0.7179	0.7404	0.7631
0.7859	0.8090	0.8322	0.8556	0.8792
0.9030	0.9270	0.9511	0.9755	1.0000

Hrad:

0.0255	0.0507	0.0755	0.0999	0.1241
0.1479	0.1714	0.1946	0.2176	0.2402
0.2627	0.2848	0.3067	0.3284	0.3499
0.3711	0.3921	0.4129	0.4336	0.4540
0.4742	0.4943	0.5141	0.5339	0.5534
0.5728	0.5920	0.6111	0.6300	0.6488
0.6675	0.6860	0.7044	0.7226	0.7408
0.7588	0.7767	0.7945	0.8121	0.8297
0.8472	0.8645	0.8818	0.8989	0.9160
0.9330	0.9499	0.9667	0.9834	1.0000

Width:

0.6325	0.6400	0.6475	0.6550	0.6625
0.6700	0.6775	0.6850	0.6925	0.7000
0.7075	0.7150	0.7225	0.7300	0.7375
0.7450	0.7525	0.7600	0.7675	0.7750
0.7825	0.7900	0.7975	0.8050	0.8125
0.8200	0.8275	0.8350	0.8425	0.8500
0.8575	0.8650	0.8725	0.8800	0.8875
0.8950	0.9025	0.9100	0.9175	0.9250
0.9325	0.9400	0.9475	0.9550	0.9625
0.9700	0.9775	0.9850	0.9925	1.0000

Transect Dry_Pond_Outlet

Area:

0.0139	0.0281	0.0425	0.0572	0.0721
0.0872	0.1026	0.1183	0.1342	0.1503
0.1667	0.1834	0.2003	0.2174	0.2348

0.2525	0.2704	0.2885	0.3069	0.3255
0.3444	0.3635	0.3829	0.4025	0.4224
0.4425	0.4629	0.4835	0.5044	0.5255
0.5469	0.5685	0.5904	0.6125	0.6348
0.6574	0.6803	0.7034	0.7267	0.7503
0.7742	0.7983	0.8226	0.8472	0.8721
0.8972	0.9225	0.9481	0.9739	1.0000

Hrad:

0.0266	0.0527	0.0784	0.1035	0.1283
0.1526	0.1766	0.2001	0.2234	0.2463
0.2688	0.2911	0.3131	0.3348	0.3562
0.3774	0.3984	0.4191	0.4396	0.4598
0.4799	0.4998	0.5195	0.5390	0.5583
0.5775	0.5965	0.6153	0.6340	0.6526
0.6710	0.6893	0.7075	0.7255	0.7434
0.7612	0.7789	0.7965	0.8139	0.8313
0.8486	0.8657	0.8828	0.8998	0.9167
0.9335	0.9503	0.9669	0.9835	1.0000

Width:

0.5358	0.5453	0.5547	0.5642	0.5737
0.5832	0.5926	0.6021	0.6116	0.6211
0.6305	0.6400	0.6495	0.6589	0.6684
0.6779	0.6874	0.6968	0.7063	0.7158
0.7253	0.7347	0.7442	0.7537	0.7632
0.7726	0.7821	0.7916	0.8011	0.8105
0.8200	0.8295	0.8389	0.8484	0.8579
0.8674	0.8768	0.8863	0.8958	0.9053
0.9147	0.9242	0.9337	0.9432	0.9526
0.9621	0.9716	0.9811	0.9905	1.0000

Transect Half_3.35m_Street_Barrier_Curb

Area:

0.0005	0.0020	0.0044	0.0079	0.0123
0.0177	0.0241	0.0315	0.0399	0.0492
0.0596	0.0709	0.0832	0.0965	0.1108
0.1261	0.1423	0.1595	0.1778	0.1970
0.2172	0.2383	0.2605	0.2836	0.3078
0.3324	0.3570	0.3816	0.4062	0.4309
0.4555	0.4801	0.5047	0.5294	0.5540
0.5786	0.6032	0.6280	0.6536	0.6801
0.7077	0.7363	0.7658	0.7963	0.8278
0.8603	0.8937	0.9282	0.9636	1.0000

Hrad:

0.0153	0.0306	0.0459	0.0611	0.0764
0.0917	0.1070	0.1223	0.1376	0.1529
0.1682	0.1834	0.1987	0.2140	0.2293
0.2446	0.2599	0.2752	0.2905	0.3057
0.3210	0.3363	0.3516	0.3669	0.3822
0.4118	0.4413	0.4706	0.4998	0.5289
0.5579	0.5867	0.6154	0.6439	0.6723
0.7006	0.7288	0.7570	0.7842	0.8098
0.8339	0.8567	0.8781	0.8985	0.9177
0.9359	0.9531	0.9695	0.9851	1.0000

Width:

0.0267	0.0534	0.0801	0.1068	0.1335
0.1602	0.1869	0.2135	0.2402	0.2669
0.2936	0.3203	0.3470	0.3737	0.4004
0.4271	0.4538	0.4805	0.5072	0.5339
0.5606	0.5873	0.6139	0.6406	0.6673
0.6673	0.6673	0.6673	0.6673	0.6673
0.6673	0.6673	0.6673	0.6673	0.6673
0.6673	0.6673	0.6806	0.7073	0.7339
0.7605	0.7871	0.8137	0.8403	0.8669
0.8935	0.9202	0.9468	0.9734	1.0000

Transect Half_3.35m_Street_Mountable

Area:

0.0003	0.0011	0.0026	0.0049	0.0079
0.0116	0.0161	0.0213	0.0272	0.0339
0.0413	0.0495	0.0585	0.0683	0.0789
0.0904	0.1026	0.1156	0.1294	0.1440

0.1595	0.1757	0.1928	0.2106	0.2292
0.2487	0.2690	0.2906	0.3136	0.3381
0.3641	0.3910	0.4187	0.4471	0.4763
0.5061	0.5367	0.5680	0.6000	0.6328
0.6662	0.7004	0.7354	0.7710	0.8074
0.8444	0.8822	0.9208	0.9600	1.0000

Hrad:

0.0104	0.0224	0.0387	0.0553	0.0729
0.0909	0.1094	0.1281	0.1470	0.1660
0.1849	0.2024	0.2202	0.2383	0.2566
0.2751	0.2937	0.3125	0.3313	0.3501
0.3691	0.3881	0.4071	0.4261	0.4452
0.4643	0.4793	0.4889	0.5008	0.5139
0.5289	0.5586	0.5878	0.6165	0.6446
0.6722	0.6990	0.7253	0.7510	0.7761
0.8007	0.8247	0.8482	0.8712	0.8937
0.9158	0.9375	0.9587	0.9795	1.0000

Width:

0.0138	0.0284	0.0467	0.0650	0.0833
0.1016	0.1199	0.1382	0.1565	0.1748
0.1933	0.2132	0.2331	0.2531	0.2730
0.2929	0.3128	0.3328	0.3527	0.3726
0.3925	0.4125	0.4324	0.4523	0.4723
0.4922	0.5174	0.5534	0.5893	0.6253
0.6596	0.6775	0.6954	0.7133	0.7313
0.7492	0.7671	0.7850	0.8029	0.8208
0.8388	0.8567	0.8746	0.8925	0.9104
0.9283	0.9463	0.9642	0.9821	1.0000

Transect Half_3.35m_Street_Parking

Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Transect Rear_Swale

Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500

0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Transect Road-Spill-1
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Transect Road-Spill-CB3-CB4
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600

0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Transect Spill_CB08-CB07
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Transect Spill_CB10-CB11
Area:

0.0010	0.0041	0.0092	0.0164	0.0256
0.0368	0.0502	0.0654	0.0813	0.0975
0.1140	0.1308	0.1479	0.1653	0.1831
0.2012	0.2195	0.2382	0.2572	0.2765
0.2961	0.3160	0.3363	0.3568	0.3777
0.3988	0.4203	0.4421	0.4642	0.4866
0.5093	0.5323	0.5557	0.5793	0.6033

```
            0.6276     0.6522     0.6770     0.7023     0.7278
            0.7536     0.7797     0.8062     0.8329     0.8600
            0.8874     0.9151     0.9431     0.9714     1.0000
Hrad:
            0.0145     0.0291     0.0436     0.0582     0.0727
            0.0873     0.1018     0.1209     0.1473     0.1732
            0.1987     0.2238     0.2484     0.2727     0.2966
            0.3202     0.3435     0.3664     0.3891     0.4115
            0.4336     0.4555     0.4771     0.4986     0.5197
            0.5407     0.5615     0.5821     0.6026     0.6228
            0.6429     0.6628     0.6826     0.7022     0.7217
            0.7410     0.7602     0.7793     0.7983     0.8171
            0.8359     0.8545     0.8730     0.8914     0.9097
            0.9280     0.9461     0.9642     0.9821     1.0000
Width:
            0.0711     0.1423     0.2134     0.2845     0.3557
            0.4268     0.4979     0.5466     0.5574     0.5682
            0.5790     0.5898     0.6006     0.6114     0.6221
            0.6329     0.6437     0.6545     0.6653     0.6761
            0.6869     0.6977     0.7085     0.7193     0.7301
            0.7409     0.7517     0.7625     0.7733     0.7841
            0.7949     0.8057     0.8165     0.8273     0.8381
            0.8489     0.8597     0.8705     0.8812     0.8920
            0.9028     0.9136     0.9244     0.9352     0.9460
            0.9568     0.9676     0.9784     0.9892     1.0000

Transect Spill_CB6-CB7
Area:
            0.0007     0.0028     0.0062     0.0111     0.0174
            0.0250     0.0340     0.0444     0.0562     0.0693
            0.0829     0.0971     0.1117     0.1268     0.1425
            0.1586     0.1752     0.1923     0.2099     0.2280
            0.2466     0.2656     0.2852     0.3053     0.3258
            0.3469     0.3684     0.3904     0.4130     0.4360
            0.4595     0.4835     0.5080     0.5330     0.5585
            0.5845     0.6109     0.6379     0.6654     0.6933
            0.7218     0.7507     0.7801     0.8101     0.8405
            0.8714     0.9028     0.9347     0.9671     1.0000
Hrad:
            0.0167     0.0334     0.0501     0.0668     0.0835
            0.1002     0.1169     0.1336     0.1503     0.1726
            0.1992     0.2251     0.2503     0.2750     0.2992
            0.3229     0.3461     0.3690     0.3915     0.4137
            0.4356     0.4572     0.4786     0.4997     0.5206
            0.5413     0.5618     0.5821     0.6022     0.6222
            0.6421     0.6618     0.6814     0.7008     0.7202
            0.7394     0.7585     0.7776     0.7965     0.8153
            0.8341     0.8528     0.8714     0.8900     0.9085
            0.9269     0.9453     0.9636     0.9818     1.0000
Width:
            0.0419     0.0838     0.1257     0.1676     0.2095
            0.2514     0.2933     0.3352     0.3771     0.4044
            0.4193     0.4342     0.4491     0.4640     0.4789
            0.4938     0.5087     0.5236     0.5384     0.5533
            0.5682     0.5831     0.5980     0.6129     0.6278
            0.6427     0.6576     0.6724     0.6873     0.7022
            0.7171     0.7320     0.7469     0.7618     0.7767
            0.7916     0.8064     0.8213     0.8362     0.8511
            0.8660     0.8809     0.8958     0.9107     0.9256
            0.9404     0.9553     0.9702     0.9851     1.0000

Transect Spill_in_Hydro_Corridor
Area:
            0.0200     0.0400     0.0600     0.0800     0.1000
            0.1200     0.1400     0.1600     0.1800     0.2000
            0.2200     0.2400     0.2600     0.2800     0.3000
            0.3200     0.3400     0.3600     0.3800     0.4000
            0.4200     0.4400     0.4600     0.4800     0.5000
            0.5200     0.5400     0.5600     0.5800     0.6000
            0.6200     0.6400     0.6600     0.6800     0.7000
            0.7200     0.7400     0.7600     0.7800     0.8000
            0.8200     0.8400     0.8600     0.8800     0.9000
            0.9200     0.9400     0.9600     0.9800     1.0000
Hrad:
            0.0212     0.0423     0.0634     0.0844     0.1054
            0.1263     0.1472     0.1680     0.1888     0.2095
            0.2302     0.2508     0.2714     0.2919     0.3124
            0.3328     0.3532     0.3735     0.3938     0.4141
            0.4343     0.4544     0.4745     0.4946     0.5146
            0.5345     0.5544     0.5743     0.5941     0.6139
            0.6336     0.6533     0.6730     0.6925     0.7121
            0.7316     0.7511     0.7705     0.7898     0.8092
            0.8284     0.8477     0.8669     0.8860     0.9051
            0.9242     0.9432     0.9622     0.9811     1.0000
Width:
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 09/01/2018 00:00:00
Ending Date .............. 09/01/2018 09:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.167        71.584
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.051        21.869
Surface Runoff ...........         0.115        49.031
Final Storage ............         0.002         0.730
Continuity Error (%) .....        -0.064
```

****
Flow Routing Continuity
****

	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.115	1.146
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.115	1.146
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.030	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
Link C2 (3)
Link C3 (2)
Link D1_1 (2)

****
Routing Time Step Summary
****

Minimum Time Step	:	2.82 sec
Average Time Step	:	4.99 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.03
Percent Not Converging	:	0.02

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm
S01	71.58	0.00	0.00	12.69	49.86	8.33	58.19
S02	71.58	0.00	0.00	17.89	43.19	9.82	53.01
S16	71.58	0.00	0.00	23.72	31.59	15.68	47.28
S17	71.58	0.00	0.00	25.52	28.72	16.81	45.53
S20	71.58	0.00	0.00	27.90	30.62	12.40	43.02
S21	71.58	0.00	0.00	15.31	45.18	10.20	55.38
S22	71.58	0.00	0.00	13.81	47.65	9.17	56.82
S23	71.58	0.00	0.00	20.14	37.58	13.13	50.71

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.04	0.63	101.95	0 01:12	0.63
J2	JUNCTION	0.03	0.29	102.66	0 01:10	0.29
J3	JUNCTION	0.02	0.43	102.96	0 01:10	0.42
J4	JUNCTION	0.02	0.29	103.18	0 01:10	0.29
J5	JUNCTION	0.01	0.39	103.44	0 01:10	0.39
J6	JUNCTION	0.00	0.18	104.12	0 01:10	0.18
J7	JUNCTION	0.03	0.29	102.20	0 01:11	0.28
210_Outfall_Goward_Storm	OUTFALL	0.00	0.00	97.50	0 00:00	0.00
Outfall_Second_Line	OUTFALL	0.02	0.28	101.38	0 01:12	0.28
Outfall_Whernside	OUTFALL	0.00	0.00	100.56	0 00:00	0.00
IN58746	STORAGE	0.76	2.78	104.16	0 01:10	2.78

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	58.28	180.54	0 01:11	0.0637	0.166	0.191
J2	JUNCTION	0.00	158.59	0 01:10	0	0.102	-0.137
J3	JUNCTION	38.94	169.04	0 01:10	0.047	0.102	0.111
J4	JUNCTION	0.00	139.09	0 01:10	0	0.0548	-0.097
J5	JUNCTION	19.48	149.77	0 01:10	0.0222	0.0552	0.776
J6	JUNCTION	0.00	133.31	0 01:10	0	0.0331	-0.050
J7	JUNCTION	0.00	159.77	0 01:11	0	0.102	-0.135
210_Outfall_Goward_Storm	OUTFALL	433.48	433.48	0 01:10	0.61	0.61	0.000
Outfall_Second_Line	OUTFALL	0.00	147.00	0 01:12	0	0.165	0.000
Outfall_Whernside	OUTFALL	0.00	119.16	0 01:10	0	0.37	0.000
IN58746	STORAGE	250.98	250.98	0 01:10	0.403	0.403	-0.040

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate LPS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
IN58746	9.00	0.00	0 00:00	0.000	-0.135

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
IN58746	-0.068	0	0	0	0.000	0	0 00:00	252.47

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
210_Outfall_Goward_Storm	58.57	32.86	433.48	0.610
Outfall_Second_Line	36.16	14.59	147.00	0.165
Outfall_Whernside	52.88	21.87	119.16	0.370
System	49.20	69.33	119.16	1.146

Link Flow Summary

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	139.09	0 01:10	0.97	0.71	0.68
C2	CONDUIT	158.59	0 01:10	1.05	0.79	0.72
C3	CONDUIT	147.00	0 01:12	1.29	1.52	0.85
D1_1	CONDUIT	159.77	0 01:11	0.78	0.07	0.36
D1_2	CONDUIT	155.68	0 01:11	0.35	0.06	0.56
D2	CONDUIT	137.46	0 01:10	0.47	0.07	0.45
D3	CONDUIT	130.77	0 01:10	0.74	0.24	0.79
C6	ORIFICE	119.16	0 01:10			1.00
DITCH_OVERFLOW	WEIR	133.31	0 01:10			0.75

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.03	0.57	0.00	0.40	0.00	0.00	0.00	0.00	0.96
C2	1.00	0.00	0.26	0.00	0.74	0.00	0.00	0.00	0.00	0.98
C3	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.23
D1_1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.87	0.00
D1_2	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.35	0.00
D2	1.00	0.00	0.03	0.00	0.97	0.00	0.00	0.00	0.30	0.00
D3	1.00	0.03	0.09	0.00	0.88	0.00	0.00	0.00	0.88	0.00

Conduit Surcharge Summary

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C3	0.01	0.13	0.01	0.18	0.01
D3	0.01	0.01	0.06	0.01	0.01

Analysis begun on: Fri Sep 25 13:34:43 2020
Analysis ended on: Fri Sep 25 13:34:43 2020
Total elapsed time: < 1 sec

Appendix G – Correspondence

Correspondence from City of Ottawa – Hydraulic Boundary Conditions

Boundary Conditions
1158 Old Second Line

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	51	0.85
Maximum Daily Demand	127	2.11
Peak Hour	279	4.65
Fire Flow Demand #1	7,000	116.67

Location

Results

Connection 1 – Goward Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	150.2	69.3
Peak Hour	140.9	56.1
Max Day plus Fire Flow #1	121.2	28.2

[1] Ground Elevation = 101.4 m

Connection 2 – Whernside Terr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	150.2	68.2
Peak Hour	140.9	55.1
Max Day plus Fire Flow #1	128.9	38.0
[1] Ground Elevation =	102.2	m

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.

COMMUNICATION

To:	Samantha Gatchene I City Development Department City of Ottawa		
Date:	November 06th, 2023		
By:	Email	From:	**Brandon Lawrence**

Project: Old Second Line Development
1158 Old Second Line Rd, Kanata, Ottawa, ON
Project No. SL-1086-22
Subject: Response to SPC Comments No.1

Dear Samantha Gatchene,
In response to your comments dated August 28th, 2023, please find below the additional information for the comments you requested.

SPC Comments: Site Servicing and Stormwater Management Report 158 Old Second Line Road,

87. Include a section in the report discussing the proposed firewalls for the buildings. Provide in the report explanation as to why they're required and confirm that the firewalls will be properly constructed (fire resistance rating not less than 2 hours) and properly protected in accordance with Building Code. Include letter from the architect confirming this in the appendices if necessary. Note that the City will be taking securities for the proposed firewalls at the time of approval. [SJL] The firewalls required by the fire flow calculations provided by EXP will be designed and constructed in accordance with OBC. To achieve the 2-hour required FRR, the firewalls will be constructed per assembly UL U342, or an approved equivalent.

We trust this is satisfactory,
S. J. LAWRENCE ARCHITECT INCORPORATED

Shawn J. Lawrence, OAA, NSAA, MRAIC

ONTARIO ASSOCIATION OF ARCHITECTS
SHAWN JAMES LAWRENCE
LICENCE
4442

Appendix H – Manufacturer Information

Tempest Inlet Control Device

Volume III: TEMPEST™ INLET CONTROL DEVICES

Municipal Technical Manual Series

SECOND EDITION

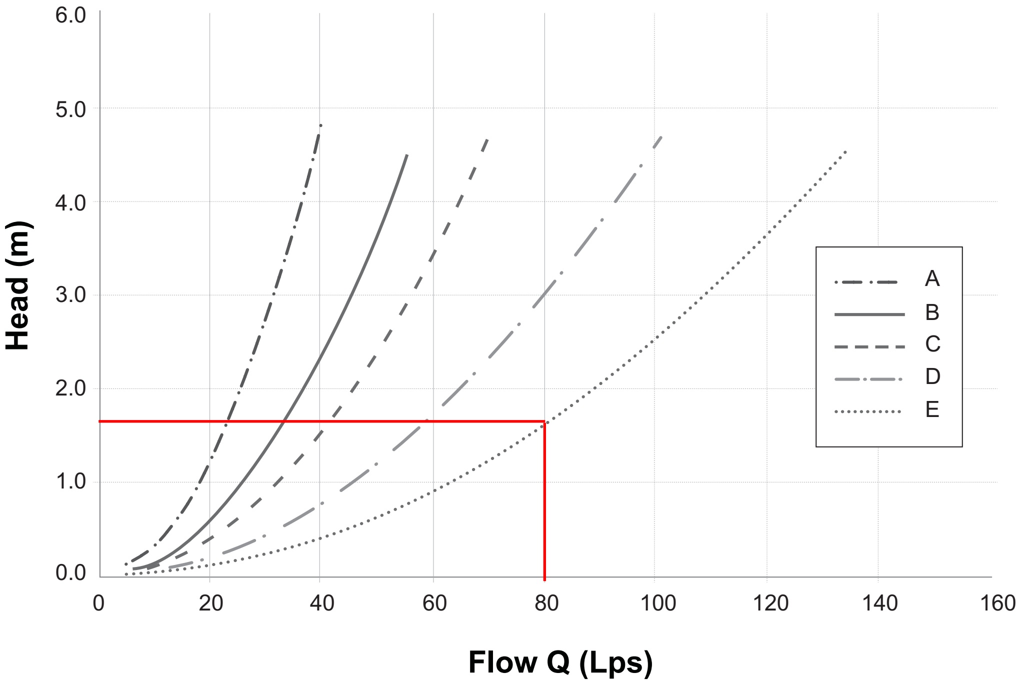
LMF (Low to Medium Flow) ICD

HF (High Flow) ICD

MHF (Medium to High Flow) ICD

IPEX

Chart 3: HF & MHF Preset Flow Curves



Appendix I – Background Information

- **Master Design Sheet (Hydraulic Grade Line Analysis). From Stormwater Management Report, Morgan Grant, Phase 12D (Report R-1591.A). 1 page.**
- **5-year Storm Design Sheet. From Stormwater Management Report, Morgan Grant, Phase 12D (Report R-1591.A). 2 pages.**
- **Stormwater Storage / Overland Balance Table. From Stormwater Management Report, Morgan Grant, Phase 12D (Report R-1591.B). 1 page.**
- **Storm Drainage Plan, Morgan's Grant Phase 12D. From Stormwater Management Report, Morgan Grant, Phase 12D (Report R-1591.B). 1 page.**
- **Storm Drainage Plan, Morgan's Grant Phase 12D. 1 page.**
- **Sanitary Drainage Plan, Morgan's Grant Phase 12D. 1 page.**
- **Morgan's Grant Master Sanitary Flows. From Master Servicing Study for the Morgan's Grant Subdivision (Report R-2287). 9 pages.**
- **Master Drainage Plan (Sanitary). From Master Servicing Study for the Morgan's Grant Subdivision (Report R-2287). 1 page.**
- **Pages 3, 4, 5 from Master Servicing Study for the Morgan's Grant Subdivision (Report R-2287). 3 pages.**
- **ECA for Storm and Sanitary Sewers No: 1005-6J6K7W-14**
- **ECA for SWM Facility. No: 9327-54JRK4-14**
- **Morgan's Grant Phase 12D, Goward Drive – Plan & Profile, Drawing # 17732-15. 1 page.**

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

J.L. Richards
& Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

MORGAN'S GRANT - STAGE 12 - Minto Developments Inc.
(MASTER DESIGN SHEET)
CITY OF OTTAWA
JLR No.: 17732

STORM SEWER DESIGN SHEET AND HYDRAULIC GRADE LINE ANALYSIS

Date: September 3, 2003
Revised : December 17, 2004
Revised : August 24, 2005
Designed by: G.F.
Checked by: L.J.
Updated by: J.B.
Checked by: L.J.

100 YEAR IDF CURVE

Manning's Coefficient (n) = 0.013

Areas with unrestricted flows (ha)

STREET	MH From	MH To	0.2	0.38	0.4	0.45	0.5	0.55	0.6	0.7	0.95	2.78AR
KLONDIKE RD.	667A	667										0.00
KLONDIKE RD.	667	666			0.220		0.240		0.030			0.63
	666	665			0.160		0.160					0.40
PIEKOFF CR.	660	661			0.730							0.81
	661	663			0.530		0.070					0.69
WALLSEND AVE.	655	663			0.120		0.320					0.58
WALLSEND AVE.	663	664										0.00
	664	665			0.350		0.160					0.61
KLONDIKE RD.	665	665A					0.160					0.22
	665A	648										0.00
KLONDIKE RD.	648	647	0.890		0.260		0.160					1.01
WIMBLEDON ST.	548A	548										0.00
	548	547					0.720					1.00
	547	546					0.230					0.32
	546	545					0.530					0.74
	545	647					0.220					0.31
KLONDIKE RD.	647	646			0.610							0.68
	646	645			0.920							1.02
PENRITH ST.	645	694			0.130							0.14
BRECHIN CR.	696	695			0.420							0.47
	695	694			0.340							0.38
PENRITH ST.	694	693			0.190							0.21
	693	692			0.320							0.36
BRECHIN CR.	696	698										0.00
BRECHIN CR.	703	698	1.940		0.460							1.59
EALING ST.	698	697										0.00
	697	692			0.290							0.32
PENRITH ST.	692	691			0.240							0.27
BRECHIN CR.	704	703	0.860		0.300							0.81
HASELMERE AVE.	703	702										0.00
	702	701			0.290							0.32
BRECHIN CR.	705	706			0.320							0.36
PENRITH ST.	707	706			0.680							0.76
PENRITH ST.	706	701			0.520							0.58
PENRITH ST.	701	691			0.210							0.23
HEYSHAM LANE	691	677			0.480							0.53
WOLISTON CR.	677	676			0.750							0.83
	676	675										0.00
	675	674			0.940		0.230					1.36
	674	673			0.750		0.110					0.99
KETTLEWELL WAY	687	688			0.240							0.27
	688	688A			0.260							0.29
	688A	689			0.360							0.40
PALTON ST.	689	673			0.140		0.260					0.52
WOLISTON CR.	673	672			0.430		0.240					0.81
WOLISTON CR.	678	681			0.390							0.43
	681	682										0.00
	682	683			0.500							0.56
KETTLEWELL WAY	687	683			0.190							0.21
WOLISTON CR.	683	684			0.650							0.72
PALTON ST.	689	685			0.090							0.10
	685	684			0.250		0.170					0.51
WOLISTON CR.	684	670			0.360		0.070					0.50
FLAMBOROUGH WAY	670	671					0.620					0.86
	671	672					0.650					0.90
	672	101										0.00
			UNRESTRICTED REAR YARD FLOWS-PHASE 12 (ha)									
12D BLK 248	Hydro Ea.	906										0.00
12D GOWARD DRIVE	908	907			0.202							0.22
	907	906										0.00
12D ISHPATINA CRESCENT	804	801										0.00
	801	906										0.00
12D BLK 246	705	704										0.00
FINLAYSON CRESCENT	705	704										0.00
	704	701										0.00
	701	700			0.180							0.20
	700	906										0.00
12D GOWARD DRIVE	906	905			0.140							0.16
ISHPATINA CRESCENT	804	803	0.391		0.483							0.75
	803	802										0.00
	802	905			0.049							0.05

1:100 YR Peak Flow Generation / Total CB With ICD

MH From	MH To	2.78AR CUMM	Time min	Intens. mm/hr	Peak Flow L/s	ICD Type 'A' @ 20.0 l/s	CUMM @ 20.0 l/s	ICD Flow (l/s)	External Flow (l/s)	CUMM Ext. Flow (l/s)	1:100 yr Capt. Flow (l/s)	Q_d/Q_{cap}
667A	667	14.07	28.92	84.81	1192.95		35	700		212.00	912.00	0.95
667	666	14.70	28.92	84.81	1246.23	2	37	740		212.00	952.00	0.58
666	665	15.10	29.39	83.83	1265.48	1	38	760		212.00	972.00	0.42
660	661	0.81	20.00	110.77	89.92	3	3	60		0.00	60.00	0.40
661	663	1.50	20.83	107.57	161.18	3	6	120		0.00	120.00	0.56
655	663	0.58	20.00	110.77	64.05	1	1	20		0.00	20.00	0.26
663	664	2.08	21.27	105.92	219.97		7	140		0.00	140.00	0.61
664	665	2.69	21.66	104.56	281.08	1	8	160		0.00	160.00	0.69
665	665A	18.01	29.71	83.18	1497.73	1	47	940		212.00	1152.00	0.53
665A	648	18.01	29.92	82.75	1490.00	0	47	940		212.00	1152.00	0.96
648	647	40.25	27.90	87.03	3502.76	4	111	2220		212.00	2432.00	0.95
548A	548	0.00	20.00	110.77	0.00		0	0		0.00	0.00	0.00
548	547	1.00	20.27	109.71	109.80	3	3	60		0.00	60.00	0.52
547	546	1.32	21.18	106.27	140.33		3	60		0.00	60.00	0.52
546	545	2.06	21.33	105.73	217.52	3	6	120		0.00	120.00	0.64
545	647	2.36	22.39	102.08	241.21	1	7	140		0.00	140.00	0.74
647	646	43.29	28.55	85.61	3705.83	3	121	2420		212.00	2632.00	0.96
646	645	44.31	29.25	84.11	3726.91	3	124	2480		212.00	2692.00	0.85
645	694	44.45	29.86	82.87	3684.03	1	110	2200		212.00	2412.00	0.84
696	695	0.47	20.00	110.77	51.73	2	2	40		0.00	40.00	0.40
695	694	0.85	20.59	108.47	91.67	1	3	60		0.00	60.00	0.39
694	693	45.51	30.34	81.93	3728.58	1	114	2280		212.00	2492.00	0.87
693	692	45.87	30.58	81.45	3735.74	1	115	2300		212.00	2512.00	0.87
696	698	0.00	20.00	110.77	0.00		0	0		0.00	0.00	0.00
703	698	1.59	20.00	110.77	176.14	3	3	60		0.00	60.00	0.33
698	697	1.59	20.74	107.88	171.54		3	60		0.00	60.00	0.33
697	692	1.91	21.41	105.44	201.67	1	4	80		0.00	80.00	0.44
692	691	48.05	30.83	80.97	3890.54	1	120	2400		212.00	2612.00	0.87
704	703	0.81	20.00	110.77	89.92	3	3	60		0.00	60.00	0.59
703	702	0.81	20.74	107.89	87.58		3	60		0.00	60.00	0.33
702	701	1.13	21.41	105.42	119.57	1	4	80		0.00	80.00	0.38
705	706	0.36	20.00	110.77	39.41	1	1	20		0.00	20.00	0.15
707	706	0.76	20.00	110.77	83.76	2	2	40		0.00	40.00	0.22
706	701	1.69	20.98	107.01	180.87	3	6	120		0.00	120.00	0.45
701	691	3.06	21.89	103.77	317.33	1	11	220		0.00	220.00	0.52
691	677	51.64	31.04	80.58	4161.03	2	133	2660		212.00	2872.00	0.95
677	676	52.47	31.52	79.68	4180.90	2	135	2700		212.00	2912.00	0.97
676	675	52.47	32.13	78.59	4123.81		135	2700		212.00	2912.00	0.97
675	674	53.84	32.20	78.46	4224.15	4	139	2780		212.00	2992.00	0.76
674	673	54.82	32.76	77.49	4248.18	3	142	2840		212.00	3052.00	0.78
687	688	0.27	20.00	110.77	29.56	1	1	20		0.00	20.00	0.17
688	688A	0.56	20.58	108.49	60.32	1	2	40		0.00	40.00	0.34
688A	689	0.96	20.70	108.06	103.34	1	3	60		0.00	60.00	0.51
689	673	1.47	21.49	105.16	154.95	2	5	100		0.00	100.00	0.81
673	672	57.11	33.17	76.79	4385.43	2	149	2980		212.00	3192.00	0.81
678	681	0.43	20.00	110.77	48.04	2	2	40		0.00	40.00	0.48
681	682	0.43	21.20	106.18	46.05		2	40		0.00	40.00	0.51
682	683	0.99	21.37	105.60	104.51	3	5	100		0.00	100.00	0.84
687	683	0.21	20.00	110.77	23.40	1	1	20		0.00	20.00	0.20
683	684	1.92	22.09	103.08	198.31	4	10	200		0.00	198.31	0.49
689	685	0.10	20.00	110.77	11.09	1	1	20		0.00	11.09	0.08
685	684	0.61	20.74	107.90	66.29	1	2	40		0.00	40.00	0.28
684	670	3.04	22.66	101.20	307.23	3	15	300		0.00	300.00	0.52
670	671	3.90	23.20	99.47	387.70	2	17	340	21.13	21.13	361.13	0.62
671	672	4.80	24.37	96.01	460.94	3	20	400	24.23	45.36	445.36	0.61
672	101	61.91	33.70	75.92	4700.20	1	170	3400		257.36	3657.36	0.94
Hydro Ea.	906	0.00	26.00	91.60	0.00	0	0.00	0	30	30.00	30.00	
908	907	0.22	20.00	110.77	24.88	6	6.00	120	0	0.00	144.88	0.48
907	906	0.22	21.01	106.90	24.01	1	7.00	140	0	0.00	164.01	0.58
			22.51									
804	801	0.00	20.00	110.77	0.00	0	0.00	0	0	0.00	0.00	0.00
801	906	0.00	20.33	109.45	0.00	0	0.00	0	0	0.00	0.00	0.00
			21.47									
705	704	0.00	30.00	82.59	0.00	0	0.00	0	50	50.00	50.00	
705	704	0.00	20.00	110.77	0.00	0	0.00	0	0	0.00	0.00	0.00
704	701	0.00	20.10	110.37	0.00	1	1.00	20	0	50.00	70.00	0.63
701	700	0.20	20.55	108.60	21.74	0	1.00	20	0	50.00	91.74	0.79
700	906	0.20	21.23	106.10	21.24	0	1.00	20	0	50.00	91.24	0.79
			21.43									
906	905	0.58	22.51	101.67	59.02	3	11.00	220	0	80.00	359.02	0.84
			23.28	99.24								
804	803	0.75	20.00	110.77	83.57	1	1.00	20	0	0.00	103.57	1.03
803	802	0.75	21.31	105.81	79.83	0	1.00	20	0	0.00	99.83	1.00
802	905	0.81	21.53	105.00	84.94	0	1.00	20	0	0.00	104.94	1.05

