REGION OF PEEL

AGNES STREET DEVELOPMENT

WATERMAIN HYDRAULIC ANALYSIS

wsp

AGNES STREET DEVELOPMENT

WATERMAIN ANALYSIS REPORT

REGION OF PEEL

DATE: DECEMBER 2023

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December 19, 2023

Khalid Mahmood
Greck & Associates Ltd.
5770 Highway 7, Unit 3
Woodbridge, Ontario L4L 1T8

Dear Mr. Mahmood,

WSP Canada Inc. (WSP) is pleased to present the results of the watermain analysis for the Agnes Street Subdivision, located in the Village of Alton within the Town of Caledon, Peel Region. This analysis reflects the demands of the proposed site under existing conditions. A stand-alone model was built for this analysis as per the site servicing plan provided by Greck and Associates Limited and calibrated to hydrant flow tests completed for this site. This report reflects the latest subdivision site plan and Required Fire Flow calculation provided by Greck and Associates Ltd. on November 17, 2023, and the latest site servicing plan provided by Greck and Associates Ltd. on December 12, 2023.

The analysis in this report includes hydraulic simulation of the Average Day, Maximum Day, Maximum Day plus Fire Flow and Peak (Maximum) Hour demands conditions for the pre- and post-development conditions. The hydraulic analysis was completed using the stand-alone WaterGEMs model of the proposed development's water distribution network, built, calibrated, and validated by WSP through hydrant flow tests provided by BA Fire Safety, a third party.

The proposed watermain sizes and network were confirmed using the model to ensure that the system can provide adequate pressures and Fire Flows to all junctions in the proposed development, subject to constraints.

The modeling shows that the development can achieve the hydraulic requirements prescribed by Ministry of the Environment, Conversation, and Parks (MECP) watermain design criteria.

If you have any questions, please do not hesitate to call.

Sincerely,

WSP Canada Inc.

Antoine Lahaie, P.Eng., PMP
Manager, W/WW Master Planning

Sharon Thomas, EIT, B.A.Sc.,
Hydraulics

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Thornhill, ON, Canada L3T 0A1

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TABLES

FIGURES

APPENDICES

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Greck and Associates Limited to provide a hydraulic analysis of the proposed watermain network for the Agnes Street Subdivision Development.

The proposed site will be located southwest of Queen Street West and Agnes Street intersection located in Alton, Town of Caledon, Ontario. The development will consist of 67 residential townhouse units and will be serviced by a 200mm looped watermain with 250mm connections to the existing watermains on Agnes Street and Emeline Street.

The proposed site layout is illustrated in **Figure 1-1**. Detailed figures including the site servicing plan and proposed system layout with node, hydrant, and pipe IDs can be found in **Appendix A** of this report.

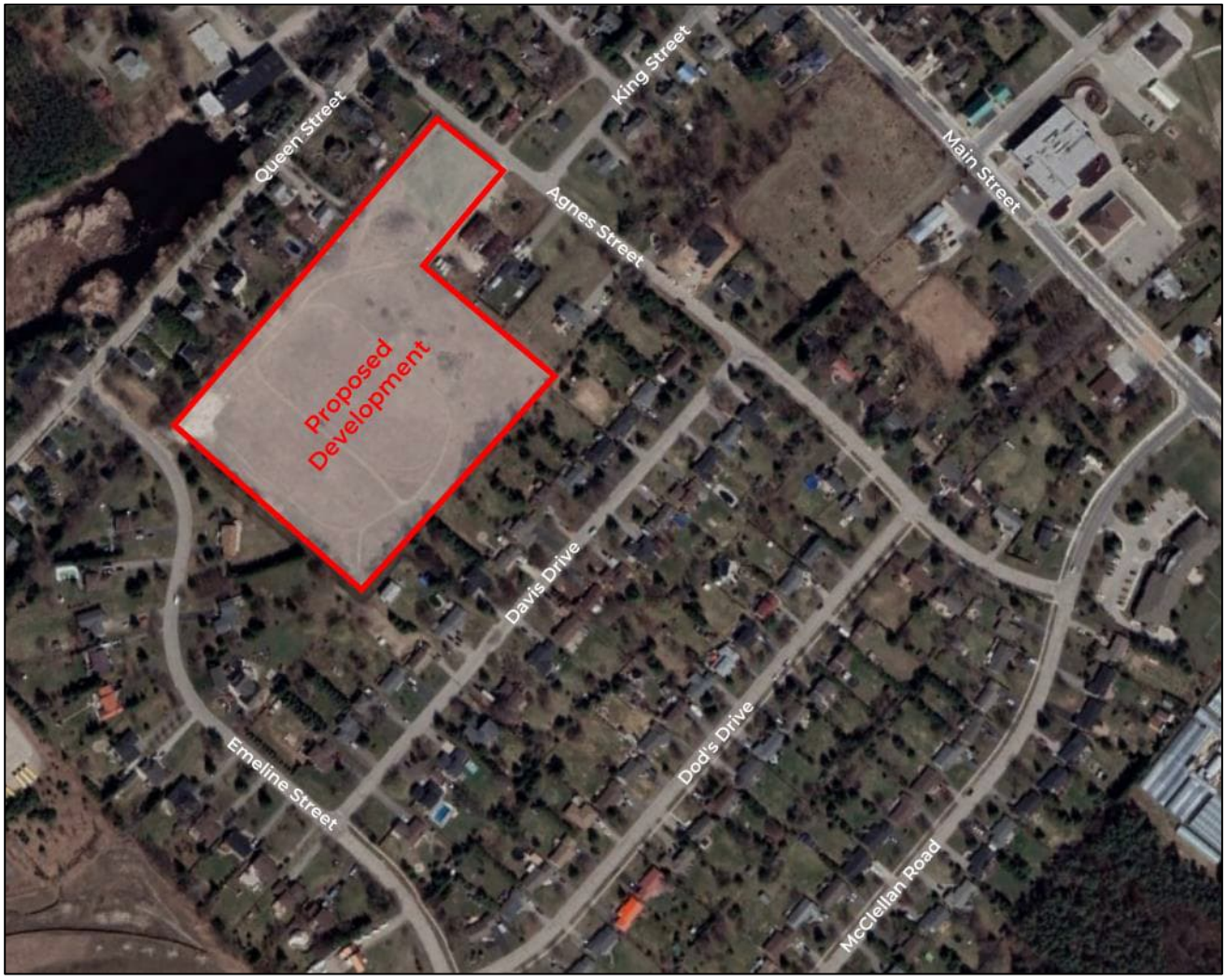


Figure 1-1 – Agnes Street Proposed Development Site Location

2 CRITERIA

2.1 DOMESTIC DEMAND

WSP completed the water demand calculations for the proposed site. The demands were calculated based off peaking factors and water consumptions rates provided in the Regional Municipality of Peel's Water and Wastewater Master Plan (2020) and Development Charges Background Study (2020). **Table 2-1** summarizes the unit rates and peaking factors used to calculate the demands for the existing area and for the proposed subdivision.

Table 2-1 – Village of Alton Water Demand and Input Criteria

DEMAND FACTORS AND INPUTS	VALUE
Average Residential Consumption	270 L/cap/day
Maximum (Peak) Hour Peaking Factor	3.0
Maximum Day Peaking Factor	1.8
Population Density (Single Family)	4.202 ppu
Population Density (Townhouses)	3.328 ppu
Population Density (Large Apartment)	3.048 ppu

Table 2-2 presents the total calculated water demands for the Agnes Street Subdivision using the rates outlined in the table above. Demands were then loaded to the closest junction in the model. **Appendix A** provides a detailed calculation of the demands and an illustration of the junction each demand was assigned to.

Table 2-2 - Calculated Demand Rates for the Agnes Street Development

STUDY AREA	AVERAGE DAY (L/S)	MAXIMUM DAY (L/S)	PEAK HOUR (L/S)
Agnes Street Subdivision	0.70	1.25	2.09
Existing Network	2.47	4.44	7.41

**Some local demands in the surrounding area were calculated/estimated to develop the stand-alone model. Building fronting mains included in the model were considered. This is not a full network model and not all demands in the district were considered.*

Development demands were calculated by counting the number of units on the site plan, converting the units into an equivalent population, and then applying the water rates and peaking factors listed above to calculate the total water demand. The calculated demands were then loaded to the closest junction in the model.

As part of building a stand-alone model for the analysis, WSP considered existing local demands serviced near the site. The demands were calculated based on counting the number of single-family homes and one Senior Housing complex and converting those into an equivalent population. The demands were then loaded for Average Day Demand (ADD), Maximum Day Demand (MDD), and Peak Hour Demand (PHD). Additional details regarding the study area are provided in **Appendix A**.

2.2 SYSTEM PRESSURES

As stipulated by the Ministry of the Environment, Conservation and Parks (MECP), the acceptable system pressures under normal conditions should range between 275 kPa (40 psi) and 690 kPa (100 psi).

Note that any service pressures which are above 550 kPa (80 psi) may require Pressure Reducing Valves (PRVs) at buildings to reduce pressure to the acceptable range as per the Ontario Building Code (OBC).

The minimum allowable pressure during Maximum Day Demand plus Fire Flow (MDD+FF) is 140 kPa (20 psi) at the location of the fire and everywhere else in the distribution network.

2.3 FIRE FLOW DEMAND

Required Fire Flows (RFF) were calculated by Greck and Associates and provided to WSP on November 16, 2023 based on procedures and figures from the Water Supply for Public Fire Protection – Fire Underwriters Survey of Canada (FUS), 2020. This guideline was used to estimate the minimum fire flow requirement for each building in the proposed development. Detailed fire flow calculations provided by Greck & Associates can be found in **Appendix C**.

Following the FUS method, the results of these calculations yielded an RFF of 183.3 L/s for the proposed Agnes Street Subdivision. The fire flows were simulated while maintaining a minimum pressure of 140 kPa (20 psi) in all junctions within the standalone model.

3 HYDRAULIC MODEL

3.1 MODEL SETUP

WSP completed this analysis using a stand-alone model of the development using WaterGEMS. The model includes existing watermains in the vicinity of the proposed development, as illustrated in **Figure 3-1**. WSP included domestic demands for the surrounding neighbourhoods and assigned them to the nearest junctions, as described in **Section 2.1**.

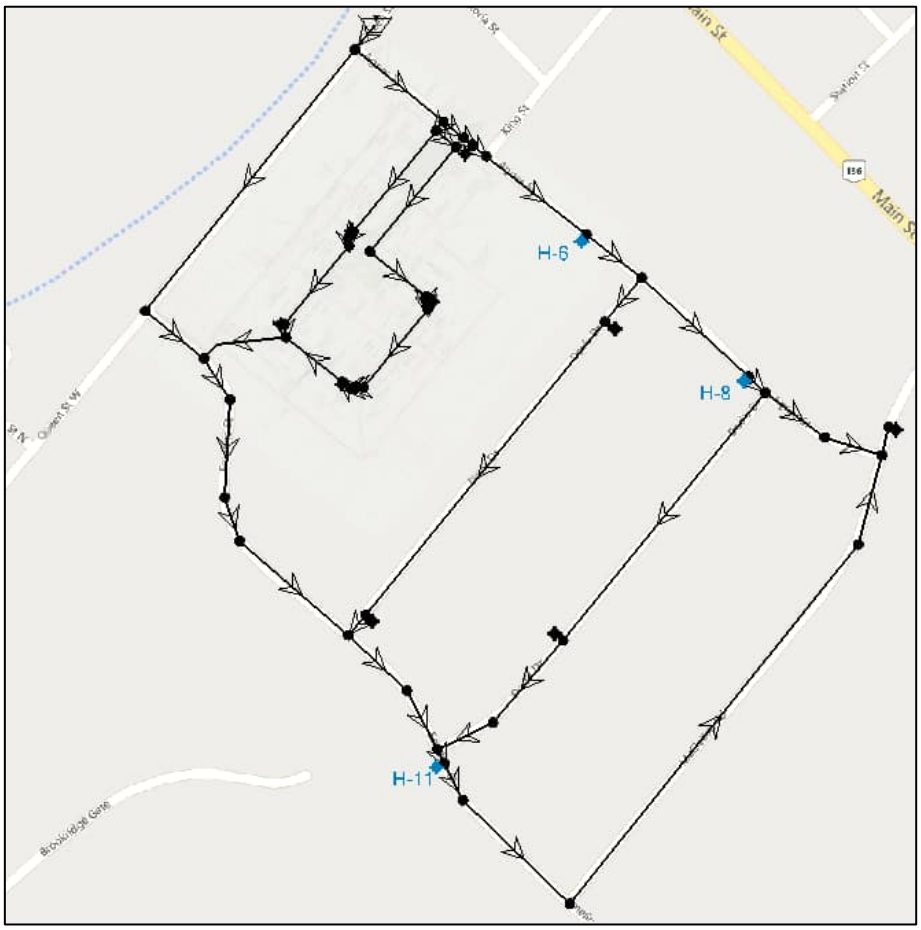


Figure 3-1 - Stand-Alone Model – Network Layout and Test Hydrants

3.2 AGNES STREET DEVELOPMENT AND MODEL

Watermains are to be sized appropriately to maintain adequate flows without causing excessive energy loss or resulting in excessive water quality decay. Main diameters should therefore be sized to carry the larger of: MDD+FF or PHD.

According to the MECP, the minimum pipe size in a distribution system providing fire protection should be at least 150 mm in diameter. Pipes should be looped where possible to improve supply security and water quality.

Friction factors for all new pipes added to the model were assigned according to the Ministry of the Environment, Conservation and Parks (MECP) watermain Design Criteria as listed in **Table 3-1.**

Table 3-1 - Hazen-Williams Roughness Factors

DIAMETER – NOMINAL	C-FACTOR
150mm	100
200mm	110
300mm to 600mm	120
Over 600mm	130

The proposed layout of the water distribution system is intended to satisfy the requirements of the Region of Peel. All pipes and nodes added for the development are shown and identified in **Appendix A.**

3.3 VALIDATION AND CALIBRATION OF MODEL

Greck & Associates provided three hydrant flow tests (HFTs) conducted by BA Fire Safety on Agnes Street and Emeline Street, respectively, for the model calibration. Of the three HFTs provided, only those conducted on Agnes Street were used for calibration due to the inconsistencies that likely resulted from different network conditions during the flow tests. Both tests conducted on Agnes Street were completed on August 22, 2022; however, the Emeline Street HFT was completed on September 6, 2022 and is likely to have occurred under different network conditions. Moreover, the hydrant on Emeline Street is the furthest of all test locations from the proposed development and, consequently, least representative of the boundary conditions experienced at the subject site. The test hydrant locations are depicted in **Figure 3-1**.

The calibration of a hydraulic model is completed in two steps: a macro calibration is completed by matching the supply conditions to within 5% of the static pressure data (in accordance with the American Water Work Association), and a micro calibration is done by adjusting C-Factors throughout the model to have residual flow rates match the results of the hydrant flow test.

Table 3-1 presents the Agnes Street test results against the calibrated stand-alone model results. The hydrant test located on Emeline Street (H-11) has been omitted due to inconsistencies described above.

Table 3-2 Comparison of Hydrant Flow Test Results with Model Outputs

Hydrant	Static Pressure (kPa)			Residual Pressure (kPa)		
	HFT Results	Model Output	Difference (%)	HFT Results	Model Output	Difference (%)
H-6	455	445	2.2%	276	290	4.9 %
H-8	441	452	2.5%	303	279	8.2 %

A comparison between the test results and the modelled hydrant curve was completed for both test hydrants located on Agnes Street (H-6, H-8). The modelled static pressures for both tests are within 5% of the tested static pressures. To achieve this, a single fixed head “dummy” reservoir was modelled at an initial hydraulic grade line (HGL) of 464.5m, generating a system pressure closely matching those reported during the flow tests for hydrants H-6 and H-8.

It was found that the modelled static pressures were within 5% of the hydrant flow test static pressures and that the modelled flows at 140 kPa (20 psi) were conservative, meaning that the model underpredicts flow compared to the hydrant flow test extrapolation. The results of this test, and how they compared to the model simulated data, can be seen in **Appendix D**.

It is important to note the limitations of the HFTs used to calibrate the model. Both HFTs on Agnes Street were reported to have been completed at the same time (i.e., 2:00 PM), on the same day and along the same section of watermain and therefore should represent identical boundary conditions. Based on typical diurnal patterns in water demand, WSP believes that the system behaviour observed during the HFTs is representative of ADD conditions. The boundary conditions used in all modelled scenarios (i.e., fixed head reservoir level = 464.5m) are limited to those captured during the HFTs; consequently, any changes to the boundary conditions (i.e., pump activity, storage levels) within the larger water network may affect the results presented in this report. With this, simulated available fire flows and system pressures under MDD and PHD conditions are the best estimation WSP can provide from the information provided by Greck and Associates but should be validated by the Region of Peel in their model upon their review.

