MEMORANDUM

J.L. Richards
& Associates Limited
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To: Mike Finley, P.Eng.
Deputy Director of Public Works & Environmental Services
Municipality of North Grenville

From: Mahad Musse, EIT
J.L. Richards & Associates

Re: Municipality of North Grenville
Booster Pumping Station Assessment

Date: September 15, 2022

JLR No.: 24362-014

CC: Mark Buchanan, P.Eng.
J.L. Richards & Associates Limited

Annie Williams, P.Eng.
J.L. Richards & Associates Limited

Objective

J.L. Richards & Associates (JLR) was retained by the Municipality of North Grenville (Municipality) to carry out an assessment of a potential new booster pumping station that could provide supplemental water supply to the community and be capable of providing fire water supply to the future correctional facility. If feasible, the Municipality would evaluate the new booster pumping station as part of a future Master Plan.

Background

The assessment of a potential new booster pumping station was carried out by using the Municipality's existing hydraulic water model in WaterCAD® which was previously modelled in 2010 and since updated in 2017 and 2020. The latest update in 2020 includes revising water demands to reflect user data provided by the Municipality, updating the pump curve at Alfred Pumping Station, adding a new pump at eQuinelle Booster Pumping Station, and accounting for new development areas. Watermain extensions and new hydrant locations were included in this revision of the model. Pressure reducing valve (PRV) settings and the static elevations of water reservoirs were not changed from the previous model.

Water Model

The assessment was carried out by modelling a booster pumping station approximately 200 m north of the proposed correctional facility with a connection to the existing watermain on Prescott Street as directed by the Municipality (refer to Attachment No. 1 for email correspondence with the Municipality). The proposed watermain for the booster pumping station was modelled with an internal diameter of 200 mm and a roughness coefficient of 110 (assumed PVC material). The elevations for the proposed junction nodes, reservoir, booster pumping station and flow control valve were approximated as 95 m above sea level, which is based on satellite imagery from Google Earth and elevations from the existing water model. The proposed reservoir dimensions are based on providing 1000 m3 of water storage for the future correctional facility as recommended in the "Kemptville Correctional Centre – Functional Servicing Report (Preliminary)" prepared by Stantec on September 16, 2021, as well as providing an additional 1000 m3 of storage for the Municipality. The reservoirwas modelled with a diameter of 16 m, an initial water level of 104 m, a minimum water level of 95.3 m and a maximum water level of 105 m. The duty pumps at the eQuinelle pumping station were not considered in this assessment since they are in a different pressure zone than the rest of the Municipality.

The model was simulated with the proposed booster pumping station under the following steady state conditions:

- Average Day Demand
- Max Day Demand + Fire Flow
- Peak Hour Demand

To provide context to the results, the system pressures and fire flow availability for the above-noted scenarios were compared to the existing conditions. Furthermore, the maximum reservoir fill rate to maintain acceptable existing system pressures under the average day demand scenario was investigated.

Design Criteria

The recommended maximum and minimum pressure requirements found within the Ministry of the Environment, Conservation and Parks (MECP) Design Guidelines for Drinking Water Systems, 2008 were followed in this assessment and are provided below:

- Distribution system pressure should not exceed 689 kPa (100 psi). When static pressures exceed 689 kPa (100 psi), pressure reducing valves should be provided on watermain or service connections in the distribution system. Furthermore, in accordance with the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi);

- Minimum pressures should not be less than 276 kPa (40 psi) during peak hour demand conditions; and

- During maximum day demand plus fire flow, a minimum pressure of 140 kPa (20 psi) shall be maintained at all points in the distribution system.

Model Results

The following pressures and fire flows were assessed based on the Municipality's hydraulic water model (last updated in 2020). Refer to Attachment No. 2 for the model schematics and details.

Average Day Demand

The average day demand scenario was simulated to assess the system pressures expected throughout the Municipality while the proposed booster pumping station is active. The results are compared to the existing conditions within the system and presented in Table 1 below. The following assumptions have been included in this assessment:

- The pump curve for the booster pumping station under the average day demand scenario was defined as a 1-point curve with a design flow of 10 L/s and a design head of 30 m;
- Under existing conditions Pump No. 1 is active at Van Buren, Kernahan, Alfred, and East Quadrant pumping stations; and
- When the proposed booster pumping station is active, Pump No. 1 is active at Kernahan and Alfred pumping stations. In order to not over pressurize the system, the pumps at East Quadrant and Van Buren are inactive.

Based on the aforementioned assumptions and under the average day demand scenario a pressure increase is anticipated within the water distribution system, but general remains comparable to existing conditions. Table 2 summarizes the duty points of the booster pumping station under the average day demand scenario.

Table 1: Average Day Demand

Pressure (kPa)		EXISTING	PROPOSED BPS
From	To		
	<=275	0.0%	0.0%
>275	<=350	0.0%	0.0%
>350	<=480	51.6%	43.2%
>480	<=550	48.4%	56.8%
>550	<=700	0.0%	0.0%
>700		0.0%	0.0%

Table 2: Pump Summary (Average Day Demand)

Location	Flow (L/s)	Total Dynamic Head (m)
Proposed Booster Pump Station	3.74	38.60

Maximum Day Demand Plus Fire Flow

The maximum day demand plus fire flow scenario was simulated to assess the available fire flows expected within the Municipality while maintaining a minimum system pressure of 140 kPa. The booster pumping station was compared with the existing condition when the Van Buren high capacity pump is active (refer to Table 3). The following assumptions have been included in this assessment:

- The pump curve for the booster pumping station under the maximum day demand plus fire flow scenario was defined as a 1-point curve with a design flow of 75 L/s and a design head of 35 m;

- For both the existing condition and the proposed booster pumping station condition, Pump No. 2 is active at Kernahan and Alfred pumping stations; and
- East Quadrant is inactive for both the existing condition and the proposed booster pumping condition since it has been observed that the model overestimates the automated fire flow results when the East Quadrant pumps are active.

Based on the assumptions above and under the maximum day demand plus fire flow scenario with the proposed booster pumping station, the increase in available fire flow is anticipated within the Township. The highest increase in fire flow availability is primarily observed along the 200 mm and 300 mm diameter watermains on Prescott Street and Van Buren Street, respectively. A manual fire flow scenario was carried out with a demand of 75 L/s allocated to Junction Node J9 located at the intersection of Prescott Street and Concession Road to assess the high capacity pump performance as summarized in. Table 4.

Table 3: Maximum Day Demand Plus Fire Flow

Avail. Flow (L/s)		EXISTING	PROPOSED BPS
From	To		
	<=30	0.4%	0.7%
>30	<=45	3.5%	2.8%
>45	<=75	38.9%	17.5%
>75	<=100	57.2%	73.7%
>100	<=150	0.0%	5.3%
>150	<=250	0.0%	0.0%
>250		0.0%	0.0%

Table 4: Pump Summary (Maximum Day Demand Plus Fire Flow)

Location	Flow (L/s)	Total Dynamic Head (m)
Proposed Booster Pump Station	52.66	40.91

Peak Hour Demand

The peak hour demand scenario was simulated to assess the system pressures expected throughout the Municipality while the proposed booster pumping station is active. The results are compared to the existing conditions within the system and presented in Table 5 below. The following assumptions have been included in this assessment:

- The pump curve for the booster pumping station under the peak hour demand scenario is the same as the one used for average day demand, thus the pump curve is defined as a 1-point curve with a design flow of 10 L/s and a design head of 30 m; and
- For both the existing condition and the proposed booster pumping station condition, Pump No. 2 is active at Van Buren, Kernahan, Alfred, and East Quad pumping stations.

Based on the aforementioned assumptions and under the peak hour demand scenario with the proposed booster pumping station, a pressure increase is anticipated within the Township. Table 6 summarizes the duty points of the booster pumping station under the peak hour demand scenario.

Table 5: Peak Hour Demand

Pressure (kPa)		EXISTING	PROPOSED BPS
From	To		
	<=275	0.0%	0.0%
>275	<=350	0.4%	0.0%
>350	<=480	98.8%	83.6%
>480	<=550	0.8%	16.4%
>550	<=700	0.0%	0.0%
>700		0.0%	0.0%

Table 6: Pump Summary (Peak Hour Demand)

Location	Flow (L/s)	Total Dynamic Head (m)
Proposed Booster Pump Station	5.98	36.43

Average Day Demand with the Reservoir Filling

As part of the assessment, the maximum reservoir fill rate to maintain the existing system pressures under the average day demand scenario was investigated. The results are compared to the existing conditions within the system and presented in Table 7 below. The following assumptions have been included in this assessment:

- The pump curve for the booster pumping station under the average day demand scenario was defined as a 1-point curve with a design flow of 10 L/s and a design head of 30 m;
- The flow control valve was set to allow 25 L/s to fill the reservoir;
- Under existing conditions Pump No. 1 is active at Van Buren, Kernahan, Alfred, and East Quadrant pumping stations; and
- For the scenario when the reservoir is filling. Pump No. 2 is active at Van Buren, Kernahan, Alfred, and East Quadrant pumping stations.

Based on the foregoing assumptions and when the booster pump station is filling at a rate of 25 L/s, the system pressures within the system are observed to drop by a maximum of 70 kPa. During a Master Plan or detailed design, it is recommended that the maximum reservoir fill rate be reviewed and refined, as need to mitigate potential pressure fluctuations during normal operations to maintain reasonability consistent average day pressures.

Table 7: Average Day Demand with the Reservoir Filling

Pressure (kPa)		EXISTING	PROPOSED BPS FILLING
From	To		
	<=275	0.0%	0.0%
>275	<=350	0.0%	0.4%
>350	<=480	51.6%	98.0%
>480	<=550	48.4%	1.6%
>550	<=700	0.0%	0.0%
>700		0.0%	0.0%

Fire Flow Availability at the Correctional Facility Site

As part of the assessment, the fire flow availability at the correctional facility was explored. Given that the proposed booster pumping station location (refer to Attachment No. 1) is on the same site as the correctional facility, the existing Kemptville water distribution system is not required to convey fire flows to the correctional facility. Therefore, the facility's new water distribution system and the high capacity pumping equipment within the booster pumping station can be designed to suit the required 150 L/s fire flow requirement. Coordination with the correctional facility distribution system design would be required to assess if the 150 L/s high-capacity pump could operate on the existing Kemptville water distribution system.

Desktop Assessment of the Fill and Drain Time of Reservoir

A desktop assessment was carried out on the cycle time (i.e., drain and refill time) of the water storage reservoir. Ideally, a 1/3 reservoir volume turnover in 24 hours is targeted to mitigate water quality and ice formation issues. A third of the total reservoir volume is 660 m^3 (660,000 L) based on a total reservoir volume of 2000 m^3, with approximately 1000 m^3 of water storage required for the correctional facility. As shown in Table 2, the average day flow rate of the booster pump station is 3.74 L/s and the maximum fill rate is 25 L/s. Thus, it would take approximately 2 days to drain and 7.5 hours to refill the 660 m^3 volume, exceeding the targeted 24-hour cycle time. Therefore, it is recommended an active mixing system and chemical feed system be considered as part of any future study or detailed design to mitigate ice formation and water quality issues.

Conclusion and Recommendations

Based on the forgoing, a new booster pumping station is hydraulically feasible for inclusion as part of a future Master Plan.

Additional study will provide an opportunity to refine assumptions of this assessment and tailor a potential booster pumping station based on additional information available as part of a Master Planning exercise. For the Municipality's consideration we offer the following recommendations that can assist in this decision-making process:

- Assess future growth needs in this area of the community;
- Confirm future Water storage requirements;
- Assess water supply and potential to add a groundwater supply to the booster pumping station;
- Review booster pumping station location and watermain diameter;
- Assess impacts of existing watermain upgrades and extension on booster pumping station performance;
- Assess maximum reservoir fill rate to mitigate pressure fluctuations during operations
- Coordinate future fire water supply requires with the proposed correction facility's water distribution system
- Consider the need for active mixing and chemical feed system to mitigate ice formation and water quality issues in the new reservoir.

Should you have any questions, please do not hesitate to contact the undersigned.

J.L. RICHARDS & ASSOCIATES LIMITED

Prepared by:

Mahad Musse, EIT
Civil Engineering Intern

Reviewed by:

Mark Buchanan, P.Eng.
Senior Civil Engineer

MM/MB
Attach.

ATTACHMENT NO. 1
Email Correspondences

Mahad Musse

From: Mike Finley <mfinley@northgrenville.on.ca>
Sent: August 11, 2022 2:17 PM
To: Mark Buchanan
Cc: Annie Williams; Mahad Musse
Subject: RE: North Grenville - Booster Pumping Station Assessment
Attachments: Water Model - Booster Station Genertal Location.pdf

Hi Mark,

Thank you and Mahad for the meeting the other day. Attached is a very general idea of where we think the booster station could go on the correction facility site. It's based on available lands from what we know of the concept layout.

Let me know if this will work or if it is too general for the modeling work and we can try to refine.

Any questions please let me know.