Sewer Data / Upstream / Downstream

MH From	MH To	Dia (mm)	Slope %	Q full (l/s)	V full (m/s)	V partial (m/s)	Depth of flow (m)	V surch (m/s)	Length (m)	Flow Time (min)	U/S Pr. Center Line	U/S Obvert	U/S Obvert Drop	U/S Invert	U/S Cover	D/S Pr. Center Line	D/S Obvert	D/S Obvert Drop	D/S Invert	D/S Cover
667A	667	750	0.68	957.73	2.10	2.41	0.587	2.00	63.00	0.50	103.200	98.758		98.008	4.442	101.950	98.330		97.580	3.620
667	666	750	1.98	1634.25	3.58	3.80	0.411	2.09	100.00	0.47	101.950	98.330		97.580	3.620	99.550	96.350		95.600	3.200
666	665	750	4.00	2322.80	5.09	4.87	0.343	2.13	97.50	0.32	99.550	95.750		95.000	3.800	95.000	91.850		91.100	3.150
660	661	300	2.20	149.60	2.05	1.93	0.134	0.82	101.60	0.83	100.500	97.441		97.141	3.059	98.500	95.207		94.907	3.293
661	663	300	4.50	214.03	2.93	3.06	0.162	1.64	78.80	0.45	98.500	95.207		94.907	3.293	94.900	91.660		91.360	3.240
655	663	300	0.60	78.14	1.07	0.91	0.104	0.27	73.40	1.14	95.250	92.104		91.804	3.146	94.900	91.664		91.364	3.236
663	664	450	0.60	230.39	1.40	1.46	0.256	0.85	32.40	0.38	94.900	91.694		91.244	3.206	94.600	91.500		91.050	3.100
664	665	450	0.60	230.39	1.40	1.50	0.279	0.97	48.30	0.57	94.600	91.500		91.050	3.100	95.000	91.210		90.760	3.790
665	665A	750	3.48	2166.59	4.75	4.93	0.389	2.53	60.70	0.21	95.000	91.252		90.502	3.748	91.800	89.140		88.390	2.660
665A	648	900	0.40	1194.45	1.82	2.09	0.713	1.75	22.50	0.21	91.800	88.690		87.790	3.110	91.800	88.600		87.700	3.200
648	647	1200	0.40	2572.39	2.20	2.51	0.939	2.08	85.00	0.64	91.800	88.606		87.406	3.194	91.400	88.266		87.066	3.134
548A	548	300	0.40	63.80	0.87	0.00	0.000	0.00	14.00	0.27	91.673	88.908		88.608	2.765	91.500	88.852		88.552	2.648
548	547	375	0.40	115.68	1.01	1.03	0.194	0.53	55.50	0.91	91.500	88.852		88.477	2.648	91.400	88.630		88.255	2.770
547	546	375	0.40	115.68	1.01	1.03	0.194	0.53	9.00	0.15	91.400	88.590		88.215	2.810	91.430	88.554		88.179	2.876
546	545	450	0.40	188.11	1.15	1.22	0.261	0.73	73.00	1.06	91.430	88.554		88.104	2.876	91.470	88.262		87.812	3.208
545	647	450	0.40	188.11	1.15	1.24	0.293	0.85	42.00	0.61	91.470	88.222		87.772	3.248	91.400	88.054		87.604	3.346
647	646	1200	0.45	2728.43	2.34	2.68	0.951	2.25	99.00	0.71	91.600	88.266		87.066	3.334	91.650	87.821		86.621	3.830
646	645	1200	0.60	3150.52	2.70	3.02	0.866	2.31	98.00	0.61	91.650	87.820		86.620	3.830	90.400	87.232		86.032	3.168
645	694	1200	0.50	2869.68	2.46	2.75	0.853	2.07	70.30	0.48	90.400	87.170		85.970	3.230	92.000	86.820		85.620	5.180
696	695	300	1.00	100.88	1.38	1.33	0.131	0.55	48.70	0.59	92.850	89.936		89.636	2.914	92.505	89.449		89.149	3.056
695	694	375	0.70	153.03	1.34	1.28	0.164	0.53	87.60	1.09	92.505	89.449		89.074	3.056	92.000	88.830		88.461	3.164
694	693	1200	0.50	2876.02	2.46	2.80	0.866	2.13	36.50	0.25	92.000	86.820		85.620	5.180	91.700	86.638		85.438	5.063
693	692	1200	0.50	2876.02	2.46	2.78	0.878	2.15	36.50	0.25	91.700	86.638		85.438	5.063	92.000	86.455		85.255	5.545
696	698	300	1.00	100.88	1.38	0.00	0.000	0.00	33.80	0.41	92.850	89.936		89.636	2.914	93.100	89.598		89.298	3.502
703	698	375	1.00	182.91	1.61	1.45	0.149	0.53	71.70	0.74	93.100	90.245		89.870	2.855	93.100	89.525		89.150	3.575
698	697	375	1.00	182.91	1.60	1.45	0.149	0.53	64.00	0.66	93.100	89.461		89.086	3.639	92.350	88.821		88.446	3.529
697	692	375	1.00	182.91	1.60	1.56	0.175	0.70	53.90	0.56	92.350	88.821		88.446	3.529	92.000	88.282		87.907	3.718
692	691	1200	0.55	3016.39	2.58	2.93	0.866	2.24	32.30	0.21	92.000	86.455		85.255	5.545	91.200	86.277		85.077	4.923
704	703	300	1.00	100.88	1.38	1.45	0.168	0.82	61.50	0.74	93.000	90.039		89.739	2.961	93.100	89.424		89.124	3.676
703	702	375	1.00	182.91	1.60	1.45	0.149	0.53	64.70	0.67	93.100	89.424		89.049	3.676	92.000	88.777		88.402	3.223
702	701	375	1.36	213.31	1.87	1.75	0.160	0.70	53.00	0.47	92.000	88.775		88.400	3.225	91.440	88.054		87.679	3.386
705	706	300	1.84	136.84	1.88	1.41	0.076	0.27	109.80	0.98	92.880	89.720		89.420	3.160	90.800	87.700		87.400	3.100
707	706	375	1.00	182.91	1.60	1.34	0.118	0.35	32.20	0.33	90.500	87.912		87.537	2.588	90.800	87.590		87.215	3.210
706	701	450	0.80	266.03	1.62	1.58	0.215	0.73	69.50	0.71	90.800	87.590		87.140	3.210	91.440	87.034		86.584	4.406
701	691	450	2.00	420.63	2.56	2.61	0.233	1.34	39.20	0.25	91.440	87.034		86.584	4.406	91.200	86.250		85.800	4.950
691	677	1200	0.55	3016.39	2.58	2.96	0.939	2.46	75.40	0.49	91.300	86.234		85.034	5.066	91.300	85.819		84.619	5.481
677	676	1200	0.55	3016.39	2.58	2.97	0.951	2.49	93.70	0.60	91.300	85.759		84.559	5.541	90.160	85.244		84.044	4.916
676	675	1200	0.55	3016.39	2.58	2.97	0.951	2.49	11.30	0.07	90.160	85.214		84.014	4.946	90.150	85.152		83.952	4.998
675	674	1350	0.50	3937.30	2.66	2.89	0.892	2.02	89.60	0.56	90.150	85.152		83.802	4.998	89.190	84.704		83.354	4.486
674	673	1350	0.50	3937.30	2.66	2.91	0.905	2.07	65.80	0.41	89.190	84.704		83.354	4.486	88.400	84.375		83.025	4.025
687	688	300	1.40	119.32	1.64	1.25	0.082	0.27	57.20	0.58	90.940	87.878		87.578	3.062	90.600	87.078		86.778	3.522
688	688A	300	1.40	119.37	1.64	1.51	0.119	0.55	11.00	0.11	90.600	87.027		86.727	3.573	90.000	86.873		86.573	3.127
688A	689	300	1.38	118.47	1.62	1.64	0.152	0.82	77.10	0.79	90.000	86.823		86.523	3.177	88.900	85.760		85.460	3.140
689	673	300	1.50	123.47	1.69	1.88	0.207	1.37	78.50	0.77	88.900	85.422		85.122	3.478	88.400	84.246		83.946	4.154
673	672	1350	0.50	3937.30	2.66	2.96	0.933	2.16	84.20	0.53	88.400	84.375		83.025	4.025	87.200	83.954		82.604	3.246
678	681	300	0.68	82.88	1.14	1.15	0.146	0.55	81.90	1.20	91.228	88.795		88.495	2.433	91.920	88.242		87.942	3.678
681	682	300	0.60	78.14	1.07	1.10	0.152	0.55	10.50	0.16	91.920	88.192		87.892	3.728	91.790	88.129		87.829	3.661
682	683	300	1.39	119.07	1.63	1.83	0.213	1.37	70.70	0.72	91.790	88.079		87.779	3.711	90.750	87.094		86.794	3.656
687	683	300	1.02	101.99	1.40	1.10	0.091	0.27	55.00	0.66	90.940	87.646		87.346	3.294	90.750	87.084		86.784	3.666
683	684	450	1.88	408.04	2.49	2.48	0.224	1.21	84.90	0.57	90.750	87.094		86.644	3.656	88.680	85.496		85.046	3.184
689	685	375	0.60	141.68	1.24	0.81	0.069	0.10	55.00	0.74	88.900	86.185		85.810	2.715	88.810	85.855		85.480	2.955
685	684	375	0.60	141.68	1.24	1.08	0.137	0.35	64.80	0.87	88.810	85.855		85.480	2.955	88.680	85.466		85.091	3.214
684	670	525	1.64	574.56	2.57	2.62	0.272	1.34	84.20	0.55	88.680	85.496		84.971	3.184	87.200	84.115		83.590	3.085
670	671	750	0.25	580.71	1.27	1.32	0.434	0.79	89.00	1.16	87.200	84.160		83.410	3.040	87.130	83.938		83.188	3.193
671	672	900	0.15	732.66	1.12	1.16	0.512	0.68	109.00	1.63	87.130	83.968		83.068	3.162	87.200	83.804		82.904	3.396
672	101	1350	0.49	3897.72	2.64	3.02	1.042	2.48	79.20	0.50	87.200	83.884		82.534	3.316	87.100	83.496		82.146	3.604
Hydro Ea.	906																			
908	907	450	1.05	304.78	1.86	1.86	0.219	0.88	112.00	1.01	102.20	99.400		98.943	2.80	101.34	98.224		97.767	3.12
907	906	525	0.40	283.76	1.27	1.33	0.288	0.73	114.87	1.51	101.34	98.197	0.03	97.664	3.14	100.70	97.738		97.204	2.96
804	801	300	0.40	63.80	0.87	0.00	0.000	0.00	17.43	0.33	100.96	98.060		97.755	2.90	100.96	97.990		97.685	2.97
801	906	300	0.40	63.80	0.87	0.00	0.000	0.00	59.50	1.13	100.96	97.950	0.04	97.645	3.01	100.70	97.712		97.407	2.99
705	704																			
705	704	300	1.20	110.51	1.51	0.00	0.000	0.00	8.98	0.10	101.47	98.670		98.365	2.80	101.33	98.562		98.257	2.77
704	701	300	1.20	110.51	1.51	1.60	0.174	0.96	41.34	0.45	101.33	98.522	0.04	98.217	2.81	100.77	98.026		97.721	2.74
701	700	375	0.40	115.68	1.01	1.12	0.255	0.80	40.92	0.67	100.77	98.026		97.645	2.74	100.62	97.862		97.481	2.76
700	906	375	0.40	115.68	1.01	1.13	0.251	0.80	12.73	0.21	100.62	97.712	0.15	97.331	2.91	100.70	97.662		97.281	3.04
906	905	600	0.45	429.70	1.47	1.66	0.421	1.23	67.57	0.76	100.70	97.662		97.052	3.04	100.66	97.357		96.748	3.30
804	803	375	0.30	100.18	0.88	1.00	0.324	0.91	68.89	1.31	100.96	98.160		97.779	2.80	100.87	97.953		97.572	2.92
803	802	375	0.30	100.18	0.88	1.01	0.309	0.88	11.88	0.23	100.87	97.913	0.04	97.532	2.96	100.86	97.878		97.497	2.98
802	905	375	0.30	100.18	0.88	1.00	0.331	0.92	67.47	1.28	100.86	97.838	0.04	97.457	3.02	100.66	97.635		97.254	3.02

Head Loss Calculation / 1:100 YR HGL / Cover

MH From	MH To	f	L / D	K FRICT	$V^2/2g$ (m)	Straight	Expansion	Bend	Major Loss (m)	Minor Loss (m)	Total Losses (m)	Applied Losses (m)	HGL Elev. Upstr.	HGL Elev. Downs.	Cover Top Foot-HGL Upstr.	Cover Top Foot-HGL Downs.	Cover-HGL Centerline Upstr.	Cover-HGL Centerline Downs.
667A	667	0.023	82.677	1.905	0.296	0.044			0.564	0.044	0.608	0.000	98.758	98.330	1.742	0.920	4.442	3.620
667	666	0.023	131.234	3.024	0.734	0.110			2.221	0.110	2.331	0.000	98.330	96.350	0.920	0.500	3.620	3.200
666	665	0.023	127.953	2.948	1.210	0.182			3.568	0.182	3.749	0.000	95.750	91.850	1.100	0.450	3.800	3.150
660	661	0.031	333.333	10.425	0.034	0.005			0.359	0.005	0.365	0.365	97.441	95.207	0.359	0.593	3.059	3.293
661	663	0.031	258.530	8.085	0.138		0.138	0.141	1.115	0.279	1.394	1.394	95.207	91.694	0.593	0.506	3.293	3.206
655	663	0.031	240.814	7.531	0.004	0.001	0.004		0.029	0.004	0.033	0.033	92.104	91.694	0.446	0.506	3.146	3.206
663	664	0.027	70.866	1.936	0.037	0.006			0.072	0.006	0.077	0.077	91.694	91.500	0.506	0.400	3.206	3.100
664	665	0.027	105.643	2.886	0.048		0.048	0.049	0.140	0.098	0.238	0.238	91.500	91.252	0.400	1.048	3.100	3.748
665	665A	0.023	79.659	1.836	1.239	0.186	1.239		2.274	1.424	3.698	0.000	91.252	89.140	1.048	-0.040	3.748	2.660
665A	648	0.022	24.606	0.534	0.222	0.033	0.222		0.119	0.256	0.374	0.000	88.690	88.600	0.410	0.500	3.110	3.200
648	647	0.020	69.718	1.374	0.321	0.048			0.441	0.048	0.489	0.000	88.606	88.266	0.494	0.434	3.194	3.134
548A	548	0.031	45.932	1.437	0.000				0.000	0.000	0.000	0.000	88.908	88.852	0.065	-0.052	2.765	2.648
548	547	0.029	145.609	4.229	0.054			0.004	0.227	0.004	0.232	0.000	88.852	88.630	-0.052	0.070	2.648	2.770
547	546	0.029	23.622	0.686	0.054		0.054	0.004	0.037	0.058	0.095	0.000	88.590	88.554	0.110	0.176	2.810	2.876
546	545	0.027	159.668	4.362	0.076	0.011			0.330	0.011	0.341	0.000	88.554	88.262	0.176	0.508	2.876	3.208
545	647	0.027	91.864	2.510	0.078		0.078	0.080	0.197	0.158	0.355	0.000	88.222	88.054	0.548	0.646	3.248	3.346
647	646	0.020	81.201	1.600	0.367	0.055			0.588	0.055	0.643	0.000	88.266	87.821	0.634	1.129	3.334	3.830
646	645	0.020	80.381	1.584	0.466			0.476	0.738	0.476	1.214	0.000	87.820	87.232	1.130	0.468	3.830	3.168
645	694	0.020	57.661	1.136	0.387	0.058			0.440	0.058	0.498	0.000	87.170	86.820	0.530	2.480	3.230	5.180
696	695	0.031	159.777	4.997	0.090		0.090	0.025	0.450	0.115	0.565	0.000	89.936	89.449	0.214	0.356	2.914	3.056
695	694	0.029	229.921	6.675	0.083		0.083	0.085	0.554	0.168	0.722	0.000	89.449	88.836	0.356	0.464	3.056	3.164
694	693	0.020	29.938	0.590	0.232			0.014	0.137	0.014	0.151	0.151	88.089	87.938	1.211	1.062	3.911	3.762
693	692	0.020	29.938	0.590	0.236	0.035			0.139	0.035	0.175	0.175	87.938	87.763	1.062	1.537	3.762	4.237
696	698	0.031	110.892	3.468	0.000				0.000	0.000	0.000	0.000	89.936	89.598	0.214	0.802	2.914	3.502
703	698	0.029	188.189	5.464	0.107			0.110	0.587	0.110	0.697	0.000	90.245	89.525	0.155	0.875	2.855	3.575
698	697	0.029	167.979	4.877	0.107	0.016			0.524	0.016	0.540	0.000	89.461	88.821	0.939	0.829	3.639	3.529
697	692	0.029	141.470	4.107	0.124		0.124	0.126	0.509	0.250	0.760	0.000	88.821	88.282	0.829	1.018	3.529	3.718
692	691	0.020	26.493	0.522	0.255			0.260	0.133	0.260	0.394	0.394	87.763	87.369	1.537	1.131	4.237	3.831
704	703	0.031	201.772	6.310	0.107		0.107	0.110	0.677	0.217	0.894	0.000	90.039	89.424	0.261	0.976	2.961	3.676
703	702	0.029	169.816	4.930	0.107	0.016			0.530	0.016	0.546	0.000	89.424	88.777	0.976	0.523	3.676	3.223
702	701	0.029	139.108	4.039	0.157		0.157	0.160	0.634	0.317	0.951	0.000	88.775	88.054	0.525	0.686	3.225	3.386
705	706	0.031	360.236	11.266	0.004		0.004	0.004	0.043	0.008	0.051	0.051	89.720	87.886	0.460	0.214	3.160	2.914
707	706	0.029	84.514	2.454	0.006	0.001	0.006		0.015	0.007	0.023	0.023	87.912	87.886	-0.112	0.214	2.588	2.914
706	701	0.027	152.012	4.153	0.027	0.004			0.113	0.004	0.117	0.117	87.886	87.769	0.214	0.971	2.914	3.671
701	691	0.027	85.739	2.342	0.092		0.092	0.093	0.214	0.185	0.399	0.399	87.769	87.369	0.971	1.131	3.671	3.831
691	677	0.020	61.844	1.218	0.309			0.315	0.376	0.315	0.691	0.691	87.369	86.679	1.231	1.921	3.931	4.621
677	676	0.020	76.854	1.514	0.317			0.089	0.480	0.089	0.569	0.569	86.679	86.110	1.921	1.350	4.621	4.050
676	675	0.020	9.268	0.183	0.317		0.317	0.089	0.058	0.406	0.464	0.464	86.110	85.646	1.350	1.804	4.050	4.504
675	674	0.019	65.325	1.237	0.209	0.031			0.259	0.031	0.290	0.290	85.646	85.356	1.804	1.134	4.504	3.834
674	673	0.019	47.973	0.909	0.218	0.033			0.198	0.033	0.230	0.230	85.356	85.125	1.134	0.575	3.834	3.275
687	688	0.031	187.664	5.869	0.079			0.022	0.464	0.022	0.487	0.000	87.878	87.078	0.362	0.822	3.062	3.522
688	688A	0.031	36.089	1.129	0.117			0.033	0.132	0.033	0.164	0.000	87.027	86.873	0.873	0.427	3.573	3.127
688A	689	0.031	252.953	7.911	0.034			0.035	0.273	0.035	0.308	0.308	86.823	86.090	0.477	0.110	3.177	2.810
689	673	0.031	257.546	8.055	0.096		0.096	0.098	0.771	0.193	0.965	0.965	86.090	85.125	0.110	0.575	2.810	3.275
673	672	0.019	61.388	1.163	0.238			0.243	0.277	0.243	0.519	0.519	85.125	84.606	0.575	-0.106	3.275	2.594
678	681	0.031	268.701	8.404	0.068			0.019	0.571	0.019	0.590	0.000	88.795	88.242	-0.267	0.978	2.433	3.678
681	682	0.031	34.449	1.077	0.061			0.017	0.066	0.017	0.083	0.000	88.192	88.129	1.028	0.961	3.728	3.661
682	683	0.031	231.955	7.254	0.170	0.026	0.170		1.235	0.196	1.431	0.000	88.079	87.094	1.011	0.956	3.711	3.656
687	683	0.031	180.446	5.643	0.061		0.061	0.063	0.346	0.124	0.470	0.000	87.646	87.084	0.594	0.966	3.294	3.666
683	684	0.027	185.696	5.073	0.313	0.047	0.313		1.588	0.360	1.948	0.000	87.094	85.496	0.956	0.484	3.656	3.184
689	685	0.029	144.357	4.191	0.033	0.005			0.140	0.005	0.145	0.000	86.185	85.855	0.015	0.255	2.715	2.955
685	684	0.029	170.079	4.938	0.006		0.006	0.006	0.031	0.013	0.044	0.044	85.855	85.496	0.255	0.484	2.955	3.184
684	670	0.026	157.855	4.097	0.092		0.092	0.094	0.376	0.186	0.562	0.562	85.496	84.816	0.484	-0.316	3.184	2.384
670	671	0.023	116.798	2.691	0.032	0.005	0.032		0.086	0.037	0.123	0.123	84.816	84.693	-0.316	-0.263	2.384	2.437
671	672	0.022	119.204	2.585	0.023	0.004	0.023		0.061	0.027	0.088	0.088	84.693	84.606	-0.263	-0.106	2.437	2.594
672	101	0.019	57.743	1.094	0.312		0.312	0.319	0.342	0.631	0.973	0.973	84.606	83.633	-0.106	0.767	2.594	3.467
Hydro Ea.	906																	
908	907	0.027	244.969	6.693	0.176	0.026	0.176		1.178	0.202	1.380	0.000	99.400	98.224	0.398	0.714	2.800	3.116
907	906	0.026	215.354	5.589	0.091	0.014	0.091		0.507	0.104	0.612	0.000	98.197	97.738	0.741	0.561	3.143	2.963
804	801	0.031	57.185	1.788	0.000				0.000	0.000	0.000	0.000	98.0[illegible]	97.990	0.498	0.568	2.900	2.970
801	906	0.031	195.210	6.105	0.000				0.000	0.000	0.000	0.000	97.[illegible]50	97.712	0.608	0.586	3.010	2.988
705	704																	
705	704	0.031	29.462	0.921	0.000				0.000	0.000	0.000	0.00[illegible]	98.670	98.562	0.398	0.366	2.800	2.768
704	701	0.031	135.630	4.242	0.130		0.130		0.553	0.130	0.683	[illegible]	98.522	98.026	0.406	0.342	2.808	2.744
701	700	0.029	107.402	3.118	0.064			0.003	0.199	0.003	0.201	0.000	98.026	97.862	0.342	0.356	2.744	2.758
700	906	0.029	33.412	0.970	0.065		0.065	0.066	0.063	0.131	0.194	0.000	97.712	97.662	0.506	0.636	2.908	3.038
906	905	0.025	110.843	2.751	0.141	0.021			0.388	0.021	0.4[illegible]9	0.000	97.662	97.357	0.636	0.901	3.038	3.303
804	803	0.029	180.814	5.250	0.051			0.014	0.268	0.014	0.282	0.000	98.160	97.953	0.398	0.515	2.800	2.917
803	802	0.029	31.181	0.905	0.052			0.014	0.047	0.014	0.061	0.000	97.913	97.878	0.555	0.580	2.957	2.982
802	905	0.029	177.087	5.141	0.050		0.050	0.051	0.260	0.10[illegible]	0.362	0.000	97.838	97.635	0.620	0.623	3.022	3.025

Connection at MH 907
U/S HGL = 98.225. D/S HGL = 98.197

Filename: V:\17732.DS\Phase 12D\Design\Morgan's Grant HGL Analysis for Carp Road Pond.XLS

min slope=
min vel = 0.8m/s

Printed on 8/24/2005 at 2:19 PM

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OK w 2004 guidelines

CITY OF OTTAWA

MINTO DEVELOPMENTS INC.

MORGAN'S GRANT SUBDIVISION - PHASE 12D
JLR NO. 17732

STORM SEWER DESIGN SHEET
Rev. No. 0: MOE Submission for Phase 12D - May 11/ 2005
Rev. No. 1: City Comments for Phase 12D - July 11/ 2005
Rev. No. 2: City Comments for Phase 12D - August 11/ 2006
Rev. No. 3: Issued with Phase 12D SWM Report - August 24/ 2007
Designed by: J.B.
Checked by: L.J./G.F.

ESIGN PARAMETERS
Manning's Coefficient, n = 0.013
IDF CURVE = 5 year

Proposed road ℄ elev.