The test results, and how they compare to the model simulated data, have also been provided in **Appendix D** for reference.

4 ANALYSIS

The proposed watermain layout was modelled for Average Day, Maximum Day, Maximum Day plus Fire Flow and Peak Hour demand conditions for the proposed Agnes Street development for the existing network, using a stand-alone WaterGEMS model built and calibrated by WSP based on the site servicing plan provided by Greck and Associates Limited. Pipes in the development were sized to meet the greater requirement of the PHD or MDD+FF requirements and as to not bottleneck the future network. A detailed summary of the demands is shown in **Appendix A** as well as the proposed pipe diameters within the development.

4.1 SYSTEM PRESSURES

Modelled service pressures are summarized in **Table 4-1** for Average Day Demand (ADD), Maximum Day Demand (MDD) and Peak Hour Demand (PHD) scenarios in the 2021 (existing) planning horizons under boundary conditions specified in **Section 3**. Baseline conditions were also simulated to examine the baseline level of service experienced by the existing network before the addition of the proposed development. By comparing simulated results under the baseline condition to the proposed condition, the impact of the proposed development on the existing water network can be examined.

Table 4-1- Simulated Service Pressures under all Modelled Scenarios

Demand Scenarios	Average Day (kPa)	Maximum Day (kPa)	Peak Hour (kPa)
Proposed Conditions	320 – 543	320 – 543	319 – 543
Baseline Conditions	320 – 543	320 – 543	319 – 543
Difference (%)	0 %	0 %	0 %

*Note: There is less than 1 kPa difference between Average Day pressures and Maximum Day pressures.

The modelling indicates that the expected service pressures range between approximately 319 kPa and 543 kPa at the proposed development and within the local distribution network under all modelled scenarios, achieving the minimum allowable pressure of 275 kPa prescribed by the MECP. The additional demands imposed on the network by the proposed development results in a drop in pressure of less than 1 kPa, suggesting that the proposed development will have a negligible impact on the baseline level of service experienced by the Alton distribution network.

Of note, the model did not simulate a large drop in pressure between ADD and MDD and from MDD to PHD. This is due to the low total demands in the simulated network which do not create a significant drop in the HGL. This can also be attributed to the proximity of the dummy reservoir to the site. With the low demands, and the proximity of the supply to the site, fewer network losses were captured by the model and, consequently, a less significant drop in pressure was simulated. Detailed pipe and node result tables are included in **Appendix B**.

4.2 AVAILABLE FIRE FLOWS

The minimum allowable pressure under MDD plus Fire is 140 kPa (20 psi) at the location of the fire or anywhere else in the model and, in accordance with FUS calculations provided by Greck & Associates, the minimum RFF for the subject development is 183.3 L/s. The fire flow scenarios were simulated under MDD conditions for ultimate buildout conditions.

In consultation with Greck and Associates Limited, WSP recommended upsizing the existing 150mm watermain on Agnes Street that extends from Queen Street to the proposed development to 250mm pipe in order to achieve the site-specific fire flow requirements. This change is reflected in the results presented in **Tables 4-1** and **4-2**, and site servicing plan (refer to **Appendix A**) was updated accordingly.

Steady state modelling results indicate that Available Fire Flows (AFFs) within the proposed development met or exceeded the target RFF of 183.3 L/s at all hydrants within the proposed development, as shown in **Table 4-2**. Baseline conditions were also simulated to examine the fire flow capacity of the existing network before the addition of the proposed development. By comparing simulated results under the baseline condition to the proposed condition, the impact of the proposed development on the existing water network can be examined.

Table 4-2- Simulated Available Fire Flows under MDD+FF

Study Area	AVAILABLE FIRE FLOWS (L/s)			SATISFIES RFF?
	Proposed Conditions	Baseline Conditions	Difference (%)	
Agnes Street Subdivision	235 – 285	-	-	Yes
Existing Network	91 - 242	83 – 151	+ 10 – 60 %	N/A

Due to the additional looping in the network, fire flow availability within the surrounding local network improved following the addition of the proposed Agnes Street Subdivision to the model. WSP recognizes that the simulated fire flows within the existing local network predominantly services single-family houses which are generally subject to a significantly lower fire flow requirement than that of townhouses.

Furthermore, WSP maintains that the simulated AFFs presented in **Table 4-2** are conservative for reasons outlined in **Section 3.2**. During a fire flow event, it is reasonable to anticipate that additional fire pumps may be turned ON, providing additional head and fire flow to the proposed development and surrounding network. However, due to the limitations of the stand-alone model, these pumps and their potential impact on fire flow availability are not captured in this analysis. WSP understands that the results from the fire flow analysis are limited to residual pressures for junctions included in the stand-alone model.

From conversations with the Region of Peel, WSP understands that the expected AFF remains to be 195 L/s at 20 psi based on the Region-wide model. WSP's model is a local representation of the system, reflecting the boundary conditions captured by the hydrant flow tests completed and may not reflect emergency operational conditions. However, the calculated RFF target (**Appendix C**) of 183.3 L/s is below the Region's simulated AFF of 195 L/s and can thus meet conditions.

A detailed analysis of fire flow availability at all hydrants in the proposed network is included in **Appendix C**.

5 CONCLUSIONS

The proposed watermain system for the Agnes Street Development site can achieve hydraulic requirements as prescribed by the MECP and Town of Caledon's design criteria as summarized below:

1. The service pressures under existing conditions are expected to range between approximately 319 kPa and 543 kPa. The addition of the proposed demand does not significantly impact the existing infrastructure;
2. To achieve the fire flow target, WSP recommends upsizing the existing 150mm watermain on Agnes Street that connects the proposed development to Queen Street to 250mm. Following this upgrade, available fire flows meeting the required fire flow target can be achieved under Maximum Day Demand conditions within the proposed development under existing conditions;
3. Under Maximum Day plus Fire Flow for existing conditions, the distribution system is able to maintain pressure above 140 kPa at ground level at all modeled nodes in the local network;

These conclusions remain valid as long as the water distribution system and the Town's network configuration remain as described herein. If significant changes are contemplated, this analysis should be updated.

APPENDIX

A DEMANDS AND PROPOSED SYSTEM LAYOUT

Agnes Street Subdivision

Demands

Population (Single Family)	4.202	ppu
Population (Townhouses)	3.328	ppu
Population (Small Apartments, < 750 sq.ft.)	1.612	ppu
Population (Large Apartments, > 750 sq.ft.)	3.048	ppu
Industrial	160.00	person/sq.m.
Other	36.00	person/sq.m.
Residential Average Day Demand	270	L/cap/day
Non-Residential Average Day Demand	250	L/cap/day

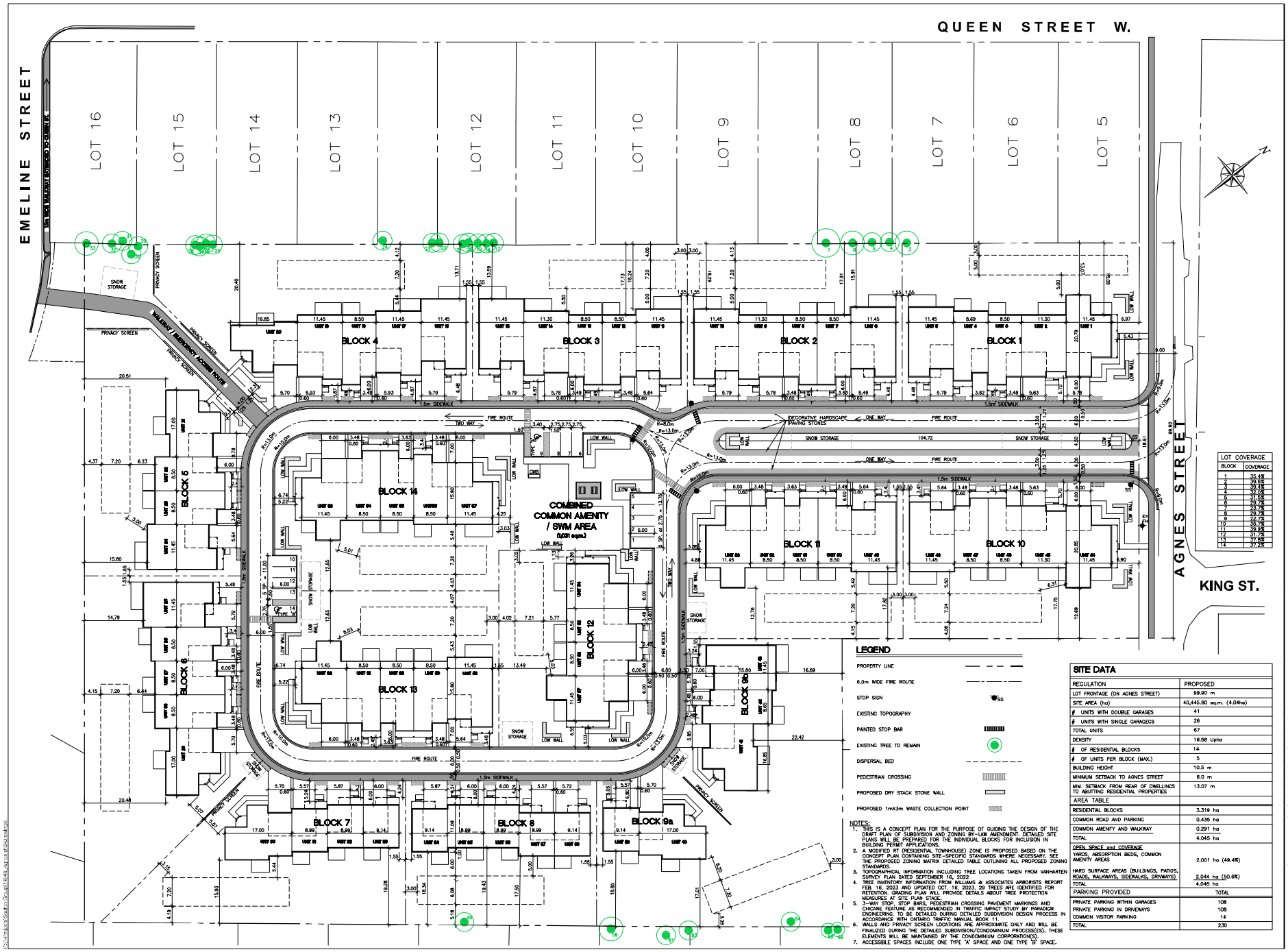
Peaking Factors	Residential	Non-Residential
Peak Hour	3.00	3.00
Maximum Day	1.80	1.40

Demand Rate Calculation

NODE	COMMENTS	SINGLE FAMILY (No. of Units)	TOWNHOUSES (No. of Units)	SMALL APARTMENTS (No. of Units)	LARGE APARTMENTS (No. of Units)	INDUSTRIAL (Sq. Metre)	OTHER (Sq. Metre)	RESIDENTIAL POPULATION	NON-RESIDENTIAL POPULATION	AVERAGE DAY (L/S)	MAX DAY (L/S)	PEAK HOUR (L/S)
J-1	Block 1		5					17		0.0520	0.0936	0.1560
J-3	Block 2		5					17		0.0520	0.0936	0.1560
J-13	Block 3		5					17		0.0520	0.0936	0.1560
J-12	Block 4		5					17		0.0520	0.0936	0.1560
J-10	Block 5		4					13		0.0416	0.0749	0.1248
J-9	Block 6		5					17		0.0520	0.0936	0.1560
J-7	Block 7		4					13		0.0416	0.0749	0.1248
J-6	Block 8		5					17		0.0520	0.0936	0.1560
J-6	Block 9a		2					7		0.0208	0.0374	0.0624
J-5	Block 9b		3					10		0.0312	0.0562	0.0936
J-1	Block 10		5					17		0.0520	0.0936	0.1560
J-4	Block 11		5					17		0.0520	0.0936	0.1560
J-5	Block 12		4					13		0.0416	0.0749	0.1248
J-7	Block 13		5					17		0.0520	0.0936	0.1560
J-12	Block 14		5					17		0.0520	0.0936	0.1560
J-16	Existing	10						42		0.1313	0.2364	0.3939
J-35	Existing	7						29		0.0919	0.1655	0.2758
J-17	Existing	9						38		0.1182	0.2127	0.3545
J-19	Existing	11						46		0.1444	0.2600	0.4333
J-21	Existing	21						88		0.2758	0.4964	0.8273
J-23	Existing	21						88		0.2758	0.4964	0.8273
J-26	Existing	26						109		0.3414	0.6145	1.0242
J-28	Existing	20			29			172		0.5389	0.9699	1.6166
J-31	Existing	23						97		0.3020	0.5436	0.9061
J-33	Existing	19						80		0.2495	0.4491	0.7485
Total	Proposed Development		67					223		0.70	1.25	2.09
	Existing Network	167			29			790		2.47	4.44	7.41
	Entire Network	**167**	**67**		**29**			**1013**		**3.17**	**5.70**	**9.50**

Note: "Existing" demands represent an approximation of existing water consumption for services fronting streets included in the stand-alone model.

Residential population (ppu) extracted from pg. 3-7 from Peel Region's Development Charges Background Study (2020)
Non-residential population (person/sq.m.) extracted from pg. 3-9 of Peel Region's Development Charges Background Study (2020)
Average day demands (per capita) and peaking factors extracted from Table 1 of Peel Region's 2020 Water & Wastewater Master Plan



LOT COVERAGE	
BLOCK	COVERAGE
1	35.4%
2	39.6%
3	39.1%
4	32.0%
5	31.6%
6	20.7%
7	23.7%
8	29.7%
9	22.7%
10	39.7%
11	39.9%
12	31.7%
13	37.8%
14	37.2%

SITE DATA

REGULATION	PROPOSED
LOT FRONTAGE (ON AGNES STREET)	99.90 m
SITE AREA (ha)	40,445.80 sq.m. (4.04ha)
# UNITS WITH DOUBLE GARAGES	41
# UNITS WITH SINGLE GARAGEGS	26
TOTAL UNITS	67
DENSITY	16.58 Upha
# OF RESIDENTIAL BLOCKS	14
# OF UNITS PER BLOCK (MAX.)	5
BUILDING HEIGHT	10.5 m
MINIMUM SETBACK TO AGNES STREET	6.0 m
MIN. SETBACK FROM REAR OF DWELLINGS TO ABUTTING RESIDENTIAL PROPERTIES	13.07 m
AREA TABLE	
RESIDENTIAL BLOCKS	3.319 ha
COMMON ROAD AND PARKING	0.435 ha
COMMON AMENITY AND WALKWAY	0.291 ha
TOTAL	4.045 ha
OPEN SPACE and COVERAGE YARDS, ABSORPTION BEDS, COMMON AMENITY AREAS	2.001 ha (49.4%)
HARD SURFACE AREAS (BUILDINGS, PATIOS, ROADS, WALKWAYS, SIDEWALKS, DRIVWAYS)	2.044 ha (50.6%)
TOTAL	4.045 ha
PARKING PROVIDED	TOTAL
PRIVATE PARKING WITHIN GARAGES	108
PRIVATE PARKING IN DRIVEWAYS	108
COMMON VISITOR PARKING	14
TOTAL	230

ORCHARD DESIGN STUDIO INC.
marketing meets architecture

User Defined

Project Information

SEATON GROUP

BUNGALOW TOWNHOMES WITH LOFTS

Agnes Street, Dalgleish, ONt.

