FUNCTIONAL SERVICING REPORT
CORK AND VINE COMMUNITY

Revised

November 24, 2025

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1. Background

Kaitlin Corp. engaged Jewell Engineering Inc. (Jewell) to complete a functional servicing study to review the feasibility of a mixed density development in the northeast portion of Wellington, Ontario. The parcels to be developed are located north of the Millennium Trail between Belleville Street and Consecon Street with a small phase to be constructed east of Belleville Street. The proposed subdivision layout is shown in Appendix A.

Previously, the development was proceeding as two separate developments, Country Club Estates (CCE) and Fields of Wellington (FOW). The two developments have joined into one and is now known as the Cork and Vine Community. In the subdivision plan, shown in Appendix A, Phase A to the east refers to formerly known CCE while Phase B to the west refers to formerly known FOW. The two previously independent developments will be constructed concurrently.

Figure 1-1: Subject Property Location

This report outlines servicing the proposed development with municipal water and sanitary. Stormwater management and traffic considerations are discussed under separate covers.

This revision of the servicing report is issued to update the servicing needs in response to proposed increased density.

1.1 Site Description

The proposed Cork and Vine Community is approximately 118.9 hectares (ha) in area. The surrounding land uses are primarily residential to the south with small portion of environmentally protected lands to the east.

The subdivision abuts the Millennium Trail to the south, residential lots and Consecon Street to the west, and Belleville Street and agricultural lands to the east. Lands abutting the north of the subdivision are in agricultural use. A small portion of environmentally protected land is in the southeast portion of the subdivision.

Lane Creek flows southwesterly from the northeast through the subdivision lands towards the village through a crossing at Millennium Trail. The site is gently graded towards the south draining and the lands drain to Lane Creek.

The site will have access points from both Consecon Street and Belleville Street. Phase 3A east lands east of Belleville Street will have two road access points from Belleville Street.

The entirety of the subject lands are undeveloped vacant fields.

1.2 Proposed Development

The subdivision is proposed to be a mix of residential and commercial units. There will be new municipal roads throughout the subdivision with access to Belleville Street and Concession Street. A golf course with hotel accommodations is proposed as part of Phase 4 in the northern portion of the development (Appendix A).

The development will be serviced with municipal water and sanitary services as well as storm sewers. The municipal and private infrastructure is designed to specifications set out by the Ministry of Environment (MOE), the Ontario Building Code (OBC) and the Fire Underwriters Survey (FUS).

1.2.1 Population

Population estimates for CCE are based on the concept plan prepared by Weston Consulting located in Appendix A while the FOW population estimates are based on those reported in the sanitary design sheet within the functional servicing report prepared by Forefront Engineering in June 2022. The persons per unit were retrieved the MSP. The calculations are summarized in Table 1-1 below.

Table 1-1: Population Calculations Derived from Dwelling Unit Types

	Unit	# of Units	Pop/Unit	Population
Country Club Estates (CCE)	Singles	533	2.5	1,333
	Townhouses	412	2.28	939
	Apartments	1,181	1.79	2,114
	CCE Total Population			**4,386**
Fields of Wellington (FOW)	Singles	374	2.5	935
	Townhouses	229	2.28	522
	Apartments	200	1.79	358
	FOW Total Population			**1,815**
CCE + FOW	***Total Population***			***6,201***

RV Anderson prepared the Wellington MSP using population projections from the proposed developments to recommend municipal collection system and treatment facility upgrades. RV Anderson considered a population of 1,075 from CCE and 1,008 from FOW for a total of 2,083 persons. Since this time, the developers are proposing an increase in units for both developments to 4,386 in CCE and 1,815 persons in FOW for a total of 6,201 persons.