STREET	M.H. # FROM	M.H. # TO	AREAS FOR "R" in (ha) 0.2	0.3	0.4	0.45	0.5	0.6	0.7	PEAK FLOW COMPUTATION 2.78AR	2.78AR (CUM.)	TIME (min.)	INTENS. (mm/hr)	PEAK FL. (L/s)	SEWER DIA. (mm)	SLOPE (%)	CAPAC. (L/s)	VEL. (m/s)	LENGTH (m)	FL.TIME (min.)	RESIDUAL CAP. (L/s)	UPSTREAM Pr. Center Line	Obvert Drop	Obvert	Invert	Cover	DOWNSTREAM Pr. Center Line	Obvert	Invert	Cover	COMMENTS
BLK 248	Hydro Ea.	906	0.720		0.118					0.53	0.53	*26.00*	59.35	31.54	-	-	-	-	-	-	-										**Flow controlled to 30 L/s**
GOWARD DRIVE	908	907			0.702		1.216			2.47	2.47	*20.00*	70.25	173.58	450	1.05	304.76	1.86	112.00	1.01	131.18	102.20		99.400	98.943	2.80	101.34	98.224	97.767	3.12	**PHASE 12D**
	907	906			0.203					0.23	2.70	21.01	68.12	213.69	525	0.40	283.74	1.27	114.87	1.51	70.05	101.34	0.027	98.197	97.664	3.14	100.70	97.738	97.204	2.96	**+ Fixed flowrate from Blks 247/248 (30 L/s)**
												22.51																			
ISHPATINA CRESCENT	804	801								0.00	0.00	*20.00*	70.25	0.00	300	0.40	63.80	0.87	17.43	0.33	63.80	100.96		98.060	97.755	2.90	100.96	97.990	97.685	2.97	**PHASE 12D**
	801	906								0.00	0.00	20.33	69.53	0.00	300	0.40	63.80	0.87	59.50	1.13	63.80	100.96	0.040	97.950	97.645	3.01	100.70	97.712	97.407	2.99	**PHASE 12D**
												21.47																			
BLK 246	705	704	1.157		0.191					0.86	0.86	*30.00*	53.93	46.14	-	-	-	-	-	-	-										**Flow controlled to 50 L/s**
FINLAYSON CRESCENT	705	704								0.00	0.00	*20.00*	70.25	50.00	300	1.20	110.50	1.51	8.98	0.10	60.50	101.47		98.670	98.365	2.80	101.33	98.562	98.257	2.77	**+ Fixed flowrate from Blk 246 (50 L/s)**
	704	701			0.360					0.40	0.40	20.10	70.03	78.04	300	1.20	110.50	1.51	41.34	0.45	32.46	101.33	0.040	98.522	98.217	2.81	100.77	98.026	97.721	2.74	**PHASE 12D**
	701	700			0.180					0.20	0.60	20.55	69.06	91.47	375	0.40	115.67	1.01	40.92	0.67	24.21	100.77		98.026	97.645	2.74	100.62	97.862	97.481	2.76	**PHASE 12D**
	700	906								0.00	0.60	21.23	67.67	90.63	375	0.40	115.67	1.01	12.73	0.21	25.04	100.62	0.150	97.712	97.331	2.91	100.70	97.662	97.281	3.04	**PHASE 12D**
												21.44																			
GOWARD DRIVE	906	905			0.837					0.93	4.23	22.51	65.18	355.56	600	0.45	429.67	1.47	67.57	0.76	74.12	100.70		97.662	97.052	3.04	100.66	97.357	96.748	3.30	**PHASE 12D**
												23.28																			
ISHPATINA CRESCENT	804	803	0.391		0.823					1.13	1.13	*20.00*	70.25	79.56	375	0.30	100.18	0.88	68.89	1.31	20.61	100.96		98.160	97.779	2.80	100.87	97.953	97.572	2.92	**PHASE 12D**
	803	802								0.00	1.13	21.31	67.51	76.46	375	0.30	100.18	0.88	11.88	0.23	23.72	100.87	0.040	97.913	97.532	2.96	100.86	97.878	97.497	2.98	**PHASE 12D**
	802	905			0.049					0.05	1.19	21.53	67.06	79.60	375	0.30	100.18	0.88	67.47	1.28	20.57	100.86	0.040	97.838	97.457	3.02	100.66	97.635	97.254	3.02	**PHASE 12D**
												22.81																			
GOWARD DRIVE	905	904			0.415					0.46	5.88	23.28	63.79	454.85	600	0.70	535.90	1.84	48.61	0.44	81.04	100.66	0.041	97.316	96.707	3.34	100.91	96.976	96.367	3.93	**PHASE 12D**
												23.72																			
FINLAYSON CRESCENT	705	703								0.00	0.00	*20.00*	70.25	0.00	300	0.35	59.68	0.82	77.42	1.58	59.68	101.47		98.670	98.365	2.80	101.33	98.399	98.094	2.93	**PHASE 12D**
	703	702								0.00	0.00	21.58	66.97	0.00	300	0.35	59.68	0.82	12.38	0.25	59.68	101.33	0.040	98.359	98.054	2.97	101.23	98.316	98.011	2.91	**PHASE 12D**
12D	702	904			0.548					0.61	0.61	21.83	66.47	40.51	300	0.45	67.67	0.93	86.27	1.55	27.16	101.23	0.040	98.276	97.971	2.95	100.91	97.887	97.583	3.02	**PHASE 12D**
												23.38																			
GOWARD DRIVE	904	903			0.552					0.61	7.10	23.72	63.02	527.41	600	1.20	701.66	2.40	77.00	0.53	174.24	100.91	0.963	96.013	95.404	4.90	99.50	95.089	**94.480**	4.41	PHASE 12C
	903	902								0.00	7.10	24.25	62.11	520.99	600	1.73	842.47	2.89	40.00	0.23	321.49	99.50	0.100	94.990	94.380	4.51	97.59	94.298	93.688	3.29	PHASE 12C
	902	901			0.355					0.39	7.49	24.48	61.73	542.64	600	1.84	868.37	2.98	40.00	0.22	325.73	97.59	0.600	93.698	93.088	3.89	95.75	92.962	92.353	2.79	PHASE 12C
	901	900			0.417					0.46	7.96	24.71	61.37	568.35	675	0.85	807.97	2.19	72.50	0.55	239.62	95.75	0.465	92.497	91.812	3.25	94.95	91.882	91.196	3.07	PHASE 12C
	900	114								0.00	7.96	25.26	60.48	561.32	750	1.09	1212.49	2.66	36.90	0.23	651.16	94.95	0.293	91.589	90.827	3.36	94.69	91.187	**90.425**	3.50	PHASE 12C
												25.49																			
TESKIWA CRESCENT	903	602			0.496					0.55	0.55	*20.00*	70.25	38.75	300	0.50	71.33	0.98	86.90	1.48	32.58	99.50		96.575	96.270	2.93	98.94	96.141	95.836	2.80	PHASE 12C
	602	601			0.233					0.26	0.81	21.48	67.16	54.44	300	0.75	87.36	1.20	12.30	0.17	32.92	98.94	0.040	96.101	95.796	2.84	98.79	96.008	95.703	2.78	PHASE 12C
	601	600			0.339					0.38	1.19	21.65	66.82	79.36	300	2.65	164.21	2.25	69.00	0.51	84.85	98.79	0.040	95.968	95.663	2.82	96.93	94.140	93.835	2.79	PHASE 12C
	600	116								0.00	1.19	22.16	65.83	78.19	300	3.23	181.29	2.48	64.50	0.43	103.11	96.93	0.266	93.874	93.569	3.06	95.50	91.790	**91.486**	3.71	PHASE 12C
HALTON TERRACE	116	115			0.321					0.36	1.54	22.60	65.02	100.43	525	0.70	375.35	1.68	41.10	0.41	274.92	95.50	0.279	91.531	90.998	3.97	95.30	91.244	90.710	4.06	PHASE 12A
	115	114			0.594					0.66	2.21	23.00	64.28	141.74	525	0.70	375.35	1.68	40.80	0.40	233.61	95.30	0.040	91.204	90.670	4.10	94.65	90.918	90.385	3.73	PHASE 12A
												23.41																			
HALTON TERRACE	114	113			0.478					0.53	10.69	25.49	60.12	722.98	825	0.60	1159.90	2.10	46.10	0.37	436.92	94.65	0.040	90.878	90.040	3.77	94.05	90.601	89.763	3.45	PHASE 12A
	113	112A			0.460					0.51	11.21	25.86	59.56	747.44	825	0.65	1207.26	2.19	33.00	0.25	459.82	94.05	0.030	90.571	89.733	3.48	94.10	90.357	89.519	3.74	PHASE 12A
	112A	112								1.61	12.82	26.11	59.18	838.48	825	0.65	1207.26	2.19	31.00	0.24	368.79	94.10		90.357	89.519	3.74	94.25	90.155	89.317	4.09	+School Flow (2.78xAC = 1.61) from CCL
												26.11																			
DGEMOORE CRESCENT	901	504	0.513		0.249					0.56	0.56	*20.00*	70.25	39.49	300	0.50	71.33	0.98	69.30	1.18	31.84	95.75		93.150	92.845	2.60	95.61	92.804	92.499	2.81	PHASE 12C
	504	503								0.00	0.56	21.18	67.76	38.09	300	1.00	100.87	1.38	12.30	0.15	62.78	95.61	0.040	92.764	92.459	2.85	95.51	92.641	92.336	2.87	PHASE 12C
	503	502	0.408		0.599					0.89	1.46	21.33	67.46	98.16	375	0.85	168.62	1.48	98.00	1.10	70.46	95.51		92.641	92.260	2.87	94.60	91.808	91.427	2.79	PHASE 12C
	502	501	0.282		0.987					1.25	2.71	22.43	65.32	176.99	525	0.35	265.41	1.19	93.00	1.30	88.42	94.60		91.808	91.274	2.79	94.44	91.482	90.949	2.96	PHASE 12C
	501	500								0.00	2.71	23.74	62.99	170.65	525	0.35	265.41	1.19	12.30	0.17	94.76	94.44	0.040	91.442	90.909	3.00	94.38	91.399	90.866	2.98	PHASE 12C
	500	112			0.586					0.65	3.36	23.91	62.69	210.70	525	1.23	497.55	2.23	79.30	0.59	286.85	94.38	0.134	91.265	90.732	3.12	94.25	90.290	**89.756**	3.96	PHASE 12C
												24.51																			
HALTON TERRACE	112	111			0.170					0.19	16.37	26.11	59.18	1048.57	825	1.00	1497.43	2.71	76.70	0.47	448.85	94.25	0.030	90.125	89.287	4.12	92.51	89.358	88.520	3.15	PHASE 12A
												26.58																			

12D = 8.462 ha

Σ = 15.949 ha

STREET	M.H. #		AREAS FOR "R" in (ha)							PEAK FLOW COMPUTATION					SEWER							UPSTREAM					DOWNSTREAM				COMMENTS
	FROM	TO	0.2	0.3	0.4	0.45	0.5	0.6	0.7	2.78AR	2.78AR (CUM.)	TIME (min.)	INTENS. (mm/hr)	PEAK FL. (L/s)	DIA. (mm)	SLOPE (%)	CAPAC. (L/s)	VEL. (m/s)	LENGTH (m)	FL.TIME (min.)	RESIDUAL CAP. (L/s)	Pr. Center Line	Obvert Drop	Obvert	Invert	Cover	Pr. Center Line	Obvert	Invert	Cover	
MUSKEGO CRESCENT	402	111			0.222					0.25	0.25	*20.00*	70.25	17.34	300	0.87	94.09	1.29	78.77	1.02	76.75	92.06		89.473	89.168	2.59	92.51	88.788	88.483	3.72	PHASE 12B
												21.02																			
HALTON TERRACE	111	110			0.200					2.46	19.08	26.58	58.48	1195.63	825	1.20	1640.35	2.97	72.40	0.41	444.72	92.51	0.017	88.771	87.933	3.74	91.00	87.902	87.064	3.10	+School Flow (2.78xAC = 2.24) from CCL
	110	109			0.579					0.64	19.72	26.99	57.90	1221.74	825	1.20	1640.35	2.97	81.90	0.46	418.61	91.00	0.560	87.342	86.504	3.66	90.10	86.359	85.521	3.74	PHASE 12A
												27.45																			
MUSKEGO CRESCENT	402	401			0.236					0.26	0.26	*20.00*	70.25	18.44	300	0.80	90.22	1.24	13.84	0.19	71.79	92.06		89.179	88.874	2.88	91.96	89.068	88.763	2.89	PHASE 12B
	401	400	0.334		0.427					0.66	0.92	20.19	69.84	64.46	300	2.30	153.08	2.10	74.30	0.59	88.62	91.96	0.040	89.028	88.723	2.93	90.24	87.317	87.012	2.92	PHASE 12B
	400	303	0.195		0.976					1.19	2.12	20.78	68.59	145.19	375	1.74	241.26	2.12	70.02	0.55	96.07	90.24		87.317	86.936	2.92	88.84	86.099	85.718	2.74	PHASE 12B
												21.33																			
DUNOLLIE CRESCENT	304	303					0.154			0.21	0.21	*20.00*	70.25	15.04	300	0.30	55.25	0.76	11.22	0.25	40.21	88.65		86.134	85.829	2.52	88.84	86.100	85.796	2.74	PHASE 12B
												20.25																			
DUNOLLIE CRESCENT	303	109			0.240					0.27	2.60	21.33	67.46	175.25	525	0.36	269.18	1.20	85.61	1.18	93.93	88.84		86.099	85.565	2.74	90.10	85.791	85.257	4.31	PHASE 12B
												22.51																			
HALTON TERRACE	109	108			0.130	0.460	0.147			0.92	23.24	27.45	57.25	1410.62	825	1.20	1640.35	2.97	66.80	0.37	229.73	90.10		85.791	84.953	4.31	88.53	84.990	84.151	3.54	PHASE 12A
												27.82																			
DUNOLLIE CRESCENT	302A	302	0.216				0.085			0.24	0.24	*20.00*	70.25	16.74	300	0.50	71.33	0.98	15.18	0.26	54.59	88.53		85.387	85.082	3.14	88.45	85.311	85.006	3.14	PHASE 12B
	302	301					0.716			1.00	1.23	20.26	69.69	85.96	375	0.35	108.20	0.95	69.40	1.22	22.24	88.45		85.311	84.930	3.14	88.20	85.068	84.687	3.13	PHASE 12B
	301	300					0.288			0.40	1.63	21.48	67.17	109.74	375	0.40	115.67	1.01	9.99	0.16	5.94	88.20	0.040	85.028	84.647	3.17	88.27	84.988	84.607	3.28	PHASE 12B
	300	108								0.00	1.63	21.64	66.84	109.21	450	0.20	133.01	0.81	90.70	1.87	23.80	88.27		84.988	84.531	3.28	88.53	84.807	84.350	3.72	PHASE 12B
												23.51																			
HALTON TERRACE	108	107				0.500				0.63	25.50	27.82	56.74	1526.82	1050	0.45	1910.95	2.14	31.70	0.25	384.13	88.53		84.807	83.740	3.72	88.75	84.664	83.597	4.09	PHASE 12A
	107	106								0.00	25.50	28.07	56.40	1518.28	1050	0.45	1910.95	2.14	43.10	0.34	392.67	88.75	0.040	84.624	83.557	4.13	88.05	84.430	83.363	3.62	PHASE 12A
												28.40																			
McBRIEN STREET	203	202			0.130					0.14	0.14	*20.00*	70.25	10.16	300	1.52	124.37	1.70	98.50	0.96	114.21	90.71		87.706	87.401	3.00	89.09	86.209	85.904	2.88	PHASE 12A
	202	201					0.690			0.96	1.10	20.96	68.21	75.28	375	0.85	168.62	1.48	74.40	0.84	93.35	89.09		86.209	85.828	2.88	88.60	85.576	85.195	3.02	PHASE 12A
	201	200								0.00	1.10	21.80	66.53	73.43	375	0.85	168.62	1.48	12.70	0.14	95.20	88.60	0.030	85.546	85.165	3.05	88.35	85.438	85.057	2.91	PHASE 12A
	200	106								0.00	1.10	21.94	66.25	73.12	375	1.75	241.95	2.12	20.90	0.16	168.83	88.35	0.030	85.408	85.027	2.94	87.92	85.043	84.662	2.88	PHASE 12A
												22.11																			
HALTON TERRACE	106	105				0.447				0.56	27.16	28.40	55.95	1599.90	1050	0.55	2112.63	2.36	41.00	0.29	512.74	88.05	0.040	84.390	83.323	3.66	87.25	84.165	83.098	3.09	PHASE 12A
	105	Ex. 101	0.465		0.312	0.652	0.084			1.54	28.70	28.69	55.57	1675.06	1200	0.40	2572.29	2.20	88.70	0.67	897.23	87.05	0.215	83.950	82.730	3.10	87.10	83.595	82.376	3.51	PHASE 12A
												29.36																			

Σ = 8.885ha

Total area = 24.837ha

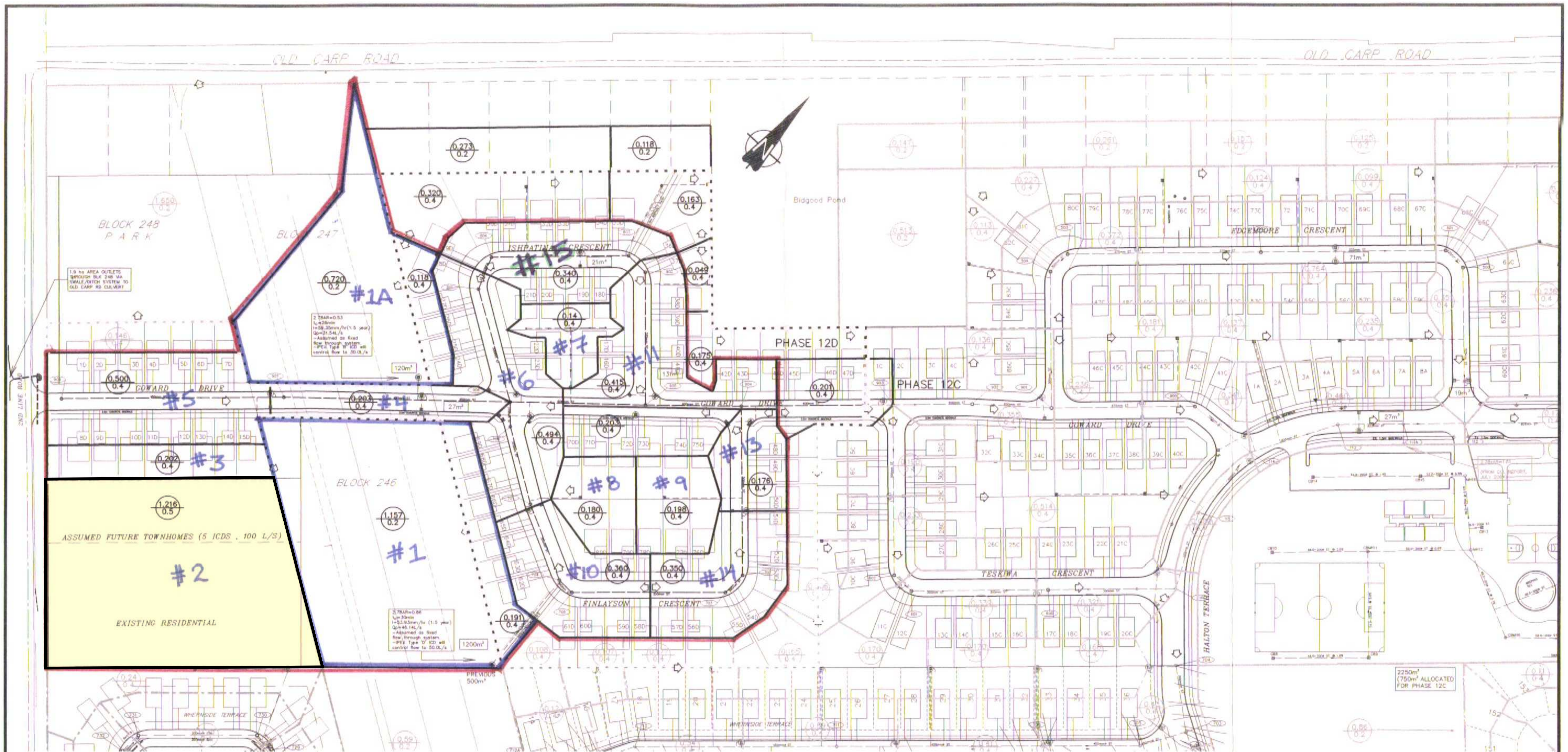
CITY OF OTTAWA
MORGAN'S GRANT PHASE 12D SUBDIVISION
MINTO DEVELOPMENTS INC.

Designed by: J.B.
Checked by: G.F.
Date: August 2005

JLR Project No. 17732

STORMWATER STORAGE / OVERFLOW BALANCE TABLE

DRAINAGE AREA				INLET FLOW				STORAGE (m^3)			OVERFLOW		SURPLUS
CATCHMENT	AREA #	"C" FACTOR	AREA (Ha)	INLETS (l/s) 20.00	13.40	Unrest. RYCBs	Equiv. Flow	REQUIRED LOCAL (m^3)	LOCAL + OVERFLOW (m^3)	PROVIDED (m^3)	(m^3)	TO AREA #	STORAGE m^3
ISHPATINA	#15	0.400	0.340	1	0	0	20	29.51	29.51	20.60	8.91	#11	
FINLAYSON	#14	0.400	0.350	1	0	0	20	30.72	30.72	0.00	30.72	#13	
FINLAYSON (at GOWARD)	#13	0.400	0.176	1	0	0	20	11.88	42.61	0.00	42.61	#11	
GOWARD	#11	0.400	0.618	2	0	0	40	51.73	103.26	131.30	-28.04	#6	28.04
FINLAYSON	#10	0.400	0.360	1	0	0	20	31.95	31.95	0.00	31.95	#6	
RY (73, 74, 75, 76, 77, 78)	#9	0.400	0.198	0	0	34	34	10.61	10.61	0.00	10.61	#8	
RY (70, 71, 72, 79, 80)	#8	0.400	0.180	0	0	34	34	8.90	19.51	0.00	19.51	#6	
RY (16-23)	#7	0.400	0.140	0	0	62	62	0.00	0.00	0.00	0.00	#6	
GOWARD (at FINLAYSON/ISHPATINA)	#6	0.400	0.494	2	0	0	40	37.97	89.43	0.00	89.43	#4	
GOWARD	#5	0.400	0.500	1	0	0	20	50.26	50.26	0.00	50.26	#4	
GOWARD	#4	0.400	0.203	1	0	0	20	14.47	154.16	27.08	127.08	#1	
FUTURE TOWNHOUSES	#2	0.500	1.216	5	0	0	100	126.46	126.46	0.00	126.46	#1	
RY(8-15)	#3	0.400	0.202	0	0	34	34	10.99	10.99	0.00	10.99	#1	
BLK 246 and RY of units 62-69	#1	0.228	1.348	2.5	0	0	50	64.19	328.72	1213.00	**-884.28**	-	884.28



LEGEND

- EXISTING CATCH BASIN
- PROPOSED CATCH BASIN
- INTERCONNECTED ROADWAY CB C/W ONE 19.8L/S IPEX TYPE 'A' ICD OR CITY APPROVED EQUIVALENT
- CATCH BASIN WITH INDIVIDUAL 19.8 L/S IPEX TYPE 'A' ICD OR CITY APPROVED EQUIVALENT
- PROPOSED HYDRANT
- EXISTING HYDRANT
- PHASING LIMITS
- EXISTING STORM SEWER & MANHOLE
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED CATCH BASIN & LEAD
- 8 LOT NUMBER
- PROPOSED OVERLAND DRAINAGE
- DRAINAGE AREA LIMITS
- 0.220 EXISTING AREA IN HECTARES / 0.4 'R' RUNOFF COEFFICIENT
- 0.350 PROPOSED AREA IN HECTARES / 0.4 'R' RUNOFF COEFFICIENT
- 1300m³ PONDING VOLUME

= MAJOR OVERLAND FLOW IS ROUTED TO HYDRO EASEMENT

3	26/08/05	ISSUED WITH 12D SWM REPORT	L.J.
2	11/07/05	REVISED PER CITY COMMENTS	L.J.
1	11/05/05	ISSUED FOR MOE APPROVAL	L.J.

SCALE 1:1000

J.L.Richards
ENGINEERS ARCHITECTS PLANNERS

J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

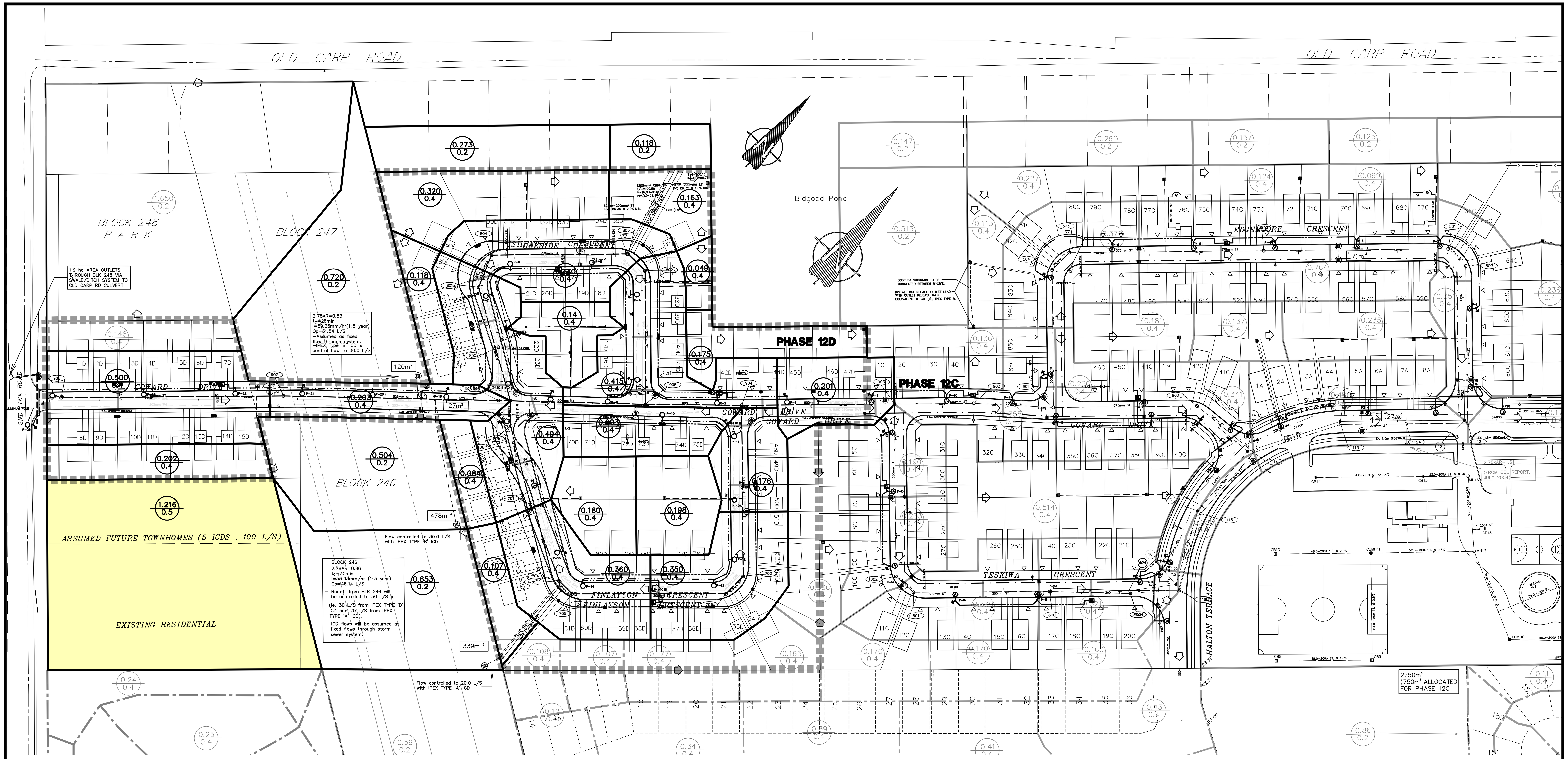
DESIGN J.B.
CHECKED L.J.
DRAWN A.M.
CHECKED
APPROVED

Ottawa

minto

MORGAN'S GRANT
PHASE 12D
STORM DRAINAGE PLAN

JOB No. 17732
DATED APRIL 2005
DWG. No. D-ST 7



LEGEND

- EXISTING CATCH BASIN
- PROPOSED CATCH BASIN
- INTERCONNECTED ROADWAY CB C/W ONE 19.8L/S IPEX TYPE 'A' ICD OR CITY APPROVED EQUIVALENT
- CATCH BASIN WITH INDIVIDUAL 19.8 L/S IPEX TYPE 'A' ICD OR CITY APPROVED EQUIVALENT
- PROPOSED HYDRANT
- EXISTING HYDRANT
- PHASING LIMITS
- EXISTING STORM SEWER & MANHOLE
- PROPOSED STORM SEWER & MANHOLE
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- 0.220 EXISTING AREA IN HECTARES / 0.4 'R' RUNOFF COEFFICIENT
- 0.350 PROPOSED AREA IN HECTARES / 0.4 'R' RUNOFF COEFFICIENT
- 1300m³ PONDING VOLUME

RECORD DRAWING
PRODUCED FROM INFORMATION PROVIDED BY FIELD INSPECTOR
date: MAY 03, 2013
J.L. RICHARDS & ASSOCIATES LIMITED

No.	Date	Revision	By
6	03/05/13	RECORD DRAWING	L.J.
4	18/10/05	REVISED PER HYDRO ONE COMMENTS	L.J.
3	26/08/05	ISSUED WITH 12D SWM REPORT	L.J.
2	11/07/05	REVISED PER CITY COMMENTS	L.J.
1	11/05/05	ISSUED FOR MOE APPROVAL	LJ

SCALE 1:1000

J.L.Richards & Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012
ENGINEERS·ARCHITECTS·PLANNERS

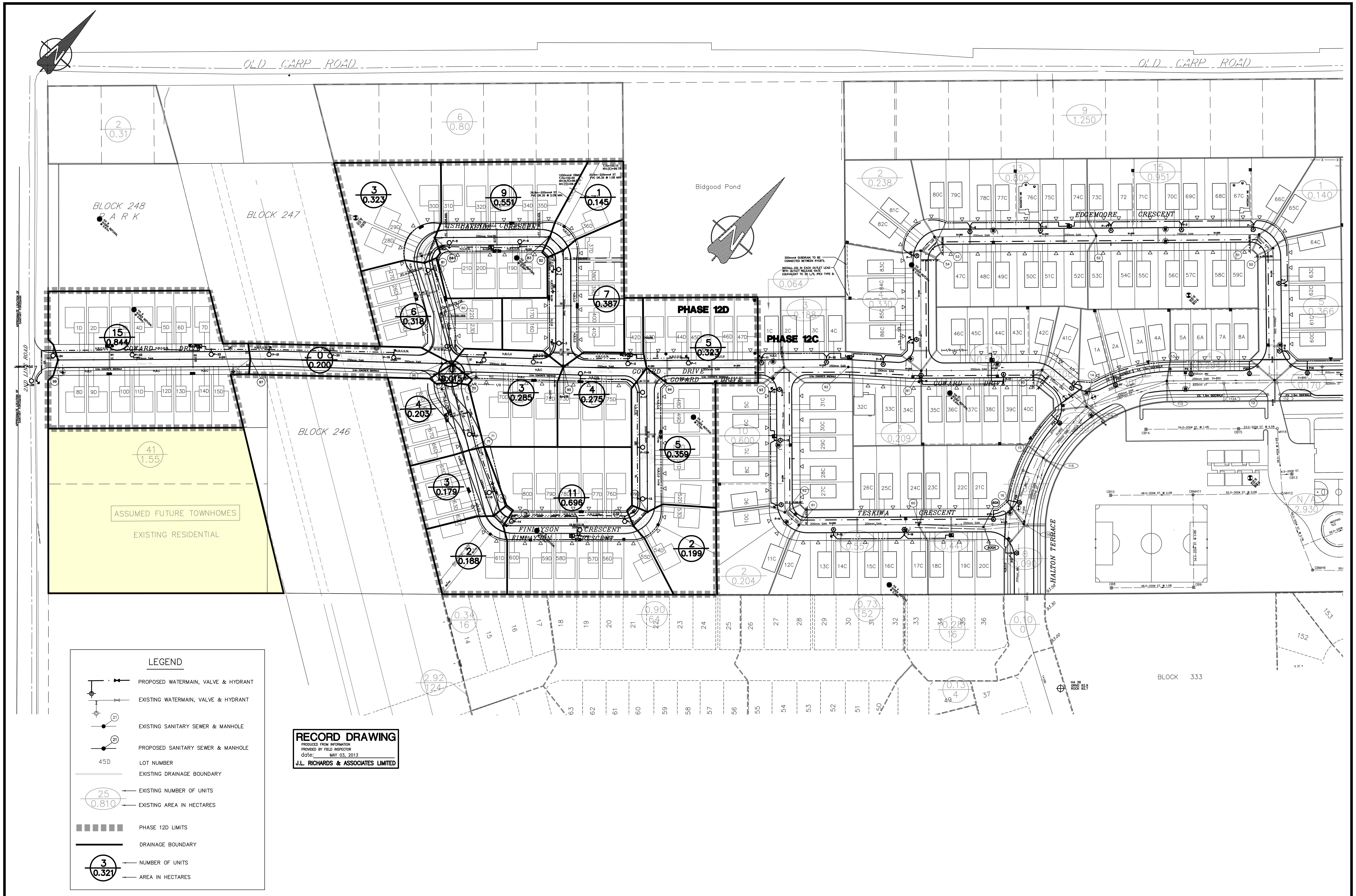
DESIGN J.B.
CHECKED L.J.
DRAWN A.M.
CHECKED
APPROVED

Ottawa

minto

MORGAN'S GRANT
PHASE 12D
STORM DRAINAGE PLAN

JOB. No. 17732
DATED APRIL 2005
DWG. No. D-ST 7



No.	Date	Revision	By
3	03/05/13	RECORD DRAWING	L.J.
2	11/07/05	BUILDING FOOTPRINT REVISED	LJ
1	11/05/05	ISSUED FOR MOE APPROVAL	LJ

SCALE
HORIZONTAL 1:1000

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ENGINEERS·ARCHITECTS·PLANNERS
J.L. Richards & Associates Limited
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Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

DESIGN J.B.
CHECKED L.J.
DRAWN M.B.
CHECKED
APPROVED

Ottawa

minto

MORGAN'S GRANT
PHASE 12D
SANITARY DRAINAGE PLAN

JOB. No. 17732
DATED AUGUST 2004
DWG. No. D-SAN 7

Extracted pages from
Morgan's Grant MSS 2003

APPENDIX 'G'

SANITARY SEWER DESIGN SHEET (2003 MSS)

J.L. Richards & Associates Limited
Consulting Engineers, Architects & Planners

CITY OF OTTAWA

MINTO DEVELOPMENT INC.
MORGAN'S GRANT SUBDIVISION - PHASE 10A & 10B
JLR NO. 17730

SANITARY SEWER DESIGN SHEET
Revised September 16, 2003

Designed by: J.B.
Checked by: L.J.

