

JUNE 25, 2026

PROJECT NO: 721-3464-2

**SENT VIA: EMAIL
DVICKERY@THEBLUEMOUNTAINS.CA**

Town of The Blue Mountains
32 Mill Street, P.O. Box 310
Thornbury, ON N0H 2P0

**Attention: Evan Hancock
Development Engineering Reviewer**

**RE: WATER DISTRIBUTION SYSTEM
HOME FARM RENTAL DEVELOPMENT
TOWN OF THE BLUE MOUNTAINS**

Dear Evan,

C.F. Crozier & Associates Inc. was retained by MacPherson Builders Ltd. to prepare a water model using Bentley WaterCAD to confirm the proposed Home Farm Rental Development can be supported by the existing municipal water distribution system. The proposed watermain system has been designed to provide minimum mandated domestic pressures, domestic flows, and fire flows in accordance with the Ministry of Environment, Conservation and Parks (MECP) Design Guidelines for Drinking-Water Systems (2008) and the Town of The Blue Mountains (TOBM) Engineering Standards (Revised November 2024).

1.0 Background

The proposed development is located within the Village of Craigleith. The site is bound by Town owned lands and the proposed Long Term Care Facility Development to the west, the Craigleith Ridge Residential Development to the north, the Trailhead Residential Development and undeveloped lands to the east, and the proposed Home Farm Residential development to the south. The Site Plan proposes 112 residential units that will have two units per townhouse, with one unit occupying the basement and one unit occupying the main and second floor. This water model has been prepared as an extension to the water model for the Home Farm Residential Development. Refer to the Home Farm Water Distribution Model Memo (December 2022) for more information.

2.0 Proposed Water Distribution System

The proposed development is located within Pressure Zone 4. The distribution watermain for the development is located along internal roadways and will connect to the proposed water distribution system with the Home Farm Residential Development. Connections to the existing TOBM water distribution network will be provided by the existing 350 mm diameter watermain on Grey Road 19. The water distribution system within the Home Farm Residential Development will be constructed prior to construction of the Rental Development.

Internal 200 mm diameter watermain will be installed at sufficient depth to achieve frost protection (minimum 1.7 m cover typical). Fire hydrants and valves have been proposed at spacing that meets the requirements of the TOBM standards. As per TOBM standards, the watermain will be PVC DR18 with all associated appurtenances required.

3.0 WaterCAD Model

A WaterCAD model was set up to confirm that the proposed development can be supported by the existing municipal system.

3.1 Design Parameters

The following design parameters were used in the WaterCAD model:

- Water system elevations were based on centreline of roadway elevations taken from the Grading Plans.
- Population of the development is based on a unit density of 2.15 persons/unit per TOBM Standards.
- The residential average daily demand for the proposed development is based on 350 L/cap/day per TOBM Standards.
- The average daily demand for the Long-Term Care Facility is based on 450 L/cap/bed per the OBC.
- A maximum daily demand and peak hour demand factor of 4.08 and 6.13, respectively, were used in accordance with MECP guidelines for the residential units.
- A maximum daily demand and peak hour demand factor of 4.54 and 6.84, respectively, were used in accordance with MECP guidelines for the Long-Term Care Facility.
- Friction factors for piping are based on MECP Guidelines using $C=110$ for 200 mm PVC watermain.
- Minor loss coefficients for pipe appurtenances were used as per Bentley Engineering Libraries in WaterCAD.
- Maximum allowable velocity for a pipe was set at 5.0 m/s per the TOBM standards.
- Required pressure for average day and peak hour is 350-550 kPa and 275-700 kPa, respectively, as per TOBM standards.
- The required pressure for maximum day plus fire flow is 140 kPa – 700 kPa as per TOBM standards.

3.2 Water Demand & Boundary Conditions

Total domestic flows required for the proposed 112 units have been calculated based on the criteria listed above. The water modelling was completed using the demands summarized in the table below. Calculations demonstrating these demands are included in Appendix A.

Table 1: Domestic Water Demands

TOBM	Average Day (L/s)	Maximum Day (L/s)	Peak Hour (L/s)
Rental Development	0.98	3.98	5.98
Long Term Care Facility	1.00	4.54	6.84

The boundary conditions for the water model were provided by J.L. Richards on May 18th, 2022, and are included in Appendix A. The boundary conditions account for multiple scenarios, each of which was modelled in WaterCAD. The boundary conditions used in the modeling were provided during design of the Home Farm Development back in 2022, for more accurate results, new boundary conditions will be requested and implemented into the model for the next submission.

3.3 Methodology

The WaterCAD model includes two connections to the proposed water distributions system in Street C within the Home Farm Residential Development. The Home Farm development will include two connections to the existing 350 mm watermain on Grey Road 19 within Pressure Zone 4. A schematic of the model is shown in Appendix A. Refer to the Site Servicing Plan for further details regarding the watermain layout. The water model for the Rental Development has been prepared under the assumption that all phases of the Home Farm Residential Development will be constructed prior to construction of the Rental Development.