Table 1-2: Proposed Population as compared to Master Servicing Plan

Population	Country Club Estates	Fields of Wellington	Total
RV Anderson Master Servicing Plan (2021)	1,075	1,008	**2,083**
Cork and Vine Community (2025)	4,386	1,815	**6,201**
Difference	3,311	807	**4,118**

2. Water Distribution System

2.1 Existing Conditions

PEC has been upgrading water servicing in Wellington and have installed new works since the original issuance of this servicing report. The 500 mm trunk line has been installed from the water treatment plant to the Millennium Trail / Belleville Street intersection. The route follows Main Street from the plant to Cleminson to the Trail to Belleville Street. Along Belleville Street the main drops to a 400mm size to feed the elevated storage tank. Remaining segments of 200 mm main remains along Belleville Street to Main Street and on Consecon Street. The 200 mm watermain on Consecon Street terminates approximately 90 m from the proposed development

The new development will make connections to the water service at several points.

Phase 1 will connect to the new 500 mm main on Millennium Trail at Walker Street. Further connections will also be made to Belleville Street and Consecon Street and a second connection to the 500 mm main on Millennium Trail as future phases are constructed.

2.2 Design Criteria

The watermain design criteria used are based on MOE, OBC, and Wellington Master Servicing Plan guidelines and are summarized below:

- Minimum Watermain Diameter Size: 200 mm
- Average Residential Daily Domestic Demand per WMSP: 320 L/d*cap
- Commercial Demand: 35 m^3/d*ha
- Maximum Day plus Fire Flow Demand Pressure Minimum: 20 psi
- Peak Hour Demand Pressure Minimum: 50 psi
- Peak Hour Demand Pressure Maximum: 80 psi
- Maximum Pressure: 100 psi

2.3 Fire Flow

The required fire flow for the subdivision was determined using the Fire Underwriters Survey (FUS) method. The FUS guidelines direct designers to a table outlined in Note J of the guideline to determine fire flow requirements for residential dwellings. The document states for contiguous dwellings not exceeding 2 stories, a minimum of 8,000 L/min fire flow is required (133.33 L/s).

The Wellington Master Servicing Plan (MSP) completed by RV Anderson in 2021 recommends that a fire flow of 179 L/s be used for the full buildout of Wellington based on recommended fire flows outlined in the 2008 MOE guidelines per population size. Jewell has modeled a fire flow of 179 L/s for a population of about 8,000.

2.4 Proposed Conditions

Phase 1A and 1B will connect to the 500 mm watermain on the Millennium Trail at the proposed Walker Street and north of West Street respectively. Further phases of the development will rely on the extension of the 400 mm watermain on Belleville Street and connection will be made as part of Phase 2 at Walker Street.

The subdivision watermain will range in size from 150 mm to 300 mm PVC and will have the following connections to the existing system:

- Millennium Trail at Walker Street and Consecon Street
- Street D at Belleville Street and Consecon Street
- Consecon Street during Phase 2B
- Belleville Street during Phase 2A

Phase 1A and 1B will only rely on connection to the 500 mm main on Millennium Trail and will not require connection to Belleville Street or Consecon Street. These connections will be made in Phases 2 and 3 of the development.

2.5 Watermain Design

Jewell received and utilized the Wellington Water Model prepared by RV Anderson as part of their MSP for the Village of Wellington. RV Anderson included the proposed subdivision the original model that showed sufficient pressures and flows would be available. However, a new concept plan proposed by Kaitlin includes an increase population density. Jewell received the RV Anderson model and tested the increased demand. Jewell exported the model and used EPANET 2.2 to update the Wellington model to reflect the proposed subdivision densification.

2.5.1 Residential Water Demand

The residential base demand of the Cork and Vine Community was calculated using per capita flow rates and population densities outlined in the MSP and are shown in Table 2-1, Table 2-2, and Table 2-3. At the time this report was prepared, a concept model showing an increased number of units was utilized ultimately generating a greater demand. These calculations represent a conservative approximation of the water demands to be experienced in association with the construction of the development.

Table 2-1: Base Water Demand – Single Detached

Type	Single Family	
# of Units	907	
Population/Unit	2.5	
Population	2,267.5	
Capita Usage	320	L/cap*d
Average Demand	725,600	L/d

Table 2-2: Base Water Demand – Townhomes

Type	Townhouse	
# of Units	641	
Population/Unit	2.28	
Population	1,461.48	
Capita Usage	320	L/cap*d
Average Demand	467,674	L/d

Table 2-3: Base Water Demand – Apartments

Type	Apartment	
# of Units	1,381	
Population/Unit	1.79	
Population	2,471.99	
Capita Usage	320	L/cap*d
Average Demand	791,037	L/d

The total average residential water demand is 1,984,311 L/d (23 L/s).