DESIGN PARAMETERS

I =	0.280	l/s/ha	q (res) =	350	l/cap/day
Singles =	4.0	pers / unit	q (com) =	50,000	l/ha/day
Townhouses =	4.0	pers / unit	q (inst) =	50,000	l/ha/day

STREET	M.H. #		RESIDENTIAL							NON-RESIDENTIAL						SEWER DATA						UPSTREAM			DOWNSTREAM		COMMENTS
			NO. of UNITS	INDIVIDUAL		CUMMULATIVE		Peaking Factor	POPUL. FLOW	AREA	CUMM. AREA	Peaking Factor	NON-RES. FLOW (l/s)	INFIL. FLOW	PEAK FLOW	DIA.	Slope	CAPAC.	VEL.	LENGTH	RESIDUAL CAP. (l/s)	Obvert Drop	Obvert	Invert	Obvert	Invert	
	FROM	TO		POPUL. people	AREA ha	POPUL. people	AREA ha		l/s	ha	ha			l/s	l/s	mm	%	l/s	m/s	m							
HALTON TERRACE	152	151		20	0.51	20	0.51	4.00	0.32	0.00	0.00	1.50	0.00	0.14	0.47	200	3.00	59.26	1.83	68.60	58.79		91.339	91.139	89.281	89.081	Phase 9
PIEKOFF CR.	159	157		20	0.43	20	0.43	4.00	0.32	0.00	0.00	1.50	0.00	0.12	0.44	200	2.00	48.38	1.49	79.00	47.94		95.718	95.518	94.138	93.938	Phase 9
PIEKOFF CR.	157	156		20	0.41	40	0.84	4.00	0.65	0.00	0.00	1.50	0.00	0.24	0.88	200	0.60	26.50	0.82	81.10	25.62		94.093	93.893	93.606	93.406	Phase 9
RAYBURN ST.	162	156		40	0.65	40	0.65	4.00	0.65	0.00	0.00	1.50	0.00	0.18	0.83	200	0.70	28.62	0.88	98.90	27.79		94.392	94.192	93.700	93.500	Phase 9
PIEKOFF CR.	156	154		28	0.38	108	1.87	4.00	1.75	0.00	0.00	1.50	0.00	0.52	2.27	200	2.00	48.38	1.49	59.50	46.11		93.606	93.406	92.416	92.216	Phase 9
	154	153		32	0.54	140	2.41	4.00	2.27	0.00	0.00	1.50	0.00	0.67	2.94	200	3.00	59.26	1.83	56.20	56.32		92.298	92.098	90.612	90.412	Phase 9
	153	151		8	0.23	148	2.64	4.00	2.40	0.00	0.00	1.50	0.00	0.74	3.14	200	3.00	59.26	1.83	49.20	56.12		90.576	90.376	89.100	88.900	Phase 9
HALTON TERRACE	151	150		0	0.00	168	3.15	4.00	2.72	0.00	0.00	1.50	0.00	0.88	3.60	200	0.60	26.50	0.82	41.4	22.90		88.481	88.281	88.233	88.033	Phase 9
	150	149		120	0.86	288	4.01	4.00	4.67	0.00	0.00	1.50	0.00	1.12	5.79	200	0.60	26.50	0.82	112.80	20.71		88.233	88.033	87.556	87.356	Phase 9
	149	148		28	0.24	316	4.25	4.00	5.12	0.00	0.00	1.50	0.00	1.19	6.31	200	0.60	26.50	0.82	40.6	20.19		87.556	87.356	87.312	87.112	Phase 9
WHERNSIDE TERRACE	234	233		28	0.39	28	0.39	4.00	0.45	0.00	0.00	1.50	0.00	0.11	0.56	200	2.85	57.76	1.78	51.7	57.20		101.90	101.70	100.43	100.23	Phase 11
	233	232		36	0.53	64	0.92	4.00	1.04	0.00	0.00	1.50	0.00	0.26	1.29	200	1.02	34.55	1.07	65.4	33.26		100.36	100.16	99.69	99.49	Phase 11
WHERNSIDE TERRACE	232	231		4	0.08	68	1.00	4.00	1.10	0.00	0.00	1.50	0.00	0.28	1.38	200	0.64	27.37	0.84	11.0	25.99		99.74	99.54	99.67	99.47	Phase 11
	231	230		24	0.38	92	1.38	4.00	1.49	0.00	0.00	1.50	0.00	0.39	1.88	200	0.78	30.22	0.93	57.2	28.34		99.63	99.43	99.18	98.98	Phase 11
	230	229		4	0.08	96	1.46	4.00	1.56	0.00	0.00	1.50	0.00	0.41	1.96	200	0.61	26.72	0.82	9.9	24.76		99.15	98.95	99.09	98.89	Phase 11
	229	228		20	0.32	116	1.78	4.00	1.88	0.00	0.00	1.50	0.00	0.50	2.38	200	0.60	26.50	0.82	30.6	24.12		99.06	98.86	98.87	98.67	Phase 11
	228	227		8	0.14	124	1.92	4.00	2.01	0.00	0.00	1.50	0.00	0.54	2.55	200	0.58	26.06	0.80	15.4	23.51		98.84	98.64	98.75	98.55	Phase 11
WHERNSIDE TERRACE	227	213		16	0.23	140	2.15	4.00	2.27	0.00	0.00	1.50	0.00	0.60	2.87	200	0.59	26.28	0.81	53.9	23.41		98.72	98.52	98.40	98.20	Phase 11
	213	212A		0	0.16	140	2.31	4.00	2.27	0.00	0.00	1.50	0.00	0.65	2.92	200	0.90	32.46	1.00	72.0	29.54		98.38	98.18	97.73	97.53	Phase 11
UPSTREAM OF MH 214 (West)	212A	212		16	0.16	156	2.47	4.00	2.53	0.00	0.00	1.50	0.00	0.69	3.22	200	1.00	34.21	1.06	55.40	30.99		93.800	93.600	97.246	97.046	PHASE 8
WHERNSIDE TERRACE	212	211		64	0.90	220	3.37	4.00	3.56	0.00	0.00	1.50	0.00	0.94	4.51	200	1.50	41.90	1.29	103.70	37.39		97.246	97.046	95.691	95.491	PHASE 8
	211	206		52	0.72	272	4.09	4.00	4.41	0.00	0.00	1.50	0.00	1.15	5.55	200	2.20	50.75	1.56	103.70	45.19		95.691	95.491	93.389	93.189	PHASE 8
	206	205		16	0.28	288	4.37	4.00	4.67	0.00	0.00	1.50	0.00	1.22	5.89	200	3.49	63.92	1.97	48.10	58.03		93.314	93.114	91.635	91.435	PHASE 8
	205	203		0	0.11	288	4.48	4.00	4.67	0.00	0.00	1.50	0.00	1.25	5.92	200	3.14	60.63	1.87	22.90	54.70		91.605	91.405	90.887	90.687	PHASE 8
SCAMPTON ST.	214	215		40	0.54	40	0.54	4.00	0.65	0.00	0.00	1.50	0.00	0.15	0.80	200	1.00	34.21	1.06	79.70	33.41		96.447	96.247	95.650	95.450	PHASE 8
	215	216		48	0.60	88	1.14	4.00	1.43	0.00	0.00	1.50	0.00	0.32	1.75	200	0.72	29.03	0.90	90.60	27.29		95.650	95.450	95.998	95.798	PHASE 8
	216	217		8	0.13	96	1.27	4.00	1.56	0.00	0.00	1.50	0.00	0.36	1.91	200	0.80	30.60	0.94	7.70	28.69		95.938	95.738	95.876	95.676	PHASE 8
	217	218		56	0.42	152	1.69	4.00	2.46	0.00	0.00	1.50	0.00	0.47	2.94	200	1.11	36.05	1.11	59.80	33.11		95.816	95.616	95.338	95.138	PHASE 8
PORTADOWN CR.	220	219		40	0.48	40	0.48	4.00	0.65	0.00	0.00	1.50	0.00	0.13	0.78	200	1.00	34.21	1.06	69.50	33.43		95.960	95.760	95.265	95.065	PHASE 8
	219	218		0	0.09	40	0.57	4.00	0.65	0.00	0.00	1.50	0.00	0.16	0.81	200	0.60	26.50	0.82	36.80	25.69		95.235	95.035	95.014	94.814	PHASE 8
SCAMPTON ST.	218	225		60	0.44	252	2.70	4.00	4.08	0.00	0.00	1.50	0.00	0.76	4.84	200	1.50	41.90	1.29	71.40	37.06		94.768	94.568	93.697	93.497	PHASE 8
PORTADOWN CRESCENT	220	221		8	0.20	8	0.20	4.00	0.13	0.00	0.00	1.50	0.00	0.06	0.19	200	1.00	34.21	1.06	12.80	34.03		96.160	95.960	96.032	95.832	PHASE 8
	221	222		20	0.33	28	0.53	4.00	0.45	0.00	0.00	1.50	0.00	0.15	0.60	200	2.88	58.06	1.79	57.90	57.46		96.002	95.802	94.332	94.132	PHASE 8
	222	223		8	0.14	36	0.67	4.00	0.58	0.00	0.00	1.50	0.00	0.19	0.77	200	1.00	34.21	1.06	7.80	33.44		94.302	94.102	94.224	94.024	PHASE 8
	223	224		40	0.45	76	1.12	4.00	1.23	0.00	0.00	1.50	0.00	0.31	1.55	200	1.00	34.21	1.06	67.50	32.67		94.194	93.994	93.519	93.319	PHASE 8
	224	225		4	0.16	80	1.28	4.00	1.30	0.00	0.00	1.50	0.00	0.36	1.65	200	0.80	30.60	0.94	44.20	28.95		93.424	93.224	93.091	92.891	PHASE 8
SCAMPTON ST.	225	226		56	0.44	388	4.42	4.00	6.29	0.00	0.00	1.50	0.00	1.24	7.52	200	2.21	50.86	1.57	64.10	43.34		92.797	92.597	91.381	91.181	PHASE 8
	226	200		36	0.36	424	4.78	4.00	6.87	0.00	0.00	1.50	0.00	1.34	8.21	200	3.17	60.91	1.88	64.10	52.71		91.382	91.182	89.351	89.151	PHASE 8
HALTON TERRACE	203	202		16	0.37	304	4.85	4.00	4.93	0.00	0.00	1.50	0.00	1.36	6.28	200	0.60	26.50	0.82	72.90	20.22		90.700	90.500	90.263	90.063	PHASE 8
	202	201		8	0.21	312	5.06	4.00	5.06	0.00	0.00	1.50	0.00	1.42	6.47	200	0.60	26.50	0.82	56.50	20.03		90.233	90.033	89.894	89.694	PHASE 8
BEAULY ST.	207	208		4	0.13	4	0.13	4.00	0.06	0.00	0.00	1.50	0.00	0.04	0.10	200	1.00	34.21	1.06	17.50	34.11		93.654	93.454	93.479	93.279	PHASE 8
	208	209		48	0.58	52	0.71	4.00	0.84	0.00	0.00	1.50	0.00	0.20	1.04	200	1.27	38.56	1.19	85.50	37.51		93.449	93.249	92.364	92.164	PHASE 8
	209	210		8	0.16	60	0.87	4.00	0.97	0.00	0.00	1.50	0.00	0.24	1.22	200	0.76	29.83	0.92	8.10	28.61		92.334	92.134	92.272	92.072	PHASE 8
	210	201		4	0.22	64	1.09	4.00	1.04	0.00	0.00	1.50	0.00	0.31	1.34	200	2.31	52.00	1.60	64.00	50.66		92.242	92.042	90.765	90.565	PHASE 8
HALTON TERRACE	201	200		12	0.32	388	6.47	4.00	6.29	0.00	0.00	1.50	0.00	1.81	8.10	200	0.70	28.62	0.88	72.60	20.53		89.850	89.650	89.342	89.142	PHASE 8
HALTON TERRACE	200	200A		0	0.18	812	11.43	3.86	12.69	0.00	0.00	1.50	0.00	3.20	15.89	200	1.80	45.90	1.42	64.70	30.02		89.042	88.842	87.876	87.676	PHASE 8
	200A	148		0	0.00	812	11.43	3.86	12.69	0.00	0.00	1.50	0.00	3.20	15.89	200	0.40	21.64	0.67	19.00	5.75		87.076	86.876	87.000	86.800	PHASE 8
WHERNSIDE TERRACE	235	236		8	0.16	8	0.16	4.00	0.13	0.00	0.00	1.50	0.00	0.04	0.17	200	1.56	42.73	1.32	11.00	42.56		102.74	102.70	102.73	102.53	Phase 11
	236	237		44	0.59	52	0.75	4.00	0.84	0.00	0.00	1.50	0.00	0.21	1.05	200	1.36	39.90	1.23	73.50	38.85		102.54	102.50	101.70	101.50	Phase 11
	237	238		32	0.47	84	1.22	4.00	1.36	0.00	0.00	1.50	0.00	0.34	1.70	200	2.03	48.78	1.50	71.90	47.08		101.52	101.47	100.21	100.01	Phase 11

J.L. Richards & Associates Limited
Consulting Engineers, Architects & Planners

CITY OF OTTAWA

MINTO DEVELOPMENT INC.

MORGAN'S GRANT SUBDIVISION - PHASE 10A & 10B
JLR NO. 17730

SANITARY SEWER DESIGN SHEET
Revised September 16, 2003

Designed by: J.B.
Checked by: L.J.

DESIGN PARAMETERS

I =	0.280	l/s/ha	q (res) =	350	l/cap/day
Singles =	4.0	pers / unit	q (com) =	50,000	l/ha/day
Townhouses =	4.0	pers / unit	q (inst) =	50,000	l/ha/day

STREET	M.H. #		NO. of UNITS	RESIDENTIAL INDIVIDUAL		RESIDENTIAL CUMMULATIVE				NON-RESIDENTIAL				INFIL. FLOW	PEAK FLOW	SEWER DATA						UPSTREAM			DOWNSTREAM		COMMENTS
	FROM	TO		POPUL. people	AREA ha	POPUL. people	AREA ha	Peaking Factor	POPUL. FLOW l/s	AREA ha	CUMM. AREA ha	Peaking Factor	NON-RES. FLOW (l/s)	l/s	l/s	DIA. mm	Slope %	CAPAC. l/s	VEL. m/s	LENGTH m	RESIDUAL CAP. (l/s)	Obvert Drop	Obvert	Invert	Obvert	Invert	
WHERNSIDE TERRACE	235	234		24	0.37	24	0.37	4.00	0.39	0.00	0.00	1.50	0.00	0.10	0.49	200	1.65	43.95	1.36	72.70	43.46		102.74	102.70	101.70	101.50	Phase 11
																200											
COLNE WAY	234	239		32	0.51	56	0.88	4.00	0.91	0.00	0.00	1.50	0.00	0.25	1.15	200	1.57	42.87	1.32	72.60	41.72		101.54	101.50	100.56	100.36	Phase 11
	239	240		28	0.42	84	1.30	4.00	1.36	0.00	0.00	1.50	0.00	0.36	1.73	200	2.50	54.10	1.67	55.10	52.37		100.32	100.27	99.09	98.89	Phase 11
	240	241		0	0.02	84	1.32	4.00	1.36	0.00	0.00	1.50	0.00	0.37	1.73	200	0.60	26.50	0.82	8.90	24.77		98.84	98.82	98.96	98.76	Phase 11
COLNE WAY	241	238		0	0.11	84	1.43	4.00	1.36	0.00	0.00	1.50	0.00	0.40	1.76	250	0.40	39.18	0.77	76.40	37.42		98.77	98.73	98.68	98.43	Phase 11
	238	242		0	0.15	168	2.80	4.00	2.72	0.00	0.00	1.50	0.00	0.78	3.51	250	0.40	39.23	0.77	77.30	35.73		98.44	98.40	98.34	98.09	Phase 11
KLONDIKE RD.	244	243		242	3.87	242	3.87	4.00	3.92	0.00	0.00	1.50	0.00	1.08	5.00	200	2.39	52.90	1.63	99.60	47.90		103.35	103.30	101.12	100.92	Phase 11
	243	242		39	0.85	281	4.72	4.00	4.55	0.00	0.00	1.50	0.00	1.32	5.87	200	1.00	34.21	1.06	104.70	28.34		100.83	100.80	99.95	99.75	Phase 11
	242	167A		0	0.18	449	7.70	4.00	7.27	0.00	0.00	1.50	0.00	2.16	9.43	250	0.50	43.86	0.87	36.60	34.44		97.73	97.69	97.76	97.51	Phase 11
STREET NO. 1	26	27		20	0.35	20	0.35	4.00	0.32	0.00	0.00	1.50	0.00	0.10	0.42	250	1.00	62.03	1.22	104.70	61.61		104.475	104.221	103.428	103.174	Phase 10B
	27	28		28	0.49	48	0.84	4.00	0.78	0.00	0.00	1.50	0.00	0.24	1.01	250	1.00	62.03	1.22	104.70	61.02		103.43	103.174	102.381	102.127	Phase 10B
	28	29		8		56	0.84	4.00	0.91	0.00	0.00	1.50	0.00	0.24	1.14	250	1.00	62.03	1.22	104.70	60.89		102.38	102.127	101.334	101.080	Phase 10B
	29	30		40	0.60	96	1.44	4.00	1.56	0.00	0.00	1.50	0.00	0.40	1.96	250	1.00	62.03	1.22	104.70	60.07		101.33	101.080	100.287	100.033	Phase 10B
	30	31		44	0.57	140	2.01	4.00	2.27	0.00	0.00	1.50	0.00	0.56	2.83	250	1.00	62.03	1.22	104.70	59.20		100.29	100.033	99.240	98.986	Phase 10B
	31	32				140	2.01	4.00	2.27	0.00	0.00	1.50	0.00	0.56	2.83	250	1.00	62.03	1.22	104.70	59.20		99.24	98.986	98.193	97.939	Phase 10B
STREET NO. 1	27	35		48	0.91	48	0.91	4.00	0.78	0.00	0.00	1.50	0.00	0.25	1.03	250	1.00	62.03	1.22	104.70	61.00		103.43	103.174	102.381	102.127	Phase 10B
	35	34		44	0.91	92	1.82	4.00	1.49	0.00	0.00	1.50	0.00	0.51	2.00	250	1.00	62.03	1.22	104.70	60.03		102.38	102.127	101.334	101.080	Phase 10B
	34	33				92	1.82	4.00	1.49	0.00	0.00	1.50	0.00	0.51	2.00	250	1.00	62.03	1.22	104.70	60.03		101.33	101.080	100.287	100.033	Phase 10B
	33	32		16		108	1.82	4.00	1.75	0.00	0.00	1.50	0.00	0.51	2.26	250	1.00	62.03	1.22	104.70	59.77		100.29	100.033	99.240	98.986	Phase 10B
																											Phase 10B
HYDRO EASEMENT	32	36			1.80	248	5.63	4.00	4.02	0.00	0.00	1.50	0.00	1.58	5.59	250	1.00	62.03	1.22	104.70	56.44		98.19	97.939	97.146	96.892	Phase 10B
	36	37				248	5.63	4.00	4.02	0.00	0.00	1.50	0.00	1.58	5.59	250	1.00	62.03	1.22	104.70	56.44		97.15	96.892	96.099	95.845	Phase 10B
	37	167A				248	5.63	4.00	4.02	0.00	0.00	1.50	0.00	1.58	5.59	250	1.00	62.03	1.22	104.70	56.44		96.10	95.845	95.052	94.798	Phase 10B
KLONDIKE RD.	167A	167				697	13.33	3.90	11.00	0.00	0.00	1.50	0.00	3.73	14.73	250	2.20	92.01	1.82	100.00			95.05	94.798	92.852	92.598	Phase 10B
KLONDIKE RD.	167	166		92	0.84	789	14.17	3.86	12.35	0.00	0.00	1.50	0.00	3.97	16.32	250	2.20	92.01	1.82	100.00	75.69		97.580	97.330	95.380	95.130	PREVIOUSLY SUBMITTED FOR C. OF A.
	166	165		88	0.80	877	14.97	3.84	13.63	0.00	0.00	1.50	0.00	4.19	17.82	250	4.00	124.07	2.45	97.50	106.25		94.780	94.530	90.880	90.630	PREVIOUSLY SUBMITTED FOR C. OF A.
PIEKOFF CR.	160	161		48	0.69	48	0.69	4.00	0.78	0.00	0.00	1.50	0.00	0.19	0.97	200	2.20	50.72	1.56	102.10	49.75		96.844	96.644	94.600	94.400	PREVIOUSLY SUBMITTED FOR C. OF A.
	161	163		20	0.34	68	1.03	4.00	1.10	0.00	0.00	1.50	0.00	0.29	1.39	200	4.50	72.58	2.24	79.10	71.19		94.600	94.400	91.041	90.841	PREVIOUSLY SUBMITTED FOR C. OF A.
WALLSEND AVE.	155	163		80	0.54	80	0.54	4.00	1.30	0.00	0.00	1.50	0.00	0.15	1.45	200	0.60	26.50	0.82	70.70	25.05		91.504	91.304	91.080	90.880	PREVIOUSLY SUBMITTED FOR C. OF A.
WALLSEND AVE.	163	164		16	0.15	164	1.72	4.00	2.66	0.00	0.00	1.50	0.00	0.48	3.14	200	0.60	26.50	0.82	34.00	23.36		90.984	90.784	90.780	90.580	PREVIOUSLY SUBMITTED FOR C. OF A.
	164	165		16	0.18	180	1.90	4.00	2.92	0.00	0.00	1.50	0.00	0.53	3.45	200	0.60	26.50	0.82	46.70	23.05		90.780	90.580	90.500	90.300	PREVIOUSLY SUBMITTED FOR C. OF A.
KLONDIKE RD.	165	165A		40	0.35	1097	17.22	3.77	16.77	0.00	0.00	1.50	0.00	4.82	21.59	250	4.30	128.63	2.54	59.30	107.04		90.280	90.030	87.730	87.480	PREVIOUSLY SUBMITTED FOR C. OF A.
	165A	148		0	0.00	1097	17.22	3.77	16.77	0.00	0.00	1.50	0.00	4.82	21.59	250	0.40	39.23	0.77	21.00	17.64		87.134	86.884	87.050	86.800	PREVIOUSLY SUBMITTED FOR C. OF A.
KLONDIKE RD.	148	147		43	0.28	2268	33.18	3.54	32.55	0.00	0.00	1.50	0.00	9.29	41.84	300	0.40	63.80	0.87	85.3	21.96		87.016	86.716	86.675	86.375	PHASE 5
WIMBLEDON ST.	48A	48		12	0.13	12	0.13	4.00	0.19	0.00	0.00	1.50	0.00	0.04	0.23	200	1.00	34.21	1.06	15.0	33.98		88.213	88.013	88.063	87.863	PHASE 5
	48	47		28	0.38	40	0.51	4.00	0.65	0.00	0.00	1.50	0.00	0.14	0.79	200	0.60	26.50	0.82	53.3	25.71		88.033	87.833	87.713	87.513	PHASE 5
	47	46		12	0.04	52	0.55	4.00	0.84	0.00	0.00	1.50	0.00	0.15	1.00	200	0.60	26.50	0.82	9.1	25.50		87.683	87.483	87.628	87.428	PHASE 5
	46	45		80	0.61	132	1.16	4.00	2.14	0.00	0.00	1.50	0.00	0.32	2.46	200	0.60	26.50	0.82	71.9	24.04		87.598	87.398	87.167	86.967	PHASE 5
	45	147		16	0.17	148	1.33	4.00	2.40	0.00	0.00	1.50	0.00	0.37	2.77	200	0.60	26.50	0.82	41.0	23.73		87.167	86.967	86.921	86.721	PHASE 5
KLONDIKE RD.	147	146		24	0.54	2440	35.05	3.52	34.76	0.00	0.00	1.50	0.00	9.81	44.58	300	0.40	63.80	0.87	98.5	19.22		86.675	86.375	86.281	85.981	PHASE 5
	146	145		44	0.52	2484	35.57	3.51	35.33	0.00	0.00	1.50	0.00	9.96	45.29	300	0.60	78.14	1.07	96.8	32.85		86.281	85.981	85.700	85.400	PHASE 5
PENRITH ST.	207	206		12	0.17	12	0.17	4.00	0.19	0.00	0.00	1.50	0.00	0.05	0.24	200	1.00	34.21	1.06	32.2	33.97		87.555	87.355	87.245	87.045	PHASE 7
BRECHIN ST.	205	206		60	0.72	60	0.72	4.00	0.97	0.00	0.00	1.50	0.00	0.20	1.17	200	1.75	45.26	1.40	107.3	44.09		89.162	88.962	87.284	87.084	PHASE 7
PENRITH ST.	206	201		20	0.34	92	1.23	4.00	1.49	0.00	0.00	1.50	0.00	0.34	1.84	200	0.60	26.50	0.82	69.50	24.67		87.245	87.045	86.828	86.628	PHASE 7
BRECHIN ST.	204	203		24	0.42	24	0.42	4.00	0.39	0.00	0.00	1.50	0.00	0.12	0.51	200	1.00	34.21	1.06	62.1	33.71		89.450	89.250	88.829	88.629	PHASE 7
HASELMERE AVE.	203	202		32	0.37	56	0.79	4.00	0.91	0.00	0.00	1.50	0.00	0.22	1.13	200	1.00	34.21	1.06	64.7	33.08		88.769	88.569	88.122	87.922	PHASE 7
	202	201		24	0.28	80	1.07	4.00	1.30	0.00	0.00	1.50	0.00	0.30	1.60	200	1.00	34.21	1.06	50.0	32.62		88.122	87.922	87.622	87.422	PHASE 7
PENRITH ST.	201	192		16	0.39	188	2.69	4.00	3.05	0.00	0.00	1.50	0.00	0.75	3.80	200	0.60	26.50	0.82	71.50	22.70		86.828	86.628	86.399	86.199	PHASE 7
BRECHIN ST.	196	198		8	0.14	8	0.14	4.00	0.13	0.00	0.00	1.50	0.00	0.04	0.17	200	1.00	34.21	1.06	31.8	34.04		89.346	89.146	89.028	88.828	PHASE 7

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SANITARY SEWER DESIGN SHEET
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Checked by: L.J.

DESIGN PARAMETERS

I =	0.280	l/s/ha	q (res) =	350	l/cap/day
Singles =	4.0	pers / unit	q (com) =	50,000	l/ha/day
Townhouses =	4.0	pers / unit	q (inst) =	50,000	l/ha/day

STREET	M.H. # FROM	M.H. # TO	RESIDENTIAL NO. of UNITS	INDIVIDUAL POPUL. people	INDIVIDUAL AREA ha	CUMMULATIVE POPUL. people	CUMMULATIVE AREA ha	Peaking Factor	POPUL. FLOW l/s	NON-RESIDENTIAL AREA ha	CUMM. AREA ha	Peaking Factor	NON-RES. FLOW (l/s)	INFIL. FLOW l/s	PEAK FLOW l/s	SEWER DATA DIA. mm	Slope %	CAPAC. l/s	VEL. m/s	LENGTH m	RESIDUAL CAP. (l/s)	Obvert Drop	UPSTREAM Obvert	UPSTREAM Invert	DOWNSTREAM Obvert	DOWNSTREAM Invert	COMMENTS
BRECHIN ST.	203	198		20	0.33	20	0.33	4.00	0.32	0.00	0.00	1.50	0.00	0.09	0.42	200	1.00	34.21	1.06	71.7	33.80		89.570	89.370	88.853	88.653	PHASE 7
EALING ST.	198	197		32	0.34	60	0.81	4.00	0.97	0.00	0.00	1.50	0.00	0.23	1.20	200	1.00	34.21	1.06	64.00	33.01		88.802	88.602	88.162	87.962	PHASE 7
	197	192		24	0.27	84	1.08	4.00	1.36	0.00	0.00	1.50	0.00	0.30	1.66	200	1.00	34.21	1.06	50.7	32.55		88.162	87.962	87.655	87.455	PHASE 7
PENRITH ST.	192	193		12	0.19	284	3.96	4.00	4.60	0.00	0.00	1.50	0.00	1.11	5.71	200	0.60	26.50	0.82	34.90	20.79		86.369	86.169	86.160	85.960	PHASE 7
	193	194		8	0.15	292	4.11	4.00	4.73	0.00	0.00	1.50	0.00	1.15	5.88	200	0.60	26.50	0.82	35.1	20.62		86.129	85.929	85.918	85.718	PHASE 7
BRECHIN ST.	196	195		16	0.45	16	0.45	4.00	0.26	0.00	0.00	1.50	0.00	0.13	0.39	200	1.00	34.21	1.06	47.5	33.83		89.346	89.146	88.871	88.671	PHASE 7
	195	194		48	0.67	64	1.12	4.00	1.04	0.00	0.00	1.50	0.00	0.31	1.35	200	0.70	28.62	0.88	85.2	27.27		88.801	88.601	88.205	88.005	PHASE 7
PENRITH ST.	194	145		20	0.28	376	5.51	4.00	6.09	0.00	0.00	1.50	0.00	1.54	7.64	250	0.40	39.18	0.77	73.30	31.55		85.942	85.692	85.650	85.400	PHASE 7
LAXFORD DR.	145	27		44	0.59	2904	41.67	3.45	40.64	0.00	0.00	1.50	0.00	11.67	52.30	300	0.40	63.80	0.87	103.60	11.49		85.672	85.372	85.258	84.958	PHASE 5
TYNE CRT.	41	40		56	0.97	56	0.97	4.00	0.91	0.00	0.00	1.50	0.00	0.27	1.18	200	1.00	34.21	1.06	50.00	33.03		87.800	87.600	87.300	87.100	PHASE 5
	40	27		16	0.29	72	1.26	4.00	1.17	0.00	0.00	1.50	0.00	0.35	1.52	200	1.00	34.21	1.06	72.00	32.69		86.626	86.426	85.906	85.706	PHASE 5
LAXFORD DR.	27	Stub		16	1.88	2992	44.81	3.44	41.74	0.00	0.00	1.50	0.00	12.55	54.28	300	0.44	67.28	0.92	34.80	13.00		85.258	84.958	85.103	84.803	PHASE 5
	Stub	26		0	0.00	2992	44.81	3.44	41.74	0.00	0.00	1.50	0.00	12.55	54.28	300	0.44	67.28	0.92	29.90	13.00		85.103	84.803	84.970	84.670	PHASE 5
	26	25		0	0.05	2992	44.86	3.44	41.74	0.00	0.00	1.50	0.00	12.56	54.30	300	0.43	66.40	0.91	12.00	12.11		84.905	84.605	84.853	84.553	PHASE 5
	25	24		8	1.99	3000	46.85	3.44	41.83	0.00	0.00	1.50	0.00	13.12	54.95	300	0.41	64.50	0.88	20.30	9.55		84.805	84.505	84.722	84.422	PHASE 5
REDCAR CR.	33	34		40	0.58	40	0.58	4.00	0.65	0.00	0.00	1.50	0.00	0.16	0.81	200	0.60	26.50	0.82	79.3	25.69		86.846	86.646	86.370	86.170	PHASE 5
	34	24		0	0.08	40	0.66	4.00	0.65	0.00	0.00	1.50	0.00	0.18	0.83	200	0.60	26.50	0.82	25.0	25.67		85.570	85.370	85.420	85.220	PHASE 5
LAXFORD DR.	24	22		36	0.60	3076	48.11	3.43	42.78	0.00	0.00	1.50	0.00	13.47	56.25	300	0.40	63.80	0.87	95.1	7.55		84.720	84.420	84.340	84.040	PHASE 5
KEIGHLY CIRC.	13	14		4	0.05	4	0.05	4.00	0.06	0.00	0.00	1.50	0.00	0.01	0.08	200	0.60	26.50	0.82	11.5	26.42		88.021	87.821	87.952	87.752	PHASE 5
	14	15		24	0.42	28	0.47	4.00	0.45	0.00	0.00	1.50	0.00	0.13	0.59	200	0.60	26.50	0.82	40.0	25.92		87.922	87.722	87.682	87.482	PHASE 5
	15	16		20	0.42	48	0.89	4.00	0.78	0.00	0.00	1.50	0.00	0.25	1.03	200	0.72	29.03	0.90	58.0	28.00		87.625	87.425	87.207	87.007	PHASE 5
LARK LANE	16	22		0	0.00	48	0.89	4.00	0.78	0.00	0.00	1.50	0.00	0.25	1.03	200	4.25	70.53	2.17	79.0	69.51		87.567	87.367	84.210	84.010	PHASE 5
LAXFORD DR.	22	21		12	0.31	3136	49.31	3.43	43.52	0.00	0.00	1.50	0.00	13.81	57.33	300	0.40	63.80	0.87	50.1	6.47		84.300	84.000	84.100	83.800	PHASE 5
REDCAR CR.	33	32		60	0.66	60	0.66	4.00	0.97	0.00	0.00	1.50	0.00	0.18	1.16	200	1.46	41.35	1.28	97.5	40.20		86.624	86.424	85.200	85.000	PHASE 5
	32	31		8	0.06	68	0.72	4.00	1.10	0.00	0.00	1.50	0.00	0.20	1.30	200	1.46	41.34	1.27	10.9	40.04		84.819	84.619	84.660	84.460	PHASE 5
	31	30		28	0.55	96	1.27	4.00	1.56	0.00	0.00	1.50	0.00	0.36	1.91	200	0.58	26.06	0.80	73.4	24.14		84.626	84.426	84.200	84.000	PHASE 5
	30	21		4	0.13	100	1.40	4.00	1.62	0.00	0.00	1.50	0.00	0.39	2.01	200	0.68	28.25	0.87	28.7	26.24		84.196	83.996	84.000	83.800	PHASE 5
LAXFORD DR.	21	20		44	0.57	3280	51.28	3.41	45.30	0.00	0.00	1.50	0.00	14.36	59.66	300	0.81	90.79	1.24	87.2	31.13		83.916	83.616	83.210	82.910	PHASE 5
	20	138		0	0.00	3280	51.28	3.41	45.30	0.00	0.00	1.50	0.00	14.36	59.66	300	0.60	78.14	1.07	21.3	18.48		83.178	82.878	83.050	82.750	PHASE 5
KLONDIKE RD NORTH	144A	144		32	0.45	32	0.45	4.00	0.52	0.00	0.00	1.50	0.00	0.13	0.64	200	0.57	25.76	0.79	73.4	25.12		86.640	86.440	86.224	86.024	PHASE 5
	144	143		68	0.77	100	1.22	4.00	1.62	0.00	0.00	1.50	0.00	0.34	1.96	200	1.22	37.73	1.16	100.0	35.77		86.224	86.024	85.008	84.808	PHASE 5
GOULBOURN RD (PHASE 5B)	143	142A		40	0.42	140	1.64	4.00	2.27	0.00	0.00	1.50	0.00	0.46	2.73	200	1.83	46.24	1.43	82.0	43.52		85.008	84.808	83.510	83.310	PHASE 5
	142A	142		24	0.37	164	2.01	4.00	2.66	0.00	0.00	1.50	0.00	0.56	3.22	200	1.75	45.30	1.40	69.0	42.08		83.510	83.310	82.300	82.100	PHASE 5
WOLISTON CRES.	177	176		52	0.74	52	0.74	4.00	0.84	0.00	0.00	1.50	0.00	0.21	1.05	200	1.00	34.21	1.06	93.9	33.16		87.785	87.585	86.846	86.646	PHASE 6
	176	175		8	0.21	60	0.95	4.00	0.97	0.00	0.00	1.50	0.00	0.27	1.24	200	1.00	34.21	1.06	11.0	32.98		86.796	86.596	86.686	86.486	PHASE 6
	175	174		40	0.65	100	1.60	4.00	1.62	0.00	0.00	1.50	0.00	0.45	2.07	200	1.00	34.21	1.06	89.80	32.14		86.636	86.436	85.738	85.538	PHASE 6
	174	173		36	0.28	136	1.88	4.00	2.20	0.00	0.00	1.50	0.00	0.53	2.73	200	1.04	34.96	1.08	65.80	32.23		85.738	85.538	85.051	84.851	PHASE 6
PALTON ST.	189	173		24	0.26	24	0.26	4.00	0.39	0.00	0.00	1.50	0.00	0.07	0.46	200	1.05	35.06	1.08	78.50	34.60		85.925	85.725	85.101	84.901	PHASE 6
WOLISTON CRES.	173	172		52	0.47	212	2.61	4.00	3.44	0.00	0.00	1.50	0.00	0.73	4.17	200	0.83	31.17	0.96	84.20	27.00		85.051	84.851	84.352	84.152	PHASE 6
FLAMBOROUGH WAY	172	171		92	0.77	304	3.38	4.00	4.93	0.00	0.00	1.50	0.00	0.95	5.87	250	0.60	47.86	0.94	107.00	41.99		83.722	83.472	83.085	82.835	PHASE 6 (as-built info. added)
	171	170		84	0.68	388	4.06	4.00	6.29	0.00	0.00	1.50	0.00	1.14	7.42	250	0.43	40.90	0.81	88.80	33.48		83.004	82.754	82.618	82.368	PHASE 6 (as-built info. added)
WOLISTON CRES.	177	181		36	0.55	36	0.55	4.00	0.58	0.00	0.00	1.50	0.00	0.15	0.74	200	0.82	30.98	0.96	86.90	30.24		88.181	87.981	87.467	87.267	PHASE 6
	181	182		8	0.23	44	0.78	4.00	0.71	0.00	0.00	1.50	0.00	0.22	0.93	200	0.60	26.50	0.82	10.40	25.57		87.417	87.217	87.355	87.155	PHASE 6
	182	183		40	0.67	84	1.45	4.00	1.36	0.00	0.00	1.50	0.00	0.41	1.77	200	1.40	40.48	1.25	70.90	38.71		87.305	87.105	86.318	86.118	PHASE 6
KETTLEWELL WAY	187	183		8	0.20	8	0.20	4.00	0.13	0.00	0.00	1.50	0.00	0.06	0.19	200	1.02	34.55	1.07	55.00	34.37		86.870	86.670	86.309	86.109	PHASE 6
WOLISTON CRES.	183	184		52	0.58	144	2.23	4.00	2.33	0.00	0.00	1.50	0.00	0.62	2.96	200	1.80	45.90	1.42	84.90	42.94		86.169	85.969	84.641	84.441	PHASE 6
KETTLEWELL WAY	187	188		24	0.38	24	0.38	4.00	0.39	0.00	0.00	1.50	0.00	0.11	0.50	200	1.40	40.50	1.25	54.20	40.00		87.102	86.902	86.343	86.143	PHASE 6
	188	188A		8	0.20	32	0.58	4.00	0.52	0.00	0.00	1.50	0.00	0.16	0.68	200	1.40	40.48	1.25	11.00	39.80		86.293	86.093	86.139	85.939	PHASE 6