Thanks,

Mike Finley, *P.Eng*
Deputy Director of Public Works &
Environmental Services
Municipality of North Grenville
Phone: 613-258-9569 ext.139
www.northgrenville.ca

From: Mark Buchanan <mbuchanan@jlrichards.ca>
Sent: July 29, 2022 2:25 PM
To: Mike Finley <mfinley@northgrenville.on.ca>
Cc: Annie Williams <awilliams@jlrichards.ca>; Mahad Musse <mmusse@jlrichards.ca>
Subject: RE: North Grenville - Booster Pumping Station Assessment

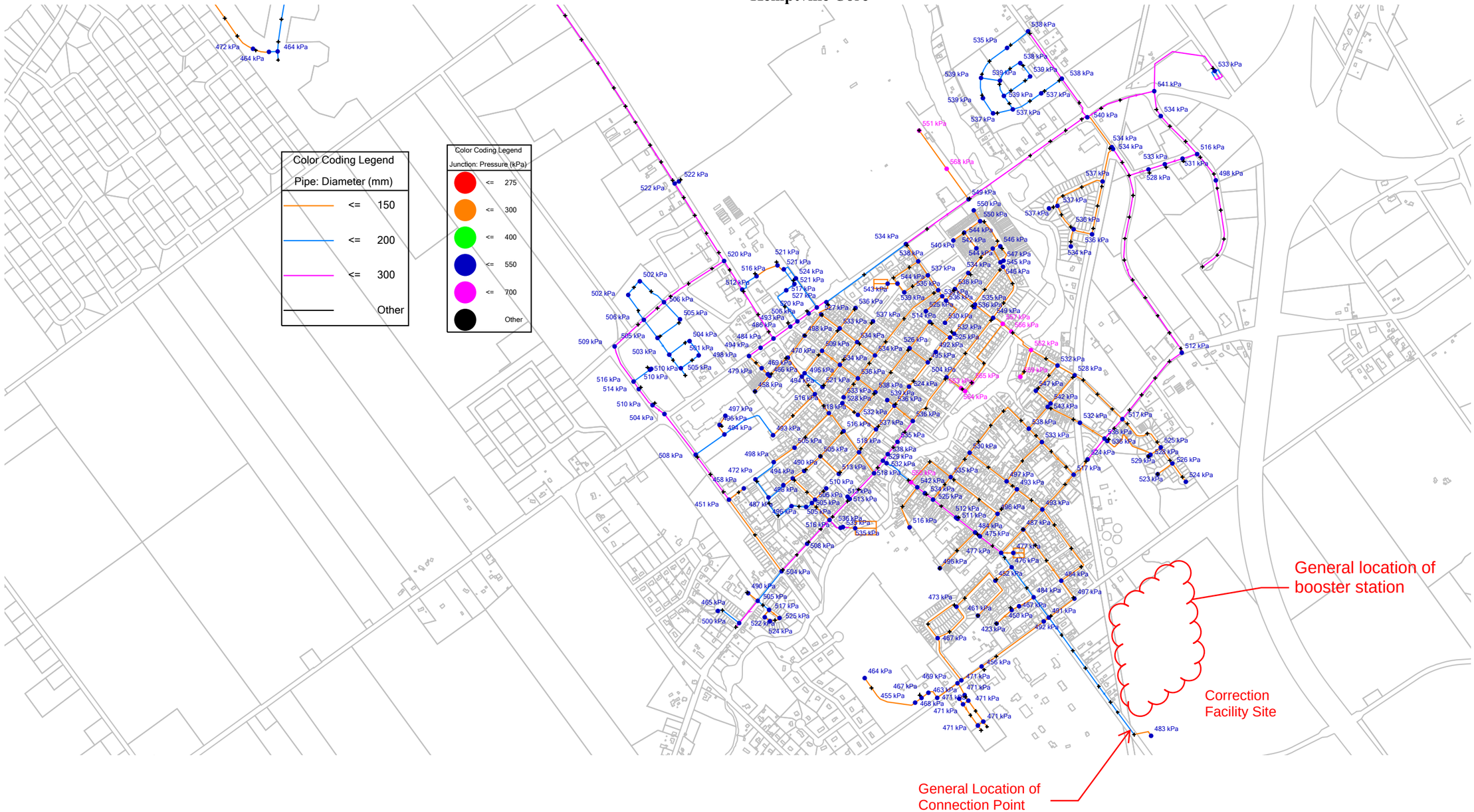
Hello Mike,

Right on. I'll send you an appt for Wednesday August 10 at 9 am

Enjoy the long weekend and your holidays.
Mark

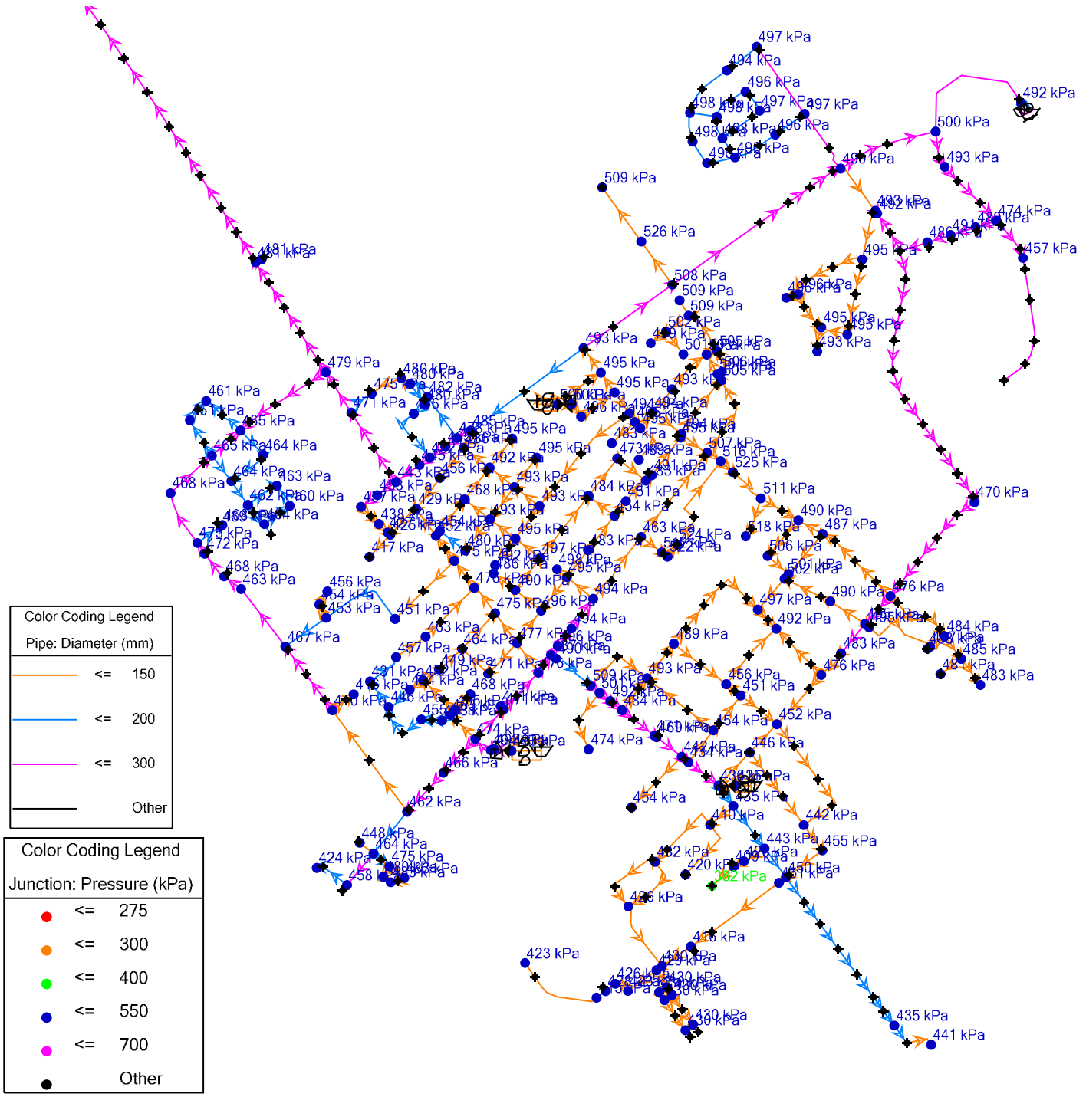
Mark Buchanan, P.Eng.
Associate
Senior Civil Engineer

Maximum Day Demand
Kemptville Core

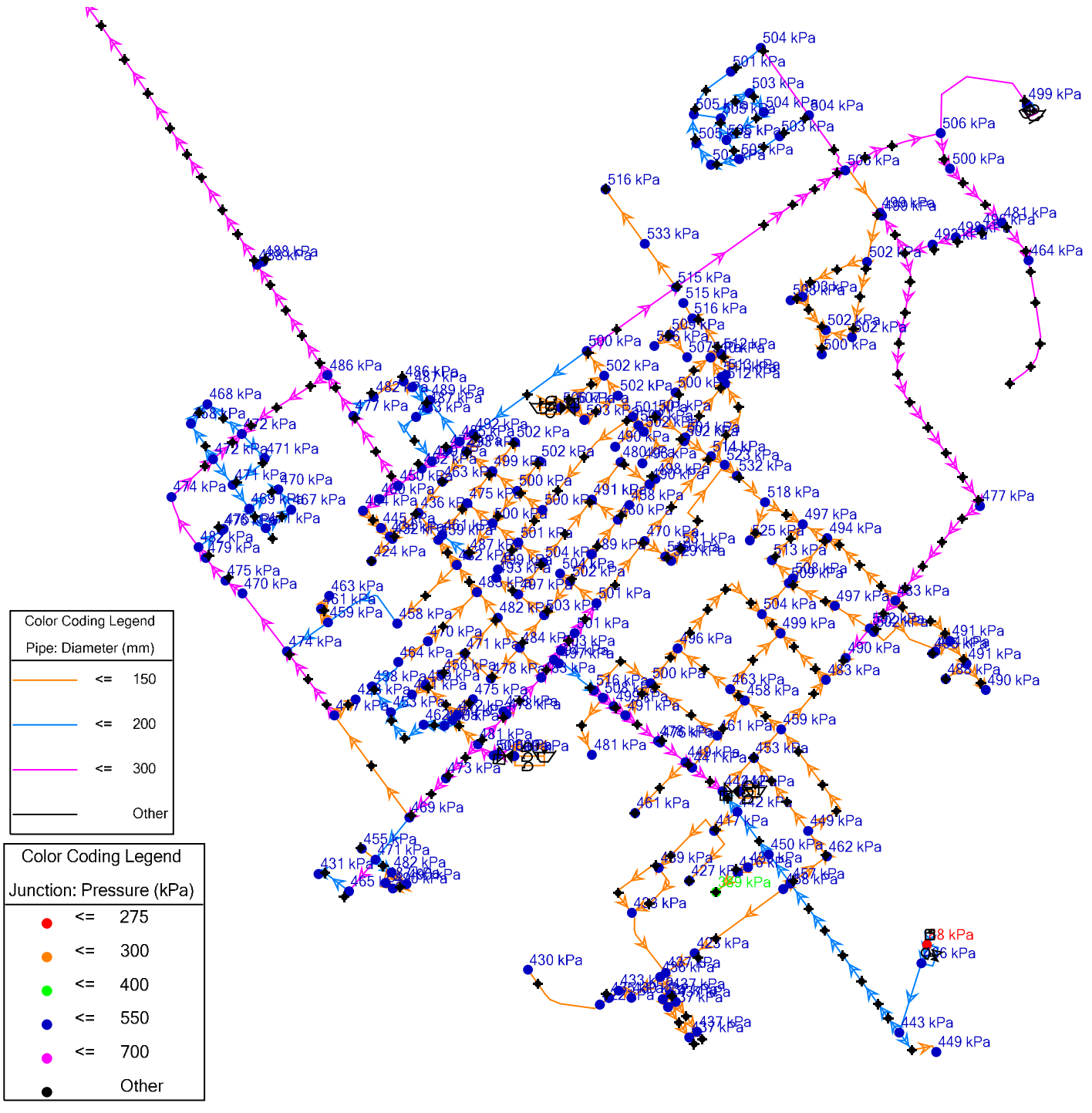


ATTACHMENT NO. 2
Modelling Schematics

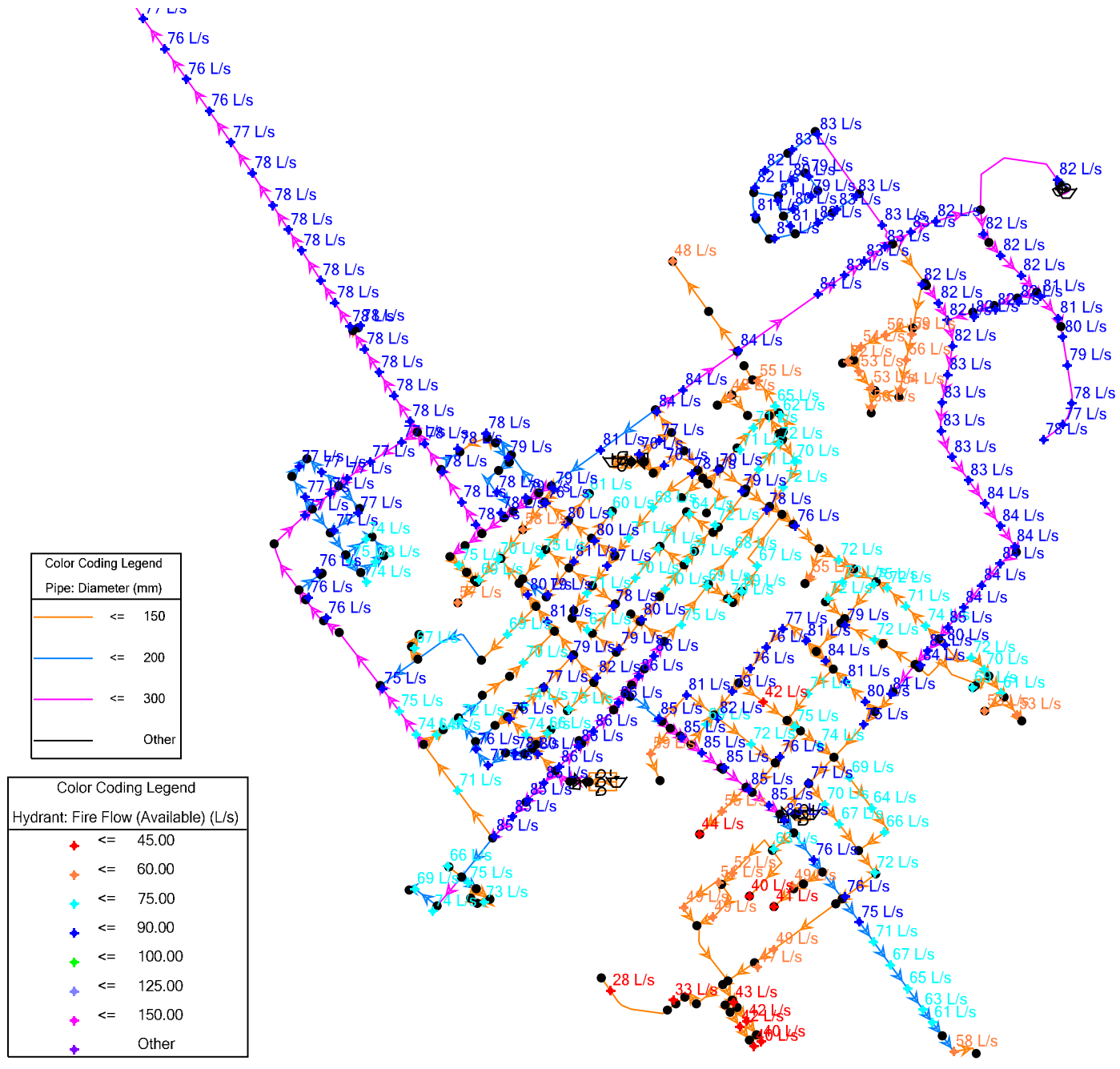
Municipality of North Grenville
Average Day Demand
Existing Conditions
Pump 1 is Active at All Pumping Stations



Municipality of North Grenville
Average Day Demand
Proposed Booster Pump is Active
Pump 1 is Active at Alfred and Kernahan, All Other Pumps are Inactive



Municipality of North Grenville
Maximum Day Demand Plus Fire Flow
Van Buren High Capacity Pump is Active
Pump 2 is Active at Alfred and Kernahan and East Quad Pumps are Inactive