Revisions

No.	Date	Description

Sheet Information

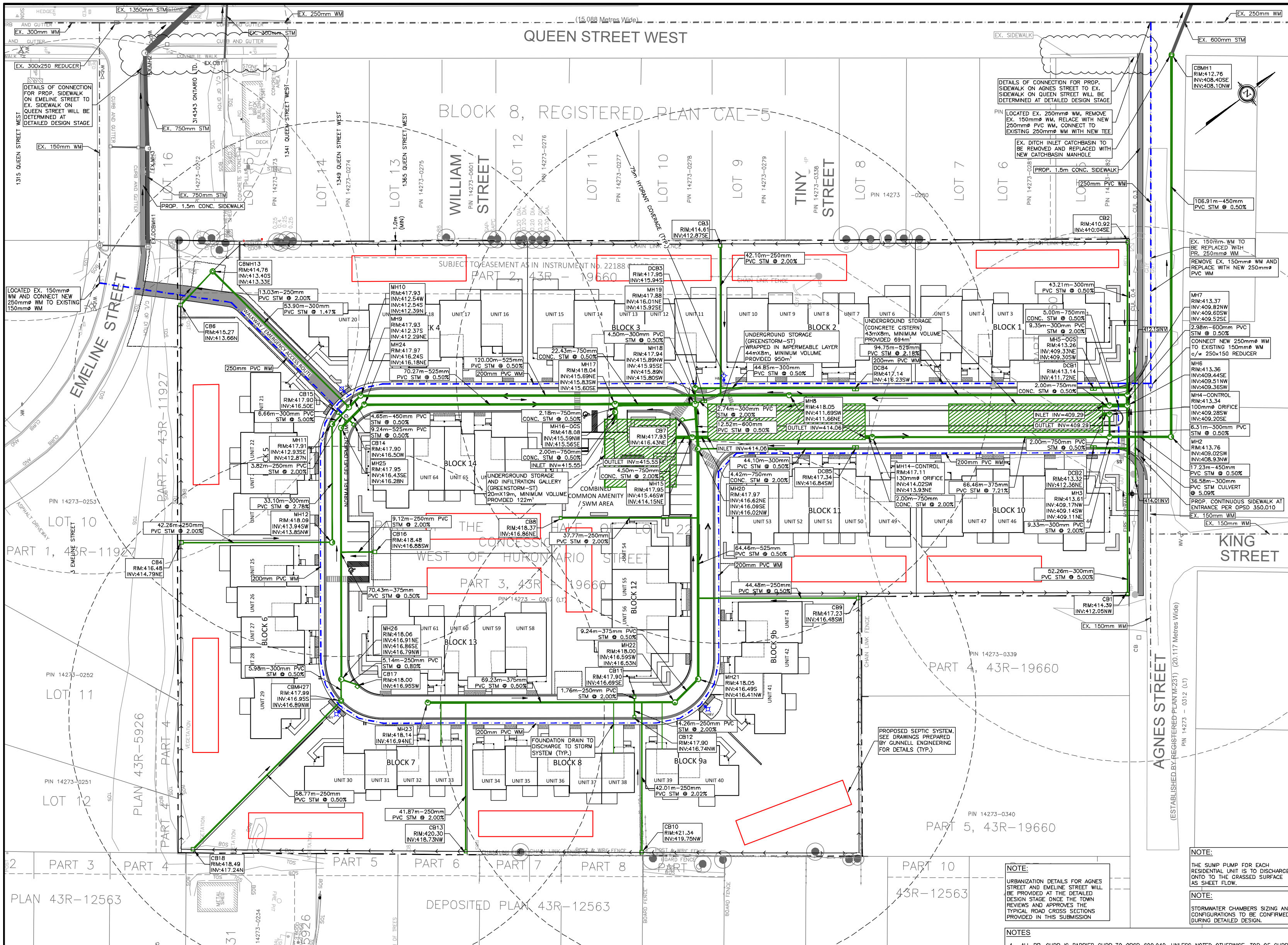
SITE PLAN

Project No.: 14048
Project Start Date: 2023.11.01
File: Agnes Street - Site Plan.dwg
Drawn by: KBR
Scale: 1:400

PRELIMINARY

A1.01

Plot Date/Time - 11/9/2023 10:58:45 AM



DRAWING LIST
(GRECK AND ASSOCIATES LTD.)

01 SITE GRADING PLAN
02 SITE SERVICING PLAN
03 EROSION AND SEDIMENT CONTROL PLAN AND DETAILS
04 CROSS SECTIONS

REGISTERED PLAN 43M-613

SUBMISSION DRAWING
NOT TO BE USED FOR CONSTRUCTION

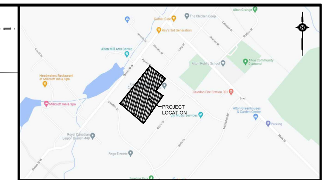
NOTE:
URBANIZATION DETAILS FOR AGNES STREET AND EMELINE STREET WILL BE PROVIDED AT THE DETAILED DESIGN STAGE ONCE THE TOWN REVIEWS AND APPROVES THE TYPICAL ROAD CROSS SECTIONS PROVIDED IN THIS SUBMISSION

NOTE:
THE SUMP PUMP FOR EACH RESIDENTIAL UNIT IS TO DISCHARGE ONTO TO THE GRASSED SURFACE AS SHEET FLOW.

NOTE:
STORMWATER CHAMBERS SIZING AND CONFIGURATIONS TO BE CONFIRMED DURING DETAILED DESIGN.

NOTES
1. ALL PR. CURB IS BARRIER CURB TO OPSD 600.040, UNLESS NOTED OTHERWISE. TOP OF CURB TO BE 0.15m ABOVE SHOWN EDGE OF PAVEMENT ELEVATIONS
2. CONCRETE AND ASPHALT PAVEMENT STRUCTURES OVER SOIL SUB-GRADE TO BE AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER
3. ALL REQUIRED ASPHALT RESTORATION ON AGNES STREET TO BE AS PER TOWN STD.
4. ALL REQUIRED PAVEMENT MARKINGS RESTORATION ON AGNES STREET AS PER OTM BOOK 11.
5. THE MINIMUM COVER ON WATERMAINS SHALL NOT BE LESS THAN 1.8m.
6. THE MINIMUM COVER ON STORM SEWERS SHALL NOT BE LESS THAN 1.5m, OTHERWISE STORM SEWERS WILL BE INSULATED. THE INSULATION DETAILS WILL BE PROVIDED AT THE DETAILED DESIGN STAGE.

NOTE:
THE CONTRACTOR IS CAUTIONED THAT ALL EXISTING UTILITIES ARE NOT INDICATED ON THIS DRAWING. THE CONTRACTOR MUST ARRANGE FOR LOCATES FROM EACH UTILITY COMPANY PRIOR TO ANY CONSTRUCTION OR EXCAVATION. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES, INCLUDING THOSE NOT INCLUDED ON THIS DRAWING. GRECK AND ASSOCIATES LIMITED CAN NOT ACCEPT RESPONSIBILITY FOR DAMAGE TO ANY EXISTING UTILITY WHICH MAY, OR MAY NOT BE INDICATED ON THIS DRAWING.



KEY PLAN
N.T.S.

LEGEND

EXISTING / PROPOSED
STORM MANHOLE
STORM CATCHBASIN MANHOLE
SINGLE CATCHBASIN
DOUBLE CATCHBASIN
FIRE HYDRANT
VALVE & BOX
STORM SEWER
WATERMAIN
LIMIT OF SUBJECT PROPERTY
EASEMENT
RIGHT OF WAY
LOT LINE
FENCE LINE
CURB/SIDEWALK
TREE
TREE – TO REMAIN
SEPTIC SYSTEM (BY OTHERS)

NOTES
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION, AND ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.
3. ALL WORK SHALL BE IN ACCORDANCE WITH CURRENT TOWN OF CALEDON STANDARD SPECIFICATIONS AND DRAWINGS UNLESS OTHERWISE NOTED HEREIN.
4. ORDER OF PRECEDENCE OF STANDARDS DRAWINGS IS FIRSTLY TOWN OF CALEDON, AND SECONDLY ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD).

BENCHMARK
BENCHMARK No. N/A
ELEVATION = N/A
DESCRIPTION:
ELEVATIONS ARE BASED ON GPS OBSERVATIONS FROM PERMANENT REFERENCE STATIONS IN THE NAD83 (CSRS-2010) COORDINATE SYSTEM, WITH HEIGHTS CONVERTED TO ORTHOMETRIC ELEVATION ON THE CVGD28 DATUM (1978 ADJUSTMENT) WITH GEOID MODEL HTV2.0, AS SUPPLIED BY NATURAL RESOURCES CANADA.

COMPLETED BY:
VAN HARTEN SURVEYING INC.
COMPLETED ON:
MAY 10, 2018

DEM SOURCE:
LIDAR DTM PEEL 2016 PACKAGE B AVAILABLE FROM LAND INFORMATION ONTARIO

NO.	REVISION	DATE	BY	APPROVED
01	ISSUED FOR 1ST SUBMISSION	2023/03/20	K.M.	
02	ISSUED FOR 2ND SUBMISSION	2023/12/12	K.M.	

Greck
5770 Highway 7, Woodbridge, Ontario, L4L 1T8 www.greck.ca

DRAFT

CLIENT NAME:
THE ALTON DEVELOPMENT INC.
1402 QUEEN STREET
ALTON, ON
L7K 0C3

PROJECT NAME:
AGNES STREET SUBDIVISION
AGNES STREET CALEDON, ON

PRELIMINARY SITE SERVICING PLAN

DESIGNED BY:	J.N.	SCALES:		PROJECT No.	20-731
CHECKED BY:	K.M.	HORIZONTAL:	1:500	DRAWING No.	
DRAWN BY:	J.N.	VERTICAL:	N/A	SHEET No.	02
DATE:	MAR. 08, 2023	SHEET SIZE:	24"x36"		

Z:\Projects\2020\20-731 – Agnes Street Subdivision, Alton\05_Drawings\CAD\GENERAL PLAN\20-731_SSP.dwg
Date Plotted: Dec 1, 2023 – 5:22 PM

APPENDIX A
PROPOSED SITE LAYOUT

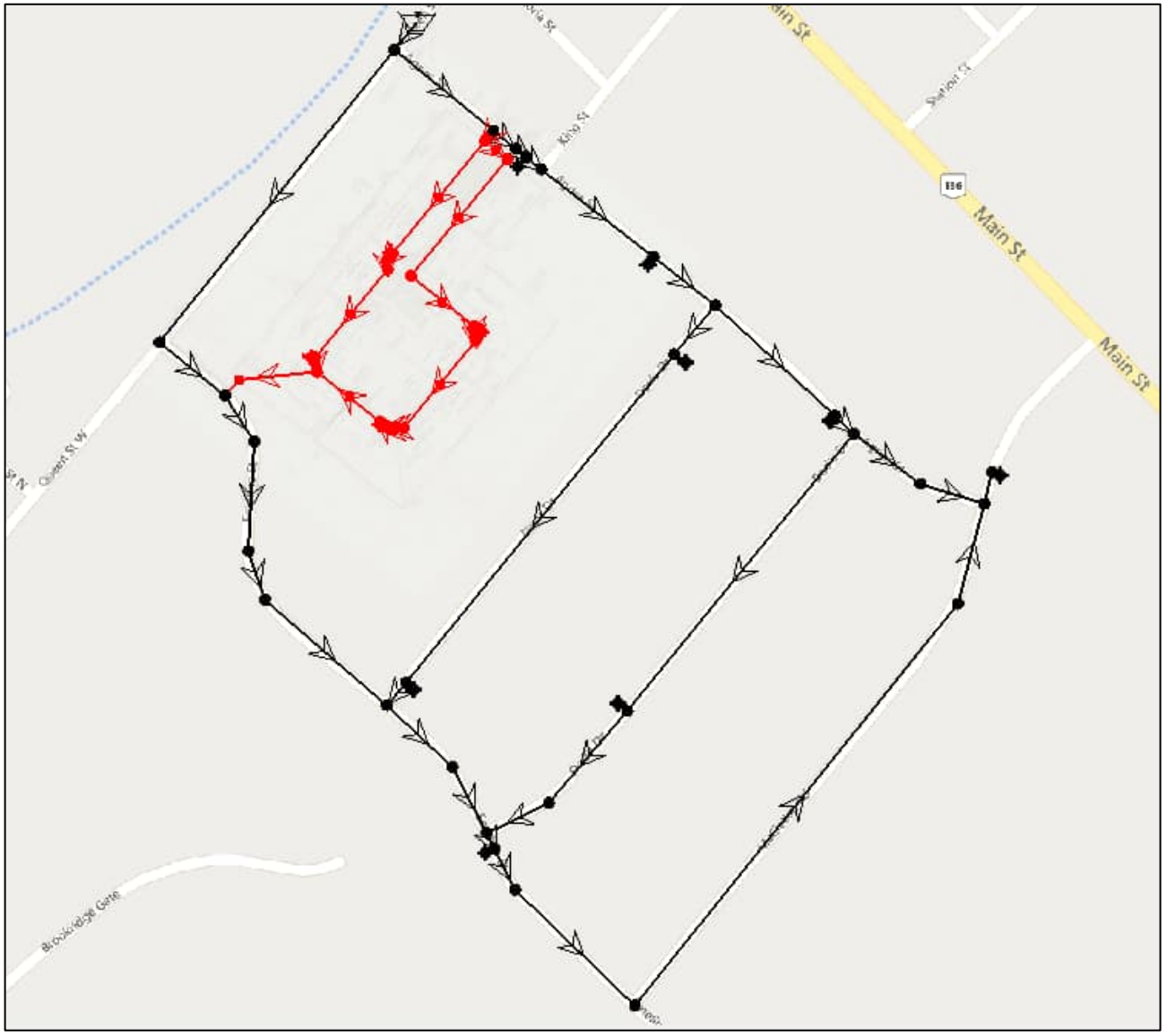


Figure A1 – Agnes St Subdivision Site Layout Highlighted in Red

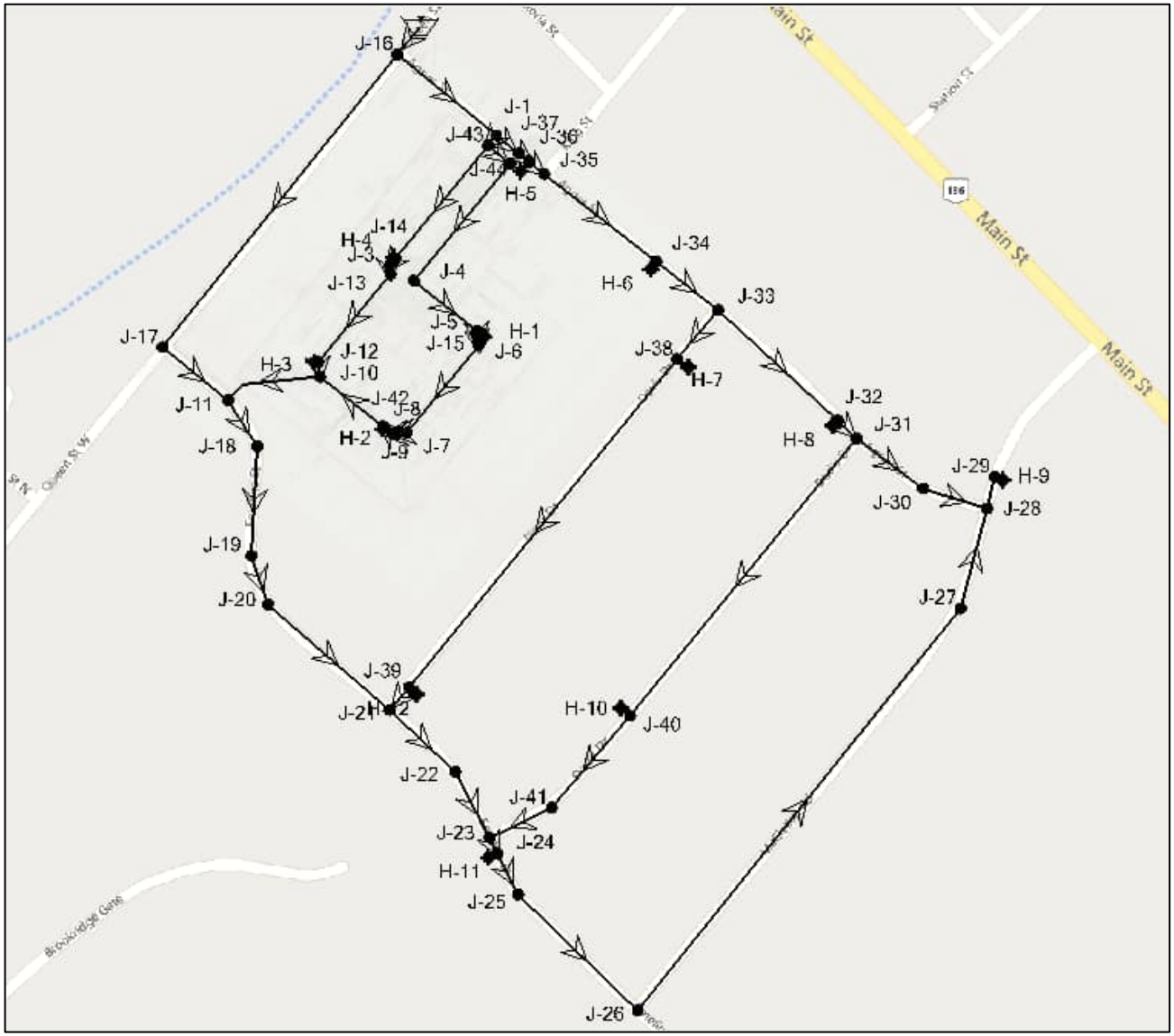


Figure A2 – Agnes St Subdivision & Local Network Layout with Junction and Hydrant IDs