J.L. Richards & Associates Limited
Consulting Engineers, Architects & Planners

CITY OF OTTAWA

MINTO DEVELOPMENT INC.
MORGAN'S GRANT SUBDIVISION - PHASE 10A & 10B
JLR NO. 17730

SANITARY SEWER DESIGN SHEET
Revised September 16, 2003

Designed by: J.B.
Checked by: L.J.

DESIGN PARAMETERS

I =	0.280	l/s/ha	q (res) =	350	l/cap/day
Singles =	4.0	pers / unit	q (com) =	50,000	l/ha/day
Townhouses =	4.0	pers / unit	q (inst) =	50,000	l/ha/day

STREET	M.H. # FROM	M.H. # TO	NO. of UNITS	RESIDENTIAL INDIVIDUAL POPUL. people	INDIVIDUAL AREA ha	CUMMULATIVE POPUL. people	CUMMULATIVE AREA ha	Peaking Factor	POPUL. FLOW l/s	NON-RESIDENTIAL AREA ha	CUMM. AREA ha	Peaking Factor	NON-RES. FLOW (l/s)	INFIL. FLOW l/s	PEAK FLOW l/s	SEWER DATA DIA. mm	Slope %	CAPAC. l/s	VEL. m/s	LENGTH m	RESIDUAL CAP. (l/s)	Obvert Drop	UPSTREAM Obvert	UPSTREAM Invert	DOWNSTREAM Obvert	DOWNSTREAM Invert	COMMENTS
	188A	189		40	0.54	72	1.12	4.00	1.17	0.00	0.00	1.50	0.00	0.31	1.48	200	1.08	35.56	1.10	77.10	34.08		86.091	85.891	85.260	85.060	PHASE 6
PALTON ST.	189	185		36	0.34	108	1.46	4.00	1.75	0.00	0.00	1.50	0.00	0.41	2.16	200	0.60	26.50	0.82	55.00	24.34		85.200	85.000	84.870	84.670	PHASE 6
	185	184		24	0.35	132	1.81	4.00	2.14	0.00	0.00	1.50	0.00	0.51	2.65	200	0.60	26.50	0.82	61.80	23.86		84.870	84.670	84.500	84.300	PHASE 6
WOLISTON CRES.	184	170		48	0.54	324	4.58	4.00	5.25	0.00	0.00	1.50	0.00	1.28	6.53	200	1.71	44.74	1.38	84.20	38.21		84.516	84.316	83.076	82.876	PHASE 6
FLAMBOROUGH WAY	170	142		44	0.41	756	9.05	3.88	11.87	0.00	0.00	1.50	0.00	2.53	14.40	250	0.37	37.88	0.75	85.00	23.48		82.600	82.350	82.283	82.033	PHASE 6 (as-built info. added)
GOULBOURN RD (PHASE 5B)	142	141		12	0.22	932	11.28	3.82	14.42	0.00	0.00	1.50	0.00	3.16	17.58	250	0.31	34.68	0.68	64.0	17.10		82.283	82.033	82.083	81.833	PHASE 5 (as-built info. Added)
	141	140		4	0.14	936	11.42	3.82	14.48	0.00	0.00	1.50	0.00	3.20	17.68	250	0.27	31.99	0.63	28.2	14.32		82.032	81.782	81.957	81.707	PHASE 5 (as-built info. Added)
KEIGHLEY CIRC.	13	12		36	0.57	36	0.57	4.00	0.58	0.00	0.00	1.50	0.00	0.16	0.74	200	2.00	48.38	1.49	70.0	47.64		88.000	87.800	86.600	86.400	PHASE 5
	12	11		36	0.51	72	1.08	4.00	1.17	0.00	0.00	1.50	0.00	0.30	1.47	200	2.00	48.38	1.49	70.0	46.92		86.600	86.400	85.200	85.000	PHASE 5
KEIGHLEY CIRC.	16	17		44	0.70	44	0.70	4.00	0.71	0.00	0.00	1.50	0.00	0.20	0.91	200	2.00	48.38	1.49	79.0	47.48		86.580	86.380	86.000	85.800	PHASE 5
	17	18		4	0.10	48	0.80	4.00	0.78	0.00	0.00	1.50	0.00	0.22	1.00	200	1.00	34.21	1.06	12.5	33.21		85.955	85.755	85.830	85.630	PHASE 5
	18	19		12	0.20	60	1.00	4.00	0.97	0.00	0.00	1.50	0.00	0.28	1.25	200	1.00	34.21	1.06	35.0	32.96		85.800	85.600	85.450	85.250	PHASE 5
	19	11		0	0.15	60	1.15	4.00	0.97	0.00	0.00	1.50	0.00	0.32	1.29	200	0.60	26.50	0.82	38.0	25.21		85.428	85.228	85.200	85.000	PHASE 5
KEIGHLEY CIRC.	11	10		28	0.35	160	2.58	4.00	2.59	0.00	0.00	1.50	0.00	0.72	3.31	200	3.80	66.69	2.06	56.0	63.38		85.128	84.928	83.000	82.800	PHASE 5
	10	140		0	0.00	160	2.58	4.00	2.59	0.00	0.00	1.50	0.00	0.72	3.31	200	2.00	48.38	1.49	34.0	45.07		82.555	82.355	81.875	81.675	PHASE 5
GOULBOURN RD (PHASE 5B)	140	139		24	0.46	1120	14.46	3.77	17.09	0.00	0.00	1.50	0.00	4.05	21.14	250	0.31	34.53	0.68	81.0	13.39		81.942	81.692	81.691	81.441	PHASE 5 (as-built info. Added)
	139	138		48	0.59	1168	15.05	3.76	17.77	0.00	0.00	1.50	0.00	4.21	21.98	250	0.46	42.13	0.83	87.8	20.15		81.690	81.440	81.285	81.035	PHASE 5 (as-built info. Added)
GOULBOURN RD	138	137		4	0.35	4452	66.68	3.29	59.36	0.00	0.00	1.50	0.00	18.67	78.03	375	0.49	128.22	1.12	70.4	50.19		81.340	80.965	80.994	80.619	PHASE 5 (as-built info. Added)
GOULBOURN RD	135	136		48	0.66	48	0.66	4.00	0.78	0.00	0.00	1.50	0.00	0.18	0.96	200	1.39	40.26	1.24	72.2	39.30		84.200	84.000	83.200	83.000	PHASE 5
	136	137		20	0.39	68	1.05	4.00	1.10	0.00	0.00	1.50	0.00	0.29	1.40	200	0.71	28.83	0.89	70.4	27.43		83.200	83.000	82.700	82.500	PHASE 5
OAKHAM RIDGE	137	135				4520	67.73	3.29	60.16	0.00	0.00	1.50	0.00	18.96	79.12	375	0.40	115.49	1.01	46.7	36.37		80.872	80.497	80.686	80.311	EXISTING SEWER (as-built info. Added)
	135	134		24	0.40	4544	68.13	3.28	60.44	0.00	0.00	1.50	0.00	19.08	79.51	375	0.39	114.65	1.01	59.8	35.14		80.670	80.295	80.435	80.060	EXISTING SEWER (as-built info. Added)
	134	133		4	0.11	4548	68.24	3.28	60.48	0.00	0.00	1.50	0.00	19.11	79.59	375	0.70	152.55	1.34	5.75	72.96		80.425	80.050	80.385	80.010	EXISTING SEWER (as-built info. Added)
	133	132		28	0.25	4576	68.49	3.28	60.81	0.00	0.00	1.50	0.00	19.18	79.99	375	0.37	111.68	0.98	43.5	31.69		80.327	79.952	80.165	79.790	EXISTING SEWER (as-built info. Added)
	132	130		12	0.23	4588	68.72	3.28	60.95	0.00	0.00	1.50	0.00	19.24	80.19	375	0.36	109.88	0.96	44.1	29.69		80.137	79.762	79.978	79.603	EXISTING SEWER (as-built info. Added)
	131	130		52	0.73	52	0.73	4.00	0.84	0.00	0.00	1.50	0.00	0.20	1.05	200	2.52	54.34	1.68	110.0	53.30		82.850	82.650	80.075	79.875	EXISTING SEWER
	130	128		36	0.51	4676	69.96	3.27	61.98	0.00	0.00	1.50	0.00	19.59	81.56	450	0.15	115.42	0.70	97.6	33.86		80.047	79.597	79.900	79.450	EXISTING SEWER (as-built info. Added)
	128	4		32	0.54	4708	70.50	3.27	62.35	0.00	0.00	1.50	0.00	19.74	82.09	450	0.09	88.00	0.54	86.8	5.92		79.870	79.420	79.794	79.344	EXISTING SEWER (as-built info. Added)
Phases 1, 2, 3, 4w, 5, 6, 7, 8, 9 based on 4 pers/unit (Point B)	4	36		2924	48.60	7632	119.10	3.07	94.92	0.00	0.00	1.50	0.00	33.35	128.27	600	0.10	202.55	0.69		74.28						
Street No. 2	26	14	10	40	0.37	40	0.37	4.00	0.65	0.00	0.00	1.50	0.00	0.10	0.75	250	2.87	105.09	2.07	83.4	104.34		104.475	104.221	102.081	101.827	Stage 10A
	14	13	28	112	0.83	152	1.20	4.00	2.46	0.00	0.00	1.50	0.00	0.34	2.80	250	2.48	97.75	1.93	104.8	94.95	0.08	102.001	101.747	99.399	99.145	Stage 10A
	13	12	4	16	0.19	168	1.39	4.00	2.72	0.00	0.00	1.50	0.00	0.39	3.11	250	2.95	106.55	2.10	9.7	103.43	0.05	99.349	99.095	99.062	98.808	Stage 10A
	12	[illegible]	10	40	0.38	208	1.77	4.00	3.37	0.00	0.00	1.50	0.00	0.50	3.87	250	2.25	93.03	1.84	78.5	89.16	0.05	99.012	98.758	97.247	96.993	Stage 10A
Street No. 7	26	25	6	24	0.33	24	0.33	4.00	0.39	0.00	0.00	1.50	0.00	0.09	0.48	250	1.50	75.97	1.50	51.0	75.49		105.010	104.756	104.245	103.991	Stage 10A
	25	24	10	40	0.66	64	0.99	4.00	1.04	0.00	0.00	1.50	0.00	0.28	1.31	250	1.38	72.77	1.44	79.0	71.45	0.03	104.215	103.961	103.128	102.874	Stage 10A
	24	23	3	12	0.26	76	1.25	4.00	1.23	0.00	0.00	1.50	0.00	0.35	1.58	250	2.67	101.36	2.00	9.0	99.78	0.10	103.028	102.774	102.788	102.534	Stage 10A
	23	[illegible]	4	16	0.32	92	1.57	4.00	1.49	0.00	0.00	1.50	0.00	0.44	1.93	250	1.40	73.50	1.45	78.0	71.57	0.08	102.708	102.454	101.613	101.359	
Street No. 3	14	15	10	40	0.40	40	0.40	4.00	0.65	0.00	0.00	1.50	0.00	0.11	0.76	250	0.70	51.90	1.02	60.0	51.14		102.460	102.206	102.040	101.786	
	15	[illegible]	19	76	0.50	116	0.90	4.00	1.88	0.00	0.00	1.50	0.00	0.25	2.13	250	0.63	49.35	0.97	76.0	47.22	0.03	102.010	101.756	101.529	101.275	Stage 10A
Street No. 3	[illegible]		7	28	0.23	236	2.70	4.00	3.82	0.00	0.00	1.50	0.00	0.76	4.58	250	2.27	93.38	1.84	84.0	88.80	0.07	101.459	101.205	99.555	99.301	Stage 10A
Street No. 4	20	19	15	60	0.52	60	0.52	4.00	0.97	0.00	0.00	1.50	0.00	0.15	1.12	250	0.81	55.97	1.10	104.2	54.85		[illegible]	98.696	98.102	97.848	Stage 10A
	19	18	4	16	0.24	76	0.76	4.00	1.23	0.00	0.00	1.50	0.00	0.21	1.44	250	0.61	48.45	0.96	14.4	47.01	0.04	98.062	97.808	97.974	97.720	Stage 10A
	18	[illegible]	3	12	0.15	88	0.91	4.00	1.43	0.00	0.00	1.50	0.00	0.25	1.68	250	1.33	71.57	1.41	41.0	69.89	0.04	97.934	97.680	97.388	97.134	Stage 10A
Street No. 2	[illegible]	10	12	48	0.39	344	3.07	4.00	5.57	0.00	0.00	1.50	0.00	0.86	6.43	250	2.16	91.11	1.80	79.6	84.67	0.07	97.177	96.923	95.460	95.206	Stage 10A
	10	9	13	52	1.36	396	4.43	4.00	6.42	0.00	0.00	1.50	0.00	1.24	7.66	250	1.63	79.20	1.56	98.5	71.54	0.03	95.430	95.176	93.824	93.570	Stage 10A
	9	9A	0	0	0.00	396	4.43	4.00	6.42	0.00	0.00	1.50	0.00	1.24	7.66	250	0.30	33.98	0.67	5.6	26.32	0.04	93.784	93.530	93.767	93.513	
Brady Avenue	9A	8	7	28	0.22	424	4.65	4.00	6.87	0.00	0.00	1.50	0.00	1.30	8.17	250	0.40	38.99	0.77	40.8	30.81	0.04	93.727	93.473	93.566	93.312	Stage 10A
	8	7	3	12	0.21	436	4.86	4.00	7.06	0.00	0.00	1.50	0.00	1.36	8.43	300	1.37	118.16	1.62	50.9	109.73		93.566	93.261	92.868	92.563	Stage 10A
Brady Avenue	22		26	104	1.11	104	1.11	4.00	1.69	0.00	0.00	1.50	0.00	0.31	2.00	250	1.06	63.96	1.26	120.8	61.96		100.920	100.666	99.636	99.382	Stage 10A

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CITY OF OTTAWA

MINTO DEVELOPMENT INC.
MORGAN'S GRANT SUBDIVISION - PHASE 10A & 10B
JLR NO. 17730

SANITARY SEWER DESIGN SHEET
Revised September 16, 2003

Designed by: J.B.
Checked by: L.J.

DESIGN PARAMETERS

I =	0.280	l/s/ha	q (res) =	350	l/cap/day
Singles =	4.0	pers / unit	q (com) =	50,000	l/ha/day
Townhouses =	4.0	pers / unit	q (inst) =	50,000	l/ha/day

STREET	M.H. #		RESIDENTIAL							NON-RESIDENTIAL				INFIL. FLOW	PEAK FLOW	SEWER DATA						UPSTREAM			DOWNSTREAM		COMMENTS
			NO. of UNITS	INDIVIDUAL		CUMMULATIVE		Peaking Factor	POPUL. FLOW	AREA	CUMM. AREA	Peaking Factor	NON-RES. FLOW (l/s)			DIA.	Slope	CAPAC.	VEL.	LENGTH	RESIDUAL CAP. (l/s)	Obvert Drop	Obvert	Invert	Obvert	Invert	
	FROM	TO		POPUL. people	AREA ha	POPUL. people	AREA ha		l/s	ha	ha			l/s	l/s	mm	%	l/s	m/s	m							
Brady Avenue	[illegible]	7	11	44	0.61	384	4.42	4.00	6.22	0.00	0.00	1.50	0.00	1.24	7.46	250	1.83	83.94	1.66	85.2	76.48	0.07	99.485	99.231	97.925	97.671	Stage 10A
Street No. 6	7	6	12	48	0.44	868	9.72	3.84	13.50	0.00	0.00	1.50	0.00	2.72	16.22	300	0.22	47.31	0.65	69.8	31.09	0.07	92.798	92.493	92.644	92.339	Stage 10A
	6	5	26	104	0.79	972	10.51	3.81	14.99	0.00	0.00	1.50	0.00	2.94	17.94	300	0.22	47.31	0.65	101.4	29.38	0.03	92.614	92.309	92.391	92.086	Stage 10A
	5	4	23	92	0.68	1064	11.19	3.78	16.30	0.00	0.00	1.50	0.00	3.13	19.44	300	0.22	47.31	0.65	84.5	27.88	0.03	92.361	92.056	92.175	91.870	Stage 10A
	4	3	7	28	0.36	1092	11.55	3.78	16.70	0.00	0.00	1.50	0.00	3.23	19.93	300	0.22	47.31	0.65	95.4	27.38	0.03	92.145	91.840	91.935	91.631	Stage 10A
	3	2	6	24	0.34	1116	11.89	3.77	17.04	0.00	0.00	1.50	0.00	3.33	20.37	300	0.22	47.31	0.65	61.5	26.95	0.03	91.905	91.601	91.770	91.465	Stage 10A
Terry Fox Drive	2	50				1116	11.89	3.77	17.04	0.00	0.00	1.50	0.00	3.33	20.37	300	0.85	92.89	1.27	100.0	72.52	0.08	91.690	91.385	90.842	90.537	Stage 10A
	50	51				1116	11.89	3.77	17.04	0.00	0.00	1.50	0.00	3.33	20.37	300	0.70	84.40	1.16	100.0	64.03	0.03	90.812	90.507	90.112	89.807	Stage 10A
	51	52				1116	11.89	3.77	17.04	0.00	0.00	1.50	0.00	3.33	20.37	300	0.74	86.83	1.19	61.7	66.47	0.03	90.082	89.777	89.625	89.320	Stage 10A
Carp Forcemain (58 L/s)		62													58.00												Stage 10A
Condo Site		62	215	860	4.80	860	4.80	3.84	13.38	0.00	0.00	1.50	0.00	1.34	14.73												Stage 10A
	62	63				860	4.80	3.84	13.38	0.00	0.00	1.50	0.00	1.34	72.73	300	0.70	84.40	1.16	112.0	11.67		89.405	89.100	88.621	88.316	Stage 10A
	63	52				860	4.80	3.84	13.38	0.00	0.00	1.50	0.00	1.34	72.73	300	0.75	87.36	1.20	12.0	14.63		88.621	88.316	88.531	88.226	Stage 10A
Terry Fox Drive Sta 1936-2016	52	53				1976	16.69	3.59	28.74	0.00	0.00	1.50	0.00	4.67	91.41	375	0.50	129.20	1.13	80.0	37.79		88.531	88.150	88.132	87.751	Stage 10A
Sta 2016-2092	53	54				1976	16.69	3.59	28.74	0.00	0.00	1.50	0.00	4.67	91.41	375	0.50	129.33	1.13	75.0	37.92	0.03	88.102	87.721	87.727	87.346	Stage 10A
Sta 2092-2182	54	55				1976	16.69	3.59	28.74	0.00	0.00	1.50	0.00	4.67	91.41	375	1.13	194.42	1.71	70.0	103.01	0.03	87.697	87.316	86.906	86.525	Stage 10A
Sta 2182-2246	55	56				1976	16.69	3.59	28.74	0.00	0.00	1.50	0.00	4.67	91.41	375	0.50	129.33	1.13	80.0	37.92	0.03	86.876	86.495	86.476	86.095	Stage 10A
Sta 2246-2286	56	57				1976	16.69	3.59	28.74	0.00	0.00	1.50	0.00	4.67	91.41	375	0.70	153.02	1.34	100.0	61.61	0.03	86.446	86.065	85.746	85.365	Stage 10A
Sta 2286-2366	57	58				1976	16.69	3.59	28.74	0.00	0.00	1.50	0.00	4.67	91.41	375	0.55	135.64	1.19	100.0	44.23	0.03	85.716	85.335	85.166	84.785	Stage 10A
	58	59				1976	16.69	3.59	28.74	0.00	0.00	1.50	0.00	4.67	91.41	375	0.53	132.65	1.16	95.0	41.24	0.03	85.136	84.755	84.636	84.255	Stage 10A
Sta 2366-2470	59	60				1976	16.69	3.59	28.74	0.00	0.00	1.50	0.00	4.67	91.41	375	1.79	244.97	2.15	90.0	153.56	0.03	84.606	84.225	82.991	82.610	Stage 10A
Sta 2470-2563	60	EX				1976	16.69	3.59	28.74	0.00	0.00	1.50	0.00	4.67	91.41	375	1.64	234.51	2.06	90.5	143.10	0.03	82.961	82.580	81.473	81.092	Stage 10A
Minto Lands West of Hydro Easement based on 4 pers/unit (Point A)		EX				1976	16.69	3.59	28.74	0.00	0.00	1.50	0.00	4.67	33.41												
Total for Morgan's Grant Subdivision north of Terry Fox Drive (4 pers/unit) to Hines Rd San. sewer (Points A & B)	36					9608	135.79	2.97	115.67	0.00	0.00	1.50	0.00	38.02	153.69												
Total for Morgan's Grant Subdivision north of Terry Fox Drive (3.05 pers/unit) to Hines Rd San. sewer (Points A & B)	36					7326	135.79	3.09	91.63	0.00	0.00	1.50	0.00	38.02	129.65												
Street No. 9	98	97	55	220	2.06	220	2.06	4.00	3.56	0.00	0.00	1.50	0.00	0.58	4.14	250	0.70	51.90	1.02	110.00	47.76		98.800	98.546	98.030	97.776	Phase 12
	97	96	0	0	0.19	220	2.25	4.00	3.56	0.00	0.00	1.50	0.00	0.63	4.19	250	0.80	55.48	1.09	113.00	51.29	0.030	98.000	97.746	97.096	96.842	Phase 12
Street No. 8	84	81	2	8	0.22	8	0.22	4.00	0.13	0.00	0.00	1.50	0.00	0.06	0.19	250	0.50	43.86	0.87	14.00	43.67		98.270	98.016	98.200	97.946	Phase 12
	81	80	4	16	0.25	24	0.47	4.00	0.39	0.00	0.00	1.50	0.00	0.13	0.52	250	0.50	43.86	0.87	39.20	43.34	0.050	98.150	97.896	97.954	97.700	Phase 12
	80	96	2	8	0.14	32	0.61	4.00	0.52	0.00	0.00	1.50	0.00	0.17	0.69	250	3.45	115.22	2.27	29.20	114.53	0.271	97.683	97.429	[illegible]	96.422	Phase 12
Street No. 7	75	71	4	16	0.27	16	0.27	4.00	0.26	0.00	0.00	1.50	0.00	0.08	0.33	250	0.65	50.01	0.99	48.30	49.68		98.440	98.186	98.126	97.872	Phase 12
	71	70	1	4	0.14	20	0.41	4.00	0.32	0.00	0.00	1.50	0.00	0.11	0.44	250	0.65	50.01	0.99	32.70	49.57	0.050	98.076	97.822	97.864	97.610	Phase 12
	70	[illegible]	0	0	0.02	20	0.43	4.00	0.32	0.00	0.00	1.50	0.00	0.12	0.44	250	0.65	50.01	0.99	15.40	49.57	0.030	97.834	97.580	97.733	97.479	Phase 12
Street No. 9	[illegible]	95	3	12	0.29	284	3.58	4.00	4.60	0.00	0.00	1.50	0.00	1.00	5.60	250	0.45	41.61	0.82	71.00	36.01	0.130	96.546	96.292	96.226	95.972	Phase 12
Street No. 8	84	83	10	40	0.56	40	0.56	4.00	0.65	0.00	0.00	1.50	0.00	0.16	0.80	250	0.75	53.72	1.06	67.40	52.92		98.270	98.016	97.765	97.511	Phase 12
	83	82	1	4	0.13	44	0.69	4.00	0.71	0.00	0.00	1.50	0.00	0.19	0.91	250	0.75	53.72	1.06	11.50	52.82	0.060	97.705	97.451	97.618	97.364	Phase 12
	82	95	7	28	0.41	72	1.10	4.00	1.17	0.00	0.00	1.50	0.00	0.31	1.47	250	1.95	86.62	1.71	72.10	85.15	0.080	97.538	97.284	[illegible]	95.878	Phase 12
Street No. 9	95	94	4	16	0.28	372	4.96	4.00	6.03	0.00	0.00	1.50	0.00	1.39	7.42	250	0.60	48.05	0.95	48.20	40.63	0.070	96.062	95.808	95.773	95.519	Phase 12
Street No. 7	75	74	1	4	0.10	4	0.10	4.00	0.06	0.00	0.00	1.50	0.00	0.03	0.09	250	0.40	39.23	0.77	74.00	39.14		98.440	98.186	98.144	97.890	Phase 12
	74	73	11	44	0.71	48	0.81	4.00	0.78	0.00	0.00	1.50	0.00	0.23	1.00	250	1.35	72.08	1.42	11.50	71.07	0.050	98.094	97.840	97.939	97.685	Phase 12
	73	72	2	8	0.18	56	0.99	4.00	0.91	0.00	0.00	1.50	0.00	0.28	1.18	250	0.75	53.72	1.06	12.50	52.54	0.040	97.899	97.645	97.805	97.551	Phase 12
	72	94	6	24	0.44	80	1.43	4.00	1.30	0.00	0.00	1.50	0.00	0.40	1.70	250	0.60	48.05	0.95	83.80	46.35	0.080	97.725	97.471	97.222	96.968	Phase 12
Street No. 9	94	93	6	24	0.39	476	6.78	3.99	7.68	0.00	0.00	1.50	0.00	1.90	9.58	250	1.10	65.06	1.28	80.00	55.48	0.050	[illegible]	95.469	94.843	94.589	Phase 12

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Revised September 16, 2003

Designed by: J.B.
Checked by: L.J.