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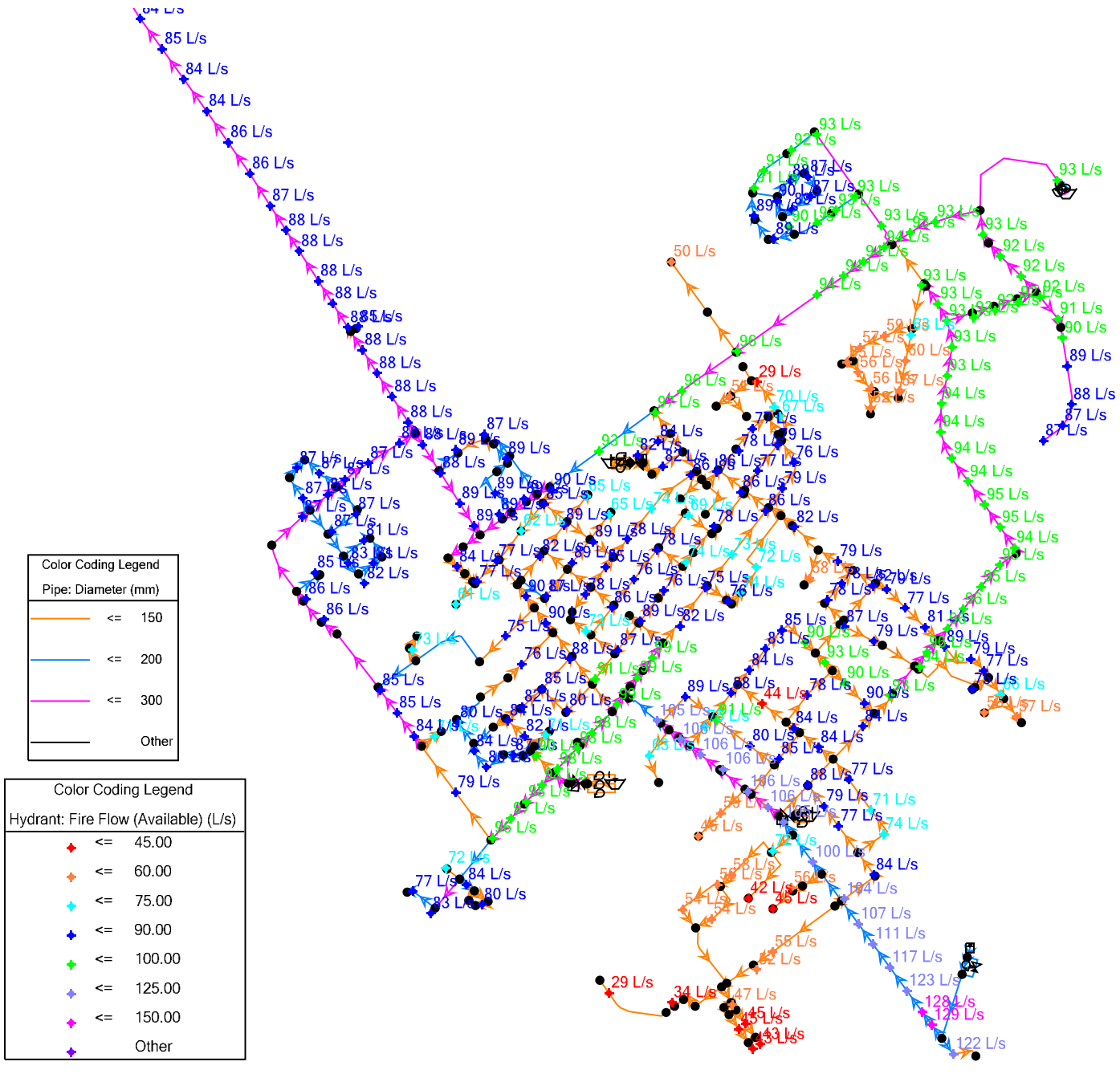
Municipality of North Grenville
Maximum Day Demand Plus Fire Flow
Booster Pump Station is Active
Pump 2 is Active at Alfred, Van Buren and Kernahan and East Quad Pumps are Inactive



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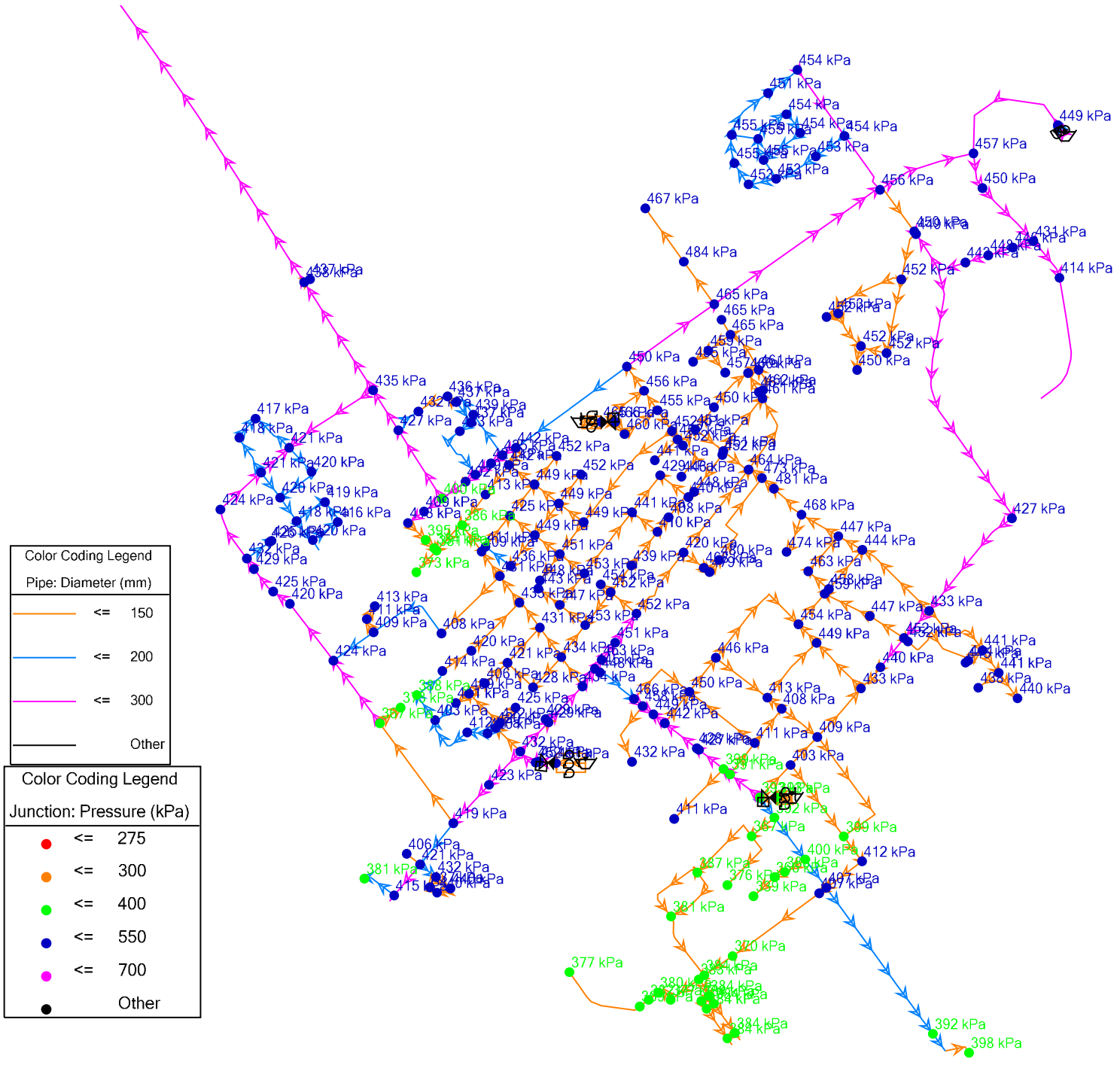
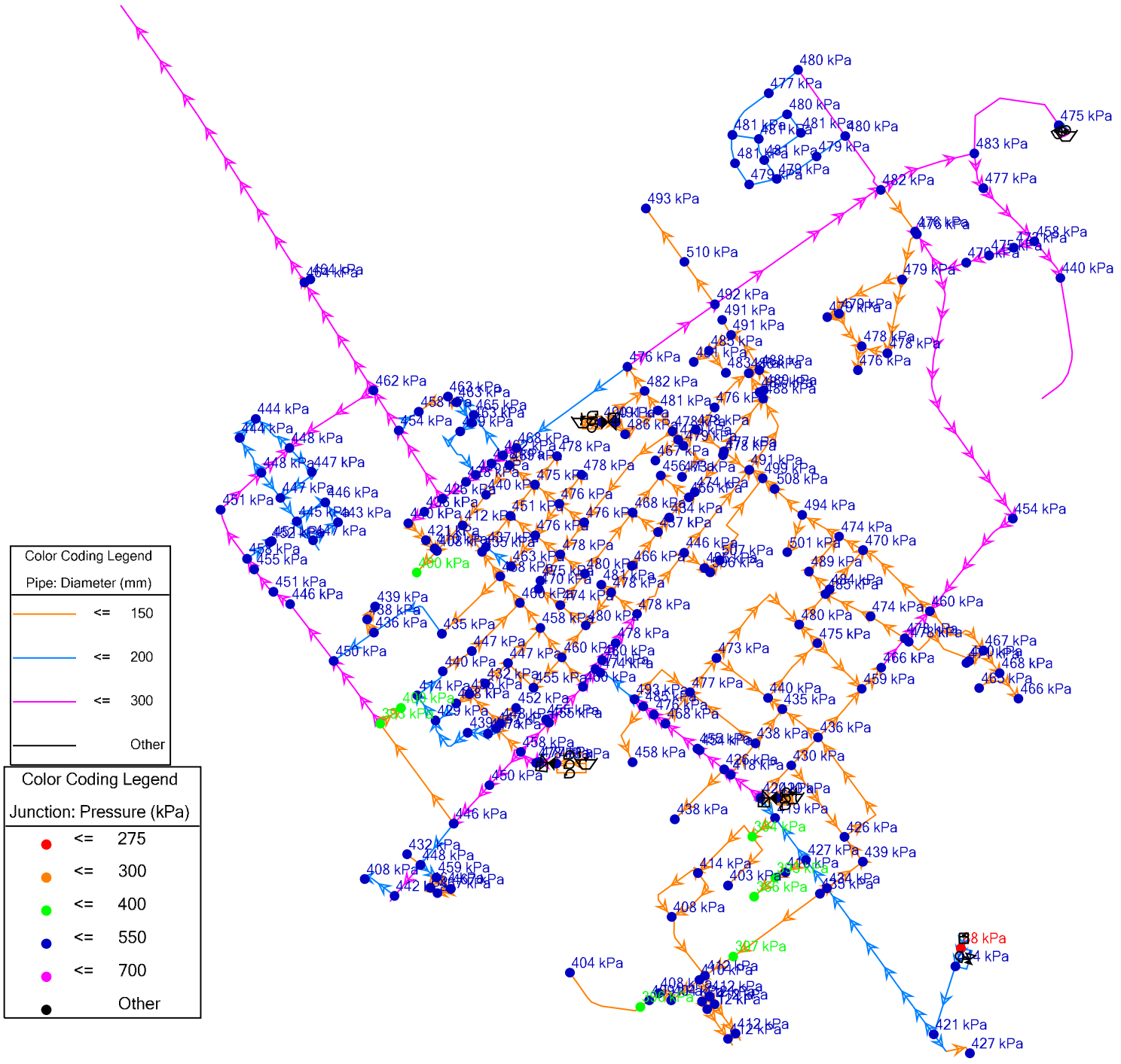
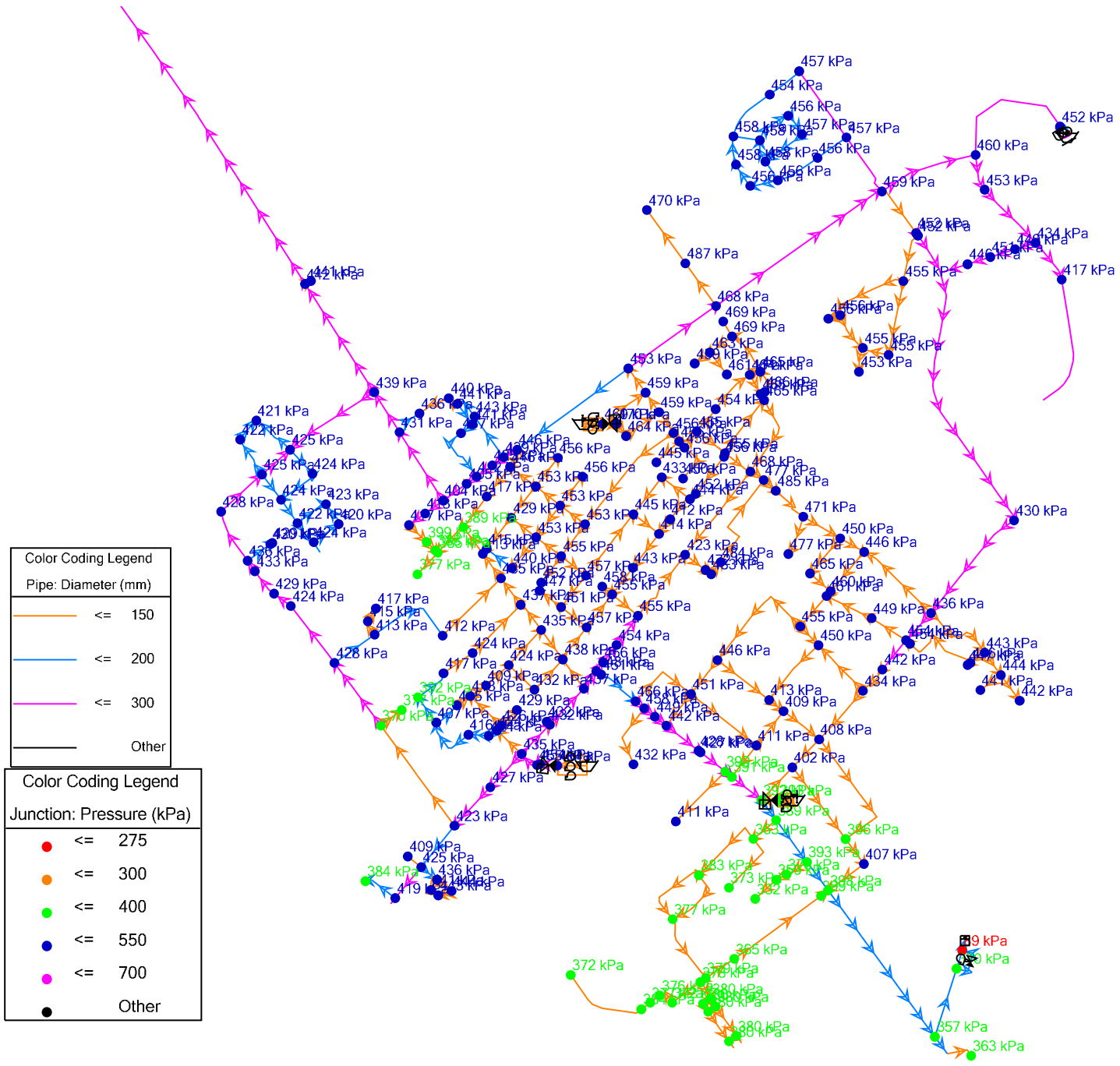
Municipality of North Grenville
Peak Hour Demand
Existing Conditions
Pump 2 is Active at All Pumping Stations



Municipality of North Grenville
Peak Hour Demand
Booster Pumping Station is Active
Pump 2 is Active at All Pumping Stations



Municipality of North Grenville
Average Day Demand
Booster Pumping Station is Filling at 25 L/s
Pump 2 is Active at Kernahan, Alfred and Van Buren and East Quad is Inactive



Tatyana Roumie

From: Nicholas Shepherd <nshepherd@northgrenville.on.ca>
Sent: July 21, 2025 4:38 PM
To: Matthew Marcuccio
Cc: Mike Finley; Eric Sly; Tatyana Roumie
Subject: RE: 33023-000 North Grenville Master Plan - Industrial Area Fire Flows

Hello Matthew,

We would want to model for the target of 150 L/s in that industrial area, so a second crossing for the watermain that would loop the system should be modelled.