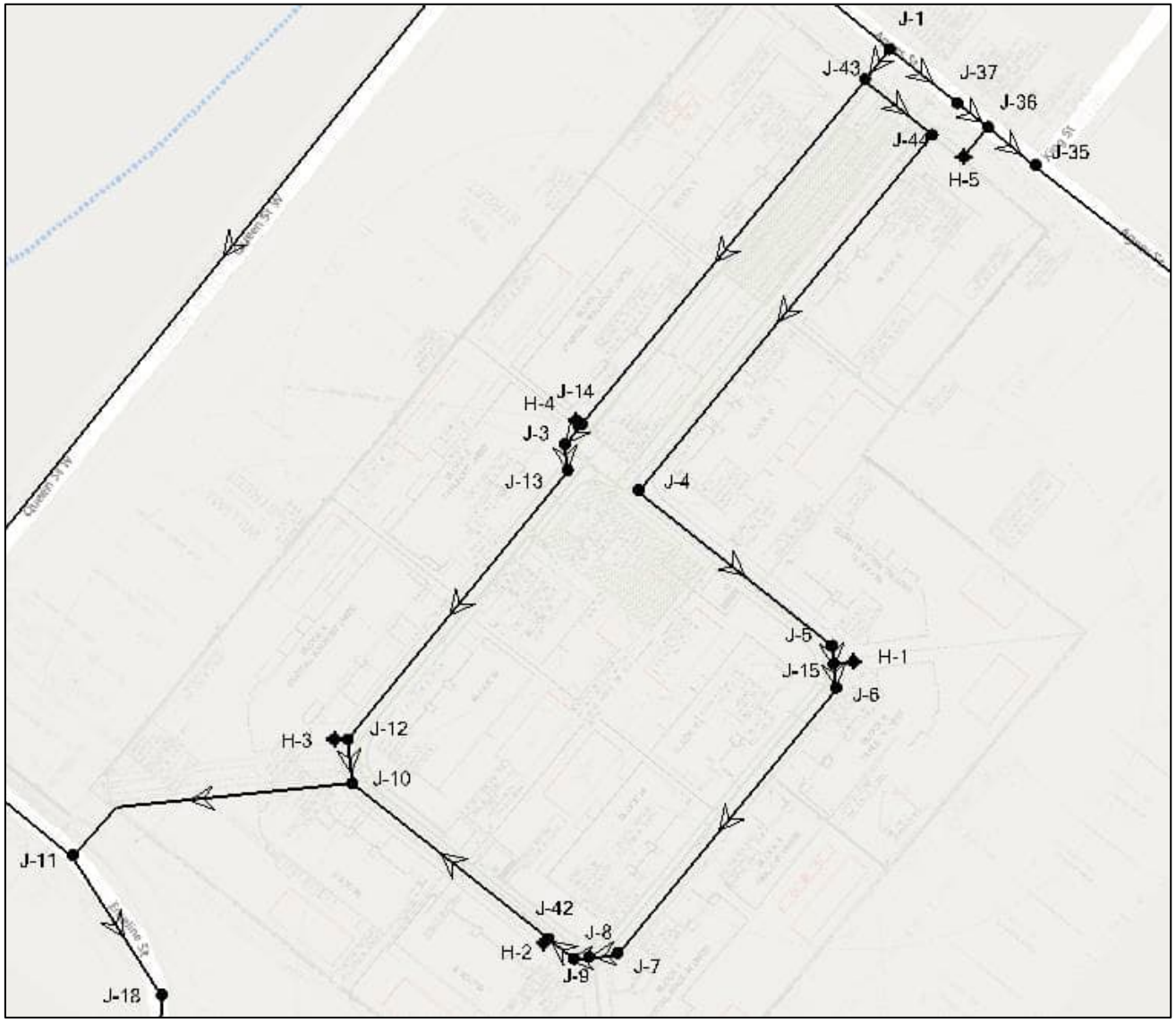


Figure A3 – Agnes St Subdivision (Close-Up) Layout with Junction and Hydrant IDs

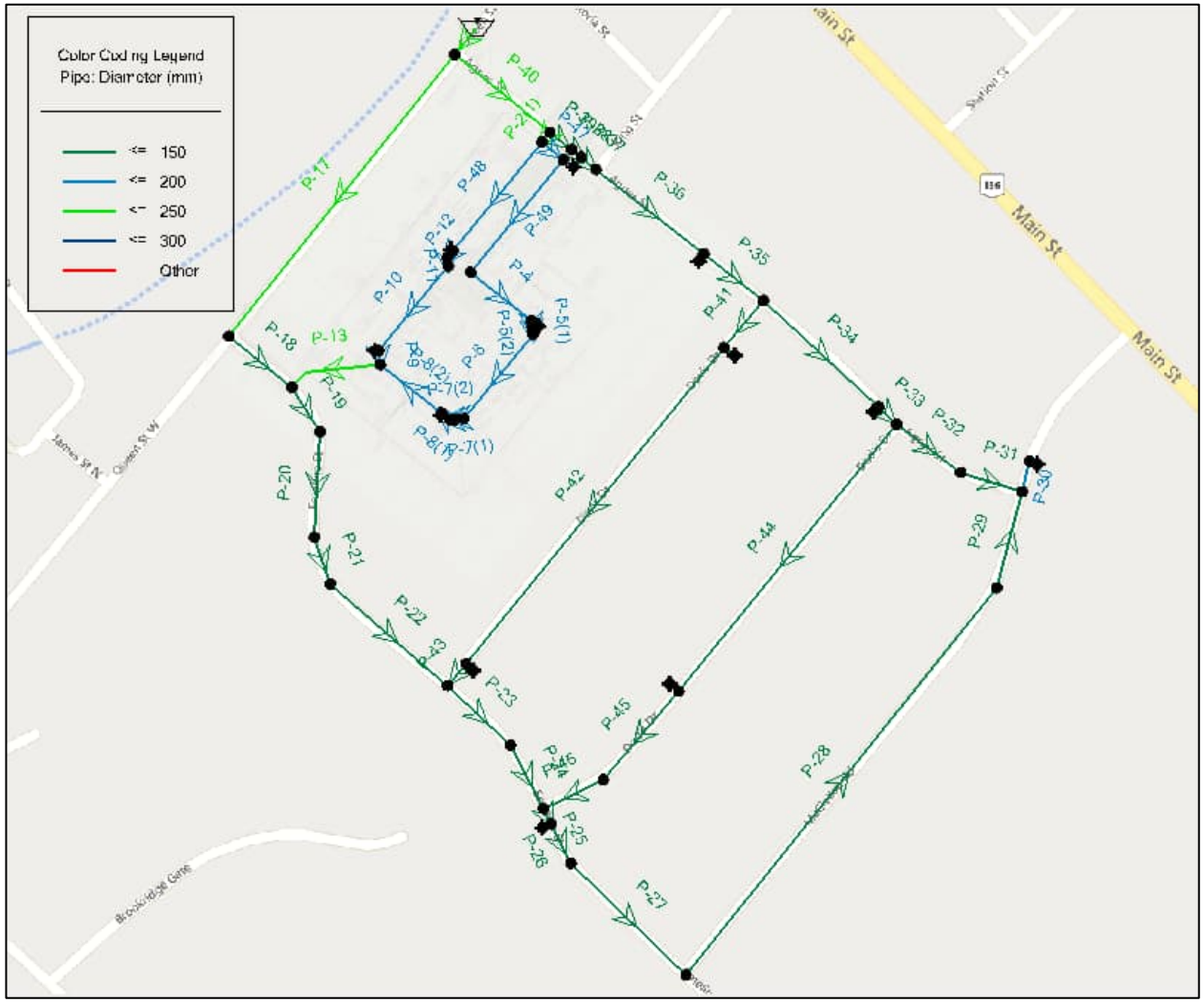


Figure A4 – Agnes St Subdivision & Local Network Layout with Pipe IDs[1]

[1] Note: Pipe P-40 is recommended as an upgrade for this development – all other watermains are sized according to WSP's understanding of the existing system.

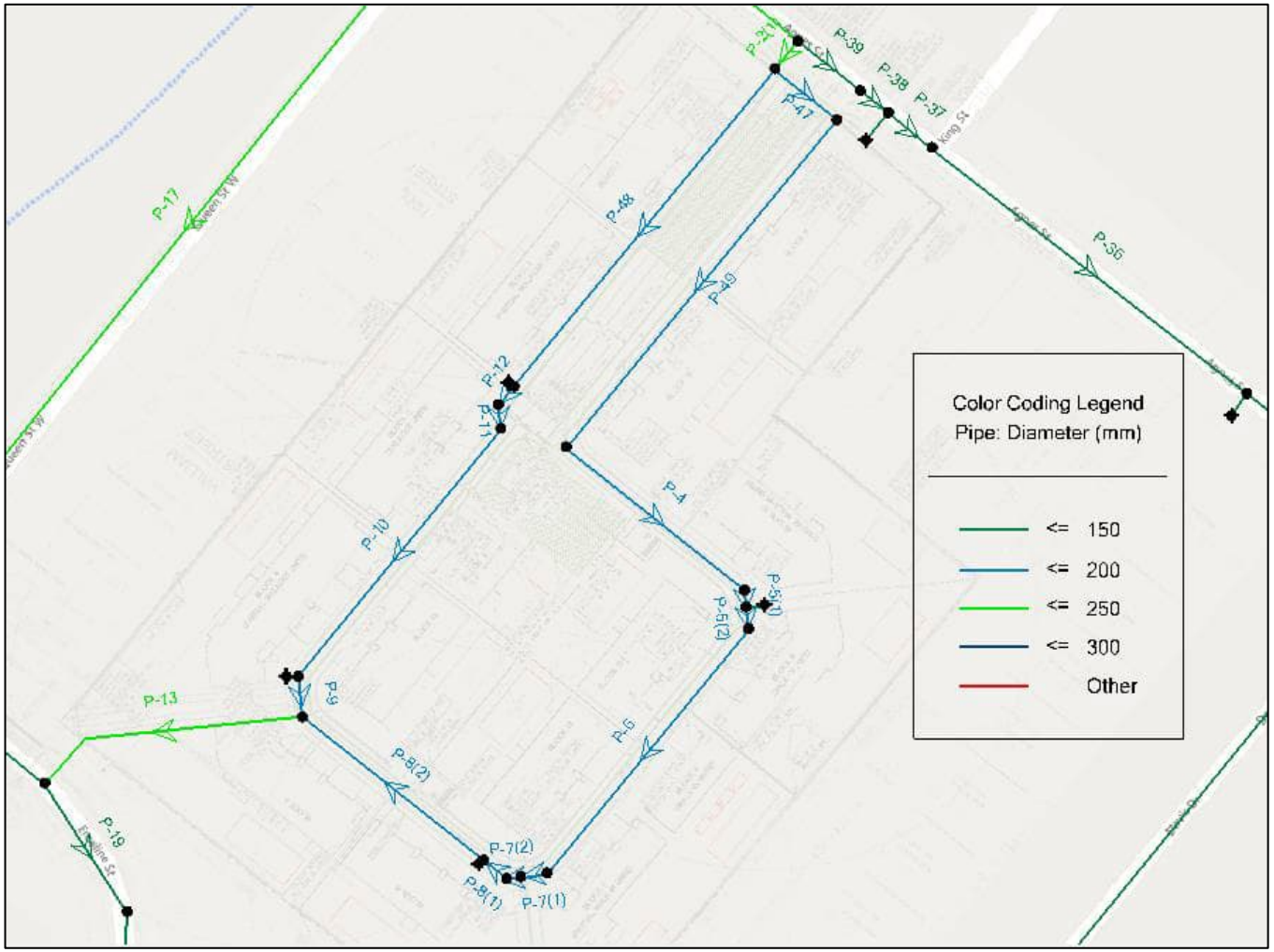


Figure A5 – Agnes St Subdivision (Close-Up) Layout with Pipe IDs

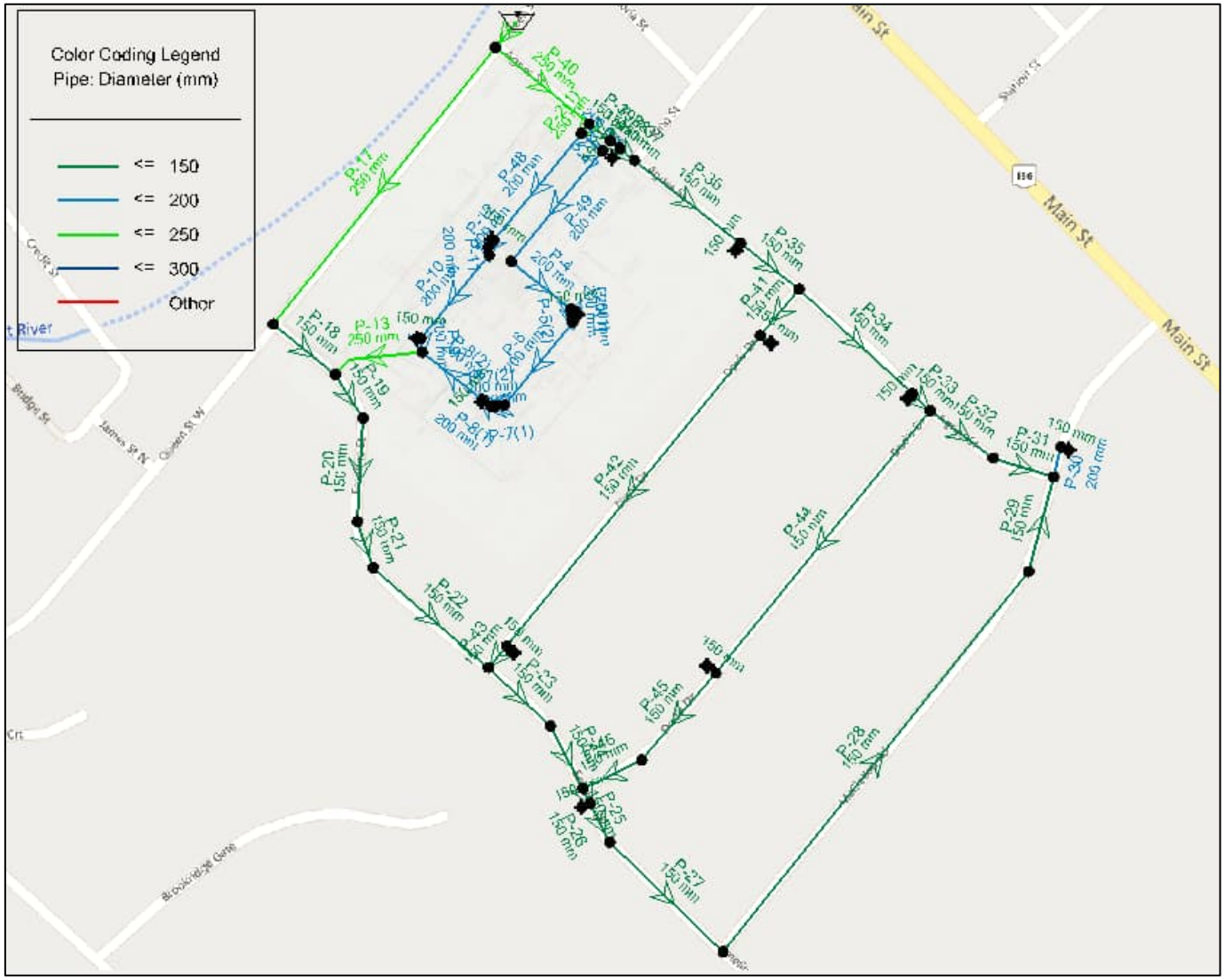


Figure A6 – Agnes St Subdivision & Local Network Layout with Pipe IDs and Diameters