Minor losses for the pipes were calculated based on the proposed watermain design, which includes minor losses due to bends, tees, and valves. Hazen-Williams (C) value has been applied to each pipe length based on TOBM standards. Minor losses calculated for each pipe length are included in Appendix A.

Junctions were placed at major grade changes (i.e. low and high points), watermain intersections and dead ends. Demands for each junction were assigned based on the dwellings closest to the specified junction. Junction demands for each scenario were calculated using TOBM standards. Refer to Appendix A for the calculated demands and fire flows.

Multiple scenarios were setup and run using the model. The scenario runs were based on the boundary condition information provided by J.L. Richards. For each scenario that was run, the boundary conditions within the model were adjusted accordingly. Boundary conditions were represented by a fixed reservoir, in which the Hydraulic Grade Line (HGL) was set to represent the scenario.

3.4 Modelling Results

Average Day

Model results for average day demand conditions show that pressures within the system range from 606 kPa to 631 kPa. Therefore, individual pressure reducing valves will be required for the water services within the Rental Development. Alternatively, installing one or two pressure reducing valves near the connections can be investigated as the results show the entire site exceeds the maximum allowable pressure. Velocities within the proposed system do not exceed the maximum allowable of 5.0 m/s.

Peak Hour

The pressures within the system during peak hour conditions range from 600 kPa to 625 kPa. Velocities within the proposed system do not exceed the maximum allowable of 5.0 m/s.

Maximum Day + Fire Flow

Boundary conditions were provided for 150 L/s based on the OBC as well as for a maximum fire flow of 174 L/s. The fire flow for the residential units (133 L/s) is based on fire walls being installed for townhouse blocks exceeding 5 units, which was confirmed through communication with the architect. The fire flow for the Long-Term Care Facility (150 L/s) was provided by LTC developers engineer. All junctions achieve the minimum allowable pressure of 140 kPa and the required fire flows for both maximum day plus fire flow scenarios. Velocities within the proposed system do not exceed the maximum allowable of 5.0 m/s.

4.0 Conclusion

Based on the foregoing analysis we conclude:

- 1) The proposed development can be supported by the existing municipal water distribution system.
- 2) The proposed water distribution system will consist of 200 mm diameter watermain to provide adequate demands and pressures.
- 3) Individual pressure reducing valves are required to achieve the Town's criteria for all scenarios.

We trust that the above modelling results are satisfactory and address the Town's requirements specifically related to the water distribution design. Should you have any questions or require any further information, please do not hesitate to contact the undersigned.

Sincerely,

C.F. CROZIER & ASSOCIATES INC.