Thanks,

Nick Shepherd (he/him)
Water & Wastewater Technologist
Municipality of North Grenville
613-258-9569 ext.179
www.northgrenville.ca

From: Matthew Marcuccio <mmarcuccio@jlrichards.ca>
Sent: Monday, July 21, 2025 1:15 PM
To: Nicholas Shepherd <nshepherd@northgrenville.on.ca>
Cc: Mike Finley <mfinley@northgrenville.on.ca>; Eric Sly <esly@northgrenville.on.ca>; Tatyana Roumie <troumie@jlrichards.ca>
Subject: RE: 33023-000 North Grenville Master Plan - Industrial Area Fire Flows

Good afternoon Nick,

Just wanted to clarify the question below regarding the industrial fire flows. In the model, we noticed the fire flows for the industrial area on the east side of Hwy 416 were under the 150L/s target per the OBC. To get that fire flow target, we

could add another watermain crossing the highway to loop the watermain, unless it is acceptable with making the fire flow target in that area above 100L/s.

Thanks,
Matthew

Matthew Marcuccio, P.Eng.
Senior Environmental Engineer

1000-343 Preston Street
Ottawa ON K1S 1N4
Work: 343-803-4554
mmarcuccio@jlrichards.ca

From: Matthew Marcuccio <mmarcuccio@jlrichards.ca>
Sent: July 15, 2025 7:55 AM
To: Nicholas Shepherd <nshepherd@northgrenville.on.ca>
Cc: Mike Finley <mfinley@northgrenville.on.ca>; Eric Sly <esly@northgrenville.on.ca>; Tatyana Roumie <troumie@jlrichards.ca>
Subject: 33023-000 North Grenville Master Plan - Industrial Area Fire Flows

Good morning Nick,

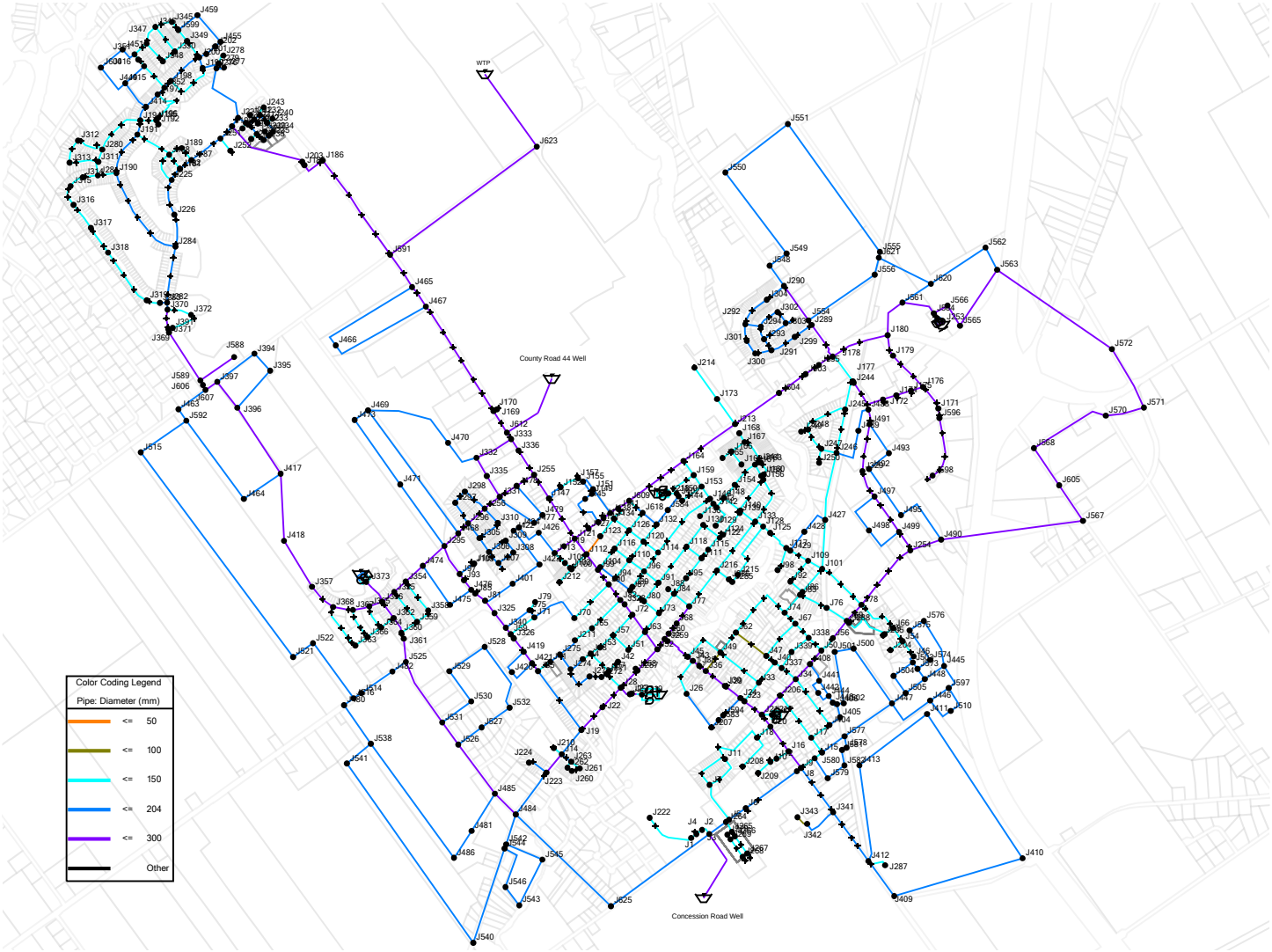
For water servicing in industrial areas, would the Municipality prefer to use a fire flow target of 150 L/s in alignment with the minimum OBC requirements, or would a target of 100 L/s be considered acceptable?

Thanks,
Matthew

Matthew Marcuccio, P.Eng.
Senior Environmental Engineer

Ottawa ON
Work: 343-803-4554

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Overall Model Schematic
Junction Labels
Build-Out (20+ years)



33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Junction Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
1020	J220	90.00
1023	J221	90.00
3178	J625	105.00
147	J209	102.75
2068	J342	100.00
26	J10	99.99
114	J18	99.84
170	J35	99.89
2633	J485	99.86
2731	J521	99.50
151	J212	99.20
177	J41	99.22
2070	J343	98.92
2434	J421	99.22
197	J6	99.22
146	J208	98.88
25	J1	99.33
48	J12	98.27
1097	J224	98.50
27	J100	98.39
30	J103	98.10
208	J7	98.14
2402	J409	97.71
164	J3	98.49
1089	J222	98.48
40	J112	97.95
1513	J275	97.74
2065	J341	97.42
157	J23	97.45
175	J4	98.15
2408	J412	97.34
1468	J264	97.88
137	J20	97.35
941	J217	97.30
186	J5	97.76
148	J21	97.27
37	J11	97.53
136	J2	97.97
1475	J267	97.72
1479	J268	97.72
1483	J269	97.72
1473	J266	97.72
1485	J270	97.72
1471	J265	97.72
2712	J514	97.38
2779	J541	97.32
2429	J419	97.23
35	J108	97.02
1634	J287	96.70
103	J17	96.57
2943	J598	95.89
158	J24	96.61
2624	J482	96.90

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Junction Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
2111	J358	96.93
92	J16	96.51
2719	J516	96.78
2115	J360	96.71
2404	J410	96.25
2746	J527	96.60
144	J206	96.23
50	J121	96.51
2121	J362	96.61
2389	J404	96.01
2113	J359	96.51
56	J127	96.31
2930	J594	96.09
2117	J361	96.43
2620	J480	96.33
2776	J540	96.34
1510	J274	96.21
105	J171	95.08
2975	J606	96.26
2891	J583	95.83
230	J9	95.80
2909	J589	96.26
2161	J366	96.12
2124	J363	96.12
176	J40	95.65
149	J210	96.00
169	J34	95.61
219	J8	95.70
190	J53	95.91
2103	J354	96.05
43	J115	95.68
2024	J337	95.50
2105	J355	95.91
2154	J364	95.86
2741	J525	95.80
2878	J579	95.29
3011	J607	95.89
2880	J580	95.29
81	J15	95.24
61	J131	95.60
145	J207	95.41
168	J33	95.37
2107	J356	95.74
209	J70	95.64
39	J111	95.43
240	J99	95.55
184	J48	95.55
47	J119	95.52
183	J47	95.17
2622	J481	95.51
210	J71	95.53
2936	J596	94.41
2501	J443	95.06

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Junction Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
2168	J368	95.56
31	J104	95.35
2157	J365	95.52
2164	J367	95.52
180	J44	95.36
2432	J420	95.42
2109	J357	95.48
2648	J490	94.34
1506	J273	95.29
214	J75	95.34
52	J123	95.13
2394	J406	94.81
2744	J526	95.24
2758	J532	95.20
150	J211	95.10
41	J113	95.10
218	J79	95.17
2782	J542	95.07
2602	J474	95.14
1091	J223	95.00
2794	J546	95.01
2876	J578	94.52
2850	J567	93.88
2771	J538	94.90
2030	J339	94.50
2631	J484	94.90
2858	J571	93.72
2734	J522	94.76
2907	J588	94.98
155	J216	94.47
2368	J397	94.91
2573	J463	94.83
1334	J254	93.70
2787	J544	94.74
2505	J444	94.30
2499	J442	94.30
2873	J577	94.22
2671	J498	93.62
125	J19	94.59
1796	J308	94.80
2673	J499	93.52
2683	J502	94.07
203	J65	94.45
1501	J271	94.45
1765	J298	94.70
1504	J272	94.43
194	J57	94.40
2754	J531	94.50
2412	J413	94.10
2887	J582	94.00
2398	J408	94.06
1762	J297	94.65
70	J14	94.40

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Junction Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
65	J135	94.30
221	J81	94.46
1908	J326	94.43
1788	J306	94.60
110	J176	93.30
2587	J468	94.56
2884	J581	93.87
172	J37	94.28
2636	J486	94.26
1798	J309	94.50
2392	J405	93.85
2440	J423	94.28
1905	J325	94.30
156	J22	94.18
1792	J307	94.40
1786	J305	94.40
1807	J310	94.40
2752	J530	94.12
1737	J296	94.30
44	J116	93.94
2047	J340	94.11
1391	J256	94.30
163	J29	93.80
217	J78	93.12
2406	J411	93.64
2381	J401	94.04
196	J59	94.03
178	J42	93.95
2257	J373	94.06
2703	J510	93.35
2925	J592	93.99
165	J30	93.67
1735	J295	94.00
2236	J369	94.10
225	J85	93.92
34	J107	93.92
2496	J441	93.37
32	J105	93.82
188	J51	93.64
2607	J476	93.80
2860	J572	92.58
1428	J257	93.64
1431	J258	93.64
60	J130	93.48
2365	J396	93.77
2668	J497	92.58
2353	J391	93.86
160	J26	93.33
2449	J426	93.55
2242	J372	93.83
2239	J371	93.80
78	J147	93.69
187	J50	93.15

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Junction Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
2939	J597	92.93
2426	J418	93.62
1996	J331	93.81
2964	J605	92.40
2691	J505	92.90
2512	J446	92.84
234	J93	93.52
1963	J329	92.36
162	J28	93.34
211	J72	93.28
193	J56	92.45
231	J90	93.27
142	J204	92.57
1460	J263	93.27
2661	J495	92.18
1948	J328	93.16
189	J52	93.13
2870	J576	92.62
76	J145	93.11
2715	J515	92.97
2575	J464	93.25
222	J82	93.09
106	J172	92.09
1592	J283	93.53
204	J66	92.31
238	J97	93.24
201	J63	93.04
2518	J448	92.52
84	J152	93.23
2510	J445	92.49
182	J46	92.42
2750	J529	93.06
2605	J475	93.11
68	J138	92.88
191	J54	92.26
2852	J568	91.85
2027	J338	92.50
235	J94	92.77
109	J175	91.78
195	J58	92.00
2748	J528	92.87
2613	J478	93.12
1589	J282	93.20
28	J101	92.00
89	J157	92.77
80	J149	92.70
87	J155	92.70
1458	J262	92.75
143	J205	91.92
2657	J493	91.68
2856	J570	91.60
2238	J370	92.99
66	J136	92.44

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Junction Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
2008	J335	93.00
2642	J488	91.59
2650	J491	91.58
108	J174	91.56
236	J95	92.47
1313	J253	91.50
1999	J332	93.00
51	J122	92.39
83	J151	92.49
1388	J255	92.86
1167	J244	91.46
171	J36	92.29
215	J76	91.68
111	J177	91.44
2443	J424	92.47
2452	J427	91.67
1456	J261	92.47
2611	J477	92.76
113	J179	91.39
36	J109	91.68
46	J118	92.28
1454	J260	92.45
1783	J304	91.34
1199	J250	91.40
2438	J422	92.41
2868	J575	91.81
72	J141	92.18
1855	J319	92.73
2680	J501	91.79
64	J134	92.14
1180	J247	91.20
1178	J246	91.20
227	J87	92.08
1771	J300	91.10
1698	J291	91.10
1170	J245	91.15
1768	J299	91.09
1195	J249	91.13
200	J62	91.82
1777	J302	91.05
1186	J248	91.10
1636	J288	91.23
192	J55	91.99
1690	J290	91.00
2847	J566	91.00
2424	J417	92.20
2812	J554	91.00
1686	J289	91.00
2840	J564	90.99
2595	J471	92.24
207	J69	91.18
58	J129	91.82
2617	J479	92.37