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Townhouses =	4.0	pers / unit	q (inst) =	50,000	l/ha/day

STREET	M.H. # FROM	M.H. # TO	RESIDENTIAL NO. of UNITS	INDIVIDUAL POPUL. people	INDIVIDUAL AREA ha	CUMMULATIVE POPUL. people	CUMMULATIVE AREA ha	Peaking Factor	POPUL. FLOW l/s	NON-RESIDENTIAL AREA ha	CUMM. AREA ha	Peaking Factor	NON-RES. FLOW (l/s)	INFIL. FLOW l/s	PEAK FLOW l/s	SEWER DATA DIA. mm	Slope %	CAPAC. l/s	VEL. m/s	LENGTH m	RESIDUAL CAP. (l/s)	Obvert Drop	UPSTREAM Obvert	UPSTREAM Invert	DOWNSTREAM Obvert	DOWNSTREAM Invert	COMMENTS
	93	92	4	16	0.27	492	7.05	3.98	7.93	0.00	0.00	1.50	0.00	1.97	9.90	250	3.60	117.70	2.32	58.40	107.80	0.194	94.649	94.395	92.547	92.293	Phase 12
	92	91	2	8	0.13	500	7.18	3.97	8.05	0.00	0.00	1.50	0.00	2.01	10.06	250	3.35	113.54	2.24	21.70	103.48	0.500	92.047	91.793	91.320	91.066	Phase 12
	91	90	8	32	0.54	532	7.72	3.96	8.53	0.00	0.00	1.50	0.00	2.16	10.70	250	0.75	53.72	1.06	70.40	43.03	0.080	91.240	90.986	90.712	90.458	Phase 12
	90	[illegible]	2	8	0.17	540	7.89	3.96	8.66	0.00	0.00	1.50	0.00	2.21	10.86	250	1.05	63.57	1.25	33.60	52.70	0.060	90.652	90.398	90.299	90.045	Phase 12
Street No. 6	93	62	10	40	0.60	40	0.60	4.00	0.65	0.00	0.00	1.50	0.00	0.17	0.82	250	1.75	82.06	1.62	84.50	81.25		96.100	95.846	94.621	94.367	Phase 12
	62	61	2	8	0.20	48	0.80	4.00	0.78	0.00	0.00	1.50	0.00	0.22	1.00	250	1.40	73.40	1.45	11.40	72.40	0.040	94.581	94.327	94.422	94.168	Phase 12
	61	60	9	36	0.56	84	1.36	4.00	1.36	0.00	0.00	1.50	0.00	0.38	1.74	250	1.75	82.06	1.62	70.00	80.32	0.040	94.382	94.128	93.157	92.903	Phase 12
	60	16	6	24	0.44	108	1.80	4.00	1.75	0.00	0.00	1.50	0.00	0.50	2.25	250	3.15	110.10	2.17	61.10	107.84	0.030	93.127	92.873	91.202	90.948	Phase 12
Street No. 1	16	15	0	0	0.18	108	1.98	4.00	1.75	0.00	0.00	1.50	0.00	0.55	2.30	250	0.70	51.90	1.02	41.10	49.60	0.500	90.702	90.448	90.414	90.160	Phase 12
	15	[illegible]	0	0	0.09	108	2.07	4.00	1.75	0.00	0.00	1.50	0.00	0.58	2.33	250	0.75	53.72	1.06	39.10	51.39	0.040	90.374	90.120	90.081	89.827	Phase 12
Street No. 1	[illegible]	13	3	12	0.27	660	10.23	3.91	10.45	0.00	0.00	1.50	0.00	2.86	13.32	250	0.61	48.45	0.96	49.10	35.13	0.340	89.741	89.487	89.442	89.188	Phase 12
	13	12	4	16	0.34	676	10.57	3.90	10.69	0.00	0.00	1.50	0.00	2.96	13.65	250	0.66	50.40	0.99	62.70	36.75	0.030	89.412	89.158	88.998	88.744	Phase 12
Street No. 5	54A	54	4	16	0.33	16	0.33	4.00	0.26	0.00	0.00	1.50	0.00	0.09	0.35	250	0.45	41.61	0.82	69.90	41.26		92.100	91.846	91.785	91.531	Phase 12
	54	53	2	8	0.24	24	0.57	4.00	0.39	0.00	0.00	1.50	0.00	0.16	0.55	250	1.50	75.97	1.50	11.50	75.43	0.040	91.745	91.491	91.573	91.319	Phase 12
	53	52	13	52	0.78	76	1.35	4.00	1.23	0.00	0.00	1.50	0.00	0.38	1.61	250	0.40	39.23	0.77	94.20	37.62	0.160	91.413	91.159	91.036	90.782	Phase 12
	52	51	15	60	0.92	136	2.27	4.00	2.20	0.00	0.00	1.50	0.00	0.64	2.84	250	0.40	39.23	0.77	95.00	36.39	0.090	90.946	90.692	90.566	90.312	Phase 12
	51	50	1	4	0.14	140	2.41	4.00	2.27	0.00	0.00	1.50	0.00	0.67	2.94	250	0.40	39.23	0.77	11.50	36.29	0.030	90.536	90.282	90.490	90.236	Phase 12
	50	12	5	20	0.36	160	2.77	4.00	2.59	0.00	0.00	1.50	0.00	0.78	3.37	250	1.20	67.95	1.34	76.90	64.59	0.040	90.450	90.196	89.527	89.273	Phase 12
Street No. 1	12	11	0	0	0.17	836	13.51	3.85	13.03	0.00	0.00	1.50	0.00	3.78	16.82	250	0.95	60.46	1.19	79.70	43.65	0.030	88.968	88.714	88.211	87.957	Phase 12
Street No. 4	42	11	5	20	0.36	20	0.36	4.00	0.32	0.00	0.00	1.50	0.00	0.10	0.42	250	0.99	61.72	1.22	76.70	61.30		88.880	88.626	88.121	87.867	Phase 12
Street No. 1	11	10	4	16	0.35	872	14.22	3.84	13.56	0.00	0.00	1.50	0.00	3.98	17.54	250	1.26	69.63	1.37	69.40	52.09	0.492	87.629	87.375	86.754	86.500	Phase 12
	10		10	40	0.65	912	14.87	3.83	14.13	0.00	0.00	1.50	0.00	4.16	18.30	250	1.47	75.21	1.48	84.90	56.91	0.572	86.182	85.928	84.934	84.680	Phase 12
Street No. 4	42	41	1	4	0.14	4	0.14	4.00	0.06	0.00	0.00	1.50	0.00	0.04	0.10	250	1.00	62.03	1.22	11.40	61.93		88.880	88.626	88.766	88.512	Phase 12
	41	40	11	44	0.71	48	0.85	4.00	0.78	0.00	0.00	1.50	0.00	0.24	1.02	250	1.70	80.88	1.60	72.70	79.87	0.050	88.716	88.462	87.480	87.226	Phase 12
	40	30	8	32	0.50	80	1.35	4.00	1.30	0.00	0.00	1.50	0.00	0.38	1.67	250	2.90	105.64	2.08	73.30	103.96	0.040	87.440	87.186	85.314	85.060	Phase 12
Street No. 3	33	32A	1	4	0.33	4	0.33	4.00	0.06	0.00	0.00	1.50	0.00	0.09	0.16	250	1.00	62.03	1.22						0.254	0.000	Phase 12
	32A	31A	0	0	0.00	4	0.33	4.00	0.06	0.00	0.00	1.50	0.00	0.09	0.16	250	1.00	62.03	1.22						0.254	0.000	Phase 12
	31A	30	0	0	0.00	4	0.33	4.00	0.06	0.00	0.00	1.50	0.00	0.09	0.16	250	1.00	62.03	1.22						0.254	0.000	Phase 12
Old Carp Road	-	30	24	96	3.29	96	3.29	4.00	1.56	0.00	0.00	1.50	0.00	0.92	2.48	250	0.40	39.23	0.77	95.00	36.76						Phase 12
Street No. 3	30		6	24	0.27	204	5.24	4.00	3.31	0.00	0.00	1.50	0.00	1.47	4.77	250	0.40	39.23	0.77	85.40	34.46	0.070	85.244	84.990	84.903	84.649	Phase 12
Street No. 1		[illegible]	12	48	0.50	1164	20.61	3.76	17.71	0.00	0.00	1.50	0.00	5.77	23.48	250	1.24	69.08	1.36	64.30	45.59	0.248	84.655	84.401	83.857	83.603	Phase 12
Street No. 3	33	32	10	40	0.33	40	0.33	4.00	0.65	0.00	0.00	1.50	0.00	0.09	0.74	250	1.05	63.57	1.25	57.90	62.82		85.100	84.846	84.492	84.238	Phase 12
	32	31	4	16	0.22	56	0.55	4.00	0.91	0.00	0.00	1.50	0.00	0.15	1.06	250	0.70	51.90	1.02	10.90	50.84	0.030	84.462	84.208	84.386	84.132	Phase 12
	31	[illegible]	17	68	0.56	124	1.11	4.00	2.01	0.00	0.00	1.50	0.00	0.31	2.32	250	0.40	39.23	0.77	86.10	36.91	0.160	84.226	83.972	83.881	83.627	Phase 12
Street No. 1	[illegible]	7	1	4	0.13	1292	21.85	3.73	19.50	0.00	0.00	1.50	0.00	6.12	25.62	250	0.40	39.23	0.77	35.50	13.62	0.416	[illegible]	83.187	83.299	83.045	Phase 12
	7		2	8	0.27	1300	22.12	3.72	19.61	0.00	0.00	1.50	0.00	6.19	25.80	250	0.45	41.61	0.82	40.10	15.81	0.040	83.259	83.005	83.079	82.825	Phase 12
Street No. 2	23	22	24	96	3.85	96	3.85	4.00	1.56	2.93	2.93	1.50	2.54	1.08	5.18	250	1.52	76.48	1.51	98.50	71.30		87.083	86.829	85.586	85.332	Future School Flow (2.93ha x 50,000 L/ha/d)
	22	21	18	72	0.59	168	4.44	4.00	2.72	0.00	2.93	1.50	2.54	1.24	6.51	250	0.85	57.19	1.13	74.90	50.68	0.076	85.510	85.256	84.873	84.619	Phase 12
	21	20	2	8	0.10	176	4.54	4.00	2.85	0.00	2.93	1.50	2.54	1.27	6.67	250	4.50	131.59	2.60	13.30	124.93	0.030	84.843	84.589	84.245	83.991	Phase 12
	20		2	8	0.12	184	4.66	4.00	2.98	0.00	2.93	1.50	2.54	1.30	6.83	250	4.50	131.59	2.60	21.90	124.76	0.331	83.914	83.660	[illegible]	82.674	Phase 12

J.L. Richards & Associates Limited
Consulting Engineers, Architects & Planners

CITY OF OTTAWA

MINTO DEVELOPMENT INC.
MORGAN'S GRANT SUBDIVISION - PHASE 10A & 10B
JLR NO. 17730

SANITARY SEWER DESIGN SHEET
Revised September 16, 2003

Designed by: J.B.
Checked by: L.J.

Peak Sewage Flow from Phase 12 = 38.87 L/s

DESIGN PARAMETERS

I =	0.280	l/s/ha	q (res) =	350	l/cap/day
Singles =	4.0	pers / unit	q (com) =	50,000	l/ha/day
Townhouses =	4.0	pers / unit	q (inst) =	50,000	l/ha/day

STREET	M.H. #		NO. of UNITS	RESIDENTIAL: INDIVIDUAL POPUL. people	INDIVIDUAL AREA ha	CUMMULATIVE POPUL. people	CUMMULATIVE AREA ha	Peaking Factor	POPUL. FLOW l/s	NON-RESIDENTIAL: AREA ha	CUMM. AREA ha	Peaking Factor	NON-RES. FLOW (l/s)	INFIL. FLOW l/s	PEAK FLOW l/s	SEWER DATA: DIA. mm	Slope %	CAPAC. l/s	VEL. m/s	LENGTH m	RESIDUAL CAP. (l/s)	Obvert Drop	UPSTREAM Obvert	UPSTREAM Invert	DOWNSTREAM Obvert	DOWNSTREAM Invert	COMMENTS
	FROM	TO																									
Street No. 1		5	4	16	0.15	1500	26.93	3.68	22.36	0.00	2.93	1.50	2.54	7.54	32.44	250	0.40	39.23	0.77	41.20	6.79	0.078	82.850	82.596	82.685	82.431	Phase 12
	5	Ex. 1	25	100	0.81	1600	27.74	3.66	23.72	0.00	2.93	1.50	2.54	7.77	34.03	250	0.40	39.23	0.77	90.60	5.21	0.063	82.622	82.368	82.260	82.006	Phase 12
STREET No. 1 Phase 12	4	3	2	8	0.21	8	0.21	4.00	0.13	0.00	0.00	1.50	0.00	0.06	0.19	250	0.40	39.23	0.77	24.00	39.04		82.140	81.890	82.044	81.794	PHASE 12
	3	2	3	12	0.33	20	0.54	4.00	0.32	0.00	0.00	1.50	0.00	0.15	0.48	250	0.40	39.23	0.77	24.70	38.76		82.024	81.774	81.925	81.675	PHASE 12
BIDGOOD LANDS	-	2	65	260	2.10	260	2.10	4.00	4.21	0.00	0.00	1.50	0.00	0.59	4.80	250	0.40	39.23	0.77	95.00	34.43						Assumed Future Townhomes
	2	Ex. 1	4	16	0.34	296	2.98	4.00	4.80	0.00	0.00	1.50	0.00	0.83	5.63	250	0.40	39.23	0.77	37.50	33.60		81.905	81.655	81.755	81.505	PHASE 12
FLAMBOROUGH WAY	Ex. 1	Ex. 172A		0	0.17	1896	30.89	3.60	27.68	0.00	2.93	1.50	2.54	8.65	38.87	300	0.18	42.21	0.58	81.10	3.34		81.726	81.426	81.584	81.284	PHASE 6 (as-built info. added)
	Ex. 172A	Ex. 171A		0	0.77	1896	31.66	3.60	27.68	0.00	2.93	1.50	2.54	8.86	39.09	300	0.19	44.07	0.60	104.80	4.98		81.584	81.284	81.384	81.084	PHASE 6 (as-built info. added)
	Ex. 171A	Ex. 170A		0	0.68	1896	32.34	3.60	27.68	0.00	2.93	1.50	2.54	9.06	39.28	300	0.20	44.98	0.62	88.50	5.71		81.344	81.044	81.168	80.868	PHASE 6 (as-built info. added)
	Ex. 170A	Ex. 142B		0	0.41	1896	32.75	3.60	27.68	0.00	2.93	1.50	2.54	9.17	39.39	300	0.18	42.24	0.58	77.00	2.85		81.165	80.865	81.035	80.730	PHASE 6 (as-built info. added)
	Ex. 142B	Ex. 142C		0	0.00	1896	32.75	3.60	27.68	0.00	2.93	1.50	2.54	9.17	39.39	300	0.21	46.28	0.63	17.10	6.89		80.954	80.649	80.918	80.613	PHASE 6 (as-built info. added)
KLONDIKE ROAD	Ex. 142C	142D		0	0.22	1896	32.97	3.60	27.68	0.00	2.93	1.50	2.54	9.23	39.45	300	3.30	183.25	2.51	110.00	143.79	0.04	80.878	80.573	77.248	76.943	
KLONDIKE ROAD	142D	142E	134	536	5.33	2432	38.30	3.52	34.66	0.37	3.30	1.50	2.86	10.72	48.25	300	0.30	55.25	0.76	50.50	7.00	1.07	76.178	75.873	76.026	75.722	Flow from Future Townhouse Complex
COMMERCIAL SITE	142E	142F		0	2.84	2432	41.14	3.52	34.66	2.84	6.14	1.50	5.33	11.52	51.51	300	0.30	55.25	0.76	110.00	3.74		76.026	75.722	75.696	75.392	
	142F	120B		0	0.00	2432	41.14	3.52	34.66	0.00	6.14	1.50	5.33	11.52	51.51	300	0.30	55.25	0.76	36.15	3.74		75.696	75.392	75.588	75.283	Commercial Property
	120B	120A		0	0.00	2432	41.14	3.52	34.66	0.00	6.14	1.50	5.33	11.52	51.51	300	0.30	55.25	0.76	18.69	3.74		75.588	75.283	75.532	75.227	Commercial Property
	120A	Ex. 120		0	0.00	2432	41.14	3.52	34.66	0.00	6.14	1.50	5.33	11.52	51.51	300	0.38	62.18	0.85	15.84	10.67		75.532	75.227	[illegible]	75.167	
Mersey Drive	122	121		24	0.38	24	0.38	4.00	0.39	0.00	0.00	1.50	0.00	0.11	0.50	200	3.78	66.52	2.05	63.5	66.02		80.400	80.200	78.000	77.800	
	121	120		24	0.28	48	0.66	4.00	0.78	0.00	0.00	1.50	0.00	0.18	0.96	200	2.53	54.43	1.68	68.0	53.47		77.900	77.700	76.179	75.979	
Westmoreland Avenue	120	[illegible]		20	0.33	2500	42.13	3.51	35.53	0.00	6.14	1.50	5.33	11.80	52.66	300	0.42	65.32	0.90	70.6	12.66		75.467	75.167	75.171	74.871	Phase IV (as-built info. Added)
Whithorn Avenue	116	119		8	0.14	8	0.14	4.00	0.13	0.00	0.00	1.50	0.00	0.04	0.17	200	2.00	48.38	1.49	8.1	48.22		79.262	79.062	79.100	78.900	
	119	118		24	0.22	32	0.36	4.00	0.52	0.00	0.00	1.50	0.00	0.10	0.62	200	2.69	56.10	1.73	37.2	55.48		79.000	78.800	78.000	77.800	
	118	[illegible]		44	0.50	76	0.86	4.00	1.23	0.00	0.00	1.50	0.00	0.24	1.47	200	2.21	50.86	1.57	81.1	49.39		77.700	77.500	75.908	75.708	
Westmoreland Avenue		116		24	0.31	2600	43.30	3.49	36.81	0.00	6.14	1.50	5.33	12.12	54.26	300	0.42	65.49	0.90	68.8	11.23		75.160	74.860	74.870	74.570	Phase IV (as-built info. Added)
	111	116		12	0.33	12	0.33	4.00	0.19	0.00	0.00	1.50	0.00	0.09	0.29	200	1.91	47.28	1.46	46.0	47.00		76.500	76.300	75.620	75.420	
Westmoreland Avenue	116	109		16	0.30	2628	43.93	3.49	37.16	0.00	6.14	1.50	5.33	12.30	54.79	300	0.36	60.31	0.83	66.3	5.52		74.840	74.540	74.603	74.303	Phase IV (as-built info. Added)
	115	114		20	0.32	20	0.32	4.00	0.32	0.00	0.00	1.50	0.00	0.09	0.41	200	4.49	72.51	2.24	51.2	72.10		81.500	81.300	79.200	79.000	
	116	114		20	0.30	20	0.30	4.00	0.32	0.00	0.00	1.50	0.00	0.08	0.41	200	0.58	26.06	0.80	64.5	25.65		79.374	79.174	79.000	78.800	
	114	113		32	0.40	72	1.02	4.00	1.17	0.00	0.00	1.50	0.00	0.29	1.45	200	0.62	26.94	0.83	72.8	25.49		78.750	78.550	78.300	78.100	
	113	112		16	0.32	88	1.34	4.00	1.43	0.00	0.00	1.50	0.00	0.38	1.80	200	0.50	24.24	0.75	67.7	22.44		78.200	78.000	77.860	77.660	
	112A	112		16	0.35	16	0.35	4.00	0.26	0.00	0.00	1.50	0.00	0.10	0.36	200	1.00	34.21	1.06	48.0	33.86		77.680	77.480	77.200	77.000	
	112	109		16	0.32	120	2.01	4.00	1.94	0.00	0.00	1.50	0.00	0.56	2.51	200	1.71	44.74	1.38	70.0	42.23		77.097	76.897	75.900	75.700	
Mersey Drive	109	106		24	0.33	2772	46.27	3.47	38.98	0.00	6.14	1.50	5.33	12.96	57.27	300	0.46	68.74	0.94	68.7	11.47		74.580	74.280	74.261	73.961	Phase IV (as-built info. Added)
Mersey Drive	124	123		28	0.44	28	0.44	4.00	0.45	0.00	0.00	1.50	0.00	0.12	0.58	200	0.55	25.38	0.78	96.3	24.80		75.600	75.400	75.070	74.870	Phase IV (as-built info. Added)
	123	103		32	0.42	60	0.86	4.00	0.97	0.00	0.00	1.50	0.00	0.24	1.21	200	0.59	26.27	0.81	109.2	25.06		75.065	74.865	74.421	74.221	Phase IV (as-built info. Added)
Easement	[illegible]	[illegible]		0	0.00	2832	47.13	3.46	39.73	0.00	6.14	1.50	5.33	13.20	58.26	375	0.32	103.88	0.91	12.4	45.62		74.245	73.870	74.205	73.830	Phase IV (as-built info. Added)
	127	126		56	0.78	56	0.78	4.00	0.91	0.00	0.00	1.50	0.00	0.22	1.13	200	1.00	34.21	1.06	100.7	33.09		78.155	77.955	77.148	76.948	
	126	126A		16	0.19	72	0.97	4.00	1.17	0.00	0.00	1.50	0.00	0.27	1.44	200	0.58	26.06	0.80	13.1	24.62		77.118	76.918	77.042	76.842	
	126A	103		0	0.00	72	0.97	4.00	1.17	0.00	0.00	1.50	0.00	0.27	1.44	200	2.83	57.56	1.77	49.8	56.12		77.012	76.812	75.600	75.400	
	107	106		12	0.19	12	0.19	4.00	0.19	0.00	0.00	1.50	0.00	0.05	0.25	200	1.00	34.21	1.06	41.0	33.97		77.470	77.270	77.060	76.860	
	106	105		36	0.36	48	0.55	4.00	0.78	0.00	0.00	1.50	0.00	0.15	0.93	200	0.58	26.06	0.80	69.9	25.12		77.000	76.800	76.595	76.395	
	105	104		32	0.39	80	0.94	4.00	1.30	0.00	0.00	1.50	0.00	0.26	1.56	200	0.58	26.06	0.80	59.2	24.50		75.860	75.660	75.516	75.316	
	104	103		4	0.01	84	0.95	4.00	1.36	0.00	0.00	1.50	0.00	0.27	1.63	200	1.00	34.21	1.06	14.9	32.59		75.049	74.849	74.900	74.700	

file name : v:\17732.DS\Design\ST & SAN Design - M.G. Stage 10 North & South - Rev 1 Sept 16, 2003

J.L. Richards & Associates Limited
Consulting Engineers, Architects & Planners

CITY OF OTTAWA

MINTO DEVELOPMENT INC.
MORGAN'S GRANT SUBDIVISION - PHASE 10A & 10B
JLR NO. 17730

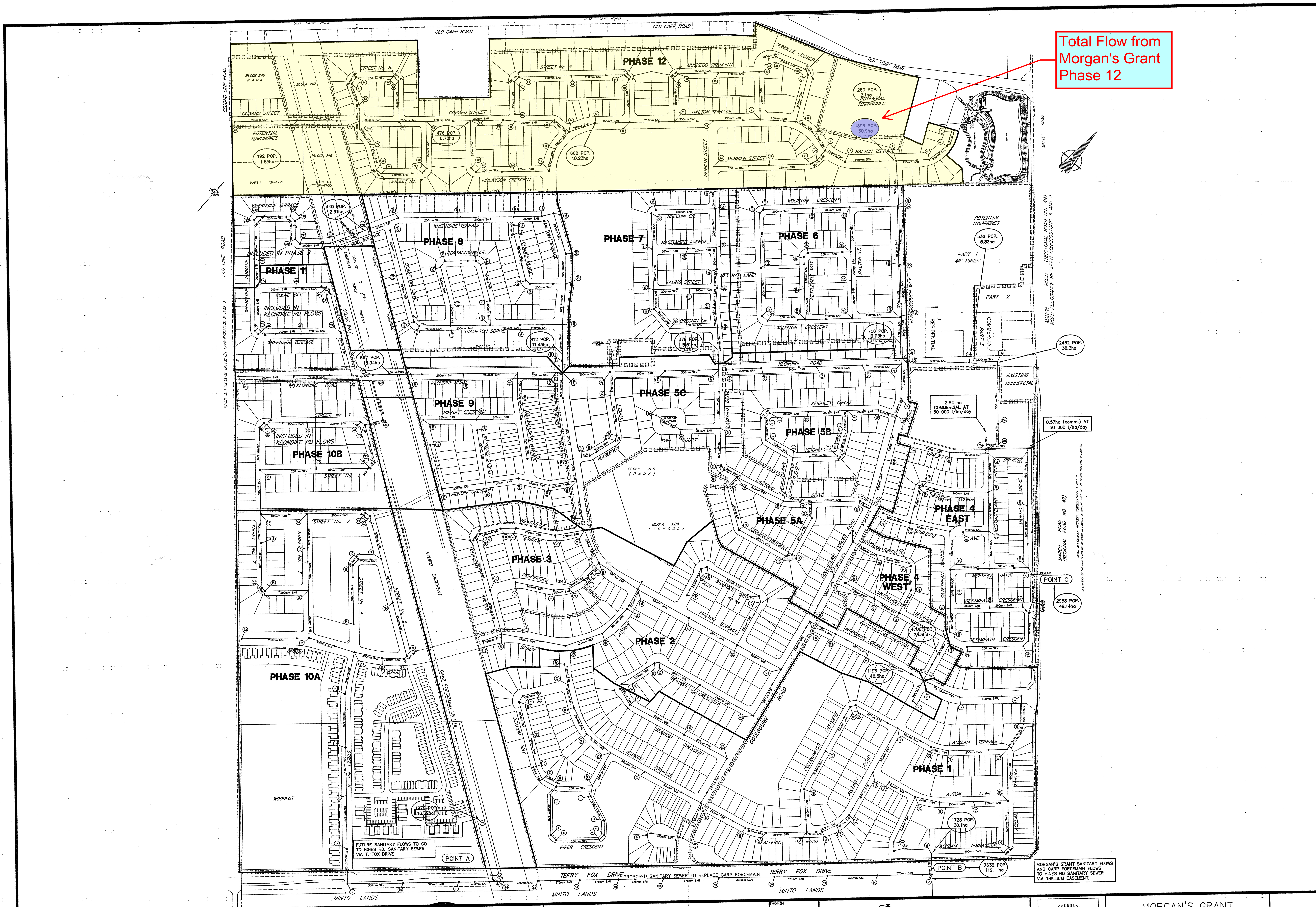
SANITARY SEWER DESIGN SHEET
Revised September 16, 2003

Designed by: J.B.
Checked by: L.J.

DESIGN PARAMETERS

I =	0.280	l/s/ha	q (res) =	350	l/cap/day
Singles =	4.0	pers / unit	q (com) =	50,000	l/ha/day
Townhouses =	4.0	pers / unit	q (inst) =	50,000	l/ha/day

STREET	M.H. # FROM	M.H. # TO	RESIDENTIAL NO. of UNITS	INDIVIDUAL POPUL. people	INDIVIDUAL AREA ha	CUMMULATIVE POPUL. people	CUMMULATIVE AREA ha	Peaking Factor	POPUL. FLOW l/s	NON-RESIDENTIAL AREA ha	CUMM. AREA ha	Peaking Factor	NON-RES. FLOW (l/s)	INFIL. FLOW l/s	PEAK FLOW l/s	SEWER DATA DIA. mm	Slope %	CAPAC. l/s	VEL. m/s	LENGTH m	RESIDUAL CAP. (l/s)	Obvert Drop	UPSTREAM Obvert	UPSTREAM Invert	DOWNSTREAM Obvert	DOWNSTREAM Invert	COMMENTS
	103	102		0	0.02	156	1.94	4.00	2.53	0.00	0.00	1.50	0.00	0.54	3.07	200	0.58	26.03	0.80	20.1	22.96		74.816	74.616	74.699	74.499	
	102	101		0	0.07	156	2.01	4.00	2.53	0.00	0.00	1.50	0.00	0.56	3.09	200	0.58	26.08	0.80	49.0	22.99		74.669	74.469	74.384	74.184	
Total from Morgan's Grant Subdivision																											
March Rd (4 pers/unit) Point C	101	STUB		0	0.00	2988	49.14	3.44	41.69	0.00	6.14	1.50	5.33	13.76	60.77	375	0.30	100.18	0.88	1.0	39.40		74.190	73.815	74.187	73.812	
				2988	49.14					6.1																	



1	17/09/03	REVISED PHASE 10 AND 12	L.J.

LICENSED PROFESSIONAL ENGINEER — L.J.A. JABLONSKI — 16/09/03 — PROVINCE OF ONTARIO

SCALE — 25m 50m 75m 100m — HORIZONTAL 1:3000

J.L.Richards & Associates Limited
Consulting Engineers, Architect & Planners
OTTAWA, KINGSTON, SUDBURY, CANADA.

DESIGN
CHECKED L.J.
DRAWN M.Z.
CHECKED
APPROVED

Ottawa

minto

MORGAN'S GRANT SUBDIVISION
MASTER DRAINAGE PLAN (SANITARY)

DATED SEPT. 2003
DWG. No. 17730-SA

3.0 SANITARY SEWAGE

3.1 Existing Sanitary Systems

Sanitary sewage generated from the Morgan's Grant Subdivision is conveyed to the following two sanitary sewer outlets:

.1 a 375 mm diameter sewer flowing easterly across March Road approximately 200 m north of Morgan's Grant Way, which eventually outlets into the East March Trunk Sewer; and

.2 a 600 mm diameter sanitary sewer crossing Terry Fox Drive approximately 200 m west of March Road, which outlets to the Hines Road sanitary sewer.

The 375 mm diameter sewer collects sanitary sewage from approximately 65 ha, of which Morgan's Grant accounts for approximately 29 ha. This outlet collects sewage for most of Morgan's Grant Phase 4, the commercial area located north of Morgan's Grant Phase 4, and approximately 32 ha of land located north of Morgan's Grant Phase 6 (i.e. Phase 12).

The 600 mm diameter sewer collects sanitary sewage for approximately 125 ha. This outlet collects sewage from all areas included in Morgan's Grant Phases 1, 2 and 3, the westerly portion of Morgan's Grant Phase 4, all areas included in Morgan's Grant Phases 5, 6, 7, 8 and 9 and some of the lands west of the hydro easement adjacent to Klondike Road (i.e. Phase 10B and Phase 11). This 600 mm diameter sanitary sewer will also collect sewage from the remainder of the Morgan's Grant lands, west of the hydro easement, via a future sanitary sewer down Terry Fox Drive (Phase 10A).

3.2 Sanitary Flows

The design of local sanitary sewers is summarized in the following table (peaking factors for each are shown in parentheses):

Land Use	Sanitary Flow Contribution		
	L/cap/day	L/ha/day	L/s/ha
Residential	350 (Harmon)		
Commercial		50,000 (1.5)	
Institutional		50,000 (1.5)	
Infiltration			0.28 (1.0)

The Harmon peaking factor was calculated for each pipe reach to determine the sanitary peak flows in residential development areas. This peaking factor provides an increased peaking factor for smaller urban areas over larger developments. The following formula is used to derive the Harmon peaking factor:

$$\text{Harmon} = 1 + \frac{14}{(4 + P^{1/2})}$$

A 1.5 peaking factor was utilized for land uses other than residential areas (i.e. institutional, commercial, etc.). Sanitary flows estimated with the above information were calculated on the conservative assumption that sanitary peak flows occurred simultaneously.

For purposes of designing flows in local sanitary sewers within the Morgan's Grant Plan of Subdivision, the standard of four persons per unit was used. This results in flows of 34.74 L/s, 128.27 L/s and 60.77 L/s at Points A, B and C on the enclosed Master Drainage Plan (see also enclosed Sanitary Sewer Design Sheet).

Flows from Point A will be combined with the Village of Carp forcemain flows and conveyed via a replacement sanitary sewer down Terry Fox Drive to Point B, where flows then travel south through the Trillium easement to the upper end of the Hines Road sewer.

It is proposed that the existing forcemain be replaced with a gravity sewer between Points A and B, and sized to convey the Morgan's Grant Stage 10A lands and ultimate Village of Carp flows of 58 L/s. Rock has been removed to install the forcemain along Terry Fox Drive. There is an economic benefit to replacing the existing forcemain with a gravity sewer rather than removing additional rock in a second trench. The City will also benefit by minimizing the number of utilities it will be responsible for maintaining in this section of the right-of-way.

A temporary outlet is proposed for the forcemain flows to an extension of the sanitary sewer on Klondike Road near the hydro easement prior to the Terry Fox Drive pipe replacement.