2.5.2 Commercial Water Demand

The proposed development has the following commercial development plans within the CCE lands:

- Three mixed use blocks with commercial developments and residential apartments
- Phase 2A commercial block
- Phase 4 golf course with hotel accommodations

Due to a lack of historical commercial water usage data in the Wellington community, the MSP recommends commercial demands be modeled using a design flow rate of 35 m^3/d*ha. This flow rate equates to approximately 0.41 L/s*ha. The commercial demands have been approximated using this flow rate for the proposed commercial developments in Phases 1-3.

Table 2-4: Commercial Demand – Phases 1-3 CCE

Type	**Commercial**	
Area (ha)	6.90	
Flow Rate	0.41	L/s*ha
Average Demand	2.8	L/s

Water demand was calculated for the Phase 4 golf course and hotel accommodations using Table 8.2.1.3. of the Ontario Building Code and are shown below. Water demands for the clubhouse were approximated based on estimated restaurant, staff, and golf course capacity.

Table 2-5: Commercial Demands – Phase 4 CCE

Location	L/Unit	# of Units	Units	Demand (L/d)	
Hotel*	250	50	rooms	12,500	
Golf Course	40	350	patrons	14,000	
Staff	50	15	employees	750	
Restaurant	350	125	seats	43,750	
Total Demand				**71,000**	L/d
				1.5	L/s
***All operations considered to be over a 12hr day except for the hotel**					

The total average commercial water demand for the proposed development is 4.3 L/s.

2.5.3 Peak Demands

Peak factors were retrieved from the MSP and were applied appropriately to analyze the network under peak hour and max day + fire flow conditions. The peak factors are shown in the table below:

Table 2-6: Peak Factors per Wellington MSP

Demand Scenario	Peaking Factor
Average	1.00
Max Day (Residential)	2.00
Max Day (Commercial)	3.00
Peak Hour	3.38

The three demand scenarios reviewed were modeled in the EPANET 2.2 water model using the following demands:

Table 2-7: Cork and Vine Community Water Demands (L/s)

Condition	Total Demand
Average Demand	27.3
Max Day + Fire Flow	237.9
Peak Hour	92.3

To model peak demand scenarios in the EPAnet model, Jewell distributed the base demand amongst the nodes that represent the Cork and Vine Community and applied the peak factors accordingly across the entire network.

2.6 Water Modeling

Jewell ran the model under average operating conditions, max day + fire flow, and peak hour. Demand was distributed amongst all nodes for the original CCE and FOW lands to illustrate

representative demand requirements for the proposed Cork and Vine Community. Fire flows were applied at the Phase 4 commercial development (Node: KAITLIN_2) as this represents the worst-case scenario for the water network.

The modelling results are summarized below in Table 2-8. A schematic of the water network is also included in Appendix B.

Table 2-8: EPAnet Results Summary

Demand Scenario	Demand (L/s)	Min. Pressure (psi)	Max. Pressure (psi)
Average Demand	27.3	57.0	68.8
Max Day + Fire Flow	237.9	54.9	71.5
Peak Hour	92.3	57.5	69.4

The new treatment plant includes three new pumps. The new pumps are found in the model and Jewell associated the NEW pump curves to the pumps. The elevated storage tank has an elevation of 126m assigned with a minimum water level of 5.5m and a maximum water level of 12.5m. Jewell added a control to the model to activate each of the three pumps as needed for the scenarios.

Model conditions applied per scenario:

1. **Average**
    a. 1 pump running on “NEW” pump curve
    b. Tower level at 6m and actively filling
    c. Average demands
2. **Max Day + Fire Flow**
    a. 2 pumps running on “NEW” pump curve
    b. Tower full and providing pressure
    c. Max day peaking factors (res = 2.00, com = 3.00)
3. **Peak Hour**
    a. 1 pump running on “NEW” pump curve
    b. Tower full and providing pressure
    c. Peak hour peaking factor (3.38)

Average Demand, Max Day + Fire Flow, and Peak Hour scenarios were found to meet minimum requirements for flow and pressure as outlined in the 2008 MOE guidelines. This demonstrates that the municipal system is capable of providing supply for the increased population while maintaining adequate system pressures.