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Junction Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
1780	J303	90.96
3026	J609	91.86
1721	J294	90.93
1717	J293	90.93
1774	J301	90.92
3121	J612	92.70
1704	J292	90.89
2361	J394	92.11
2011	J336	92.44
2833	J561	90.87
205	J67	91.53
2000	J333	92.50
2933	J595	90.92
2689	J504	91.31
2654	J492	90.86
2844	J565	90.79
112	J178	90.82
2645	J489	90.76
1433	J259	91.68
115	J180	90.73
53	J124	91.59
97	J164	91.43
220	J80	91.66
104	J170	92.65
102	J169	92.62
173	J38	91.49
185	J49	91.39
2866	J574	91.08
86	J154	91.39
2957	J603	90.70
229	J89	91.53
55	J126	91.50
2583	J467	93.60
42	J114	91.43
77	J146	91.35
71	J140	91.29
49	J120	91.41
2798	J548	90.41
38	J110	91.42
79	J148	91.27
2363	J395	91.68
85	J153	91.30
74	J143	91.24
91	J159	91.25
206	J68	91.36
161	J27	91.44
73	J142	91.20
213	J74	91.00
69	J139	91.17
75	J144	91.27
992	J219	91.40
2599	J473	91.62
2686	J503	90.81

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Junction Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
216	J77	91.27
237	J96	91.24
224	J84	91.24
3149	J620	90.24
159	J25	91.32
2592	J470	91.70
226	J86	90.59
2578	J465	93.48
62	J132	91.17
2590	J469	91.51
198	J60	91.11
2455	J428	90.41
223	J83	90.47
212	J73	91.09
2863	J573	90.59
2383	J402	91.04
2960	J604	90.34
232	J91	91.01
951	J218	91.00
98	J165	90.81
228	J88	90.94
82	J150	90.90
2800	J549	89.77
95	J162	90.62
1210	J252	92.50
2919	J591	93.36
2457	J429	90.10
2838	J563	89.73
233	J92	90.09
179	J43	90.62
99	J166	90.42
1598	J284	91.58
2514	J447	90.14
94	J161	90.35
1847	J318	91.25
3158	J623	97.00
2073	J344	90.28
90	J158	90.24
96	J163	90.20
152	J213	89.87
2894	J584	90.33
88	J156	90.18
2785	J543	90.49
2581	J466	92.51
93	J160	90.09
153	J214	89.73
45	J117	89.55
63	J133	89.92
1841	J317	90.92
2815	J555	89.03
3152	J621	89.03
1118	J226	91.20
3141	J618	90.02

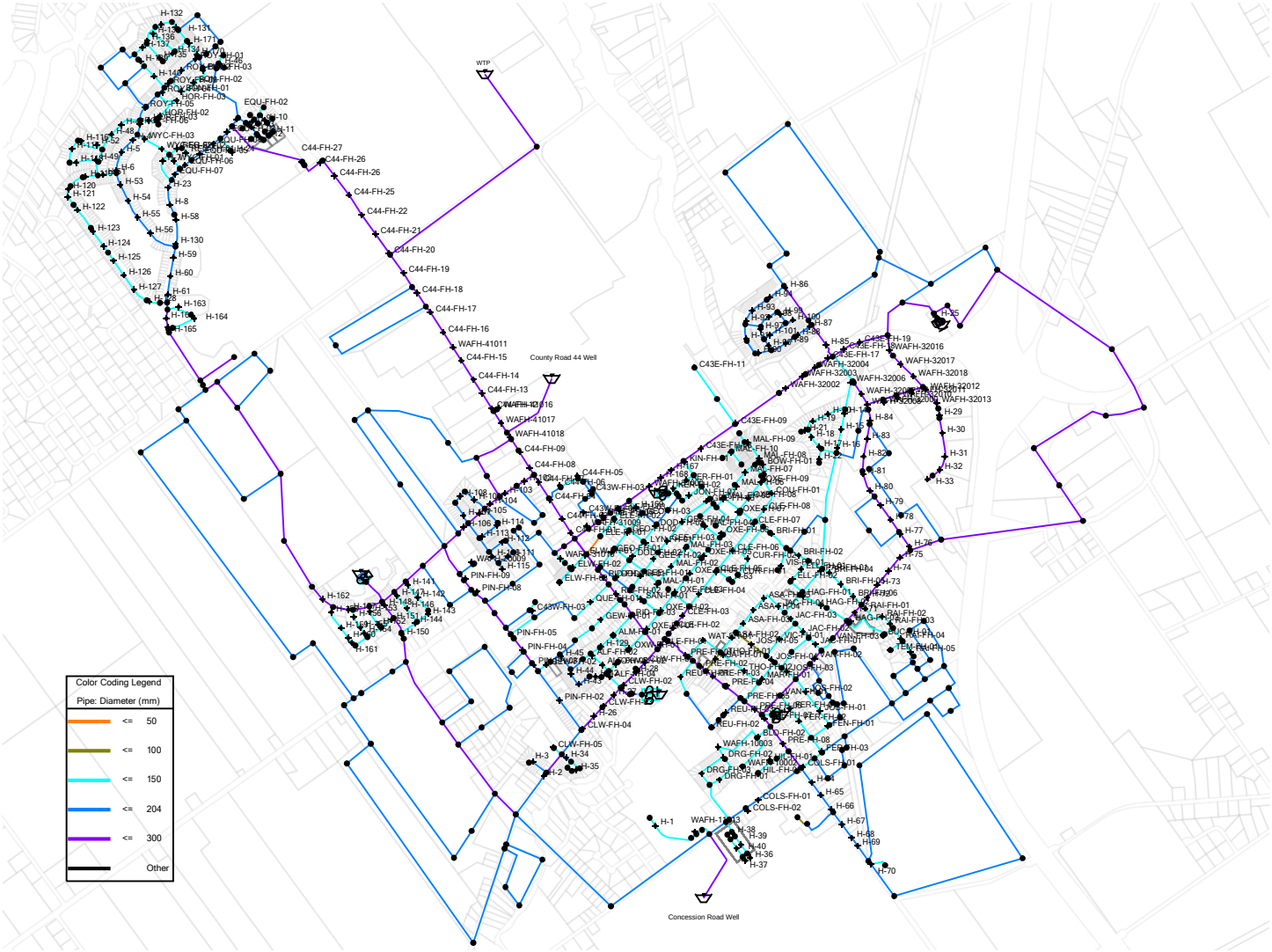
33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Junction Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
2819	J556	89.03
2836	J562	89.03
1837	J316	90.95
1120	J227	91.81
101	J168	89.80
100	J167	89.79
129	J193	91.80
2677	J500	89.46
181	J45	89.79
1831	J315	90.84
1616	J286	89.50
2791	J545	89.80
2415	J414	90.82
1829	J314	90.63
131	J195	90.75
128	J192	90.75
132	J196	90.75
239	J98	88.87
134	J198	90.70
1207	J251	91.18
133	J197	90.60
2802	J550	88.14
57	J128	89.02
2522	J449	90.45
130	J194	90.40
1818	J312	90.33
126	J190	90.30
1526	J276	90.62
1529	J277	90.62
2095	J352	90.40
1123	J228	91.00
1125	J229	91.00
1127	J230	91.00
2089	J350	90.43
2085	J349	90.42
127	J191	90.30
2077	J345	90.39
2420	J416	90.31
124	J189	90.50
1547	J281	90.20
1813	J311	90.21
1110	J225	90.40
2946	J599	90.36
1140	J234	90.90
122	J187	90.50
117	J182	90.40
2093	J351	90.23
116	J181	90.40
1159	J240	90.85
2083	J348	90.23
1138	J233	90.80
1155	J238	90.80
1157	J239	90.80

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Junction Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
1161	J241	90.80
1163	J242	90.80
1165	J243	90.80
2081	J347	90.20
135	J199	90.30
1543	J280	90.07
2079	J346	90.21
1131	J232	90.75
1144	J235	90.75
1150	J237	90.75
1129	J231	90.75
1822	J313	90.00
123	J188	90.20
2804	J551	87.46
1146	J236	90.65
2952	J600	89.89
140	J202	90.00
139	J201	90.00
138	J200	90.00
1531	J278	90.10
1612	J285	88.40
54	J125	88.15
107	J173	87.99
1533	J279	89.90
154	J215	88.27
2532	J451	89.49
2560	J459	89.48
141	J203	90.21
120	J185	90.21
121	J186	90.27
2418	J415	88.79
2543	J455	88.65

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Overall Model Schematic
Hydrant Labels
Build-Out (20+ years)



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Hydrant Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
242	PRE-FH-07	96.98
243	BLO-FH-02	99.64
244	WAFH-10002	98.92
245	WAFH-10003	98.11
246	DRG-FH-01	98.16
247	DRG-FH-02	97.67
248	DRG-FH-03	97.74
249	PRE-FH-08	96.82
250	HIL-FH-01	99.87
251	HIL-FH-02	103.00
252	VAN-FH-01	96.20
253	FER-FH-01	96.81
254	FER-FH-02	97.88
255	FER-FH-03	94.73
256	COLS-FH-01	95.42
257	FEN-FH-01	95.96
258	VAN-FH-02	93.53
259	VAN-FH-03	92.57
260	JAC-FH-01	92.68
261	JAC-FH-02	91.95
262	JAC-FH-03	91.32
263	COLS-FH-01	99.91
264	COLS-FH-02	99.89
265	WAFH-11013	98.48
266	PRE-FH-06	97.48
267	PRE-FH-05	97.18
268	PRE-FH-04	94.11
269	PRE-FH-03	92.79
270	PRE-FH-02	91.77
271	REU-FH-03	96.23
272	REU-FH-02	95.48
273	REU-FH-01	91.33
274	MAR-FH-01	95.51
275	THO-FH-02	93.82
276	THO-FH-01	91.77
277	WAT-FH-01	89.47
278	ASA-FH-01	91.59
279	ASA-FH-02	91.87
280	ASA-FH-03	91.70
281	ASA-FH-04	90.86
282	ASA-FH-05	90.32
283	JAC-FH-04	90.48
284	JOS-FH-05	94.20
285	JOS-FH-04	95.76
286	JOS-FH-03	96.04
287	JOS-FH-02	94.86
288	JOS-FH-01	96.33
289	VIC-FH-01	93.80
290	HAG-FH-01	90.60
291	HAG-FH-02	91.14
292	HAG-FH-03	90.92
293	BUC-FH-01	92.57
294	RAI-FH-04	92.24

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Hydrant Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
295	TEM-FH-01	92.79
296	RAI-FH-05	92.66
297	RAI-FH-03	92.22
298	RAI-FH-02	92.42
299	RAI-FH-01	92.96
300	BRI-FH-06	93.29
301	BRI-FH-05	92.22
302	BRI-FH-04	91.74
303	PAR-FH-01	92.04
304	ELL-FH-02	90.45
305	ELL-FH-01	91.38
306	BRI-FH-02	91.22
307	VIS-FH-01	89.58
308	BRI-FH-01	88.41
309	CUR-FH-02	88.15
310	CUR-FH-01	88.71
311	CLW-FH-03	94.18
312	CLW-FH-04	95.04
313	CLW-FH-05	97.16
314	PIN-FH-02	97.28
315	PIN-FH-03	99.53
316	PIN-FH-04	96.98
317	PIN-FH-05	93.92
318	PIN-FH-08	94.51
319	PIN-FH-09	94.37
320	WAFH-20009	94.05
321	GEW-FH-02	99.74
322	C43W-FH-03	95.37
323	ALF-FH-04	94.10
324	OXW-FH-02	94.27
325	ALF-FH-03	94.96
326	ALF-FH-02	95.58
327	CLW-FH-02	93.25
328	CLW-FH-01	93.85
329	CLE-FH-01	92.73
330	CLE-FH-02	91.42
331	CLE-FH-03	91.20
332	CLE-FH-04	92.42
333	CLE-FH-05	94.30
334	CLE-FH-06	90.59
335	CLE-FH-07	90.00
336	CLE-FH-08	89.60
337	COU-FH-01	90.05
338	PRE-FH-01	89.60
339	OXE-FH-01	92.38
340	SAN-FH-01	92.01
341	OXE-FH-02	91.28
342	OXE-FH-03	91.38
343	OXE-FH-04	92.77
344	OXE-FH-05	96.11
345	OXE-FH-06	91.56
346	OXE-FH-07	90.93
347	OXE-FH-08	91.54

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Hydrant Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
348	OXE-FH-09	90.30
349	BOW-FH-01	90.37
350	KER-FH-02	91.65
351	KER-FH-01	91.24
352	JON-FH-01	91.23
353	KIN-FH-01	91.37
354	MAL-FH-05	91.12
355	MAL-FH-06	91.74
356	MAL-FH-07	90.63
357	MAL-FH-08	90.21
358	MAL-FH-09	89.90
359	MAL-FH-10	90.40
360	WAFH-31000	91.28
361	C43W-FH-03	93.42
362	C43W-FH-02	93.94
363	C44-FH-05	93.06
364	C44-FH-06	93.13
365	C44-FH-04	93.95
366	C44-FH-02	94.14
367	C44-FH-01	95.41
368	C43E-FH-06	93.84
369	WAFH-31009	96.04
370	WAFH-31010	96.17
371	ELW-FH-03	99.15
372	ELW-FH-02	98.31
373	ELW-FH-01	98.06
374	ELE-FH-03	91.81
375	ELE-FH-02	91.85
376	LYN-FH-01	90.88
377	ELE-FH-01	94.86
378	RID-FH-01	93.63
379	QUE-FH-01	95.12
380	RID-FH-02	93.16
381	GEW-FH-01	93.73
382	RID-FH-03	93.21
383	ALM-FH-01	94.15
384	OXW-FH-01	93.81
385	GEO-FH-01	94.68
386	GEO-FH-02	91.35
387	DOD-FH-01	92.68
388	DOD-FH-02	91.21
389	DOD-FH-03	91.14
390	GEO-FH-03	90.88
391	GEE-FH-01	90.85
392	GEE-FH-02	91.42
393	GEE-FH-03	91.79
394	GEE-FH-04	91.74
395	GEE-FH-05	91.10
396	MAL-FH-01	90.85
397	MAL-FH-02	91.30
398	MAL-FH-03	92.07
399	MAL-FH-04	94.02
400	C43E-FH-08	90.76

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Hydrant Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
401	C43E-FH-09	89.79
402	WAFH-32002	90.43
403	WAFH-32003	90.64
404	WAFH-32004	90.88
405	C43E-FH-17	91.01
406	WAFH-32006	91.12
407	WAFH-32007	91.54
408	WAFH-32008	91.62
409	WAFH-32009	92.45
410	WAFH-32010	92.34
411	WAFH-32011	92.50
412	WAFH-32012	92.32
413	WAFH-32013	92.81
414	C43E-FH-18	90.92
415	C43E-FH-19	91.39
416	WAFH-32016	92.01
417	WAFH-32017	91.99
418	WAFH-32018	92.28
419	EQU-FH-02	91.85
420	BON-FH-03	90.37
421	BON-FH-02	91.08
422	BON-FH-01	91.46
423	ROY-FH-01	89.96
424	ROY-FH-02	90.41
425	ROY-FH-03	90.73
426	HOR-FH-03	90.98
427	HOR-FH-02	90.78
428	HOR-FH-03	90.78
429	ROY-FH-04	90.65
430	ROY-FH-05	90.84
431	ROY-FH-06	90.41
432	WYC-FH-03	90.21
433	WYC-FH-02	90.23
434	REG-FH-02	90.59
435	REG-FH-01	90.52
436	WYC-FH-01	90.27
437	EQU-FH-06	90.39
438	EQU-FH-05	90.61
439	EQU-FH-04	90.81
440	EQU-FH-03	91.34
441	C44-FH-27	90.21
442	C44-FH-26	90.27
443	C44-FH-26	91.07
444	C44-FH-25	90.81
445	C44-FH-22	91.19
446	C44-FH-21	91.52
447	C44-FH-20	93.29
448	C44-FH-19	94.26
449	C44-FH-18	93.13
450	C44-FH-17	93.88
451	C44-FH-16	93.03
452	WAFH-41011	92.54
453	C44-FH-15	92.12