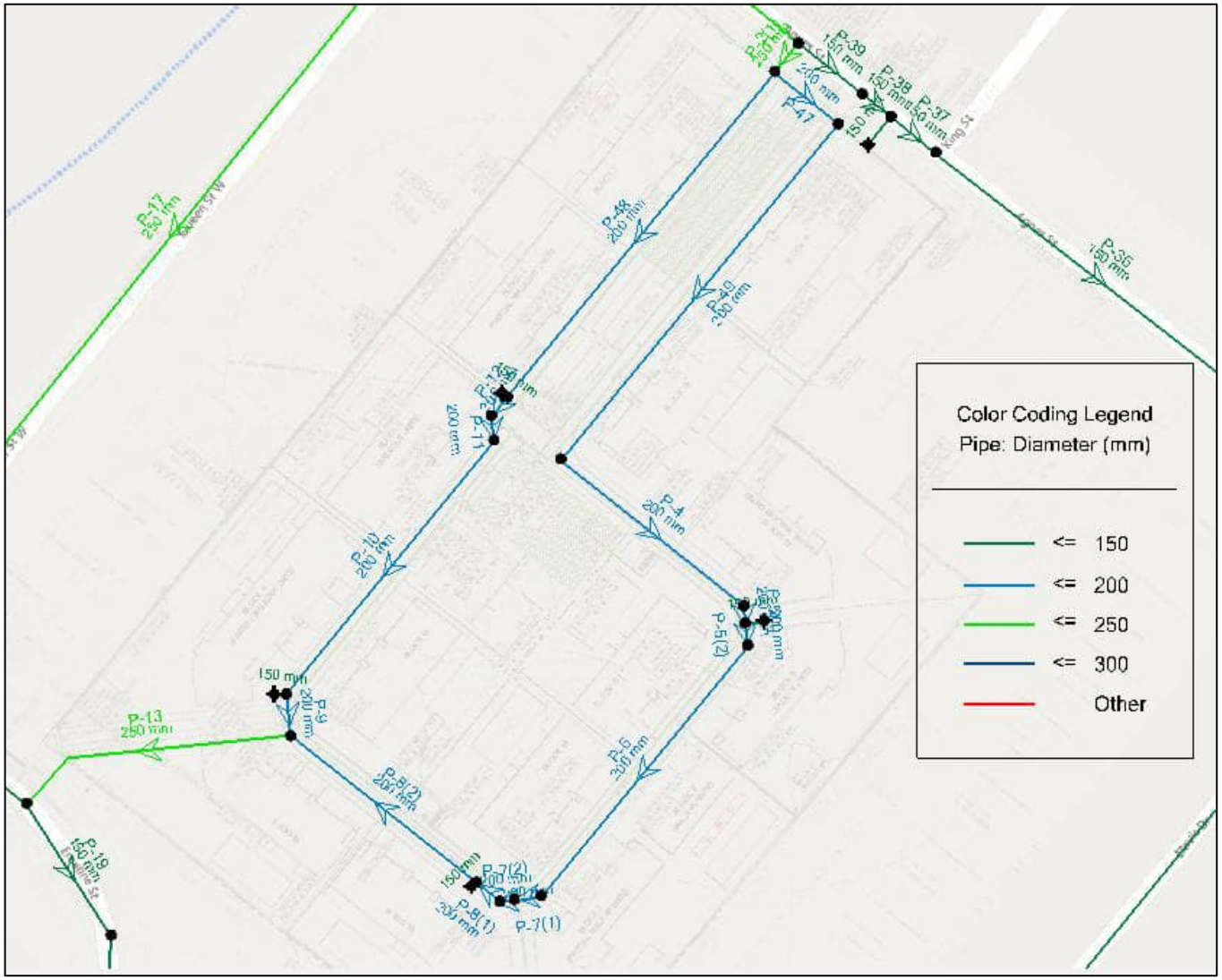


Figure A7 – Agnes St Subdivision (Close-Up) Layout with Pipe IDs and Diameters

APPENDIX

B PIPE AND JUNCTION TABLES

2021 Junctions Table
Agnes Street Subdivision

2021 ADD Junction Results					
ID	Zone	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
J-1	Existing	0.10	412.87	464.5	505
J-3	Proposed	0.05	411.88	464.5	515
J-4	Proposed	0.05	418.00	464.5	455
J-5	Proposed	0.07	418.05	464.5	455
J-6	Proposed	0.07	418.00	464.5	455
J-7	Proposed	0.09	418.06	464.5	454
J-8	Proposed	0.00	418.06	464.5	454
J-9	Proposed	0.05	418.06	464.5	454
J-10	Proposed	0.04	417.95	464.5	456
J-11	Existing	0.00	415.20	464.5	482
J-12	Proposed	0.10	417.97	464.5	455
J-13	Proposed	0.05	417.94	464.5	456
J-14	Proposed	0.00	418.06	464.5	454
J-15	Proposed	0.00	418.03	464.5	455
J-16	Existing	0.13	409.05	464.5	543
J-17	Existing	0.12	414.68	464.5	488
J-18	Existing	0.00	417.93	464.5	456
J-19	Existing	0.14	423.09	464.5	405
J-20	Existing	0.00	425.50	464.5	382
J-21	Existing	0.28	426.15	464.5	375
J-22	Existing	0.00	426.22	464.5	375
J-23	Existing	0.28	429.00	464.5	347
J-24	Existing	0.00	429.90	464.5	339
J-25	Existing	0.00	431.28	464.5	325
J-26	Existing	0.34	431.79	464.5	320
J-27	Existing	0.00	421.00	464.5	426
J-28	Existing	0.54	418.36	464.5	451
J-29	Existing	0.00	418.08	464.5	454
J-30	Existing	0.00	418.36	464.5	451
J-31	Existing	0.30	418.41	464.5	451
J-32	Existing	0.00	418.32	464.5	452
J-33	Existing	0.25	418.84	464.5	447
J-34	Existing	0.00	418.97	464.5	446
J-35	Existing	0.09	414.40	464.5	490
J-36	Existing	0.00	414.50	464.5	489
J-37	Existing	0.00	414.11	464.5	493
J-38	Existing	0.00	420.00	464.5	435
J-39	Existing	0.00	425.25	464.5	384
J-40	Existing	0.00	425.13	464.5	385
J-41	Existing	0.00	427.49	464.5	362
J-42	Proposed	0.00	418.05	464.5	455
J-43	Proposed	0.00	413.30	464.5	501
J-44	Proposed	0.00	414.42	464.5	490

Total Demand	3.17	**Maximum Pressure**	543
		Minimum Pressure	320

2021 Junctions Table
Agnes Street Subdivision

2021 MDD Junction Results					
ID	Zone	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
J-1	Existing	0.19	412.87	464.5	505
J-3	Proposed	0.09	411.88	464.5	515
J-4	Proposed	0.09	418.00	464.5	455
J-5	Proposed	0.13	418.05	464.5	455
J-6	Proposed	0.13	418.00	464.5	455
J-7	Proposed	0.17	418.06	464.5	454
J-8	Proposed	0.00	418.06	464.5	454
J-9	Proposed	0.09	418.06	464.5	454
J-10	Proposed	0.07	417.95	464.5	456
J-11	Existing	0.00	415.20	464.5	482
J-12	Proposed	0.19	417.97	464.5	455
J-13	Proposed	0.09	417.94	464.5	456
J-14	Proposed	0.00	418.06	464.5	454
J-15	Proposed	0.00	418.03	464.5	455
J-16	Existing	0.24	409.05	464.5	543
J-17	Existing	0.21	414.68	464.5	488
J-18	Existing	0.00	417.93	464.5	456
J-19	Existing	0.26	423.09	464.5	405
J-20	Existing	0.00	425.50	464.5	381
J-21	Existing	0.50	426.15	464.5	375
J-22	Existing	0.00	426.22	464.5	374
J-23	Existing	0.50	429.00	464.5	347
J-24	Existing	0.00	429.90	464.5	338
J-25	Existing	0.00	431.28	464.5	325
J-26	Existing	0.61	431.79	464.5	320
J-27	Existing	0.00	421.00	464.5	425
J-28	Existing	0.97	418.36	464.5	451
J-29	Existing	0.00	418.08	464.5	454
J-30	Existing	0.00	418.36	464.5	451
J-31	Existing	0.54	418.41	464.5	451
J-32	Existing	0.00	418.32	464.5	452
J-33	Existing	0.45	418.84	464.5	447
J-34	Existing	0.00	418.97	464.5	445
J-35	Existing	0.17	414.40	464.5	490
J-36	Existing	0.00	414.50	464.5	489
J-37	Existing	0.00	414.11	464.5	493
J-38	Existing	0.00	420.00	464.5	435
J-39	Existing	0.00	425.25	464.5	384
J-40	Existing	0.00	425.13	464.5	385
J-41	Existing	0.00	427.49	464.5	362
J-42	Proposed	0.00	418.05	464.5	455
J-43	Proposed	0.00	413.30	464.5	501
J-44	Proposed	0.00	414.42	464.5	490

Total Demand	5.70	**Maximum Pressure**	543
		Minimum Pressure	320

2021 Junctions Table
Agnes Street Subdivision

2021 PHD Junction Results					
ID	Zone	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
J-1	Existing	0.31	412.87	464.5	505
J-3	Proposed	0.16	411.88	464.5	515
J-4	Proposed	0.16	418.00	464.5	455
J-5	Proposed	0.22	418.05	464.5	454
J-6	Proposed	0.22	418.00	464.5	455
J-7	Proposed	0.28	418.06	464.5	454
J-8	Proposed	0.00	418.06	464.5	454
J-9	Proposed	0.16	418.06	464.5	454
J-10	Proposed	0.12	417.95	464.5	455
J-11	Existing	0.00	415.20	464.5	482
J-12	Proposed	0.31	417.97	464.5	455
J-13	Proposed	0.16	417.94	464.5	456
J-14	Proposed	0.00	418.06	464.5	454
J-15	Proposed	0.00	418.03	464.5	455
J-16	Existing	0.39	409.05	464.5	543
J-17	Existing	0.35	414.68	464.5	488
J-18	Existing	0.00	417.93	464.5	456
J-19	Existing	0.43	423.09	464.5	405
J-20	Existing	0.00	425.50	464.5	381
J-21	Existing	0.83	426.15	464.4	375
J-22	Existing	0.00	426.22	464.4	374
J-23	Existing	0.83	429.00	464.4	347
J-24	Existing	0.00	429.90	464.4	338
J-25	Existing	0.00	431.28	464.4	324
J-26	Existing	1.02	431.79	464.4	319
J-27	Existing	0.00	421.00	464.4	425
J-28	Existing	1.62	418.36	464.4	451
J-29	Existing	0.00	418.08	464.4	453
J-30	Existing	0.00	418.36	464.4	451
J-31	Existing	0.91	418.41	464.4	450
J-32	Existing	0.00	418.32	464.4	451
J-33	Existing	0.75	418.84	464.4	446
J-34	Existing	0.00	418.97	464.4	445
J-35	Existing	0.28	414.40	464.5	490
J-36	Existing	0.00	414.50	464.5	489
J-37	Existing	0.00	414.11	464.5	493
J-38	Existing	0.00	420.00	464.4	435
J-39	Existing	0.00	425.25	464.4	383
J-40	Existing	0.00	425.13	464.4	384
J-41	Existing	0.00	427.49	464.4	361
J-42	Proposed	0.00	418.05	464.5	454
J-43	Proposed	0.00	413.30	464.5	501
J-44	Proposed	0.00	414.42	464.5	490

Total Demand	9.50	**Maximum Pressure**	543
		Minimum Pressure	319

2021 Pipes Table
Agnes Street Subdivision

2021 ADD Pipe Results										
ID	Zone	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-2(1)	Proposed	J-1	J-43	10.3	250	110	0.8	0.0	0.0	0.00
P-4	Proposed	J-5	J-4	63.9	200	110	-0.3	0.0	0.0	0.00
P-5(1)	Proposed	J-15	J-5	4.8	200	110	-0.3	0.0	0.0	0.00
P-5(2)	Proposed	J-6	J-15	6.2	200	110	-0.3	0.0	0.0	0.00
P-6	Proposed	J-7	J-6	88.9	200	110	-0.2	0.0	0.0	0.00
P-7(1)	Proposed	J-8	J-7	7.4	200	110	-0.1	0.0	0.0	0.00
P-7(2)	Proposed	J-9	J-8	3.9	200	110	-0.1	0.0	0.0	0.00
P-8(1)	Proposed	J-42	J-9	8.2	200	110	0.0	0.0	0.0	0.00
P-8(2)	Proposed	J-10	J-42	64.8	200	110	0.0	0.0	0.0	0.00
P-9	Proposed	J-12	J-10	11.3	200	110	0.2	0.0	0.0	0.00
P-10	Proposed	J-13	J-12	89.7	200	110	0.3	0.0	0.0	0.00
P-11	Proposed	J-3	J-13	6.7	200	110	0.4	0.0	0.0	0.00
P-12	Proposed	J-14	J-3	6.9	200	110	0.4	0.0	0.0	0.01
P-13	Proposed	J-10	J-11	78.1	250	110	0.2	0.0	0.0	0.00
P-17	Existing	J-16	J-17	295.6	250	172	0.9	0.0	0.0	0.00
P-18	Existing	J-17	J-11	66.4	150	137	0.7	0.0	0.0	0.02
P-19	Existing	J-11	J-18	43.0	150	137	1.0	0.1	0.0	0.03
P-20	Existing	J-18	J-19	86.2	150	137	1.0	0.1	0.0	0.03
P-21	Existing	J-19	J-20	40.5	150	137	0.8	0.1	0.0	0.02
P-22	Existing	J-20	J-21	127.0	150	137	0.8	0.1	0.0	0.02
P-23	Existing	J-21	J-22	70.6	150	137	0.6	0.0	0.0	0.01
P-24	Existing	J-22	J-23	59.0	150	137	0.6	0.0	0.0	0.01
P-25	Existing	J-23	J-24	13.9	150	137	0.4	0.0	0.0	0.01
P-26	Existing	J-24	J-25	35.9	150	137	0.4	0.0	0.0	0.01
P-27	Existing	J-25	J-26	131.3	150	137	0.4	0.0	0.0	0.01
P-28	Existing	J-26	J-27	406.3	150	137	0.0	0.0	0.0	0.00
P-29	Existing	J-27	J-28	80.9	150	137	0.0	0.0	0.0	0.00
P-30	Existing	J-28	J-29	25.7	200	172	0.0	0.0	0.0	0.00
P-31	Existing	J-28	J-30	52.6	150	137	-0.5	0.0	0.0	0.01
P-32	Existing	J-30	J-31	65.7	150	137	-0.5	0.0	0.0	0.01
P-33	Existing	J-31	J-32	20.6	150	137	-0.8	0.1	0.0	0.02
P-34	Existing	J-32	J-33	128.1	150	202	-0.8	0.1	0.0	0.01
P-35	Existing	J-33	J-34	61.8	150	202	-1.1	0.1	0.0	0.02
P-36	Existing	J-34	J-35	112.1	150	137	-1.1	0.1	0.0	0.04
P-37	Existing	J-36	J-35	15.8	150	137	1.2	0.1	0.0	0.05
P-38	Existing	J-37	J-36	10.0	150	137	1.2	0.1	0.0	0.05
P-39	Existing	J-1	J-37	22.6	150	137	1.2	0.1	0.0	0.05
P-40	Existing	J-16	J-1	100.8	250	137	2.2	0.0	0.0	0.01
P-41	Existing	J-33	J-38	50.3	150	137	0.1	0.0	0.0	0.00
P-42	Existing	J-38	J-39	333.9	150	137	0.1	0.0	0.0	0.00
P-43	Existing	J-39	J-21	23.3	150	137	0.1	0.0	0.0	0.00
P-44	Existing	J-40	J-31	281.8	150	137	0.0	0.0	0.0	0.00
P-45	Existing	J-41	J-40	95.2	150	137	0.0	0.0	0.0	0.00
P-46	Existing	J-23	J-41	54.3	150	137	0.0	0.0	0.0	0.00
P-47	Proposed	J-43	J-44	22.5	200	110	0.4	0.0	0.0	0.00
P-48	Proposed	J-43	J-14	115.3	200	110	0.4	0.0	0.0	0.00
P-49	Proposed	J-4	J-44	119.4	200	110	-0.4	0.0	0.0	0.00