Nicholas Sproule, EIT
Engineering Intern

C.F. CROZIER & ASSOCIATES INC



Julie Scott, P.Eng.
Manager, Land Development

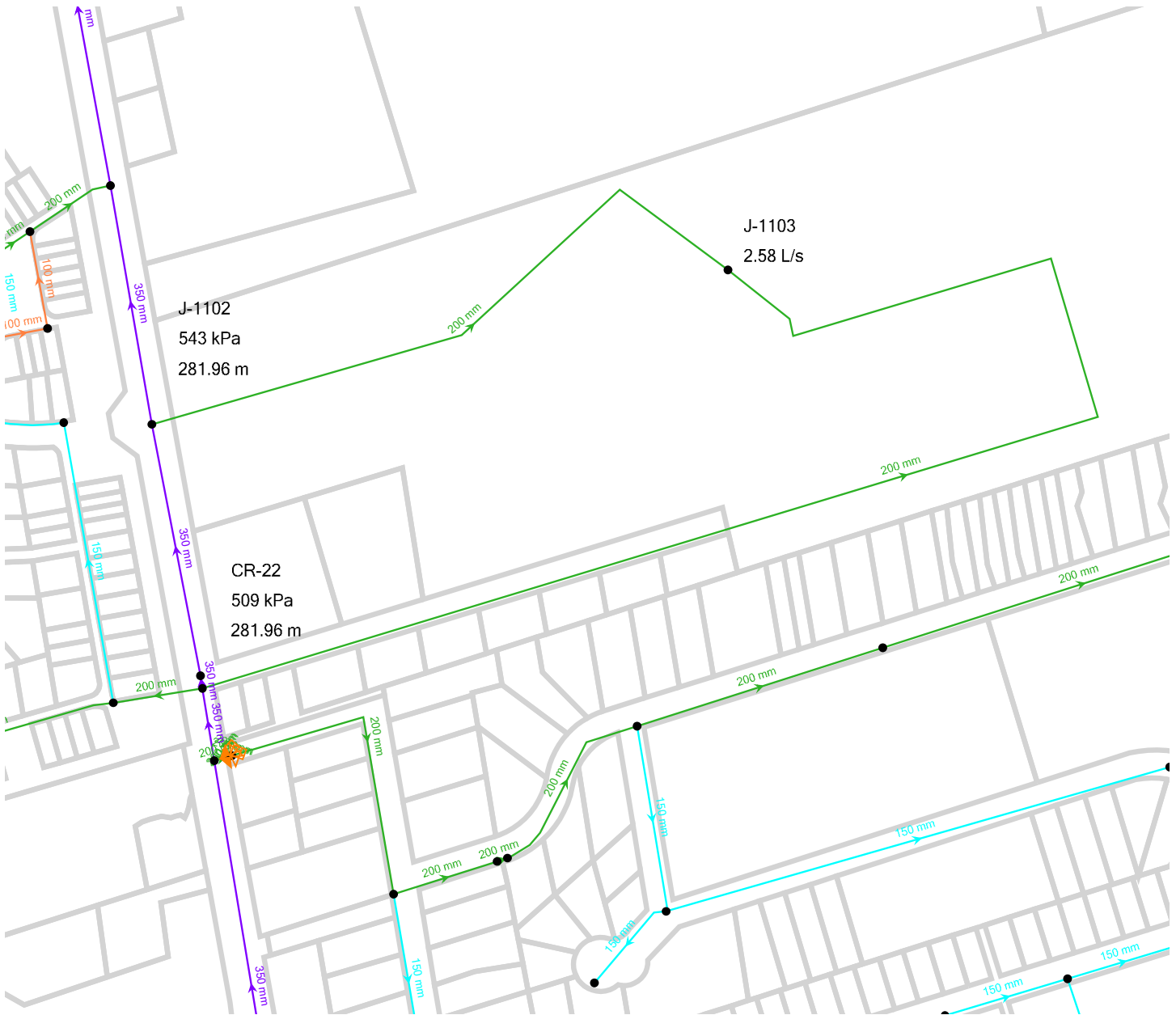
JS/NS

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APPENDIX A