It is noted that we are not aware of the municipality’s detailed operating plan for the plant and the tower and the simulations we completed as part of this servicing report are useful to demonstrate that the system can supply the development.

3. Sanitary Sewer System

3.1 Existing Conditions

Presently the lands are unserviced. New 525 mm sanitary sewers have been installed as part of the MSP on Millennium Trail. This includes two new stubs on Millennium Trail for future connections on Walker Street (former Country Club Estates side) and West Street (former Fields of Wellington side).

3.2 Cork and Vine Sanitary Sewer Design

The sanitary design criteria used are based on MOE guidelines as well as the design guidance outlined within the MSP.

- Minimum Sanitary Sewer Diameter Size — 200 mm
- Average Daily Residential Domestic Flows: (per agreement with Prince Edward County, Appendix F) — 350 L/d*cap
- Domestic Peaking Factor: — Harmon
- Extraneous Flow Allowance: — 1.27 m^3/d*ha
- Average Commercial Flows: — 35 m^3/d*ha
- Commercial Peaking Factor: — 2.0
- Minimum Full Flow Velocity: — 0.6 m/s
- Maximum Full Flow Velocity: — 3.0 m/s
- Population Factors:
    - Single detached unit: — 2.5 per unit
    - Townhouse unit: — 2.28 per unit
    - Apartment Unit: — 1.79 per unit

There are two proposed sanitary connection locations for the subdivision, both will be made to the trunk sewer along the Millennium Trail. The connections will be made at the southern portion of Phase 1A (Walker Street) and the southern portion of Phase 1B (West Street).

The community will be serviced with DR35 PVC sanitary sewers ranging from 200 mm to 375 mm in diameter. Residential sanitary laterals will be 125 mm DR28 PVC sewers while the commercial blocks and the Phase 4 lands will be serviced with a 200 mm DR35 PVC connection. A sanitary sewer design sheet is shown in Appendix C.

3.3 Downstream System Capacity

The capacity of the Wellington sanitary system was reviewed as part of the MSP. The conclusion of the study requires to upgrade the sanitary conveyance and treatment facilities to accommodate proposed developments.

The proposed upgrades to the system outlined in the MSP included:

- Installation of a 450 mm DR35 PVC trunk sewer along the Millennium Trail (*525mm sewers were installed*)
- Expansion of the Wellington Wastewater Treatment Plant
- Upsizing of existing sewers on Main Street

Since the publication of the RV Anderson report, a revised layout of the Cork and Vine Community has been prepared that includes an increase in residential units as discussed in Section 1.2. Jewell reviewed the capacity of the 525 mm trunk sewer along the Millennium Trail to ensure capacity was available to accommodate the proposed increase in population. The trunk has a capacity of 192.3 L/s. The proposed sewage flows from full buildout of the Cork and Vine Community is anticipated to be 71.8 L/s. This represents approximately 46% of the trunk sewer capacity (Appendix C)

The trunk sewer will have sufficient capacity to convey the increased sewage flows.

3.4 Wastewater Treatment Plant

The Wellington WWTP Class EA (by CIMA+) was completed in June 2024 and considered a serviced population of 8,600 residents by 2047. The upgrades would increase the rated capacity from the current 1,500 m^3/d to 3,900 m^3/d. Peak daily design flow will be 10,440m^3 and peak hourly flow 18,000m^3. Designers also considered the full buildout potential of the plant indicating the plant could be later expanded to serve a future population of 14,500 residents.

The plan relied on population growth forecasts from 2013 provided by Watson and Associates whose highest growth forecast included 6,426 persons by 2047 and 8,600 persons by 2066. But, PEC and CIMA+ accelerated the population growth estimates to reach 8,600 population by 2047.

The Cork and Vince community draft plan under consideration for approval would include a full buildout population of 6,201 residents. This is in pace with the growth forecasts and suggests the 2047 design horizon could be achieved.