2021 Pipes Table
Agnes Street Subdivision

2021 MDD Pipe Results										
ID		From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-2(1)	Proposed	J-1	J-43	10.3	250	110	1.5	0.0	0.0	0.01
P-4	Proposed	J-5	J-4	63.9	200	110	-0.6	0.0	0.0	0.01
P-5(1)	Proposed	J-15	J-5	4.8	200	110	-0.5	0.0	0.0	0.00
P-5(2)	Proposed	J-6	J-15	6.2	200	110	-0.5	0.0	0.0	0.01
P-6	Proposed	J-7	J-6	88.9	200	110	-0.3	0.0	0.0	0.00
P-7(1)	Proposed	J-8	J-7	7.4	200	110	-0.2	0.0	0.0	0.00
P-7(2)	Proposed	J-9	J-8	3.9	200	110	-0.2	0.0	0.0	0.00
P-8(1)	Proposed	J-42	J-9	8.2	200	110	-0.1	0.0	0.0	0.00
P-8(2)	Proposed	J-10	J-42	64.8	200	110	-0.1	0.0	0.0	0.00
P-9	Proposed	J-12	J-10	11.3	200	110	0.4	0.0	0.0	0.00
P-10	Proposed	J-13	J-12	89.7	200	110	0.6	0.0	0.0	0.01
P-11	Proposed	J-3	J-13	6.7	200	110	0.7	0.0	0.0	0.01
P-12	Proposed	J-14	J-3	6.9	200	110	0.8	0.0	0.0	0.01
P-13	Proposed	J-10	J-11	78.1	250	110	0.4	0.0	0.0	0.00
P-17	Existing	J-16	J-17	295.6	250	172	1.6	0.0	0.0	0.00
P-18	Existing	J-17	J-11	66.4	150	137	1.3	0.1	0.0	0.06
P-19	Existing	J-11	J-18	43.0	150	137	1.8	0.1	0.0	0.10
P-20	Existing	J-18	J-19	86.2	150	137	1.8	0.1	0.0	0.10
P-21	Existing	J-19	J-20	40.5	150	137	1.5	0.1	0.0	0.07
P-22	Existing	J-20	J-21	127.0	150	137	1.5	0.1	0.0	0.07
P-23	Existing	J-21	J-22	70.6	150	137	1.1	0.1	0.0	0.04
P-24	Existing	J-22	J-23	59.0	150	137	1.1	0.1	0.0	0.04
P-25	Existing	J-23	J-24	13.9	150	137	0.7	0.0	0.0	0.02
P-26	Existing	J-24	J-25	35.9	150	137	0.7	0.0	0.0	0.02
P-27	Existing	J-25	J-26	131.3	150	137	0.7	0.0	0.0	0.02
P-28	Existing	J-26	J-27	406.3	150	137	0.1	0.0	0.0	0.00
P-29	Existing	J-27	J-28	80.9	150	137	0.1	0.0	0.0	0.00
P-30	Existing	J-28	J-29	25.7	200	172	0.0	0.0	0.0	0.00
P-31	Existing	J-28	J-30	52.6	150	137	-0.9	0.1	0.0	0.03
P-32	Existing	J-30	J-31	65.7	150	137	-0.9	0.1	0.0	0.03
P-33	Existing	J-31	J-32	20.6	150	137	-1.5	0.1	0.0	0.07
P-34	Existing	J-32	J-33	128.1	150	202	-1.5	0.1	0.0	0.03
P-35	Existing	J-33	J-34	61.8	150	202	-2.1	0.1	0.0	0.06
P-36	Existing	J-34	J-35	112.1	150	137	-2.1	0.1	0.0	0.13
P-37	Existing	J-36	J-35	15.8	150	137	2.2	0.1	0.0	0.15
P-38	Existing	J-37	J-36	10.0	150	137	2.2	0.1	0.0	0.15
P-39	Existing	J-1	J-37	22.6	150	137	2.2	0.1	0.0	0.15
P-40	Existing	J-16	J-1	100.8	250	137	3.9	0.1	0.0	0.03
P-41	Existing	J-33	J-38	50.3	150	137	0.1	0.0	0.0	0.00
P-42	Existing	J-38	J-39	333.9	150	137	0.1	0.0	0.0	0.00
P-43	Existing	J-39	J-21	23.3	150	137	0.1	0.0	0.0	0.00
P-44	Existing	J-40	J-31	281.8	150	137	0.0	0.0	0.0	0.00
P-45	Existing	J-41	J-40	95.2	150	137	0.0	0.0	0.0	0.00
P-46	Existing	J-23	J-41	54.3	150	137	0.0	0.0	0.0	0.00
P-47	Proposed	J-43	J-44	22.5	200	110	0.7	0.0	0.0	0.01
P-48	Proposed	J-43	J-14	115.3	200	110	0.8	0.0	0.0	0.01
P-49	Proposed	J-4	J-44	119.4	200	110	-0.7	0.0	0.0	0.01

2021 Pipes Table
Agnes Street Subdivision

2021 PHD Pipe Results										
ID		From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-2(1)	Proposed	J-1	J-43	10.3	250	110	2.5	0.1	0.0	0.02
P-4	Proposed	J-5	J-4	63.9	200	110	-1.0	0.0	0.0	0.01
P-5(1)	Proposed	J-15	J-5	4.8	200	110	-0.8	0.0	0.0	0.02
P-5(2)	Proposed	J-6	J-15	6.2	200	110	-0.8	0.0	0.0	0.01
P-6	Proposed	J-7	J-6	88.9	200	110	-0.6	0.0	0.0	0.00
P-7(1)	Proposed	J-8	J-7	7.4	200	110	-0.3	0.0	0.0	0.00
P-7(2)	Proposed	J-9	J-8	3.9	200	110	-0.3	0.0	0.0	0.00
P-8(1)	Proposed	J-42	J-9	8.2	200	110	-0.1	0.0	0.0	0.00
P-8(2)	Proposed	J-10	J-42	64.8	200	110	-0.1	0.0	0.0	0.00
P-9	Proposed	J-12	J-10	11.3	200	110	0.7	0.0	0.0	0.01
P-10	Proposed	J-13	J-12	89.7	200	110	1.0	0.0	0.0	0.01
P-11	Proposed	J-3	J-13	6.7	200	110	1.1	0.0	0.0	0.02
P-12	Proposed	J-14	J-3	6.9	200	110	1.3	0.0	0.0	0.02
P-13	Proposed	J-10	J-11	78.1	250	110	0.7	0.0	0.0	0.00
P-17	Existing	J-16	J-17	295.6	250	172	2.6	0.1	0.0	0.01
P-18	Existing	J-17	J-11	66.4	150	137	2.2	0.1	0.0	0.15
P-19	Existing	J-11	J-18	43.0	150	137	2.9	0.2	0.0	0.25
P-20	Existing	J-18	J-19	86.2	150	137	2.9	0.2	0.0	0.25
P-21	Existing	J-19	J-20	40.5	150	137	2.5	0.1	0.0	0.18
P-22	Existing	J-20	J-21	127.0	150	137	2.5	0.1	0.0	0.18
P-23	Existing	J-21	J-22	70.6	150	137	1.9	0.1	0.0	0.11
P-24	Existing	J-22	J-23	59.0	150	137	1.9	0.1	0.0	0.11
P-25	Existing	J-23	J-24	13.9	150	137	1.1	0.1	0.0	0.04
P-26	Existing	J-24	J-25	35.9	150	137	1.1	0.1	0.0	0.04
P-27	Existing	J-25	J-26	131.3	150	137	1.1	0.1	0.0	0.04
P-28	Existing	J-26	J-27	406.3	150	137	0.1	0.0	0.0	0.00
P-29	Existing	J-27	J-28	80.9	150	137	0.1	0.0	0.0	0.00
P-30	Existing	J-28	J-29	25.7	200	172	0.0	0.0	0.0	0.00
P-31	Existing	J-28	J-30	52.6	150	137	-1.5	0.1	0.0	0.07
P-32	Existing	J-30	J-31	65.7	150	137	-1.5	0.1	0.0	0.07
P-33	Existing	J-31	J-32	20.6	150	137	-2.5	0.1	0.0	0.18
P-34	Existing	J-32	J-33	128.1	150	202	-2.5	0.1	0.0	0.09
P-35	Existing	J-33	J-34	61.8	150	202	-3.4	0.2	0.0	0.16
P-36	Existing	J-34	J-35	112.1	150	137	-3.4	0.2	0.0	0.33
P-37	Existing	J-36	J-35	15.8	150	137	3.7	0.2	0.0	0.38
P-38	Existing	J-37	J-36	10.0	150	137	3.7	0.2	0.0	0.39
P-39	Existing	J-1	J-37	22.6	150	137	3.7	0.2	0.0	0.38
P-40	Existing	J-16	J-1	100.8	250	137	6.5	0.1	0.0	0.09
P-41	Existing	J-33	J-38	50.3	150	137	0.2	0.0	0.0	0.00
P-42	Existing	J-38	J-39	333.9	150	137	0.2	0.0	0.0	0.00
P-43	Existing	J-39	J-21	23.3	150	137	0.2	0.0	0.0	0.00
P-44	Existing	J-40	J-31	281.8	150	137	-0.1	0.0	0.0	0.00
P-45	Existing	J-41	J-40	95.2	150	137	-0.1	0.0	0.0	0.00
P-46	Existing	J-23	J-41	54.3	150	137	-0.1	0.0	0.0	0.00
P-47	Proposed	J-43	J-44	22.5	200	110	1.2	0.0	0.0	0.02
P-48	Proposed	J-43	J-14	115.3	200	110	1.3	0.0	0.0	0.02
P-49	Proposed	J-4	J-44	119.4	200	110	-1.2	0.0	0.0	0.02

APPENDIX

C FIRE FLOW REPORT

THEORETCIAL FIRE FLOW CALCULATIONS

PROJECT: Agnes Street Subdivision
PROJECT No: 20-731
LOCATION: Caledon, ON
DATE: October 18, 2023

DESIGNED BY: Deven Verma, EIT.
REVIEWED BY:Khalid Mahmood, P. Eng

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

F = The required Fire Flow in litres per minute

C = Coefficient related to the type of construction

A = The tatal floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered

Total Floor Area (A) considered for fire flow (m2) 510.0

NOTES

- Table below is based on procedures and figures from the Water Supply for Public Fire Protection - Fire Underwriters Survey of Canada, 2020.
- Exposure distance factor max adjustment is 75%.
- Type of building construction is wood frame as confirmed by the architect.

Manual Input

PROPOSED RESIDENTIAL UNIT

Step	Description	Term	Options		Multiplier Associated with Option	Value used	Unit	Total Fire Flow (L/min)
1	Frame Use for Construction of Unit	**Building Material**						
		Coefficient related to type of construction (C)	Wood Frame		1.5	1.5	N/A	N/A
			Ordinary Construction		1			
			Non-Combustible Construction		0.8			
			Fire Resistive materials (<2hrs)		0.7			
			Fire Resistive materials (>2hrs)		0.6			
2	Number of Storeys	Number of floors not inlcuding basement				2	N/A	N/A
3	Floor Area (A)	Total Floor Area (A) - for all stories exluding basement (m^2)				510.0	(m^2)	N/A
		Average Floor Measurements	Square Feet (ft^2)		0.093	255.0		
			Square Metres (m^2)		1			
			Hectares (ha)		10,000			
4	Fire Flow	Required fire flow without reductions or increases (rounded to the nearest 1000 L/min:					L/min	7,000
5	Combustibility of Building Contents	**Reductions / Increases From Factors Affecting Burning**						
		Occupancy content hazard reduction or surcharge Factor	Non-Combustible		-0.25	-0.15	N/A	-1,050
			Limited Combustible		-0.15			
			Combustible		0.00			
			Free Burning		0.15			
			Rapid Burning		0.25			
6	Building Equipped with Sprinklers	Sprinkler Reduction Factor	Complete Automatic Sprinklers		-0.50	0.00	N/A	0
			Adequate Automatic Sprinklers		-0.30			
			None		0.00			
7	Separation Distance Between Buildings	Exposure Distance Factor *	North Separation	20.1 - 30m	0.10	0.65	N/A	4,550
			South Separation	20.1 - 30m	0.10			
			East Separation	0 to 3m	0.25			
			West Separation	3.1 to 10m	0.20			
8	Required Fire Flow						**Total Required Fire Flow Rounded to the Nearest 1000 L/min:**	**11,000**
							Total Required Fire Flow in L/s:	183.3
							Duration of Fire Flow (hrs):	2
							Required Volume of Fire Flow (m^3):	1,485

*Floor areas confirmed with the architect (ORCHARD Design Studio Inc.). Coefficient for type of construciton (C) is for non-conbustible construction as confimred by the architect.

Separation Distance Factor as per Fire Underwriters Survey of Canada, 2020

Seperation	*Charge*	*Seperation*	*Charge*
0 to 3m	*25%*	*20.1 to 30m*	*10%*
3.1 to 10m	*20%*	*30.1 to 45m*	*5%*
10.1m to 20m	*15%*		

Acceptable Fire Flow ranges as per Fire Underwriters Survey of Canada, 2020

2,000 Lpm < F < 45,000 Lpm; therefore acceptable

Note: For types of construction that do not fall within the categories given, coefficients shall not be greater than 1.5 nor less than 0.6 and may be determined by interpolation between consecutive construction types as listed above. Construction types are defined in the Appendix.

NOTE: THIS IS ONLY PRELIMINARY AND SUBJECT TO CHANGE BASED ON ARCHITECTURAL AND MECHANICAL DESIGN. THIS IS ONLY FOR AN ESTIMATE AS WE DO NOT CLAIM TO BE FIRE PROTECTION EXPERTS.

Fire Flow Report
2021 Maximum Day + Fire Flow

Baseline Condition												
Label	Zone	Elevation (m)	Fire Flow (Needed) (L/s)	Fire Flow (Available) (L/s)	Satisfies Fire Flow Constraints?	Hydraulic Grade (m)	Pressure (Residual Lower Limit) (kPa)	Pressure (Zone Lower Limit) (kPa)	Pressure (Calculated Residual) (kPa)	Pressure (Calculated Zone Lower Limit) (kPa)	Junction w/ Minimum Pressure (System)	Junction w/ Minimum Pressure (Zone)
H-1	Proposed	418.03	(N/A)	(N/A)	(N/A)	(N/A)	140	140	(N/A)	(N/A)	(N/A)	(N/A)
H-2	Proposed	418.05	(N/A)	(N/A)	(N/A)	(N/A)	140	140	(N/A)	(N/A)	(N/A)	(N/A)
H-3	Proposed	417.97	(N/A)	(N/A)	(N/A)	(N/A)	140	140	(N/A)	(N/A)	(N/A)	(N/A)
H-4	Proposed	418.17	(N/A)	(N/A)	(N/A)	(N/A)	140	140	(N/A)	(N/A)	(N/A)	(N/A)
H-5	Existing	414.50	(N/A)	151	(N/A)	464.5	140	140	210	140	J-26	J-26
H-6	Existing	418.97	(N/A)	111	(N/A)	464.5	140	140	221	140	J-26	J-26
H-7	Existing	420.00	(N/A)	105	(N/A)	464.5	140	140	186	140	J-26	J-26
H-8	Existing	418.32	(N/A)	96	(N/A)	464.5	140	140	236	140	J-26	J-26
H-9	Existing	418.08	(N/A)	85	(N/A)	464.5	140	140	198	140	J-26	J-26
H-10	Existing	425.13	(N/A)	86	(N/A)	464.5	140	140	140	148	J-40	J-40
H-11	Existing	429.90	(N/A)	83	(N/A)	464.5	140	140	144	140	J-25	J-25
H-12	Existing	425.25	(N/A)	103	(N/A)	464.5	140	140	154	140	J-26	J-26

Proposed Developments Added												
Label	Zone	Elevation (m)	Flow (Total Needed) (L/s)	Fire Flow (Available) (L/s)	Satisfies Fire Flow Constraints?	Hydraulic Grade (m)	Pressure (Residual Lower Limit) (kPa)	Pressure (Zone Lower Limit) (kPa)	Pressure (Calculated Residual) (kPa)	Pressure (Calculated Zone Lower Limit) (kPa)	Junction w/ Minimum Pressure (System)	Junction w/ Minimum Pressure (Zone)
H-1	Proposed	418.03	183	235	TRUE	464.5	140	140	140	229	J-15	J-15
H-2	Proposed	418.05	183	252	TRUE	464.5	140	140	140	241	J-42	J-42
H-3	Proposed	417.97	183	285	TRUE	464.5	140	140	140	267	J-26	J-12
H-4	Proposed	418.17	183	266	TRUE	464.5	140	140	140	253	J-26	J-14
H-5	Existing	414.50	183	242	TRUE	464.5	140	140	187	140	J-26	J-26
H-6	Existing	418.97	(N/A)	132	(N/A)	464.5	140	140	213	140	J-26	J-26
H-7	Existing	420.00	(N/A)	122	(N/A)	464.5	140	140	166	140	J-26	J-26
H-8	Existing	418.32	(N/A)	108	(N/A)	464.5	140	140	228	140	J-26	J-26
H-9	Existing	418.08	(N/A)	93	(N/A)	464.5	140	140	184	140	J-26	J-26
H-10	Existing	425.13	(N/A)	93	(N/A)	464.5	140	140	140	149	J-40	J-40
H-11	Existing	429.90	(N/A)	91	(N/A)	464.5	140	140	143	140	J-25	J-25
H-12	Existing	425.25	(N/A)	117	(N/A)	464.5	140	140	140	141	J-26	J-26

Note: Results from the fire flow analysis are limited to residual pressures for junctions included in the stand-alone model. They also reflect boundary conditions captured by the hydrant flow tests completed and may not reflect emergency operational conditions.