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Hydrant Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
454	C44-FH-14	92.35
455	C44-FH-13	92.01
456	C44-FH-12	92.37
457	WAFH-41016	92.01
458	WAFH-41017	93.09
459	WAFH-41018	92.50
460	C44-FH-09	92.43
461	C43E-FH-11	89.95
462	C44-FH-08	92.64
463	C44-FH-07	93.09
464	EQU-FH-07	90.40
1087	H-1	98.50
1093	H-2	95.25
1095	H-3	98.45
1101	H-4	90.84
1104	H-5	90.54
1107	H-6	90.39
1112	H-7	90.30
1116	H-8	91.21
1133	H-9	90.77
1136	H-10	90.83
1142	H-11	90.89
1148	H-12	90.55
1152	H-13	90.98
1172	H-14	91.22
1174	H-15	90.78
1176	H-16	91.20
1182	H-17	91.30
1184	H-18	91.03
1188	H-19	91.25
1190	H-20	91.40
1193	H-21	91.18
1197	H-22	91.45
1201	H-23	90.74
1212	H-24	92.81
1311	H-25	91.00
1419	H-26	94.55
1422	H-27	93.69
1425	H-28	93.59
1446	H-29	94.10
1447	H-30	95.98
1448	H-31	96.07
1449	H-32	96.36
1450	H-33	95.55
1464	H-34	93.00
1465	H-35	92.20
1489	H-36	97.72
1490	H-37	97.72
1491	H-38	97.72
1494	H-39	97.72
1497	H-40	97.72
1516	H-42	94.83
1519	H-43	95.33

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Hydrant Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
1520	H-44	96.18
1523	H-45	97.47
1538	H-46	90.35
1553	H-47	90.97
1554	H-48	90.63
1555	H-49	90.23
1557	H-51	90.17
1561	H-52	90.29
1566	H-53	90.75
1567	H-54	92.12
1577	H-55	92.10
1578	H-56	91.66
1580	H-58	91.60
1594	H-59	91.72
1595	H-60	92.50
1596	H-61	93.53
1614	H-63	88.87
1620	H-64	96.42
1622	H-65	97.56
1624	H-66	97.56
1626	H-67	96.77
1628	H-68	96.62
1630	H-69	97.26
1632	H-70	97.36
1639	H-71	92.09
1642	H-72	93.11
1645	H-73	93.09
1648	H-74	93.21
1651	H-75	93.40
1654	H-76	94.19
1657	H-77	93.59
1660	H-78	93.03
1663	H-79	92.60
1666	H-80	92.56
1669	H-81	92.43
1672	H-82	92.01
1675	H-83	91.84
1678	H-84	91.52
1685	H-85	89.40
1688	H-86	91.00
1692	H-87	91.07
1694	H-88	91.09
1696	H-89	91.10
1700	H-90	91.10
1702	H-91	90.92
1706	H-92	90.89
1708	H-93	90.94
1710	H-94	91.34
1715	H-96	91.07
1719	H-97	90.93
1727	H-98	91.05
1728	H-99	91.05
1729	H-100	90.96

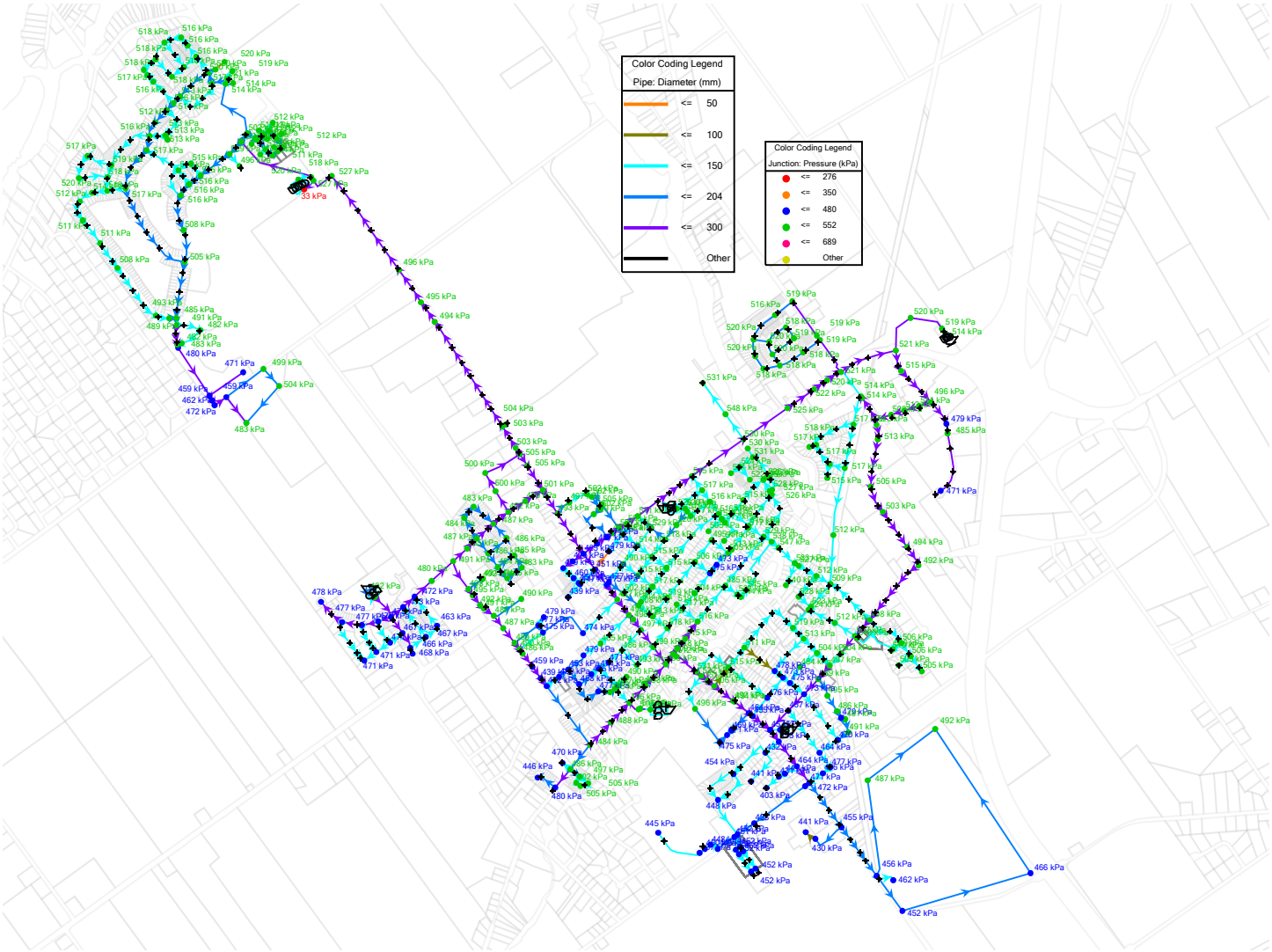
33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Hydrant Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
1731	H-101	90.93
1740	H-102	92.93
1743	H-103	93.42
1746	H-104	94.59
1749	H-105	94.62
1752	H-106	94.80
1755	H-107	94.52
1757	H-108	94.57
1759	H-109	94.63
1790	H-110	94.63
1794	H-111	95.05
1800	H-112	94.79
1803	H-113	94.38
1805	H-114	94.68
1812	H-115	94.06
1816	H-116	90.33
1820	H-117	90.10
1824	H-118	90.34
1827	H-119	90.63
1833	H-120	90.84
1835	H-121	90.85
1839	H-122	91.00
1843	H-123	90.92
1845	H-124	91.10
1849	H-125	91.43
1851	H-126	91.42
1853	H-127	91.68
1857	H-128	92.73
1868	H-129	95.91
1871	H-130	91.58
2126	H-131	90.35
2129	H-132	90.05
2132	H-133	90.39
2135	H-134	90.36
2138	H-135	90.27
2141	H-136	89.93
2144	H-137	90.14
2148	H-139	90.39
2151	H-140	90.62
2172	H-141	95.59
2175	H-142	96.41
2178	H-143	96.92
2181	H-144	96.54
2185	H-146	95.99
2188	H-147	95.81
2191	H-148	95.70
2197	H-150	96.55
2200	H-151	96.43
2203	H-152	95.83
2206	H-153	95.30
2209	H-154	96.09
2212	H-155	95.63
2215	H-156	95.42

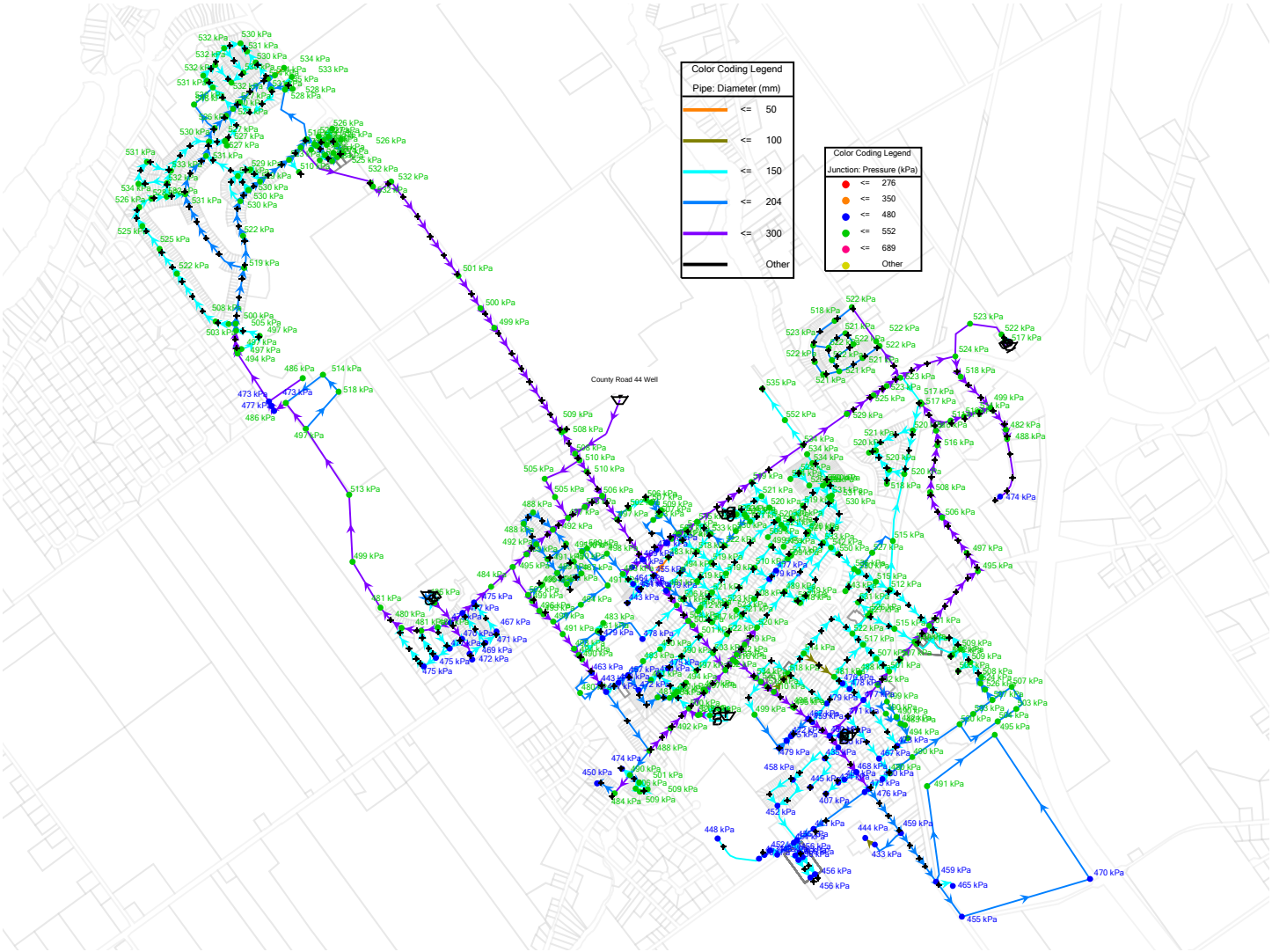
33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Hydrant Elevations
Build-Out (20+ years)

ID	Label	Elevation (m)
2218	H-157	95.87
2221	H-158	95.43
2224	H-159	95.62
2227	H-160	95.89
2230	H-161	96.29
2233	H-162	95.63
2245	H-163	93.48
2248	H-164	94.15
2251	H-165	93.77
2254	H-166	93.49
3019	H-167	91.38
3022	H-168	91.33
3031	H-169	89.48
3032	H-170	90.42
3035	H-171	90.42