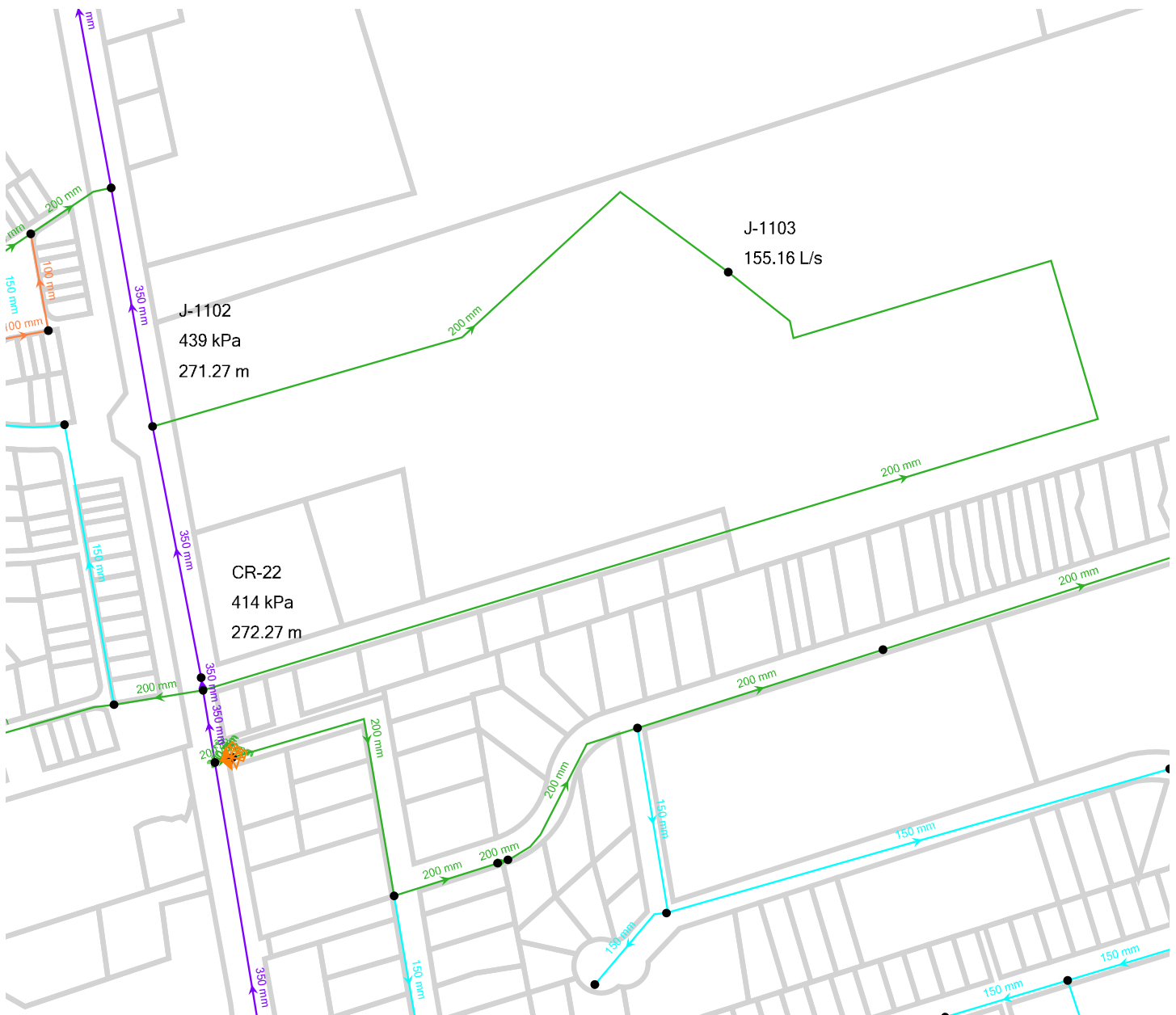
Home Farm Boundary Conditions

Average Day



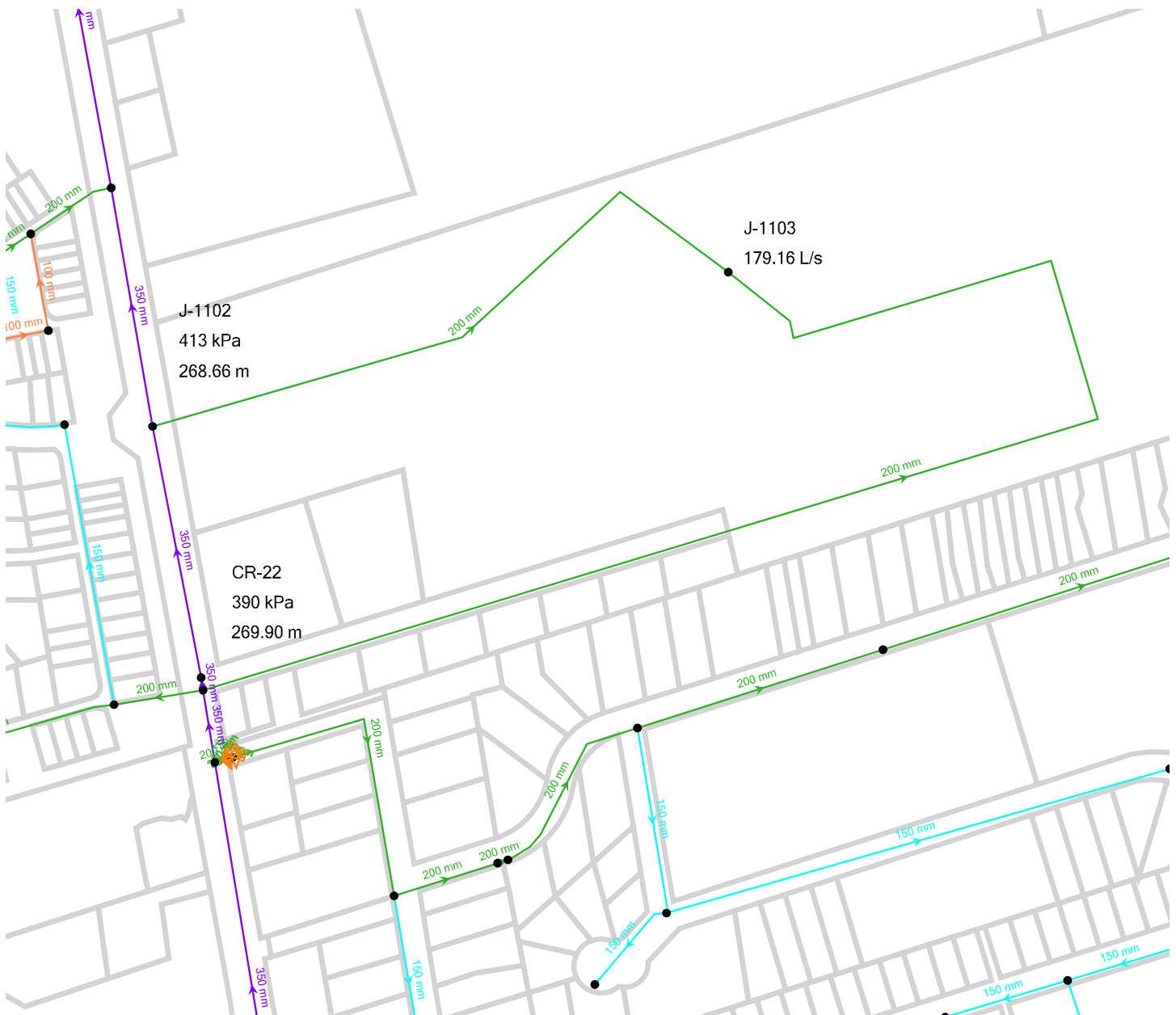
Home Farm Boundary Conditions

Maximum Day + Fire Flow (150 L/s)