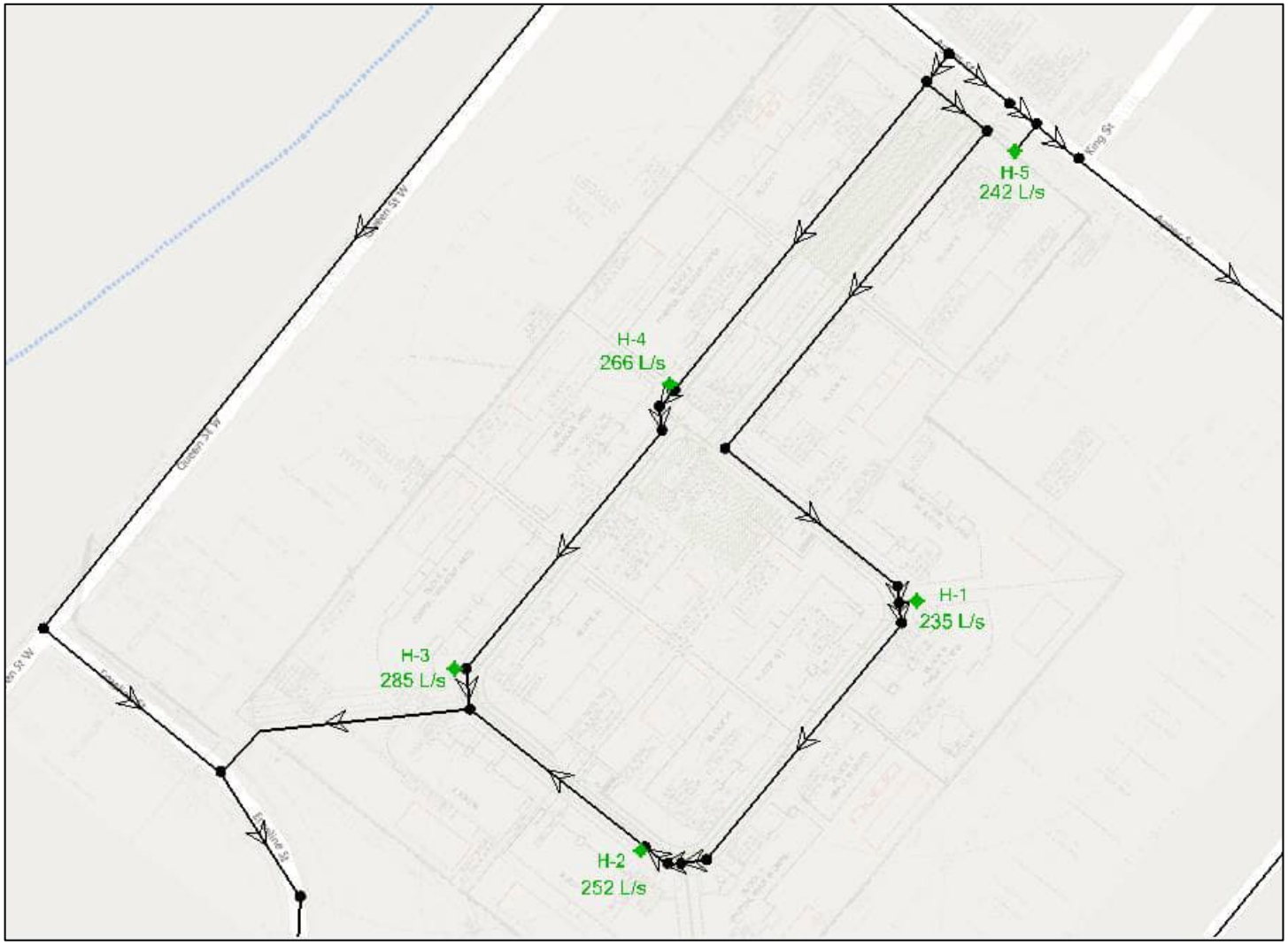


Figure C1 – Simulated AFF at the Proposed Agnes St Development under 2021 MDD+FF

Figure C2 – Simulated AFF at the Proposed Agnes St Development & Local Network under 2021 MDD+FF

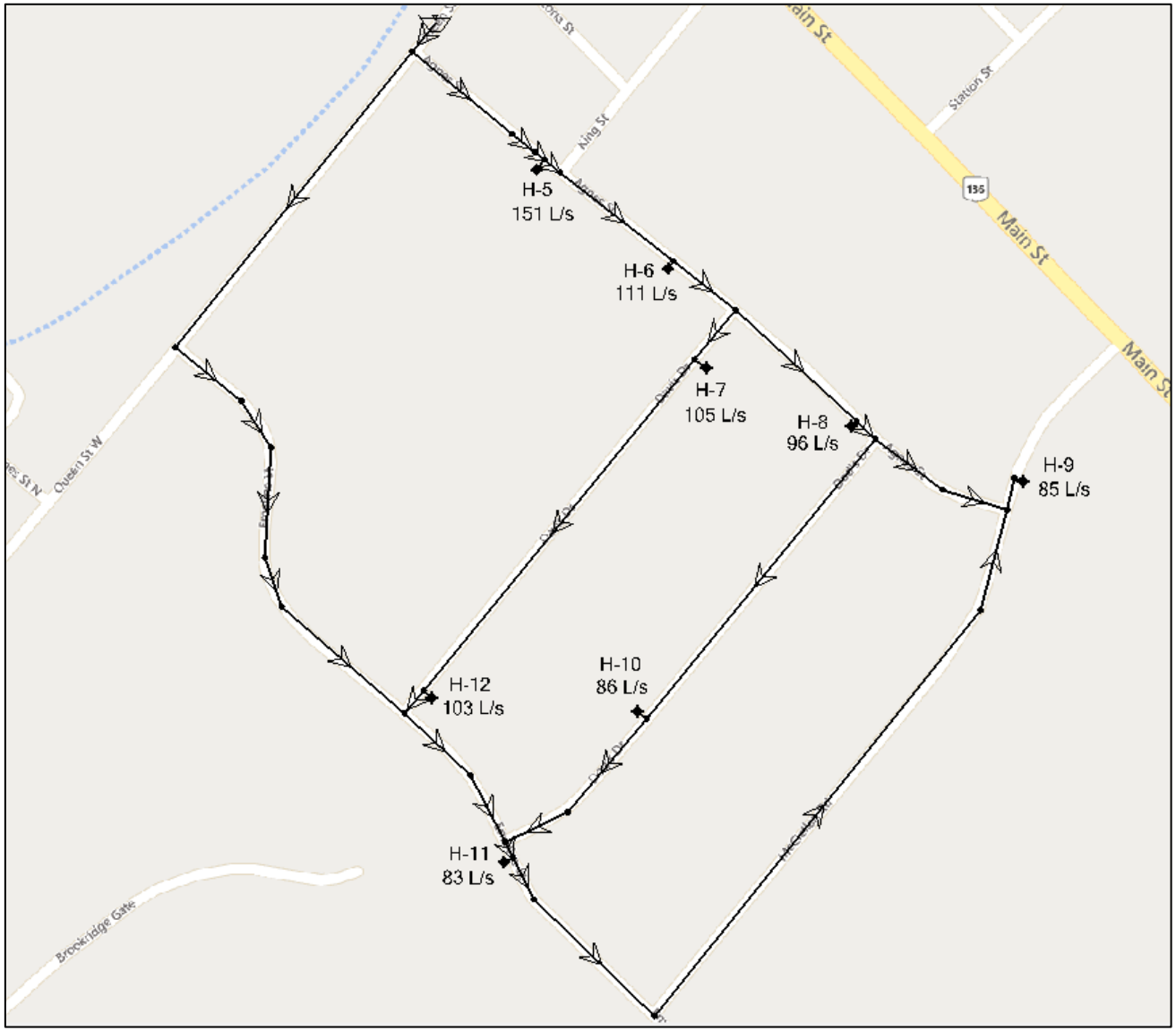


Figure C3 – Simulated AFF in the Existing Local Network under 2021 MDD+FF (Baseline Conditions)

APPENDIX

D HYDRANT FLOW TEST DATA

HYDRANT FLOW TEST REPORT

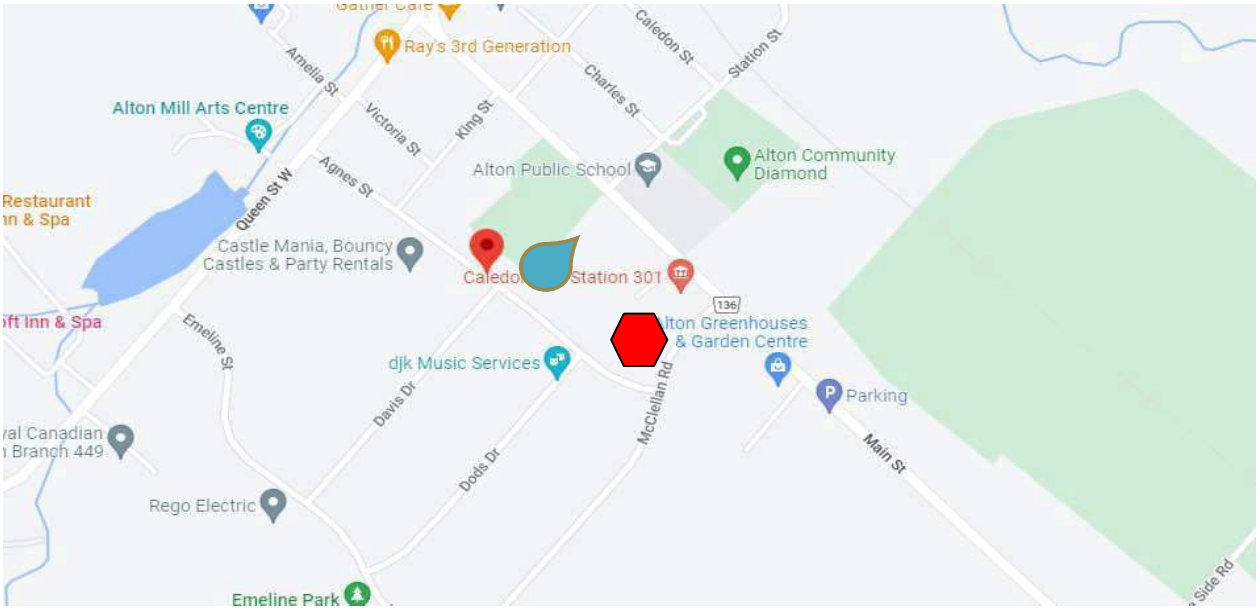
GENERAL INFORMATION:

PROJECT ID	**105-22**	TESTED BY:	AA/RS
PROJECT NAME	**Agnes Street - Hydrant Flow Test #1**	DATE	**August 22-22**
BUILDING ADDRESS	**Agnes Street**	TIME	**2:00:00 PM**
	Alton, Ontario		

WATER MAIN INFORMATION:

MAIN SIZE / MATERIAL	**150MM**
CONFIGURATION	**Looped**

HYDRANT LOCATION:



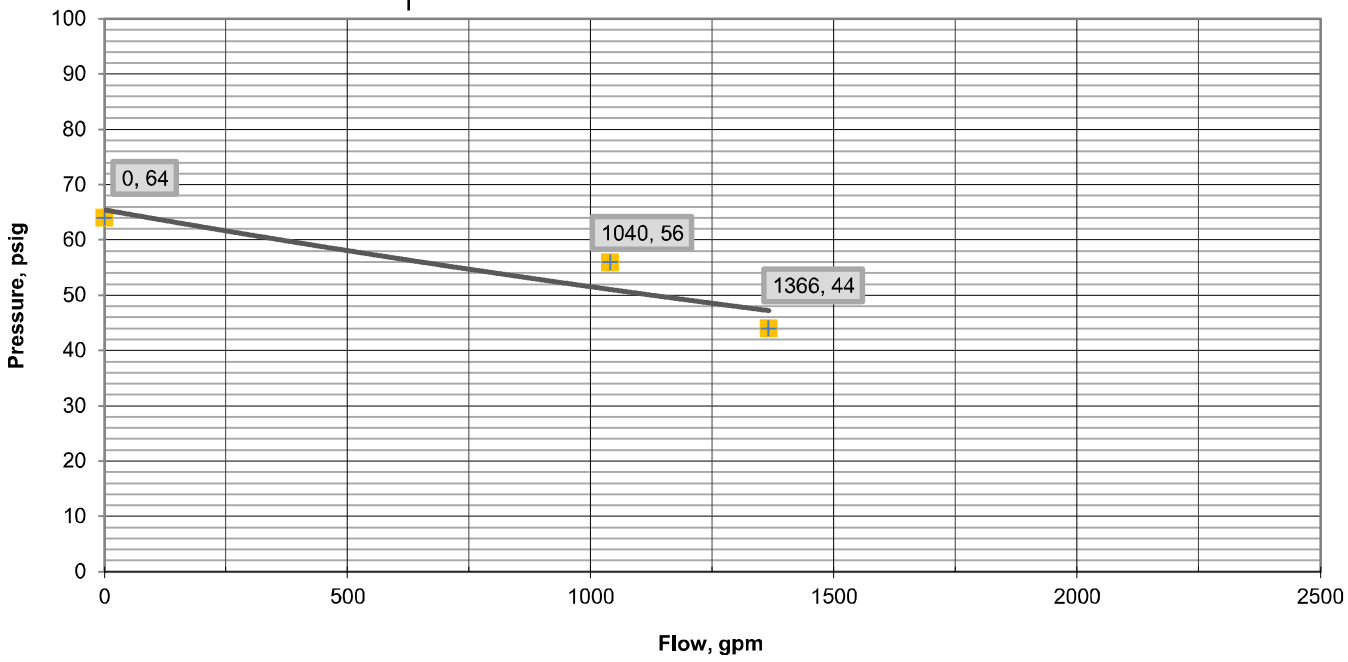
LEGEND: STATIC HYDRANT RESIDUAL HYDRANT

FINAL RESULTS:

Test #	Number of Outlets	Orifice Size (in)	Pitot Reading (psig)	Equivlnt Flow (usgpm)	Total Flow (usgpm)	Projected flow at 20psi	Gauge Pressure (psig)	Discharge Coef'nt
Static	N/A	N/A	N/A	N/A	**0**	N/A	**64**	N/A
1	1	2.47	51	1040	**1040**	2610	**56**	0.8
2	2	2.47	22	683	**1366**	2091	**44**	0.8

FLOW AT 20PSI (140kPa) :

SINGLE OUTLET **2610 GPM (2 1/2 NOZZLE)**
DOUBLE OUTLET **2091 GPM (2 1/2 NOZZLE)**



HYDRANT INFORMATION:

HYDRANT DETAILS **CLASS C (RED)**
LISTED FLOW **500GPM @ 20PSI**

HYDRANT FLOW TEST REPORT

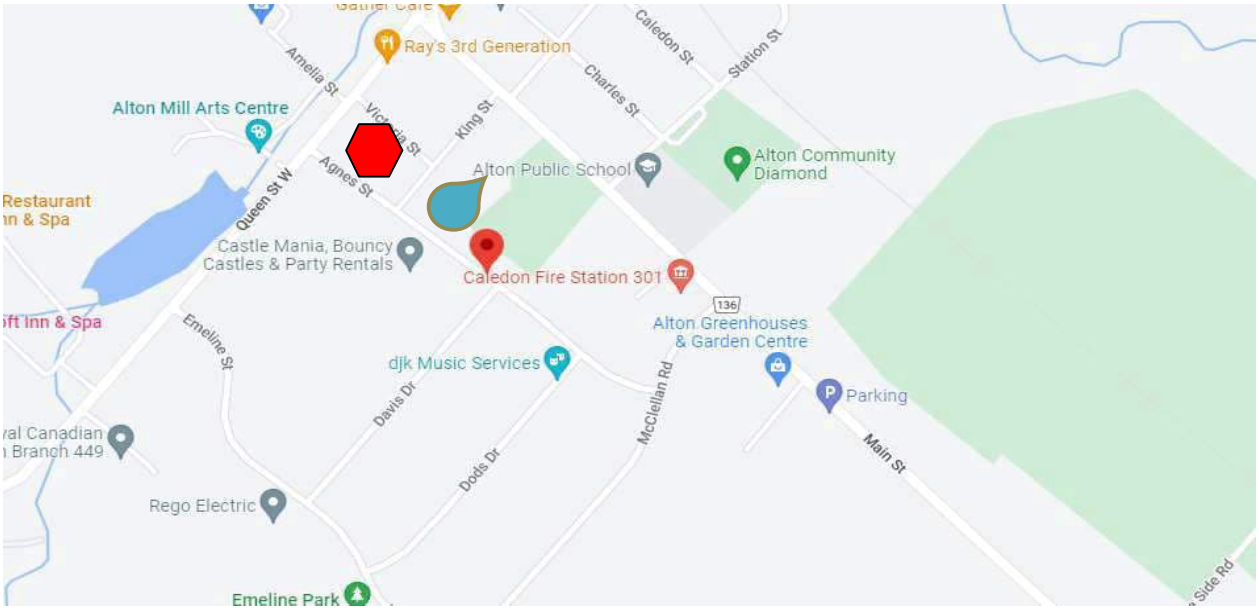
GENERAL INFORMATION:

PROJECT ID	**105-22**	TESTED BY:	AA/RS
PROJECT NAME	**Agnes Street - Hydrant Flow Test #2**	DATE	**August 22-22**
BUILDING ADDRESS	**Agnes Street**	TIME	**2:00:00 PM**
	Alton, Ontario		

WATER MAIN INFORMATION:

MAIN SIZE / MATERIAL	**150MM**
CONFIGURATION	**Looped**

HYDRANT LOCATION:



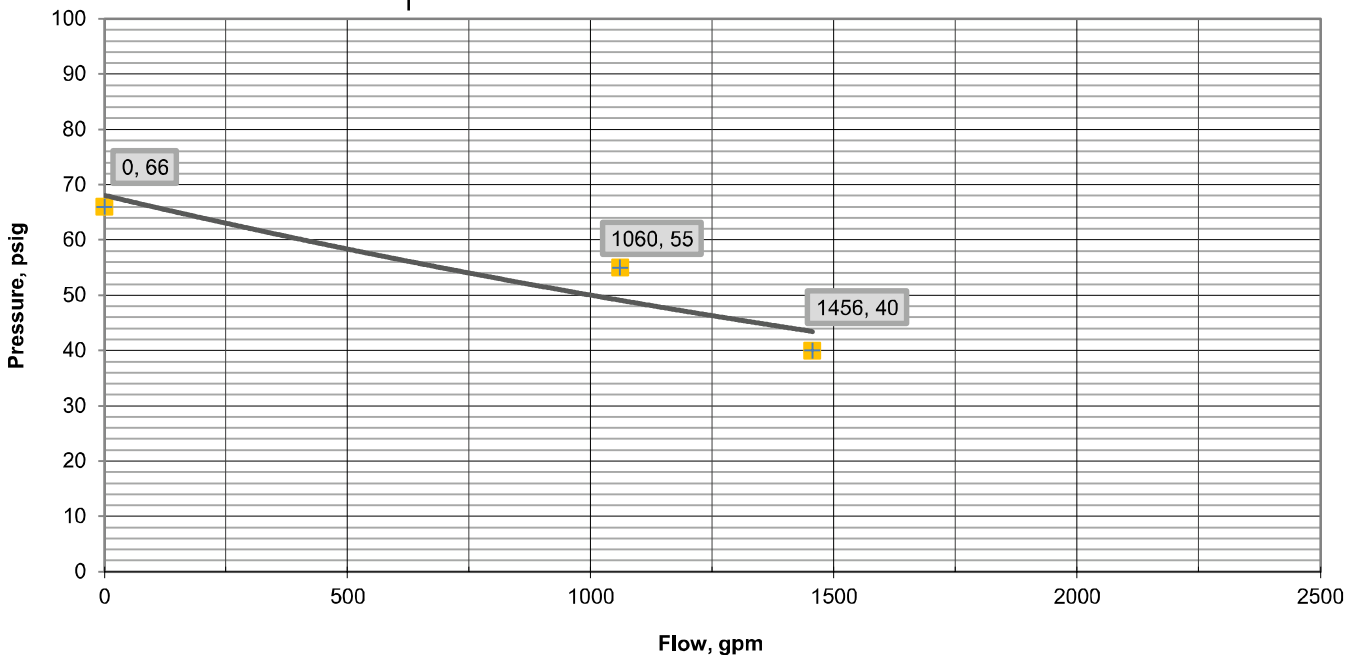
LEGEND: STATIC HYDRANT RESIDUAL HYDRANT

FINAL RESULTS:

Test #	Number of Outlets	Orifice Size (in)	Pitot Reading (psig)	EquivInt Flow (usgpm)	Total Flow (usgpm)	Projected flow at 20psi	Gauge Pressure (psig)	Discharge Coef'nt
Static	N/A	N/A	N/A	N/A	**0**	N/A	**66**	N/A
1	1	2.47	53	1060	**1060**	2295	**55**	0.8
2	2	2.47	25	728	**1456**	1981	**40**	0.8

FLOW AT 20PSI (140kPa) :

SINGLE OUTLET	**2295 GPM (2 1/2 NOZZLE)**
DOUBLE OUTLET	**1981 GPM (2 1/2 NOZZLE)**



HYDRANT INFORMATION:

HYDRANT DETAILS	**CLASS C (RED)**
LISTED FLOW	**500GPM @ 20PSI**

HYDRANT FLOW TEST REPORT

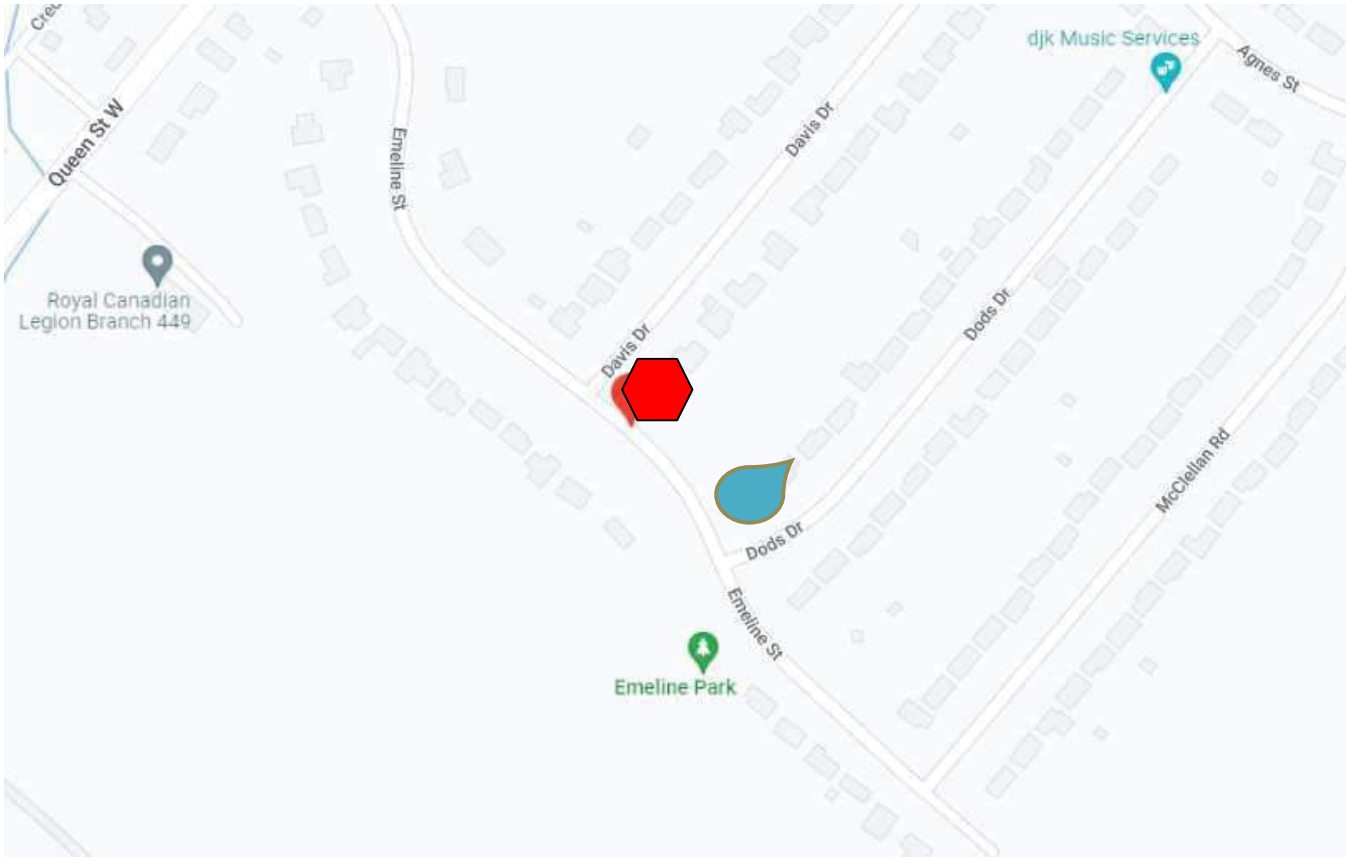
GENERAL INFORMATION:

PROJECT ID	**116-22**	TESTED BY:	RS
PROJECT NAME	**Emeline Street Flow Test**	DATE	**Sept 6-22**
BUILDING ADDRESS	**Emeline Street and Dods Drive**	TIME	**2:00:00 PM**
	Alton, Ontario		

WATER MAIN INFORMATION:

MAIN SIZE / MATERIAL	**150MM**
CONFIGURATION	**Looped**

HYDRANT LOCATION:



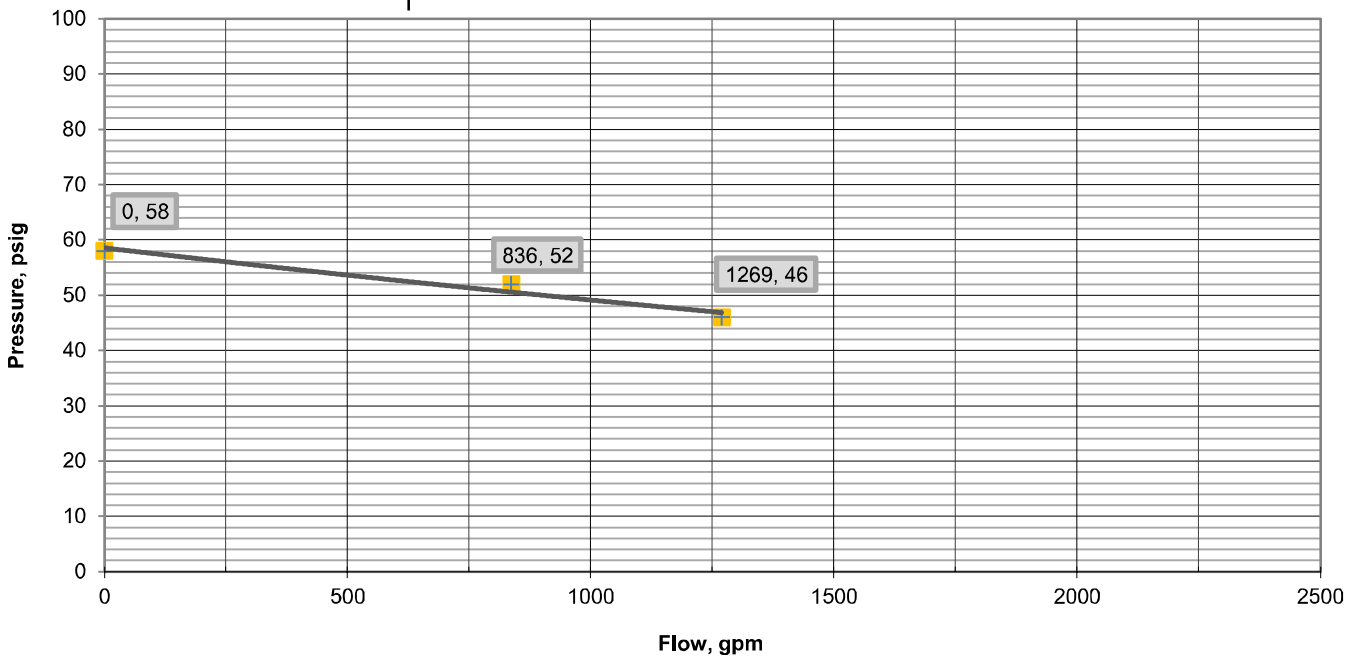
LEGEND: STATIC HYDRANT RESIDUAL HYDRANT

FINAL RESULTS:

Test #	Number of Outlets	Orifice Size (in)	Pitot Reading (psig)	EquivInt Flow (usgpm)	Total Flow (usgpm)	Projected flow at 20psi	Gauge Pressure (psig)	Discharge Coef'nt
Static	N/A	N/A	N/A	N/A	**0**	N/A	**58**	N/A
1	1	2.47	33	836	**836**	2266	**52**	0.8
2	2	2.47	19	635	**1269**	2365	**46**	0.8

FLOW AT 20PSI (140kPa) :

SINGLE OUTLET	**1269 GPM (2 1/2 NOZZLE)**
DOUBLE OUTLET	**836 GPM (2 1/2 NOZZLE)**



HYDRANT INFORMATION:

HYDRANT DETAILS	**CLASS C (RED)**
LISTED FLOW	**500GPM @ 20PSI**

Table D1: Hydrant Flow Test vs. Simulated Flow Test Results @ Hydrant H-8

Source	Static Pressure (kPa)	Residual Pressure (kPa)	Test Flow (L/s)	Theoretical Flow Available at 140 kPa Residual (L/s)
Hydrant Test	441	386	66	165
Model Curve	452	355	63	118

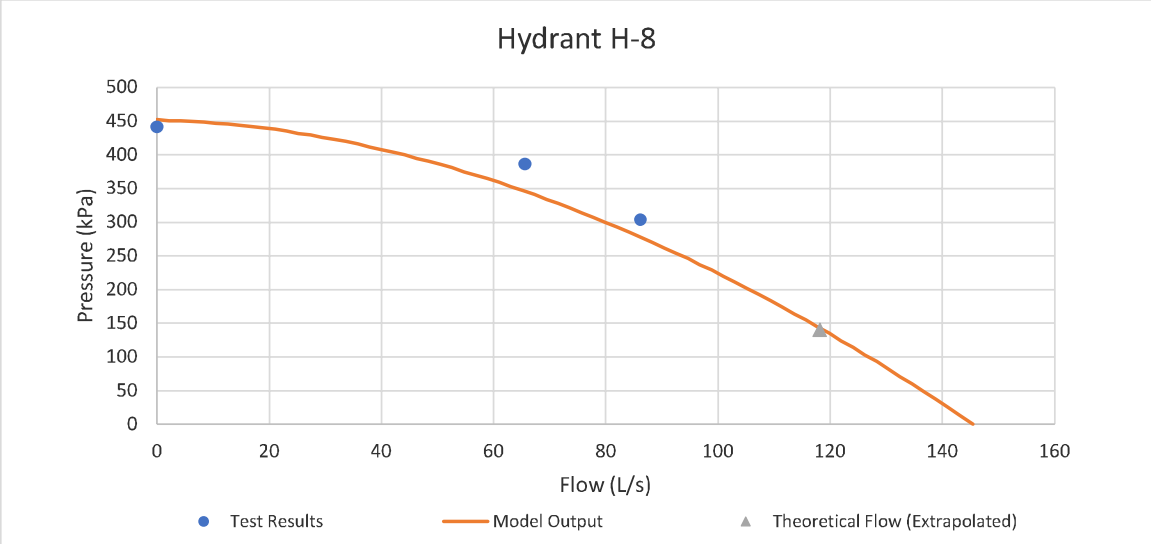


Figure D1: Hydrant Flow Test vs. Simulated Flow Test Results @ Hydrant H-8

Table D2: Hydrant Flow Test vs. Simulated Flow Test Results @ Hydrant H-6

Source	Static Pressure (kPa)	Residual Pressure (kPa)	Test Flow (L/s)	Theoretical Flow Available at 140 kPa Residual (L/s)
Hydrant Test	455	379	67	145
Model Curve	445	355	69	134

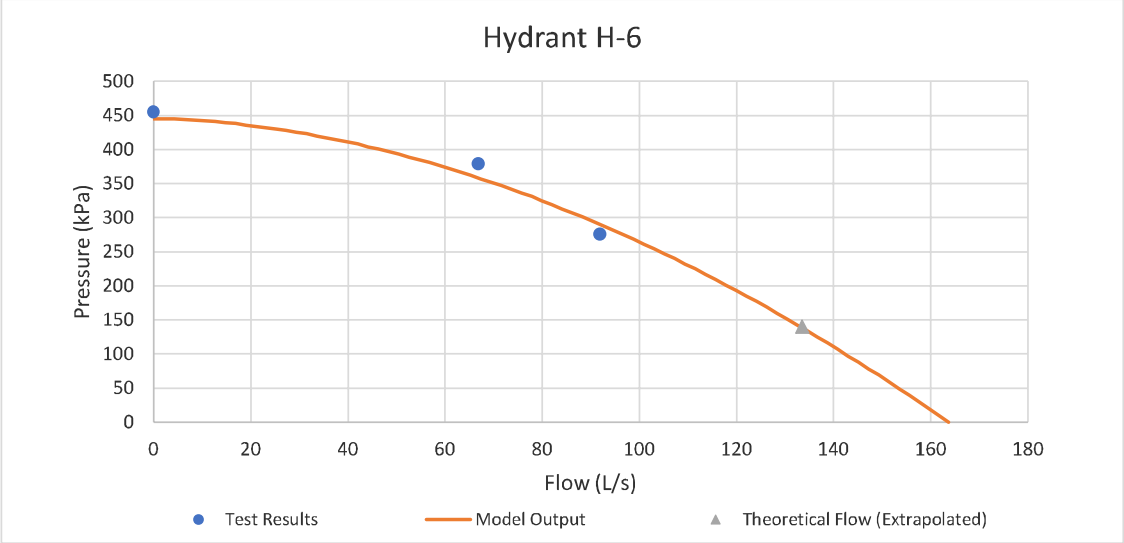


Figure D2: Hydrant Flow Test vs. Simulated Flow Test Results @ Hydrant H-6