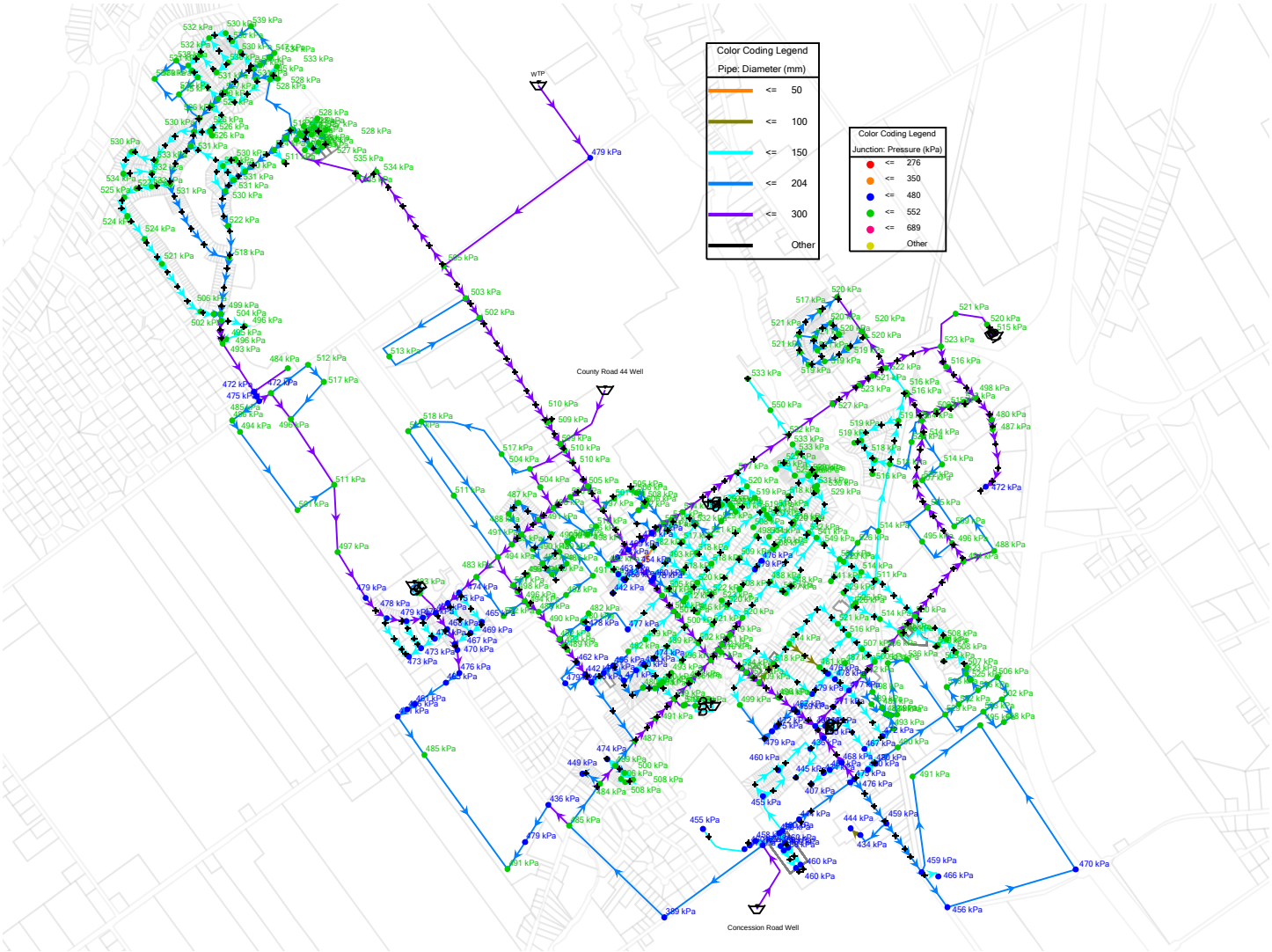
33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Average Day Demand
Short-Term (0-5 years)



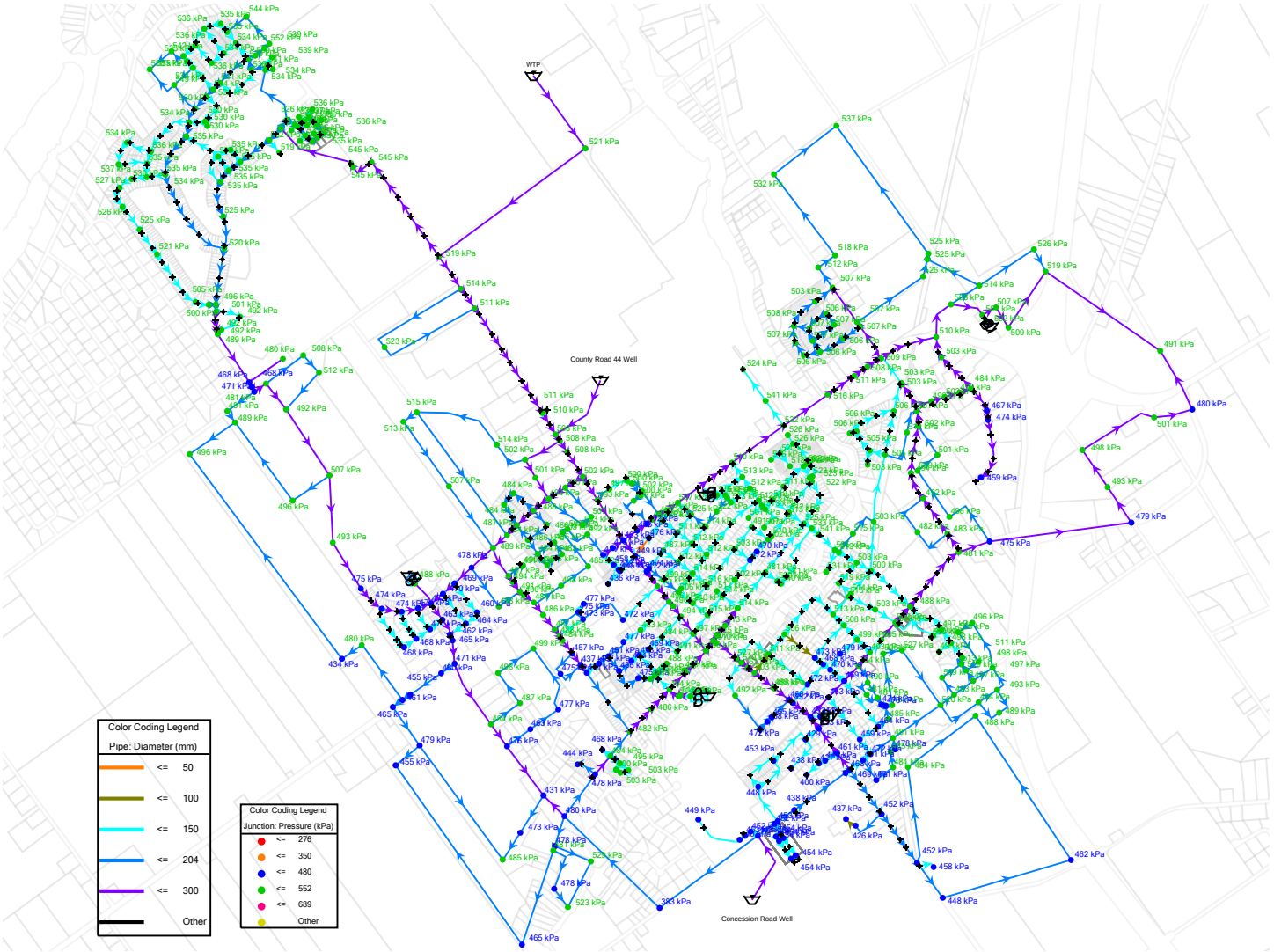
33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Average Day Demand
Mid-Term (5-10 years)



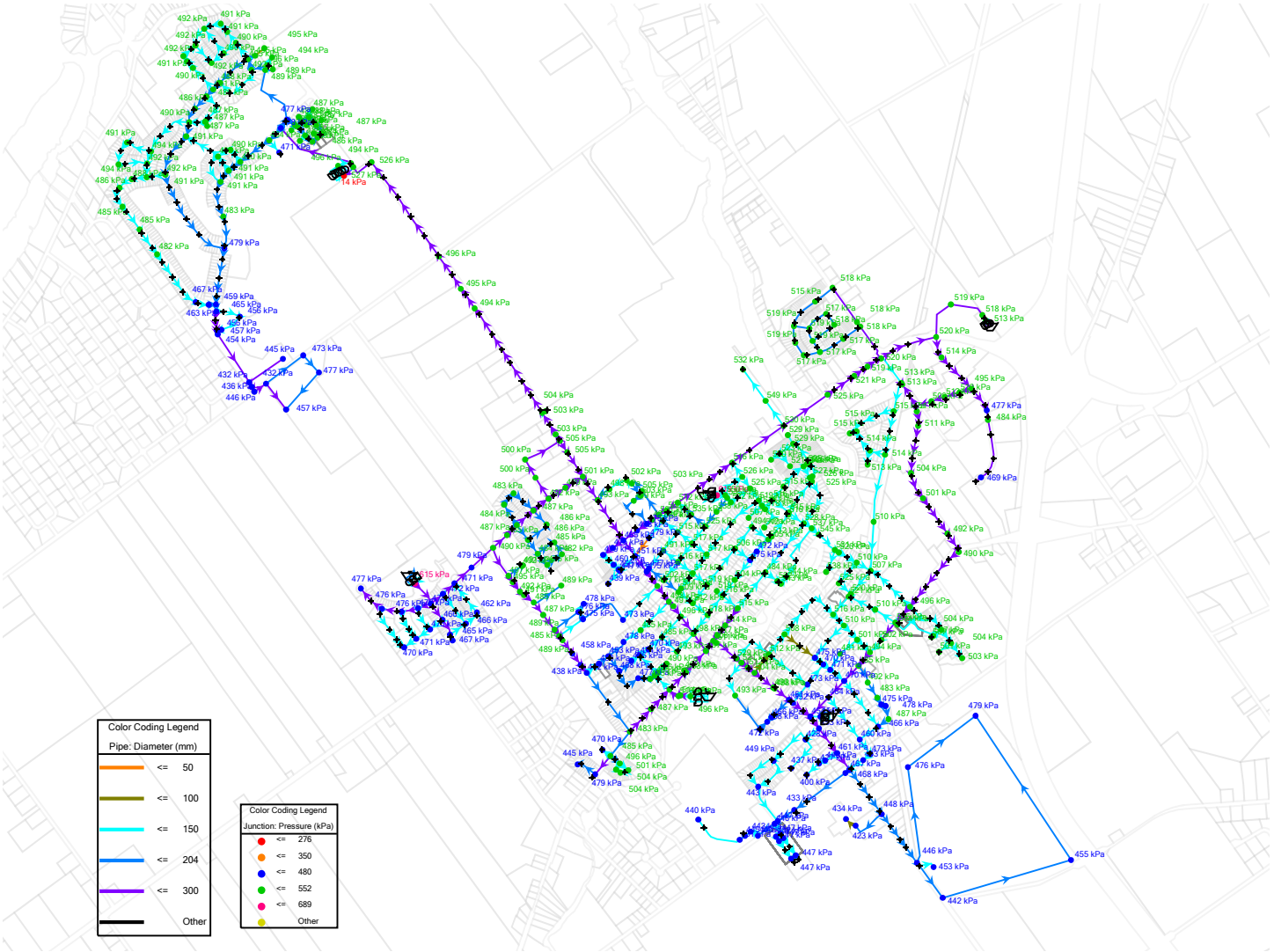
33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Average Day Demand
Long-Term (10-20 years)



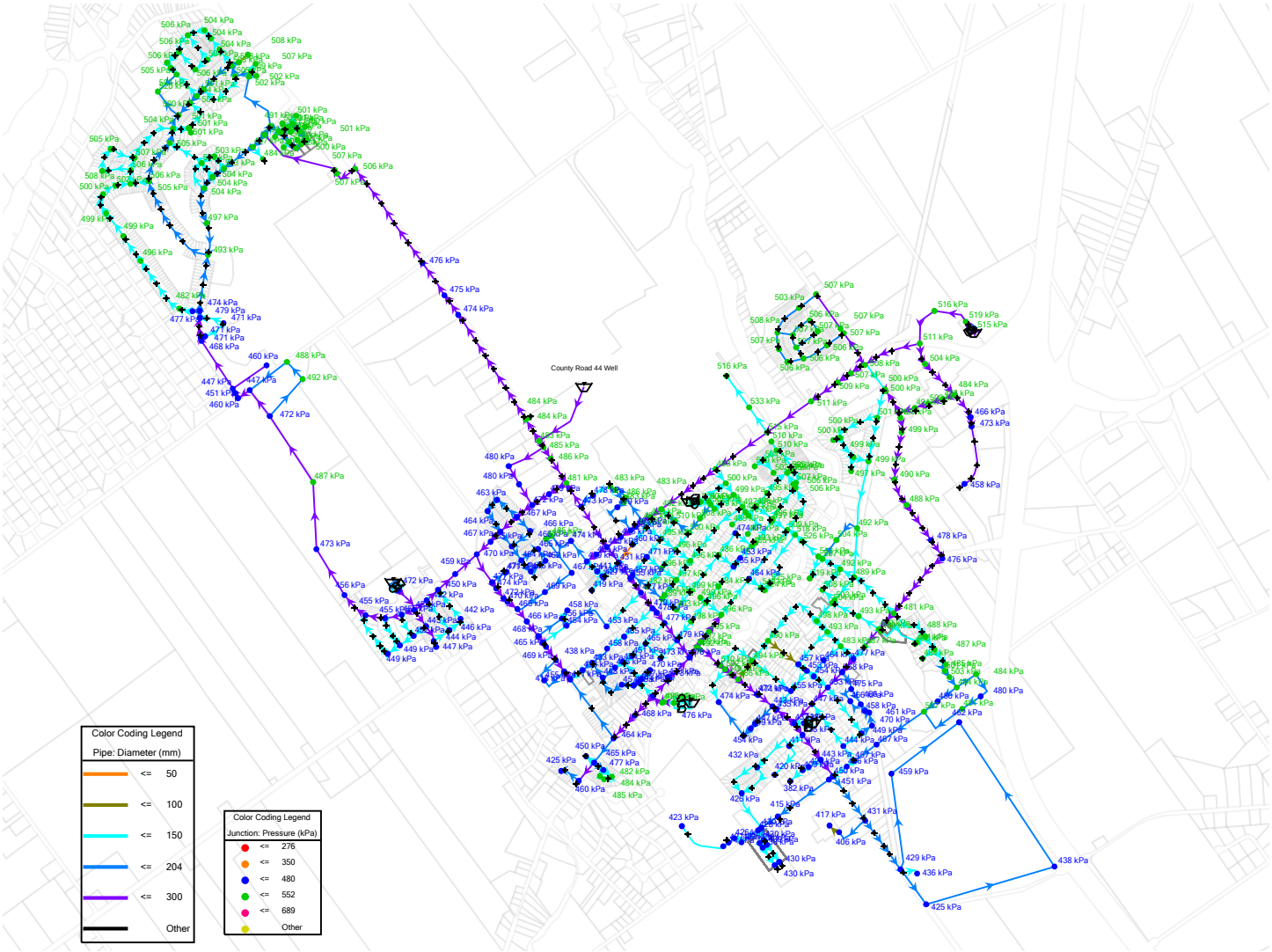
33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Average Day Demand
Build-Out (20+ years)