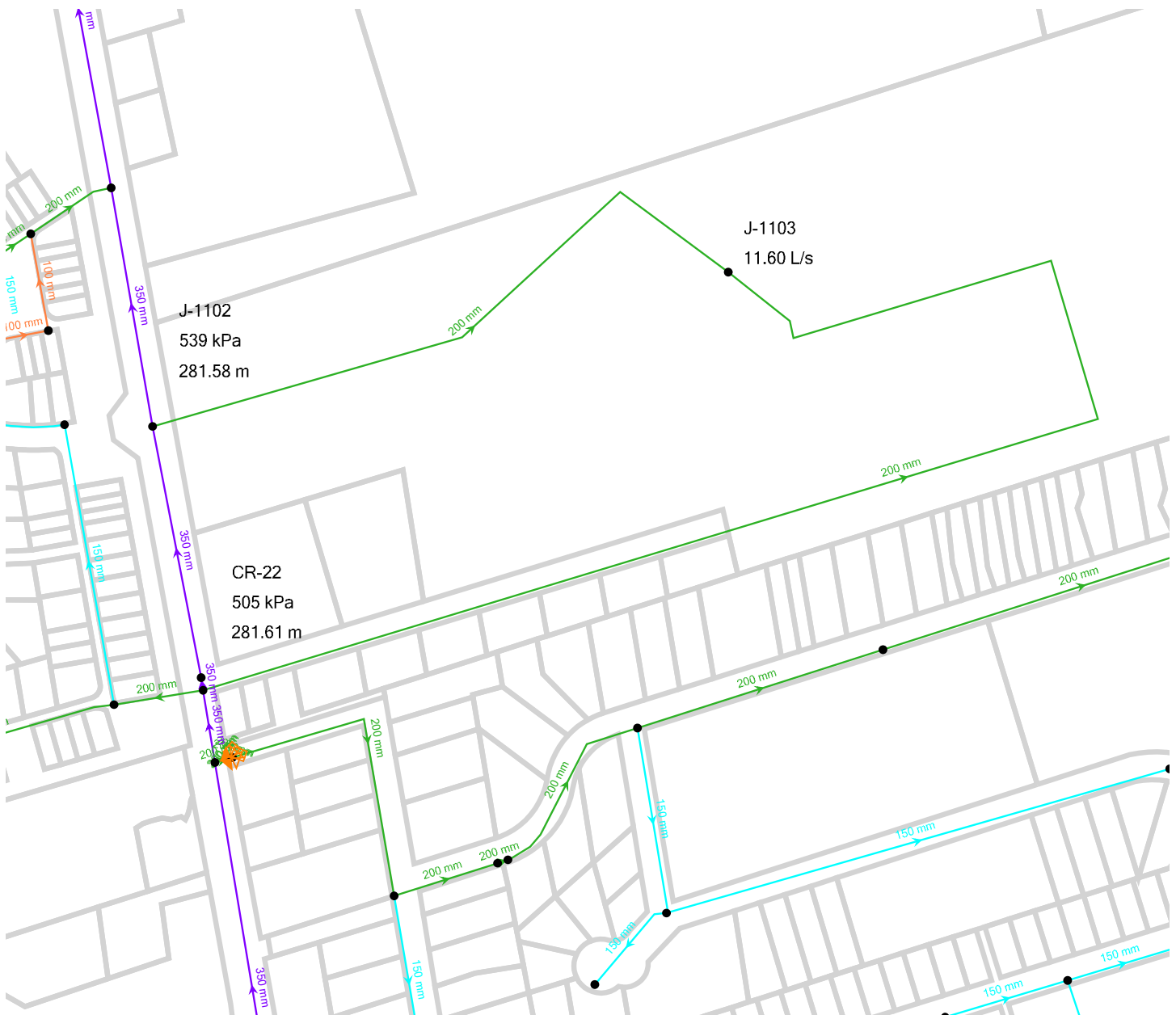


Home Farm Boundary Conditions

Maximum Day + Fire Flow (174 L/s)



Home Farm Boundary Conditions Peak Hour





Project: Home Farm Rental
Project No.: 721-3464-2
Design by: M.J./N.S.
Date: 24-Jun-26