The Cork and Vine developers are working closely with PEC on the financing for the upgrades and it is anticipated that the expected plant capacity improvements will be in place as future phases of Cork and Vine come on line.

4. Conclusion

Kaitlin is proposing to increase the density of the Cork and Vine Community resulting in a population of 6,201 at full buildout. Jewell has reviewed the municipal water and sanitary systems considering the increased demands and found the water distribution and sanitary collection systems have sufficient capacity to meet the demand.

Water

Jewell completed a review of the water system using EPAnet 2.2. The model was received from RV Anderson and modifications to the model were made to reflect the proposed development including the addition of nodes, pipes, and increased demands. Jewell reviewed the system under average operating, peak hour, and max day + fire flow scenarios. All scenarios were found to meet minimum requirements for flow and pressure.

Sanitary

The local collection system was sized using standard sanitary design sheets with daily per capita flow rate, persons per unit factors, and extraneous flow values taken from the MSP. The local system would be satisfactory to convey the anticipated development flows.

The new trunk sewer on Millennium Trail was also reviewed and Jewell found it would be at 46% capacity at full buildout. The trunk sewer would have no capacity constraint.

The wastewater treatment facility, when fully completed, will have a rated capacity of 3,900m^3/day to service an expected population of 8,600 persons. The Class EA study anticipated achieving this population near 2047 after which a new environmental assessment would be triggered for plant expansion for an ultimate serviced population of 14,500. The Cork and Vine community full buildout is expected to align well with the timing horizon of the Class EA study.

Prepared by:

Julie Humphries, C.E.T.
Jewell Engineering Inc.

Approved by:

Bryon Keene, P. Eng.
Jewell Engineering Inc.

5. References

The information used to prepare this report is based on the following documents and information provided as noted below:

- Ontario Building Code, 2017
    - Table 8.2.1.3.
- Ontario Ministry of Environment
    - Design Guidelines for Sewage Works, 2007
    - Design Guidelines for Drinking-Water Systems, 2007
- RV Anderson
    - Wellington Master Servicing Plan – Technical Memorandum 1, May 6, 2021

APPENDIX A:
CORK AND VINE COMMUNITY CONCEPT PLAN

PHASE 1A	Total Units 200
Single-Detached	110
Street Townhouses	9
Condo Townhouses	81

PHASE 1B	Total Units 385
Single-Detached	123
Townhouses	62
Medium Density (Blocks 15, 54 & 55)	200

PHASE 2B	Total Units 276
Single-Detached	160
Townhouses	116

PHASE 3B	Total Units 142
Single-Detached	91
Townhouses	36
Medium Density (Block 52-Townhouse Units)	15

PHASE 2A	Approx. Total Units 1,020
Single-Detached	395
Standard Freehold and Condo Townhouses	163
Apartments in Gateway Mixed-Use Area	462

PHASE 3A EAST	Approx. Total Units 613
Single-Detached	25
Standard Freehold and Condo Townhouses	26
Apartments in Gateway Mixed-Use Area	562

PHASE 3A SOUTH	Approx. Total Units 293
Single-Detached	3
Standard Freehold and Condo Townhouses	133
Apartments in Gateway Mixed-Use Area	157

Total Units	2,929

PHASE 4

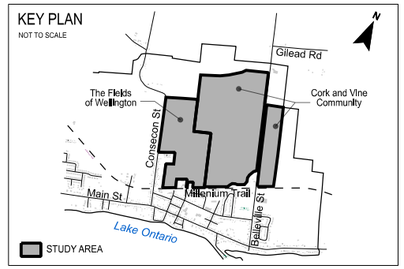
1. Club House
2. Hotel
3. Parking
4. Tennis Courts
5. Pool

NOTES:

-Phase 1A, 1B, 2B and 3B based on proposed Draft Plans.
-Phase 2A, 3A East, and 3A South units are based on working copy Draft Plan, dated 2025.08.22 .
-Average Apartment size @ 70m²/unit based on 85% efficiency of residential GFA.

Notes:

- Property Boundary is approximate based on available mapping and subject to confirmation by survey.
- Air photo from Google Earth, 2019 image.
- Not based on engineering, grading or environmental analysis.
- Units are estimated and subject to change based on detailed design.