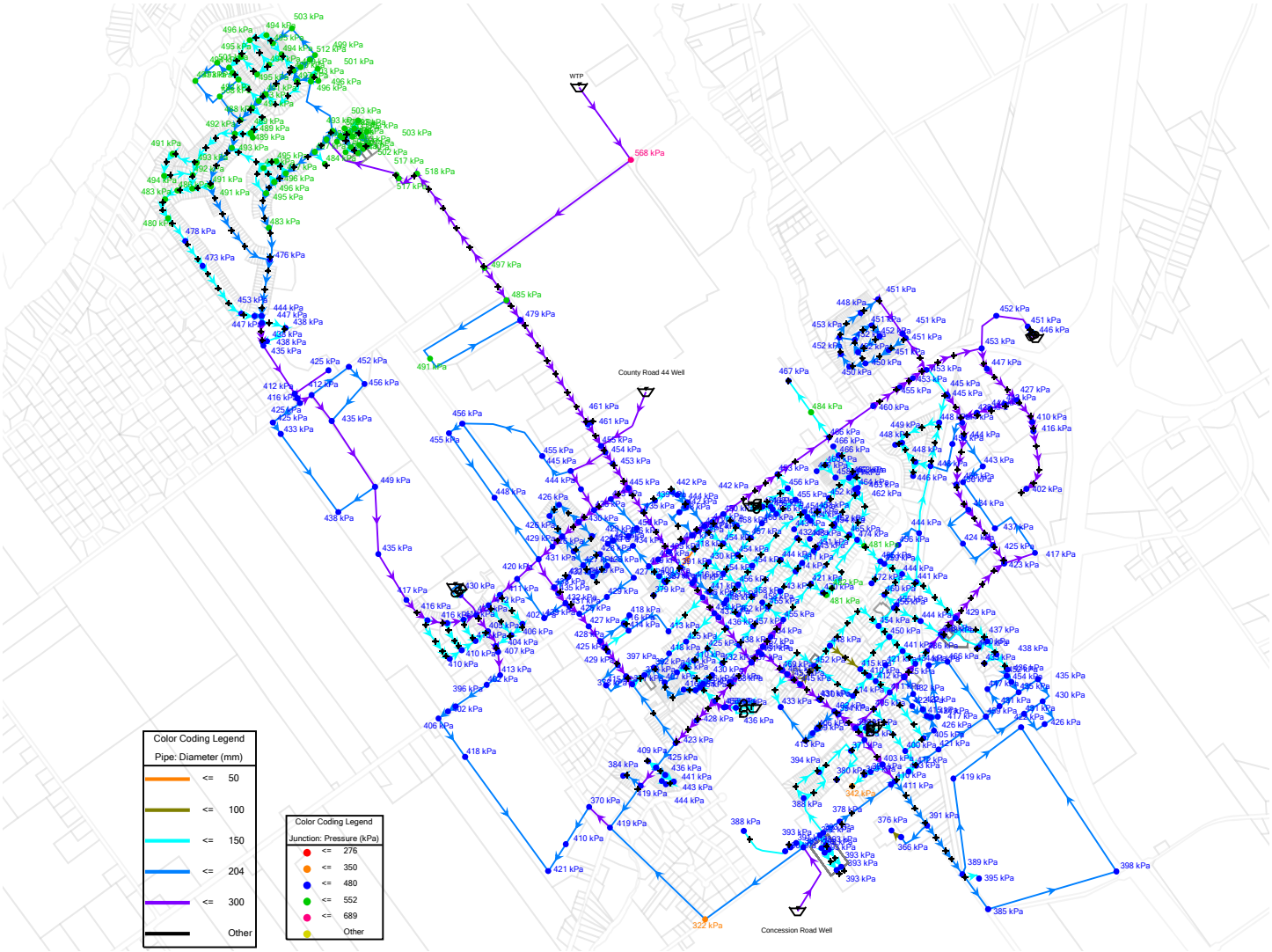
33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Peak Hour Demand
Short-Term (0-5 years)



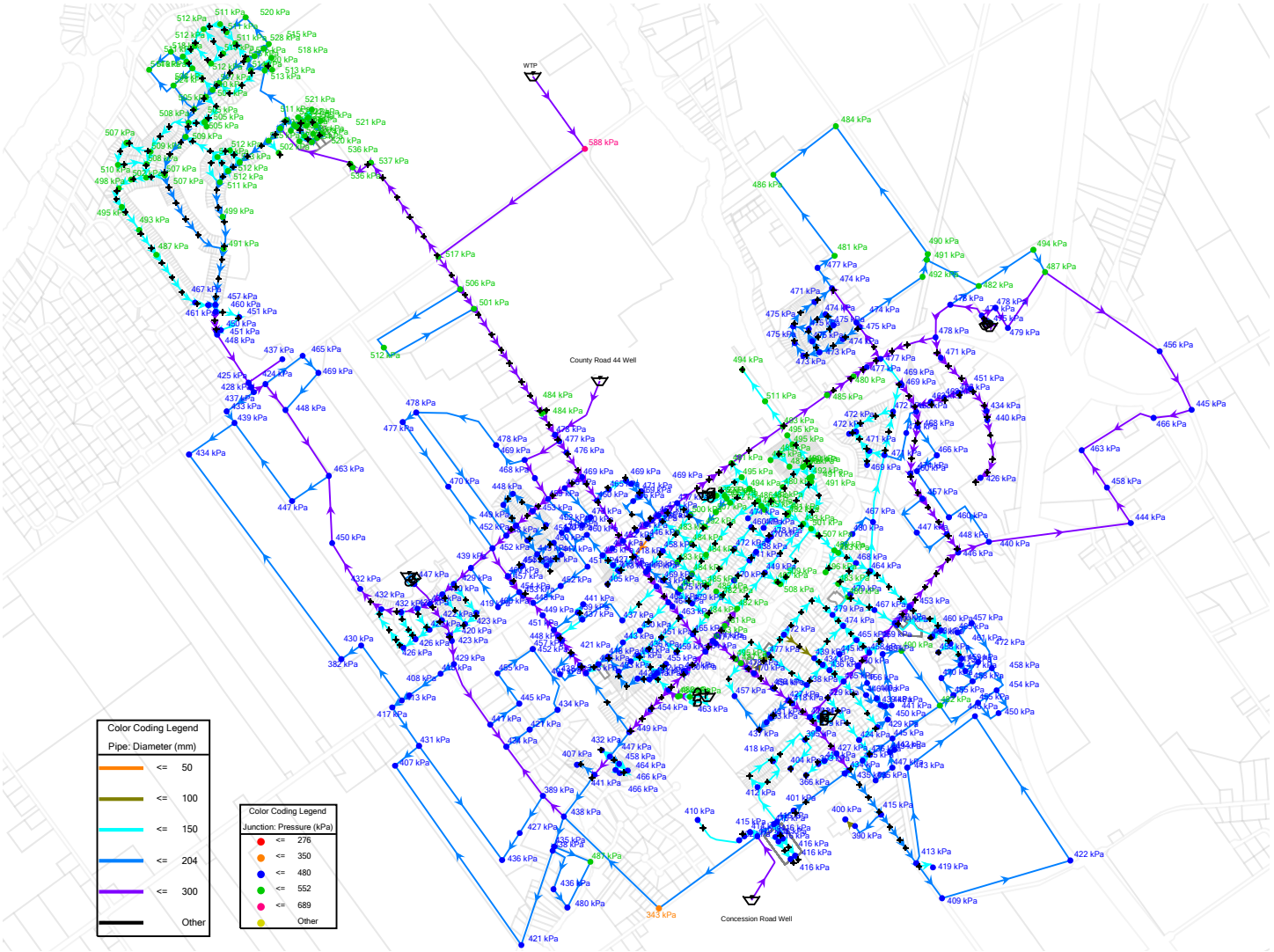
33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Peak Hour Demand
Mid-Term (5-10 years)



33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Peak Hour Demand
Long-Term (10-20 years)

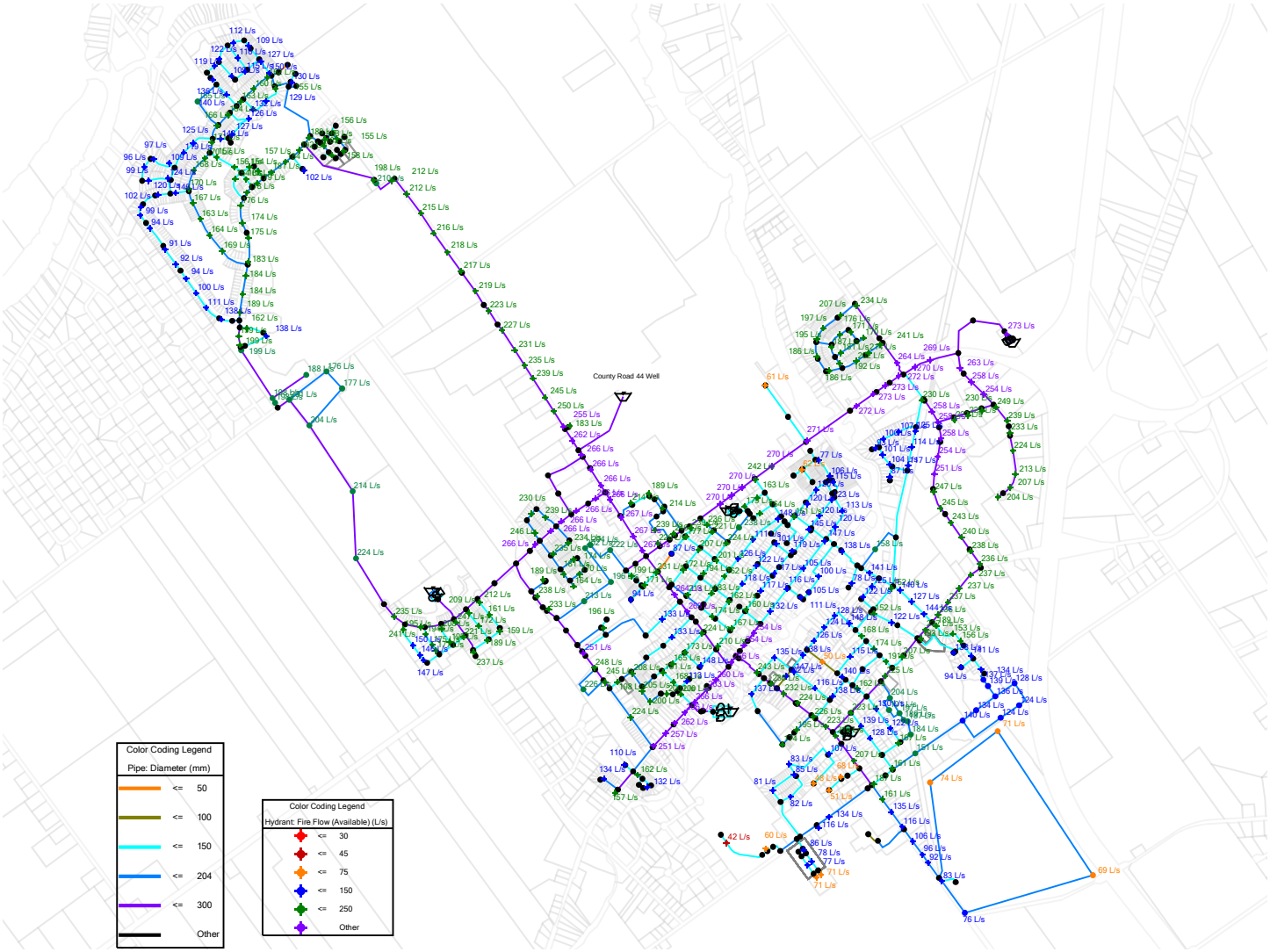


33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Peak Hour Demand
Build-Out (20+ years)

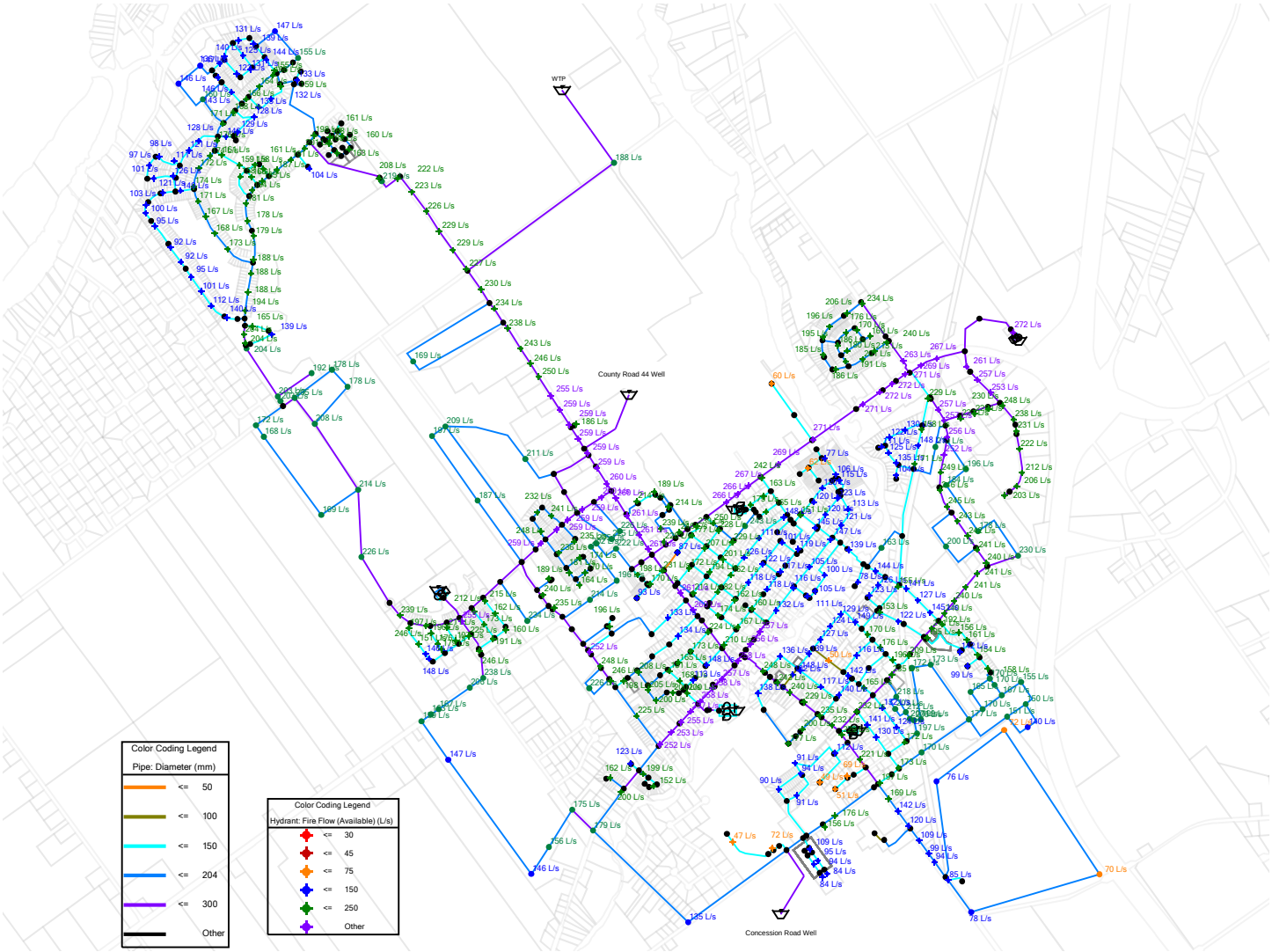


33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Maximum Day + Fire Flow
Short-Term (0-5 years)

33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Maximum Day + Fire Flow
Mid-Term (5-10 years)



33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Maximum Day + Fire Flow
Long-Term (10-20 years)



33023-000 - North Grenville - Master Plan - Water Model - Phase 2
Maximum Day + Fire Flow
Build-Out (20+ years)