Junction Demands

Junction (ID)	Land Use -	Unit #	Elevation (m)	Population (persons)	ADD (L/s)	MDD (L/s)	PH (L/s)
Rental Development							
J-R1	Residential	0	220.00	0	0.00	0.00	0.00
J-R2	Residential	58	218.63	124.7	0.51	2.06	3.10
J-R3	Residential	14	218.47	30.1	0.12	0.50	0.75
J-R4	Long Term Care*	89	218.73	192	1.00	4.54	6.84
J-R5	Residential	40	217.67	86	0.35	1.42	2.14
J-R6	Residential	0	217.5	0	0.00	0.00	0.00
Total	-	201	-	433	1.98	8.52	12.82

Pipe Minor Losses Summary

Pipe ID P-R1

Minor Loss	Number of Fittings	Loss Coef. (K)	SubTotal
Gate Valve (Open)	1	0.39	0.39
90° Bend (R/D=1 - Vertical)	0	0.37	0.00
90° Bend (R/D=1 - Horizontal)	0	0.37	0.00
45° Bend (Mitered - Vertical)	0	0.20	0.00
45° Bend (Mitered - Horizontal)	0	0.20	0.00
30° Bend (Mitered - Vertical)	0	0.10	0.00
30° Bend (Mitered - Horizontal)	2	0.10	0.20
Tee (Line Flow)	0	0.35	0.00
Tee (Branch Flow)	1	1.28	1.28
Reducer	0	0.64	0.00
Total			<u>1.87</u>

Pipe ID P-R2

Minor Loss	Number of Fittings	Loss Coef. (K)	SubTotal
Gate Valve (Open)	0	0.39	0.00
90° Bend (R/D=1 - Vertical)	0	0.37	0.00
90° Bend (R/D=1 - Horizontal)	0	0.37	0.00
45° Bend (Mitered - Vertical)	0	0.20	0.00
45° Bend (Mitered - Horizontal)	0	0.20	0.00
30° Bend (Mitered - Vertical)	0	0.10	0.00
30° Bend (Mitered - Horizontal)	4	0.10	0.40
Tee (Line Flow)	1	0.35	0.35
Tee (Branch Flow)	1	1.28	1.28
Reducer	0	0.64	0.00
Total			<u>2.03</u>

Pipe ID P-R3

Minor Loss	Number of Fittings	Loss Coef. (K)	SubTotal
Gate Valve (Open)	1	0.39	0.39
90° Bend (R/D=1 - Vertical)	0	0.37	0.00
90° Bend (R/D=1 - Horizontal)	0	0.37	0.00
45° Bend (Mitered - Vertical)	0	0.20	0.00
45° Bend (Mitered - Horizontal)	0	0.20	0.00
30° Bend (Mitered - Vertical)	0	0.10	0.00
30° Bend (Mitered - Horizontal)	0	0.10	0.00
Tee (Line Flow)	1	0.35	0.35
Tee (Branch Flow)	0	1.28	0.00
Reducer	0	0.64	0.00
Total			<u>0.74</u>

Pipe ID P-R4

Minor Loss	Number of Fittings	Loss Coef. (K)	SubTotal
Gate Valve (Open)	1	0.39	0.39
90° Bend (R/D=1 - Vertical)	0	0.37	0.00
90° Bend (R/D=1 - Horizontal)	0	0.37	0.00
45° Bend (Mitered - Vertical)	0	0.20	0.00
45° Bend (Mitered - Horizontal)	0	0.20	0.00
30° Bend (Mitered - Vertical)	0	0.10	0.00
30° Bend (Mitered - Horizontal)	0	0.10	0.00
Tee (Line Flow)	0	0.35	0.00
Tee (Branch Flow)	1	1.28	1.28
Reducer	0	0.64	0.00
Total			<u>1.67</u>



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Pipe Minor Losses Summary

Pipe ID P-R5

Minor Loss	Number of Fittings	Loss Coef. (K)	SubTotal
Gate Valve (Open)	1	0.39	0.39
90° Bend (R/D=1 - Vertical)	0	0.37	0.00
90° Bend (R/D=1 - Horizontal)	0	0.37	0.00
45° Bend (Mitered - Vertical)	0	0.20	0.00
45° Bend (Mitered - Horizontal)	0	0.20	0.00
30° Bend (Mitered - Vertical)	0	0.10	0.00
30° Bend (Mitered - Horizontal)	3	0.10	0.30
Tee (Line Flow)	2	0.35	0.70
Tee (Branch Flow)	1	1.28	1.28
Reducer	0	0.64	0.00
Total			<u>2.67</u>

Pipe ID P-R6

Minor Loss	Number of Fittings	Loss Coef. (K)	SubTotal
Gate Valve (Open)	1	0.39	0.39
90° Bend (R/D=1 - Vertical)	0	0.37	0.00
90° Bend (R/D=1 - Horizontal)	0	0.37	0.00
45° Bend (Mitered - Vertical)	0	0.20	0.00
45° Bend (Mitered - Horizontal)	1	0.20	0.20
30° Bend (Mitered - Vertical)	0	0.10	0.00
30° Bend (Mitered - Horizontal)	0	0.10	0.00
Tee (Line Flow)	1	0.35	0.35
Tee (Branch Flow)	0	1.28	0.00
Reducer	0	0.64	0.00
Total			<u>0.94</u>