At Terry Fox Drive, the flows from the Morgan's Grant Subdivision are based on 3.05 persons per unit, for consistency with the City of Ottawa (former Region of Ottawa-Carleton) Wastewater Master Plan, which results in a flow of 130.53 L/s. The City of Ottawa (former Region of Ottawa-Carleton) has advised that, at that point, allowable sanitary flows were as follows:

Morgan's Grant Subdivision	136 L/s	
Village of Carp Forcemain	58 L/s	
	194 L/s	(i.e. 600 mm diameter sanitary at 0.1% has a capacity of 194 L/s)

Sanitary flow from Point C leaving the Subdivision, results in projected flows of 60.77 L/s (see enclosed Sanitary Sewer Design Sheet).

The capacity of this sewer crossing under March Road at point C is 96.02 L/s (i.e. 375 mm sanitary at 0.30%).

3.3 Summary

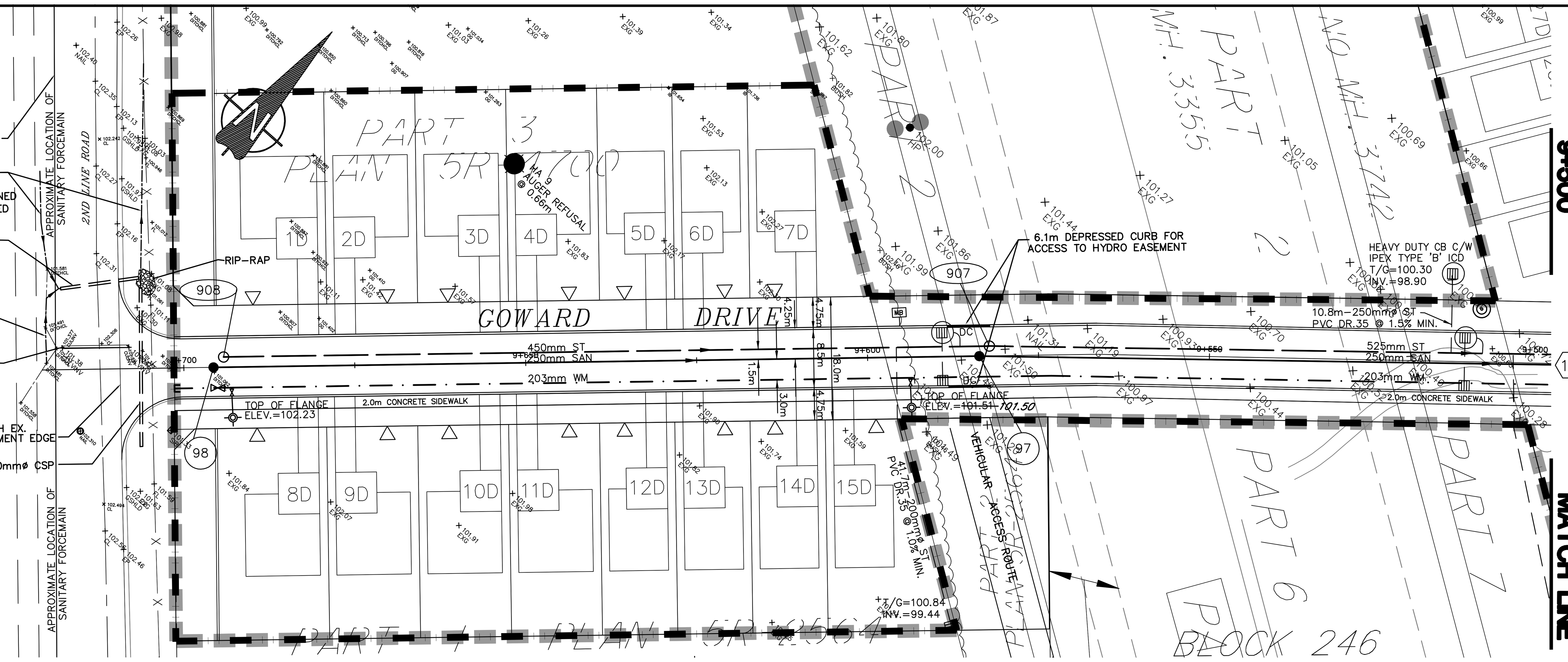
The proposed sanitary sewer servicing scheme has been developed to accommodate all of the lands within the boundaries of Morgan's Grant Subdivision, as well as the recently acquired Phase 12 lands, and the Sanitary Sewer Design Sheets demonstrate that all sanitary sewer flows are within the allocations provided by the City of Ottawa (i.e. City of Kanata, Region of Ottawa-Carleton).

CONTENT COPY OF ORIGINAL

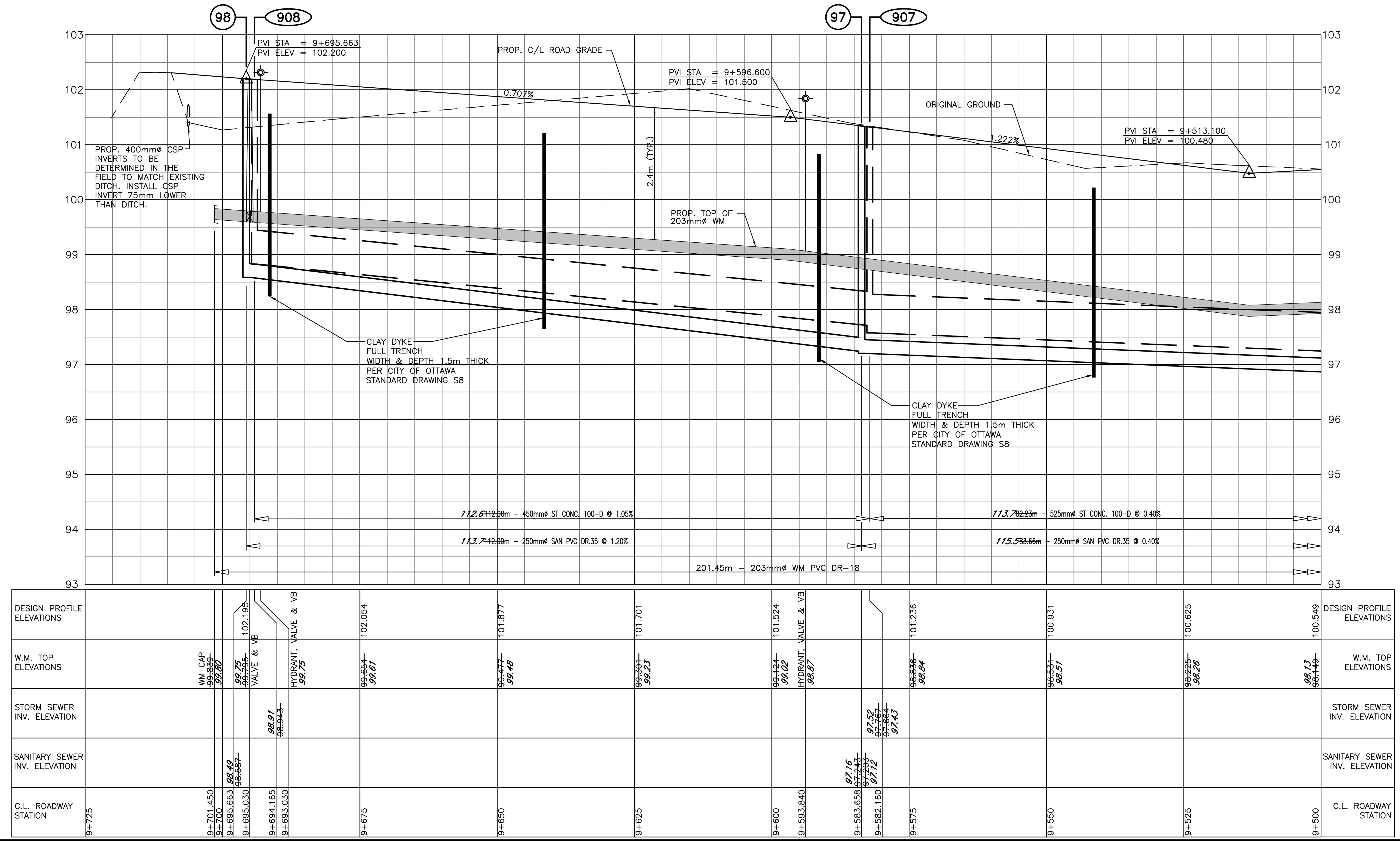
LEGEND

- EXISTING CATCH BASIN
- PROPOSED CATCH BASIN
- INTERCONNECTED ROADWAY CB C/W ONE 19.8L/S IPEX TYPE 'A' ICD OR CITY APPROVED EQUIVALENT
- CATCH BASIN WITH INDIVIDUAL 19.8 L/S IPEX TYPE "A" ICD OR CITY APPROVED EQUIVALENT
- PROPOSED CATCH BASIN / MANHOLE
- PROPOSED CATCH BASIN FOR LANDSCAPED AREAS
- PROPOSED WATERMAIN, VALVE & HYDRANT
- EXISTING WATERMAIN, VALVE & HYDRANT
- WATERMAIN VALVE AND VALVE CHAMBER
- WATERMAIN VALVE AND VALVE BOX
- EXISTING SANITARY SEWER & MANHOLE
- EXISTING STORM SEWER & MANHOLE
- PROPOSED SANITARY SEWER & MANHOLE
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED CATCH BASIN & LEAD
- 30C LOT NUMBER
- 2.0m CONC. CURB AND SIDEWALK
- DC DEPRESSED CURB
- SILT FENCE (OPSD 249.110)
- PHASING LIMIT
- DRAWING NUMBER
- TP 4 81.07 ROCK — TEST PIT SHOWING ELEVATION OF ROCK
- HA 1 AUGER REFUSAL 0.3m DEPTH — HAND AUGER HOLE LOCATION SHOWING DEPTH FROM EXISTING GROUND SURFACE TO REFUSAL (INFERED DEPTH TO BEDROCK)

ALL MANHOLES TO BE 1200mmø UNLESS SHOWN OTHERWISE



GOWARD DRIVE



RECORD DRAWING
PRODUCED FROM INFORMATION PROVIDED BY FIELD INSPECTOR
date: MAY 03, 2013
J.L. RICHARDS & ASSOCIATES LIMITED

NOTES:

1. INSTALL CLAY DYKES AT 50m INTERVALS BEGINNING AT THE LOW END OF THE SEWERS AND PROCEEDING UPSTREAM FOR EACH OF THE THREE STREETS SERVICED. EACH CLAY DYKE SHALL BE CONSTRUCTED OF CLAY GEOTECHNICAL MATERIAL AND PLACED THE FULL HEIGHT AND WIDTH OF THE TRENCH AND BE 1.5m THICK.

No.	Date	Revision	By
6	02/05/13	RECORD DRAWING	L.J.
5	24/11/05	ISSUED FOR CONSTRUCTION	L.J.
4	18/10/05	REVISED PER HYDRO ONE COMMENTS	L.J.
3	11/07/05	REVISED PER CITY COMMENTS	L.J.
2	11/05/05	ISSUED FOR MOE APPROVAL	L.J.
1	15/04/05	ISSUED TO BLASTING CONTRACTOR	L.J.

SCALE
HORIZONTAL 1:500
VERTICAL 1:50

J.L.Richards
ENGINEERS·ARCHITECTS·PLANNERS
J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

DESIGN J.B.
CHECKED L.J.
DRAWN M.B.
CHECKED
APPROVED

Ottawa

minto

MORGAN'S GRANT
PHASE 12D
GOWARD DRIVE
PLAN & PROFILE
FROM STA. 9+500.00 TO STA. 9+695.66

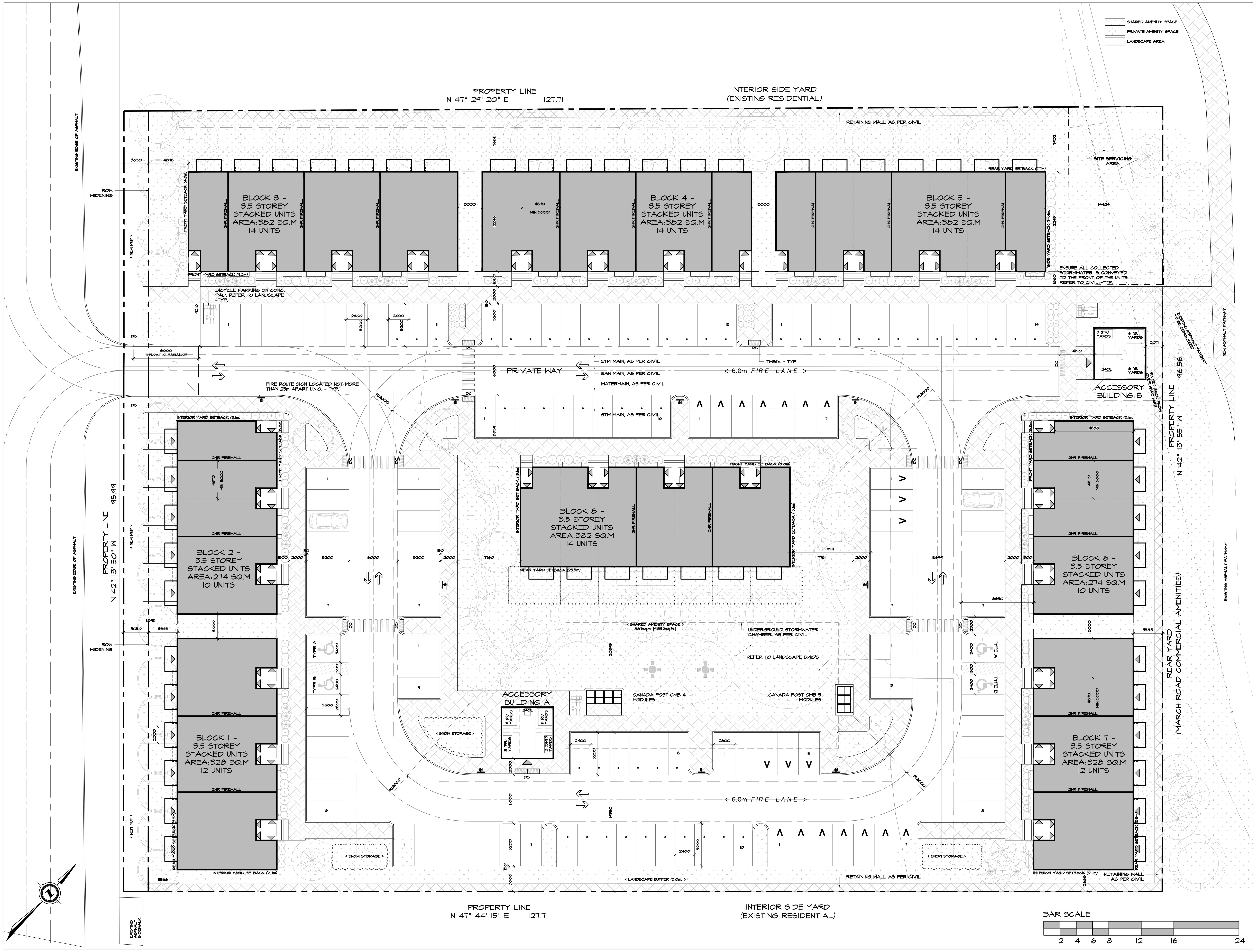
DATED APRIL 2005
DWG. No. 17732-13

Appendix J – Drawings

Site Plan Drawing

Survey Plan

J:\2018\39-18_1158 Old Second Line Rd_Topo\Final\39-18_ThebergeHomes_1158SecondLineRd_T_F.dwg



01
A1.0

PROPOSED SITE PLAN

SCALE: 1:250

LEGEND

NEW OVERHEAD DOOR	NEW SIGN, REFER TO SIGN LEGEND	TWO WAY TRAFFIC
NEW DOOR / ENTRANCE	FIRE ROUTE SIGN	DEPRESSED CURB (DC)
BICYCLE PARKING SPACE (1.8Mx0.6M)	STREET LIGHT	TACTILE WALKING SURFACE INDICATORS (TWSIs)
NO PARKING LINES	DESIGNATED ACCESSIBLE PARKING SPACE AS PER AODA STANDARDS	PROPERTY LINE
PARKING STALL COUNT PER ROW	V VISITOR PARKING	PROPOSED FENCE

MINIMUM SETBACKS (ZONING)	
NEW CONSTRUCTION	
EXISTING BUILDINGS	
BUILDING MOUNTED LIGHTS REFER TO ELECTRICAL DWGs	

BUILDING AREAS (NOT INCLUDING BASEMENT)

	BUILDING FOOT PRINT [SQ.M]	GROSS AREA [SQ.M]
BLOCK 1	328m²	984m²
BLOCK 2	274m²	822m²
BLOCK 3	382m²	1146m²
BLOCK 4	382m²	1146m²
BLOCK 5	382m²	1146m²
BLOCK 6	274m²	822m²
BLOCK 7	328m²	984m²
BLOCK 8	382m²	1146m²
TOTAL	2350m²	7050m²

CITY OF OTTAWA ZONING BY-LAW

ZONING MECHANISM (R3Z - PUD)	PROVISION	PROVIDED
MINIMUM LOT WIDTH	18.0m	96.0m
MINIMUM LOT AREA	1,400m²	12,294.4m²
MAXIMUM BUILDING HEIGHT	AS PER DWELLING TYPE, DWELLING TYPE NOT PERMITTED	11.31m
MINIMUM FRONT YARD SETBACK	3.0m	3.5m
MINIMUM REAR YARD SETBACK	6.0m	3.5m
MINIMUM INTERIOR YARD SETBACK	6.0m	2.6m
MINIMUM REQUIRED VEHICLE PARKING SPACES (AREA C OF SCHEDULE 1A)	RESIDENTIAL: 1.2 PER DWELLING UNIT	120
	VISITOR: 0.2 PER DWELLING UNIT	20
	TOTAL	140
PROVIDED PARKING	REGULAR SPACES	80 (20 VISITORS)
	ACCESSIBLE SPACE (TYPE A)	2
	ACCESSIBLE SPACE (TYPE B)	2
	COMPACT SPACES	56
	TOTAL	140
BICYCLE PARKING REQUIRED	5% OF 140 SPACES = 7 SPACES	9 BICYCLE PARKING SPACES
MINIMUM DRIVEWAY WIDTH	PARKING LOT: 6.0m	6.0m
MINIMUM AISLE WIDTH	PARKING LOT: 6.0m	6.0m
MINIMUM PARKING SPACE DIMENSIONS	LENGTH: 5.2m WIDTH: 2.6m	LENGTH: 5.2m WIDTH: 2.6m
	UP TO 40% OF REQUIRED PARKING SPACES MAY BE 4.6m x 2.4m	40% = 56 SPACES
MINIMUM WIDTH OF LANDSCAPED AREA AROUND A PARKING LOT	ABUTTING A STREET: 3.0m	3.0m
	NOT ABUTTING A STREET: 1.5m	2.6m
MINIMUM REQUIRED LANDSCAPED AREA WITHIN A PARKING LOT	15%	>15% = 1535.7m²
PROVIDED SHARED AMENITY SPACE	50% OF AMENITY AREA (100 UNITS x 6m²) = 600m² x 50% = 300m²	867m²
PROVIDED PRIVATE AMENITY SPACE	N/A	1122m²
PROVIDED TOTAL LANDSCAPE AREA		3916m²
OUTDOOR REFUSE COLLECTION	MIN. SETBACK FROM A PUBLIC STREET: 9.0m	>9.0m
	MIN. SETBACK FROM ANY LOT LINE: 3.0m	>3.0m
	SCREENING MIN. HEIGHT: 2.0m	2.0m
MINIMUM WIDTH OF PRIVATE WAY	6.0m	6.0m
MINIMUM SETBACK FOR ANY WALL OF A RESIDENTIAL USE BUILDING TO A PRIVATE WAY	NOTWITHSTANDING ANY FRONT YARD SETBACK REQUIREMENT ASSOCIATED WITH ANY ZONE OR SUBZONE, THE MINIMUM SETBACK FOR ANY WALL OF A RESIDENTIAL USE BUILDING TO A PRIVATE WAY IS 1.8m	3.5m
MINIMUM SEPARATION AREA BETWEEN BUILDINGS WITHIN A PLANNED UNIT DEVELOPMENT	3m	3m
GARBAGE	0.231 CUBIC YARDS PER UNIT: 100 x 0.231 = 23.1	24 YARDS
RECYCLING (MORE THAN 18 UNITS)	0.018 CUBIC YARDS PER UNIT FOR FEL GLASS-METAL-PLASTIC: 100 x 0.018 = 1.8	2 YARDS
	0.062 CUBIC YARDS PER UNIT FOR FEL FIBRE CONTAINERS: 100 x 0.062 = 6.2	6 YARDS
ORGANICS	"KITCHEN CATCHER" CONTAINER FOR EACH DWELLING UNIT AND ONE COMMUNAL 240L GREEN CONTAINER PER 50 UNITS	2: 240L CONTAINERS

KEY PLAN

TOPOGRAPHIC PLAN OF SURVEY OF PART OF LOT 11, CONCESSION 3, GEOGRAPHIC TOWNSHIP OF MARCH, CITY OF OTTAWA

SURVEYED BY FARLEY, SMITH & DENIS SURVEYING LTD.

CLIENT NAME:

THEBERGE HOMES

NOTES:

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UNIT COUNT

STACKED TOWNS: 100 UNITS

SEAL:

NORTH ARROW:

No.	DATE	REVISION
14	2023.11.09	ISSUED FOR COORDINATION
13	2023.11.07	ISSUED FOR COORDINATION
12	2023.09.12	ISSUED FOR REVIEW
11	2023.08.21	ISSUED FOR REVIEW
10	2023.07.13	ISSUED FOR COORDINATION
09	2023.06.13	ISSUED FOR SPC
08	2023.03.20	RE-ISSUED FOR PRE-CONSULT
07	2023.03.14	ISSUED FOR REVIEW
06	2023.02.22	RE-ISSUED FOR PRE-CONSULT
05	2023.02.14	ISSUED FOR REVIEW
04	2023.01.19	ISSUED FOR REVIEW
03	2022.11.22	ISSUED FOR PRE-CONSULT
02	2022.11.18	ISSUED FOR REVIEW
01	2022.11.09	ISSUED FOR REVIEW

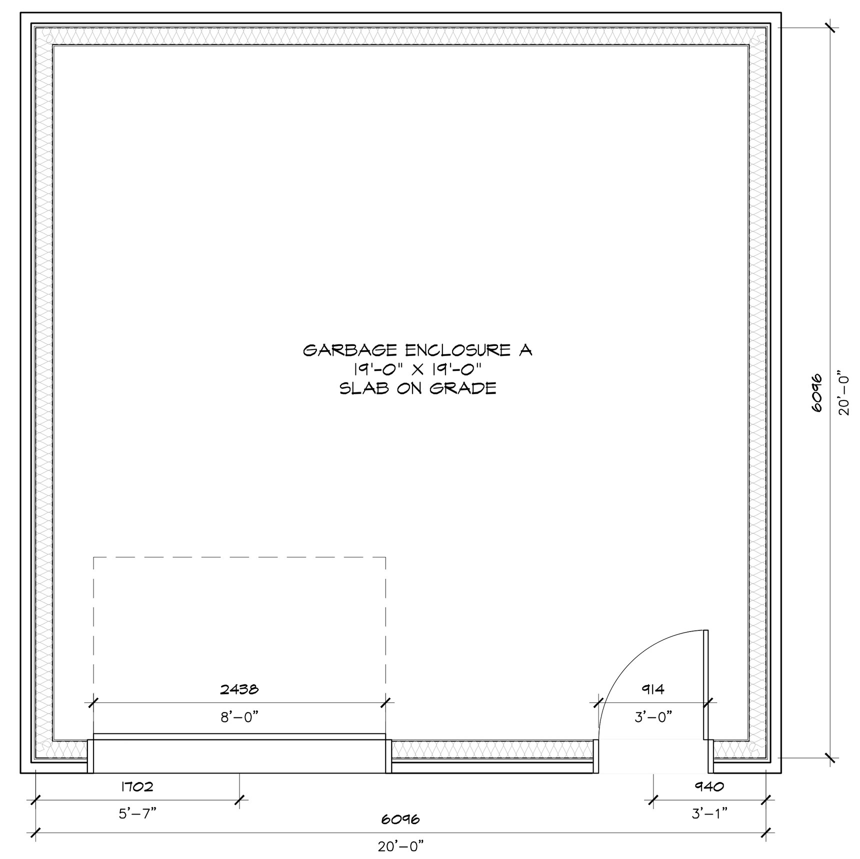
S.J.LAWRENCE ARCHITECT INCORPORATED
18 DEAKIN STREET
SUITE 205
OTTAWA, ONTARIO
K2E 8B7
T: (613) 739.7770
F: (613) 739.7703
sjl@sjlarchitect.com

PROJECT:
OLD SECOND LINE DEVELOPMENT
1158 OLD SECOND LINE ROAD, OTTAWA, ON

SHEET TITLE:
SITE PLAN

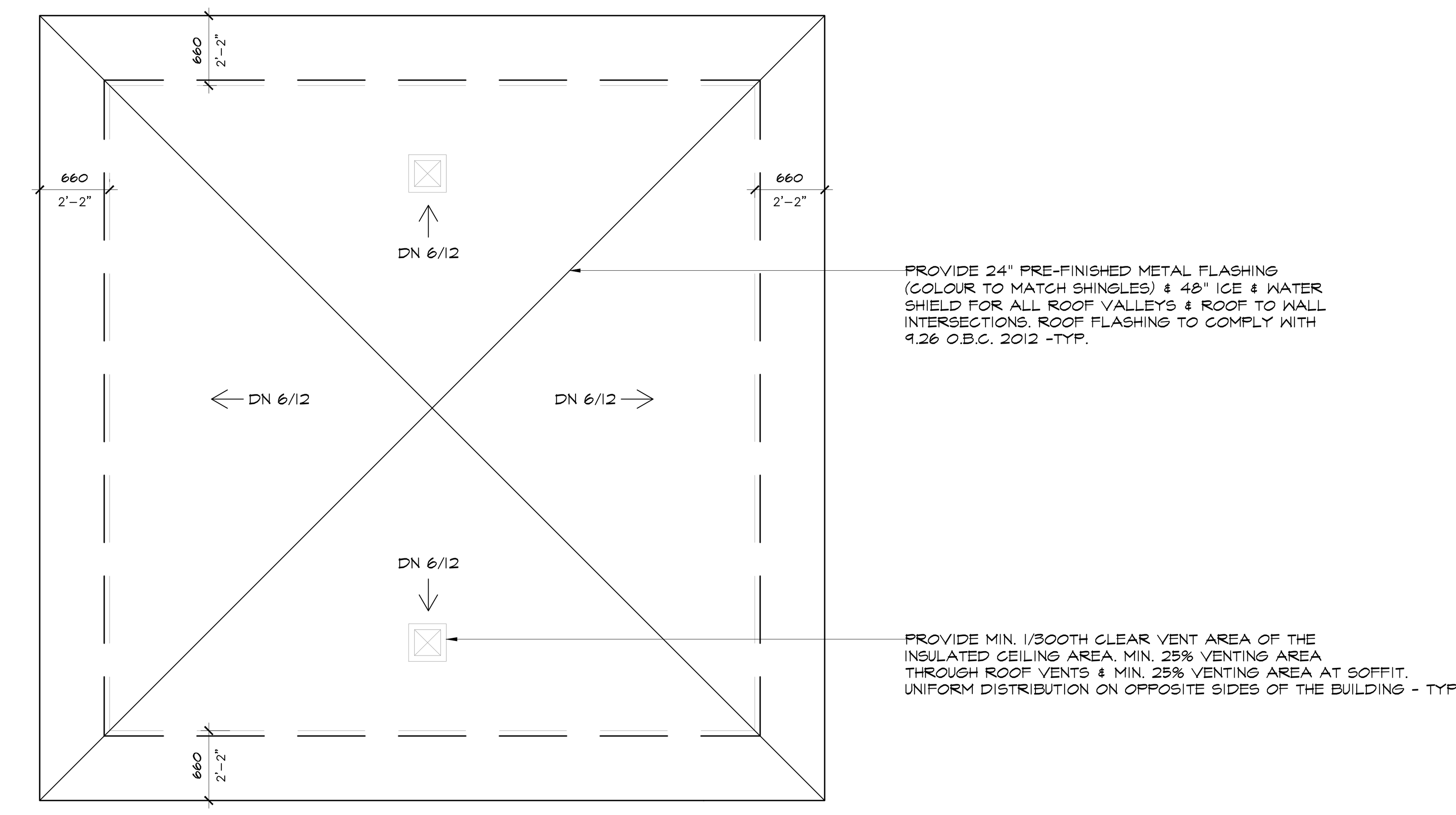
DRAWN BY: D.T.
CHECKED BY: B.L. S.J.L.
PLOT DATE: 2023.11.09
PROJECT DATE: DATE
JOB NUMBER: SL-1086-22
SCALE: 1:250
SHEET NUMBER: A1.0

PLAN #
APPLICATION #



01 A1.1 ACCESSORY BUILDING A FLOOR PLAN

SCALE: 1:50



02 A1.1 ACCESSORY BUILDING A ROOF PLAN

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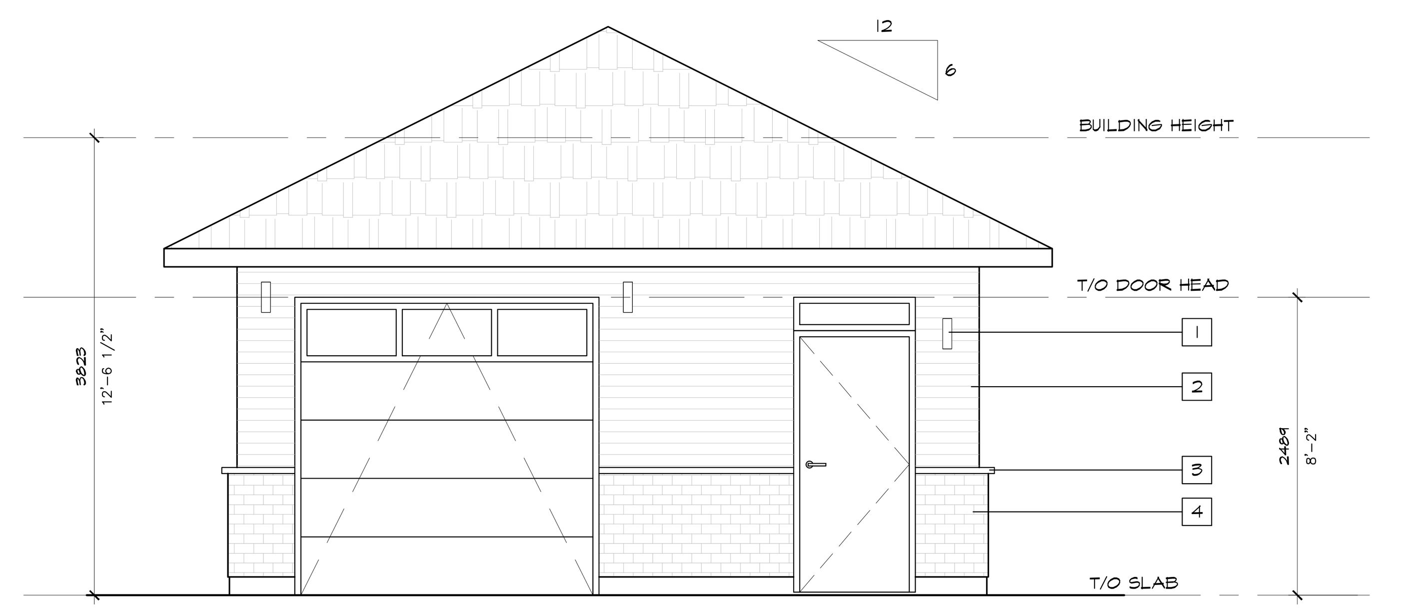