LEGEND

- Subject Lands
- Phasing Boundary
- Single-Detached
- Standard Condo and Free-hold Townhouses
- Bungalow Townhouses
- Mid-Rise/Future Development
- Gateway Mixed-Use (MU)
- Parks and Green Links
- Common Greens
- Natural Open Space
- Storm Pond
- Multi-use Pathway/Pedestrian Links
- Secondary Pathways
- Flood Line 2022
- Water Course
- Conceptual Parking Areas
- Conceptual Private Roads
- Conceptual Buildings in Gateway MU Areas
- Major Cross Walk
- Major Entry Feature, Signage, Landscaping etc.

DRAFT

FOR DISCUSSION PURPOSES ONLY

CORK AND VINE COMMUNITY

WELLINGTON,
PRINCE EDWARD COUNTY

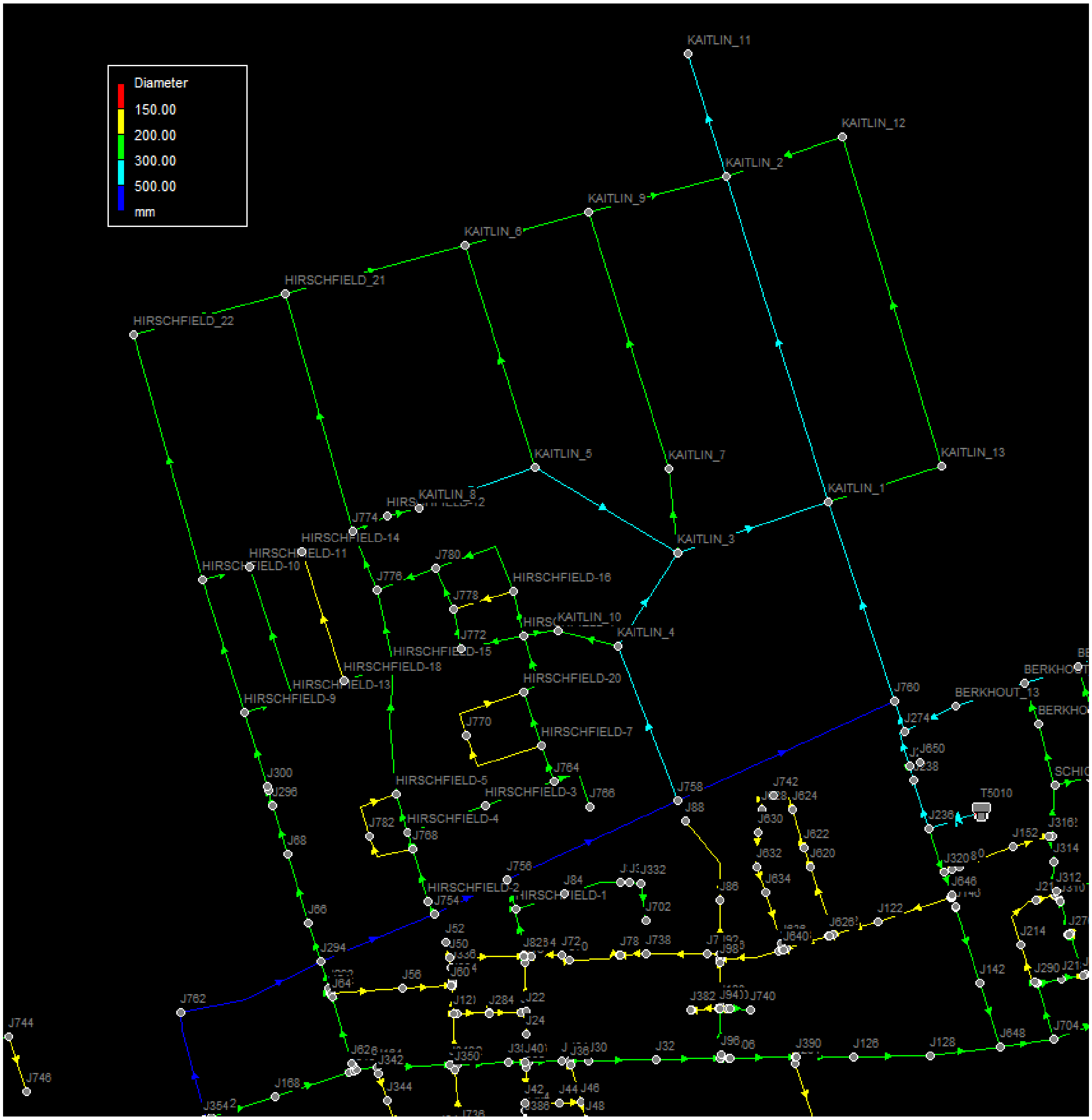
SCALE BAR
0 50 100 200 m

WESTON CONSULTING

File Number: 10793
Date: 2025-08-28
Drawn By: MH
Planner: RG and MQ
CAD: 10793/Composite Plan/2025/C3_2025-08-28.dgn

Drawing
C3

APPENDIX B:
WATER MODEL SCHEMATIC AND RESULTS


Diameter
150.00
200.00
300.00
500.00
mm
KAITLIN_11
KAITLIN_12
KAITLIN_2
KAITLIN_9
KAITLIN_6
HIRSCHFIELD_21
HIRSCHFIELD_22
KAITLIN_5
KAITLIN_7
KAITLIN_13
KAITLIN_1
KAITLIN_8
KAITLIN_3
J774
HIRSCHFIELD-14
HIRSCHFIELD-11
HIRSCHFIELD-10
J780
J776
HIRSCHFIELD-16
J778
KAITLIN_10
KAITLIN_4
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HIRSCHFIELD-18
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HIRSCHFIELD-20
J770
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J760
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J274
J650
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J648
J32
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J44
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J48
J354

APPENDIX C:
SANITARY SEWER DESIGN SHEET