Pipe ID P-R7

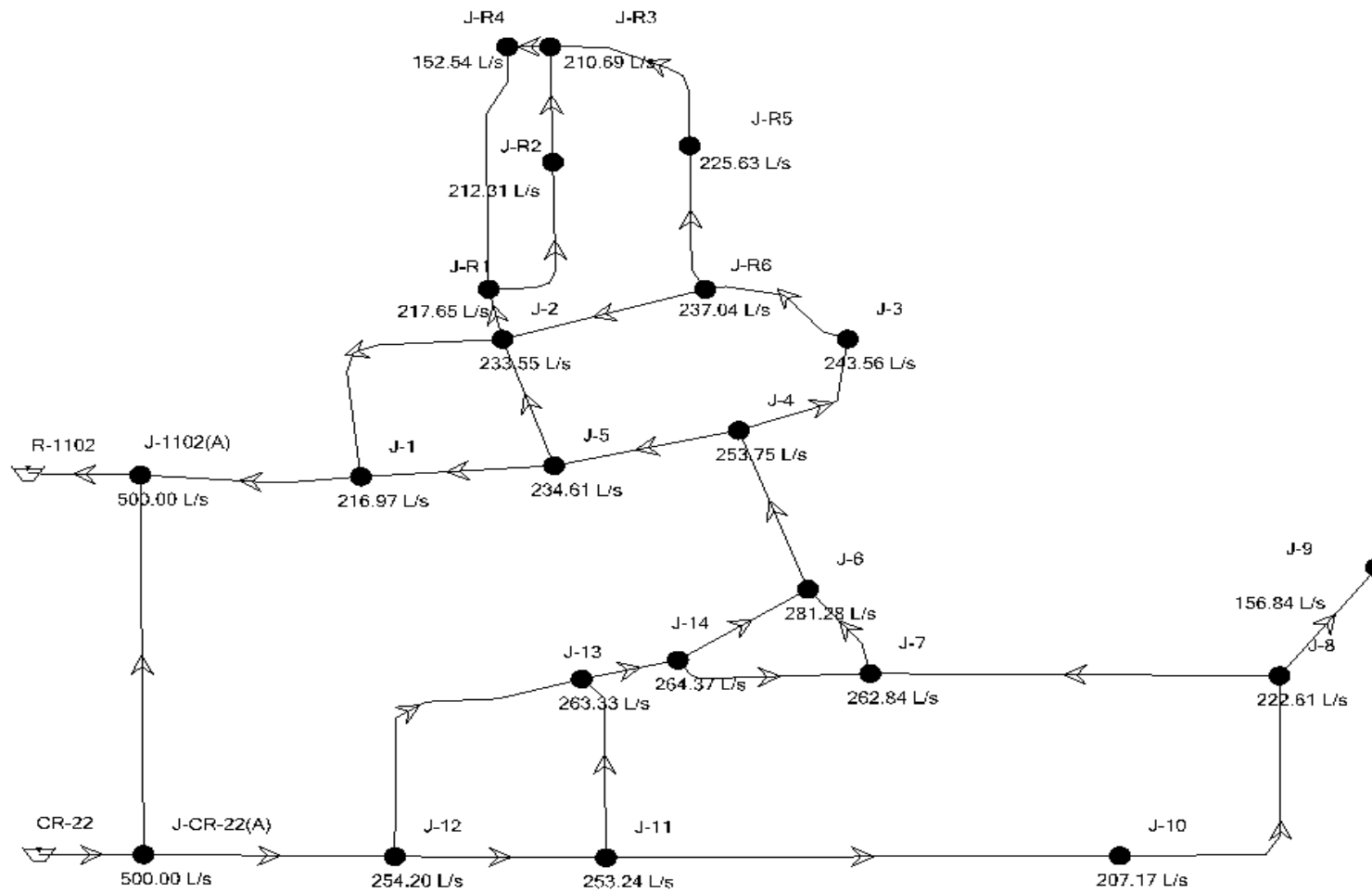
Minor Loss	Number of Fittings	Loss Coef. (K)	SubTotal
Gate Valve (Open)	2	0.39	0.78
90° Bend (R/D=1 - Vertical)	0	0.37	0.00
90° Bend (R/D=1 - Horizontal)	0	0.37	0.00
45° Bend (Mitered - Vertical)	0	0.20	0.00
45° Bend (Mitered - Horizontal)	2	0.20	0.40
30° Bend (Mitered - Vertical)	0	0.10	0.00
30° Bend (Mitered - Horizontal)	0	0.10	0.00
Tee (Line Flow)	1	0.35	0.35
Tee (Branch Flow)	0	1.28	0.00
Reducer	0	0.64	0.00
Total			<u>1.53</u>