03 A1.1 ACCESSORY BUILDING A FRONT EVELATION

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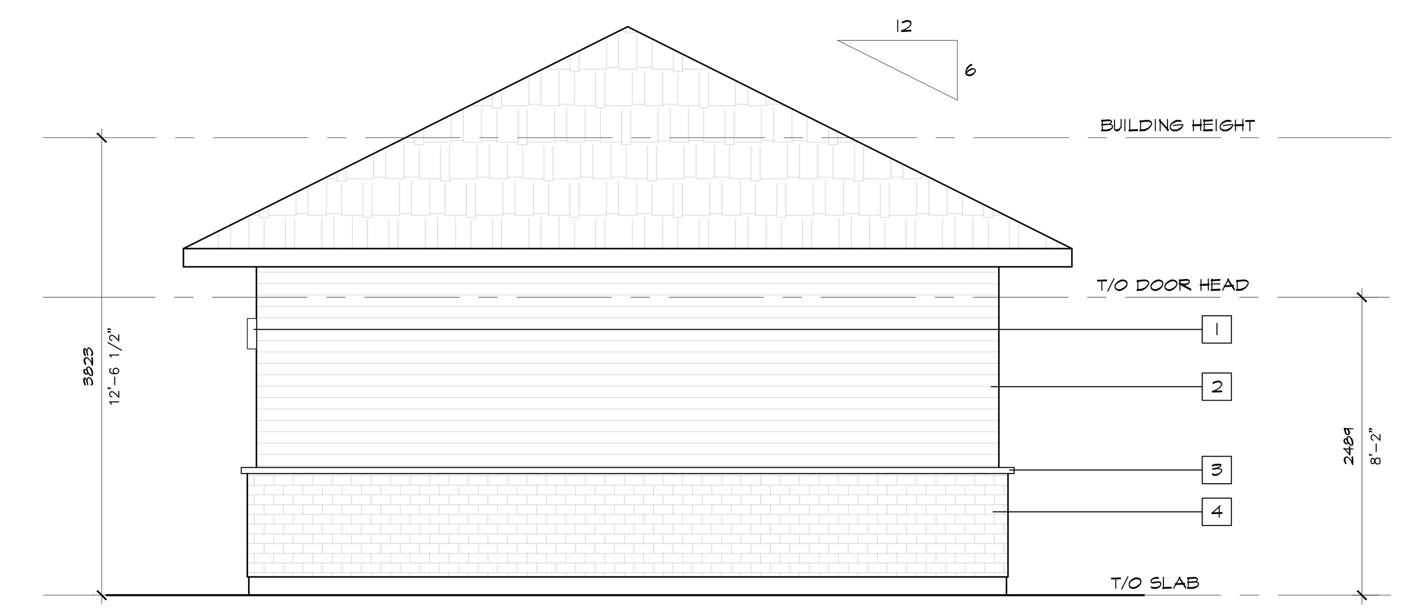
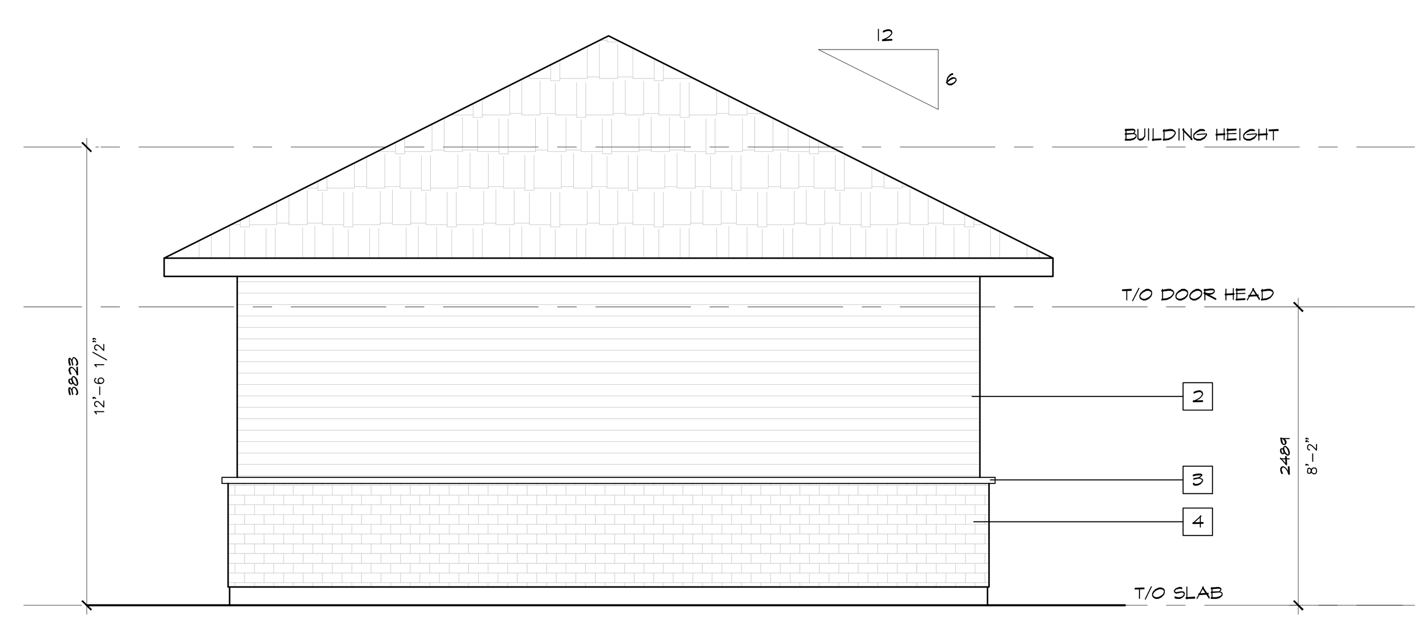


04 A1.1 ACCESSORY BUILDING A RIGHT EVELATION

SCALE: 1:250



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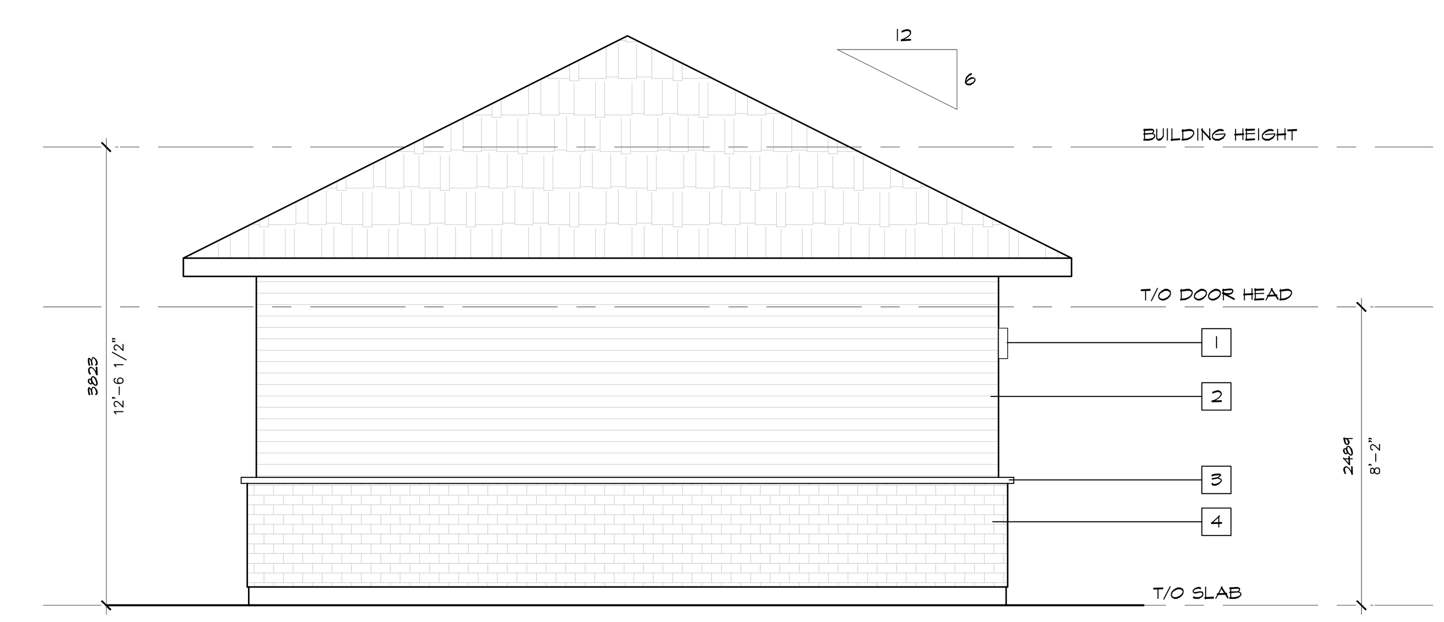
SCALE: 1:250



06 A1.1 ACCESSORY BUILDING A LEFT EVELATION

SCALE: 1:250

CLIENT NAME:

THEBERGE HOMES

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KEY NOTES:

1. WALL SCONCE
2. SIDING
3. PRECAST CONCRETE SILL
4. STONE VENEER

SEAL:

NORTH ARROW:

No.	DATE	REVISION
14	2023.11.09	ISSUED FOR COORDINATION
13	2023.11.07	ISSUED FOR COORDINATION
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sjl@sjlarchitect.com

SJL LAWRENCE ARCHITECT INCORPORATED

PROJECT:

OLD SECOND LINE DEVELOPMENT

1158 OLD SECOND LINE ROAD, OTTAWA, ON

SHEET TITLE:

ACCESSORY BUILDING A

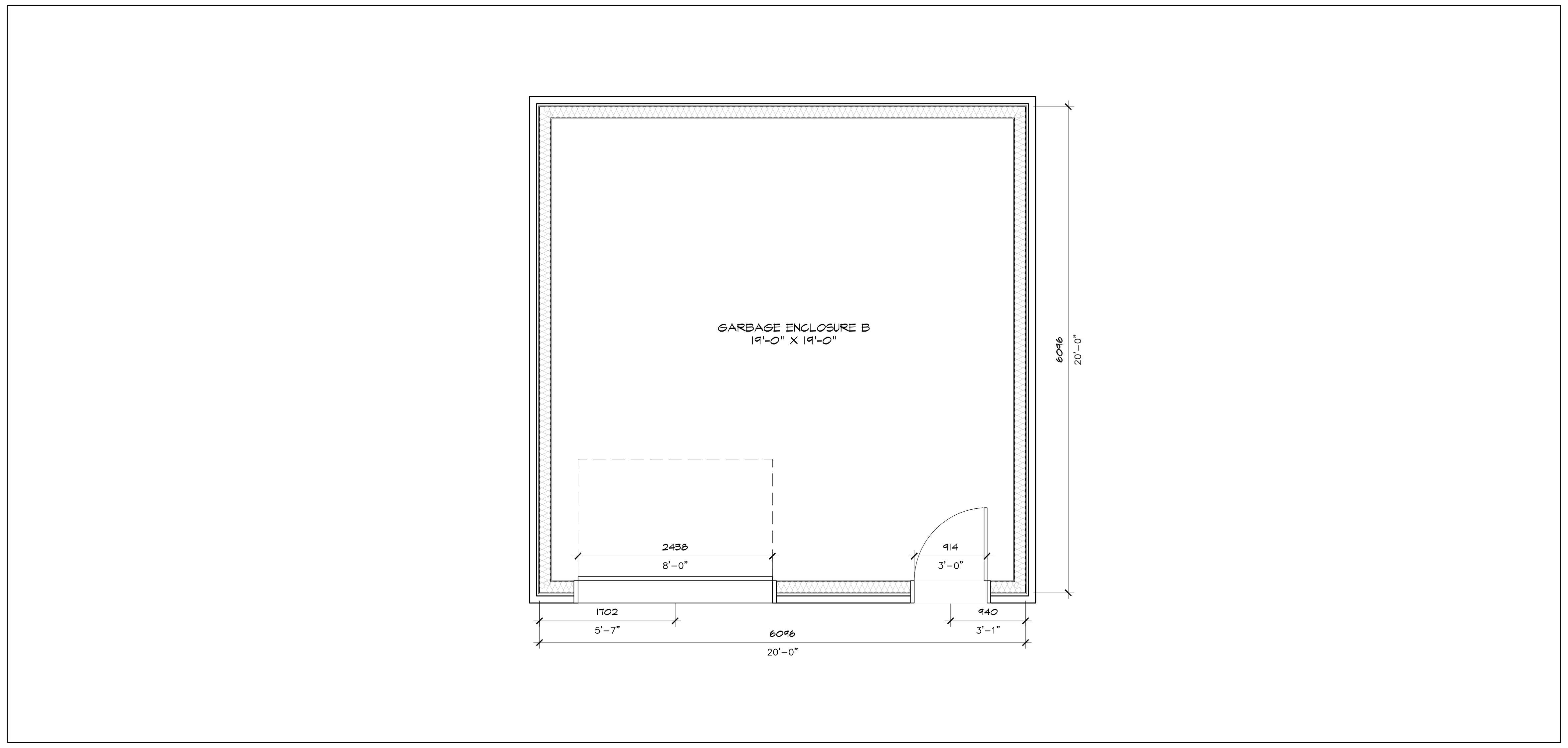
DRAWN BY: D.T.	CHECKED BY: B.L. S.J.L.
PLOT DATE: 2023.11.09	PROJECT DATE: DATE
JOB NUMBER: SL-1086-22	SCALE: AS NOTED

SHEET NUMBER:

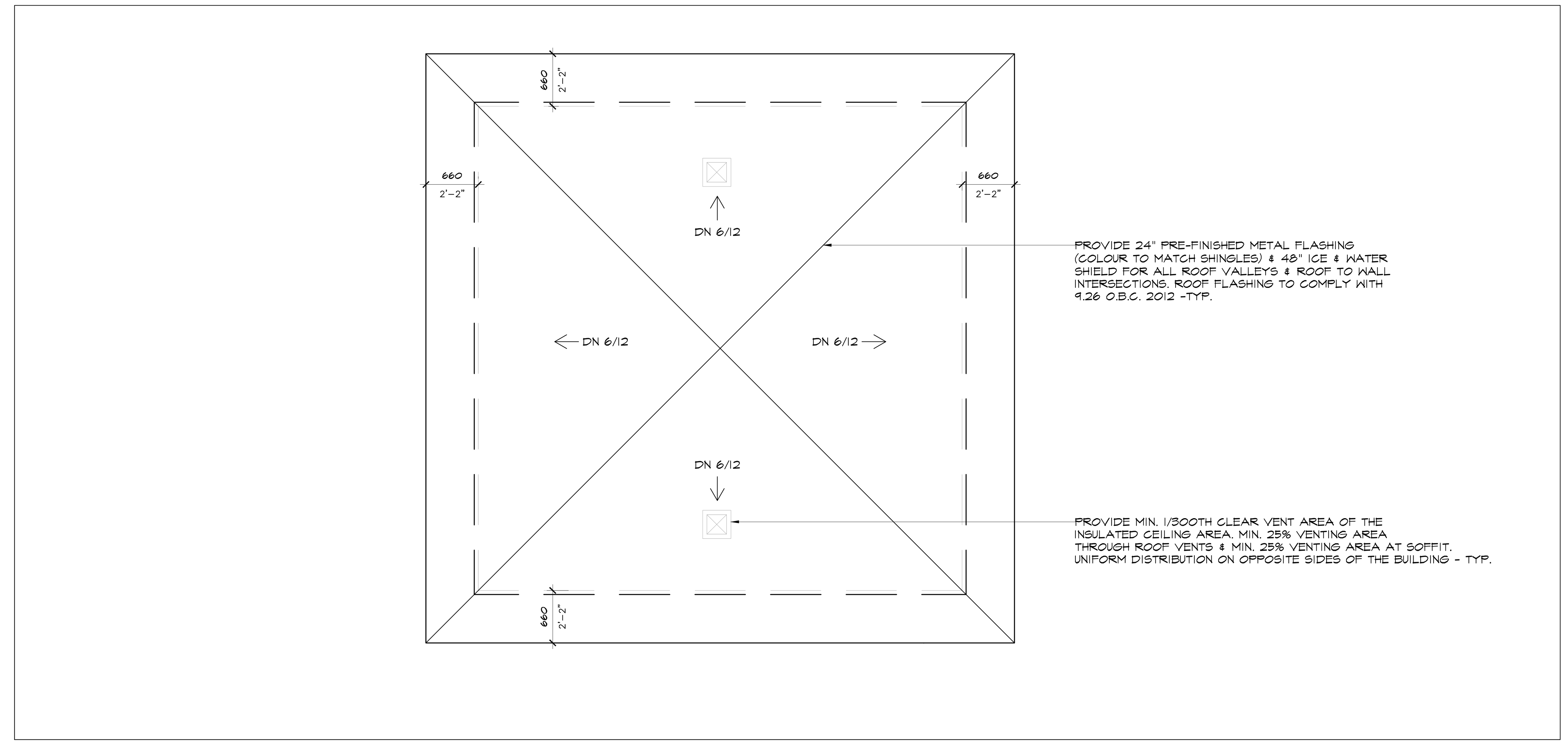
A1.1

PLAN #

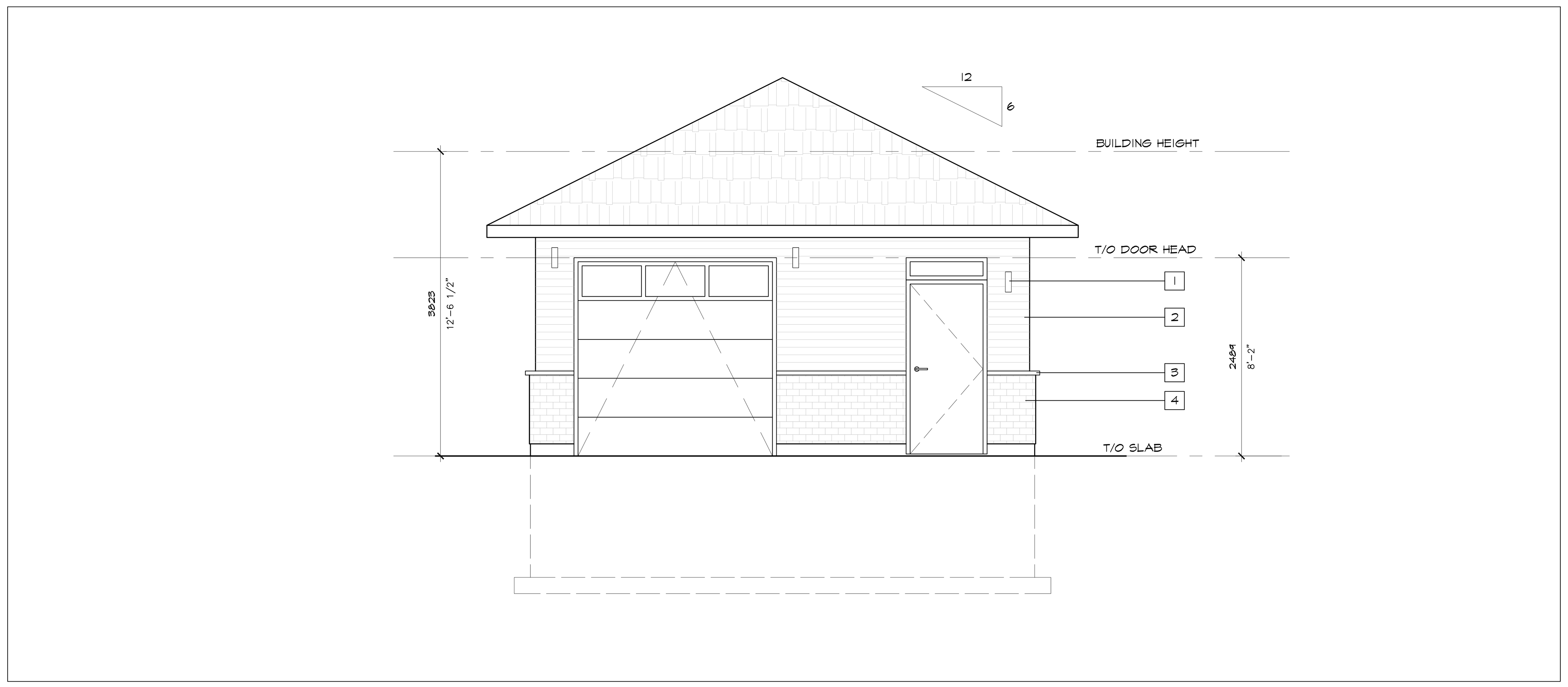
APPLICATION #



01 A1.2 ACCESSORY BUILDING B FLOOR PLAN
SCALE: 1:50



02 A1.2 ACCESSORY BUILDING B ROOF PLAN
SCALE: 1:50



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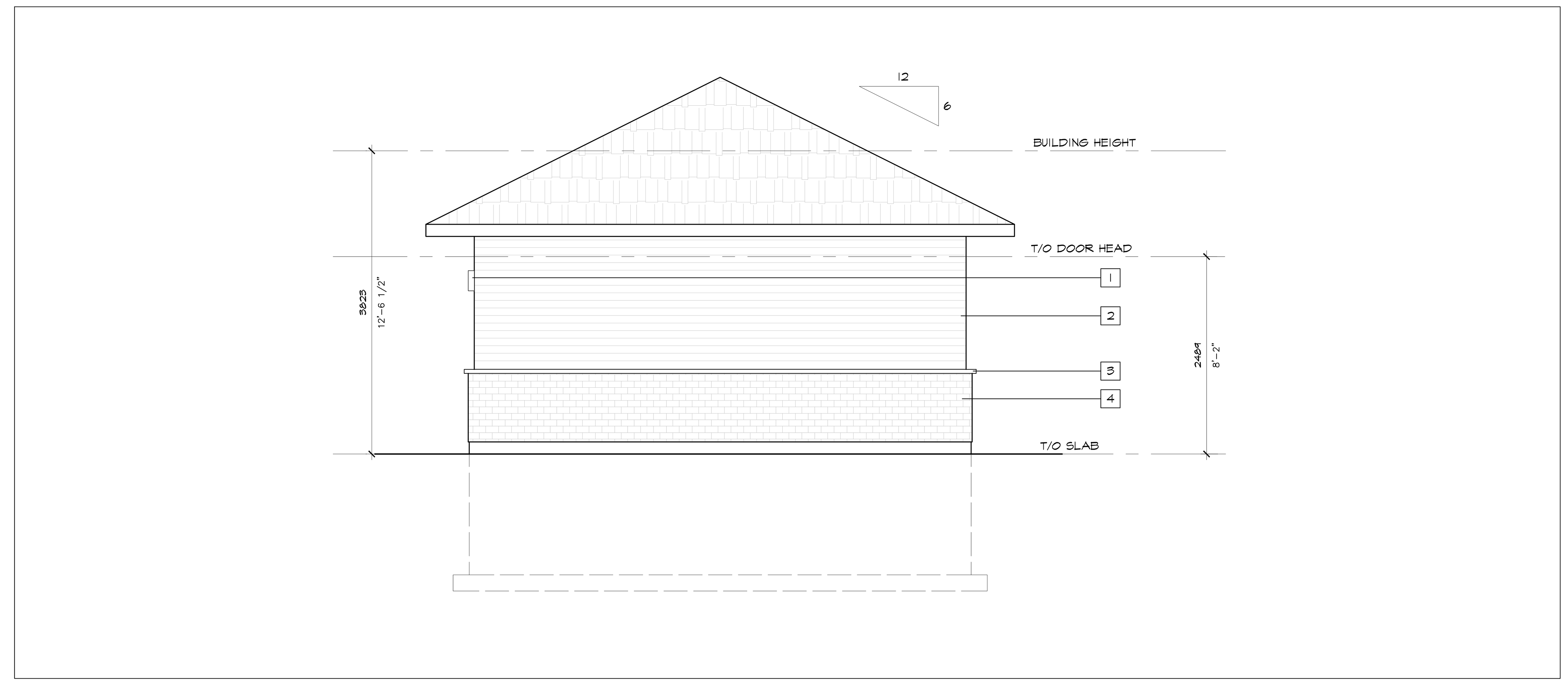

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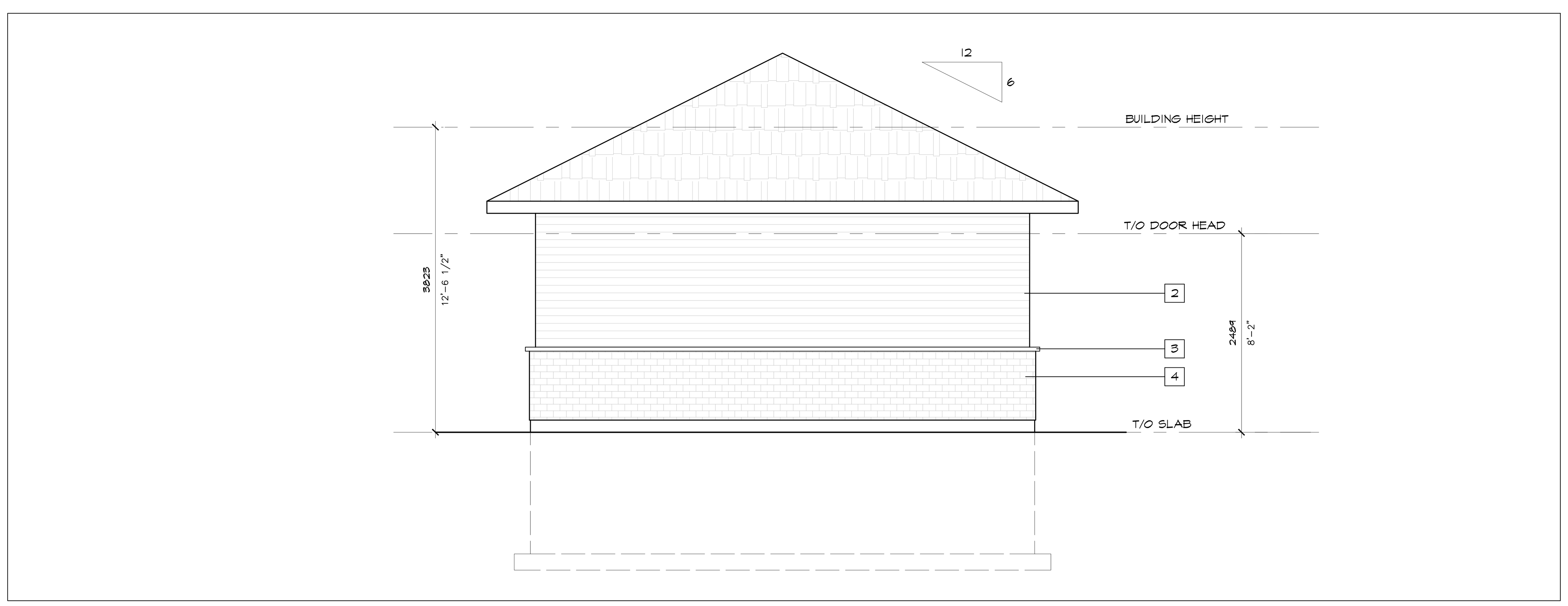
SCALE: 1:250



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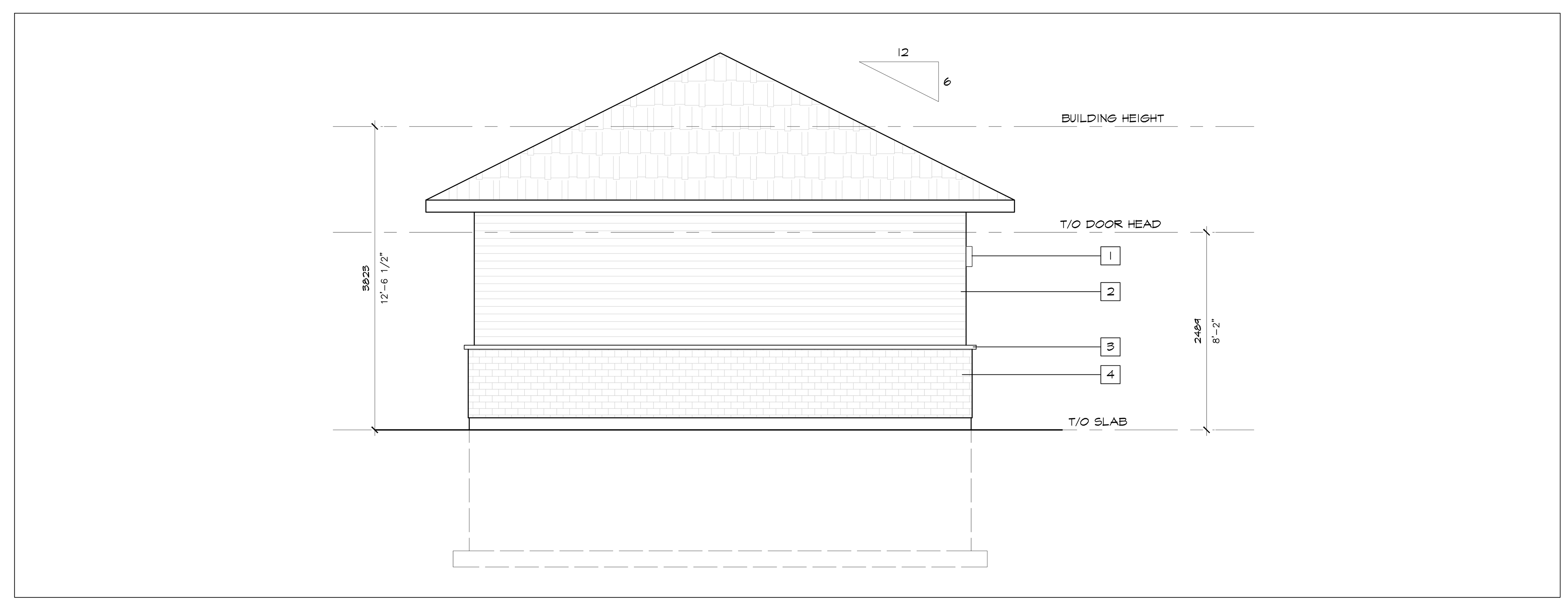

06 A1.2 ACCESSORY BUILDING B LEFT EVELATION
SCALE: 1:250

CLIENT NAME: THEBERGE HOMES

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5) NOTIFY SHAWN J. LAWRENCE ARCHITECT FOR ANY ERRORS AND/OR OMISSIONS PRIOR TO START OF WORK.

KEY NOTES:

1. WALL SCONCE
2. SIDING
3. PRECAST CONCRETE SILL
4. STONE VENEER

SEAL:

NORTH ARROW:

No.	DATE	REVISION
14	2023.11.09	ISSUED FOR COORDINATION
13	2023.11.07	ISSUED FOR COORDINATION
12	2023.09.12	ISSUED FOR REVIEW
11	2023.08.21	ISSUED FOR REVIEW
10	2023.07.13	ISSUED FOR COORDINATION
09	2023.06.13	ISSUED FOR SPC
08	2023.03.20	RE-ISSUED FOR PRE-CONSULT
07	2023.03.14	ISSUED FOR REVIEW
06	2023.02.22	RE-ISSUED FOR PRE-CONSULT
05	2023.02.14	ISSUED FOR REVIEW
04	2023.01.19	ISSUED FOR REVIEW
03	2022.11.22	ISSUED FOR PRE-CONSULT
02	2022.11.18	ISSUED FOR REVIEW
01	2022.11.09	ISSUED FOR REVIEW

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sjl@sjlarchitect.com

PROJECT:
OLD SECOND LINE DEVELOPMENT
1158 OLD SECOND LINE ROAD, OTTAWA, ON

SHEET TITLE:
ACCESSORY BUILDING B

DRAWN BY: D.T.
CHECKED BY: B.L. S.J.L.
PLOT DATE: 2023.11.09
PROJECT DATE: DATE
JOB NUMBER: SL-1086-22
SCALE: AS NOTED
SHEET NUMBER: A1.2

PLAN #

APPLICATION #