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Pipe Losses Summary

Pipe ID	Length (m)	Diameter (mm)	Material	Hazen-Williams C	Total Minor Loss Coefficient
Rental Development					
P-R1	62	200	PVC	110	1.87
P-R2	115	200	PVC	110	2.03
P-R3	71	200	PVC	110	0.74
P-R4	35	200	PVC	110	1.67
P-R5	112	200	PVC	110	2.67
P-R6	60	200	PVC	110	0.94
P-R7	145	200	PVC	110	1.53





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Junction Table - Average Day Demand

Label	Demand (L/s)	Elevation (m)	Hydraulic Grade (m)	Pressure (kPa)
Rental Development				
J-R1	0.00	220.00	281.95	606
J-R2	0.51	218.63	281.95	620
J-R3	0.12	218.47	281.95	621
J-R4	1.00	218.73	281.95	619
J-R5	0.35	217.67	281.95	629
J-R6	0.00	217.50	281.95	631



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Pipe Table - Average Day Demand

Label	Start Node	Stop Node	Flow (L/s)	Velocity (m/s)
Rental Development				
P-R1	J-2	J-R1	1.09	0.03
P-R2	J-R1	J-R2	0.54	0.02
P-R3	J-R2	J-R3	0.03	0.00
P-R4	J-R3	J-R4	0.45	0.01
P-R5	J-R3	J-R5	-0.54	0.02
P-R6	J-R5	J-R6	-0.89	0.03
P-R7	J-R1	J-R4	0.55	0.02



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Junction Table - Peak Hour Demand

Label	Demand (L/s)	Elevation (m)	Hydraulic Grade (m)	Pressure (kPa)
Rental Development				
J-R1	0.00	220.00	281.33	600
J-R2	3.10	218.63	281.31	613
J-R3	0.75	218.47	281.31	615
J-R4	6.84	218.73	281.31	612
J-R5	2.14	217.67	281.33	623
J-R6	0.00	217.50	218.35	625



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Pipe Table - Peak Hour Demand

Label	Start Node	Stop Node	Flow (L/s)	Velocity (m/s)
Rental Development				
P-R1	J-2	J-R1	6.95	0.22
P-R2	J-R1	J-R2	3.39	0.11
P-R3	J-R2	J-R3	0.29	0.01
P-R4	J-R3	J-R4	3.28	0.10
P-R5	J-R3	J-R5	-3.74	0.12
P-R6	J-R5	J-R6	-5.88	0.19
P-R7	J-R1	J-R4	3.56	0.11



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Junction Table - Max Day + Fire Demand (174 L/s)

Label	Max Day Demand (L/s)	Pressure (Calculated Lower Limit) (kPa)	Fire Flow Available (L/s)	Required Fire Flow (L/s)
Rental Development				
J-R1	0.00	166	231.04	133
J-R2	2.06	203	210.65	133
J-R3	0.50	150	225.39	133
J-R4	4.54	192	212.67	150
J-R5	1.42	195	236.13	133
J-R6	0.00	223	236.93	133



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Pipe Table - Maximum Day Demand + Fire Flow

Label	Start Node	Stop Node	Flow (L/s)	Velocity (m/s)
Rental Development				
P-R1	J-2	J-R1	4.00	0.13
P-R2	J-R1	J-R2	1.87	0.06
P-R3	J-R2	J-R3	-0.19	0.01
P-R4	J-R3	J-R4	2.42	0.08
P-R5	J-R3	J-R5	-3.10	0.10
P-R6	J-R5	J-R6	-4.52	0.14
P-R7	J-R1	J-R4	2.12	0.07



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Junction Table - Max Day + Fire Demand (150 L/s)

Label	Demand (L/s)	Pressure (Calculated Lower Limit) (kPa)	Fire Flow Available (L/s)	Required Fire Flow Residential (L/s)
Rental Development				
J-R1	0.00	188	232.22	133
J-R2	2.06	207	218.71	133
J-R3	0.50	150	233.99	133
J-R4	4.54	195	220.84	150
J-R5	1.42	221	235.59	133
J-R6	0.00	249	236.38	133



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Pipe Table - Maximum Day Demand + Fire Flow

Label	Start Node	Stop Node	Flow (L/s)	Velocity (m/s)
Rental Development				
P-R1	J-2	J-R1	4.16	0.13
P-R2	J-R1	J-R2	1.97	0.06
P-R3	J-R2	J-R3	-0.09	0.00
P-R4	J-R3	J-R4	2.36	0.08
P-R5	J-R3	J-R5	-2.94	0.09
P-R6	J-R5	J-R6	-4.36	0.14
P-R7	J-R1	J-R4	2.18	0.07