SANITARY SEWER DESIGN SHEET

Jewell Engineering Inc.
1 - 71 Millennium Parkway
Belleville, ON K8P 4Z5
Tel: 613-969-1111
Fax: 613-969-8988
Website: www.jewelleng.ca

Notes:
- Phase 3 East to connect to future sewer in Belleville Street
- Portion of Fields of Wellington Phases 1B & 2B to connect to trunk sewer
- Commercial flows include infiltration

Designed: Julie Humphries, C.E.T.
Checked: Bryon Keene, P.Eng.
Date: November 24, 2025

Project: Cork and Vine Community
Updated Full Buildout Concept

Peak Design Flow Calculation

Peak Design Flow (Q_d) = Peak Population Flow (Q_p) + Peak Extraneous Flow (Q_I)

$Q_d = Q_p + Q_I$ *Where:*

$Q_p = \frac{PqM}{86.4}$ q = Average daily per capita flow, 350 L/d*cap

$Q_I = IA$ I = Unit of peak extraneous flow, 1.27 m^3/d*ha

M = Harmon peaking factor (min = 2)

$M = 1 + \frac{14}{4 + \sqrt{P}}$ P = Population in 1000's

A = Area in hectares (ha)

Population Flows (Persons/Unit)

Single Dwelling	(Single)	2.5
Townhouse	(Town)	2.28
Apartment	(Apt)	1.79

Commercial Flows

Average Commercial Flows	35 m^3/d*ha
Peaking Factor	2.0

Stamp

Pipe Capacity by Manning's Equation

Where:

$Q = \frac{1}{n} A R^{2/3} S^{1/2}$

A = Area of pipe in m^2
R = Hydraulic radius = a/p
P = Wetted perimeter
S = Slope (m/m)
n = Manning's friction coef.

Check

$Q_d \leq 0.8 \cdot (Pipe\ Capacity)$
$0.6 \leq V \leq 3.0$
use Actual V if d:D < 0.3

LOCATION				PEAK FLOW CALCULATION												PROPOSED SEWER									
				RESIDENTIAL																					
				INDIVIDUAL					CUMULATIVE		RESID. PEAKING FACTOR M	COMMERCIAL INDIVIDUAL	COMMERCIAL CUMULATIVE	POP. FLOW Q_p	COMMER. FLOW Q_c	PEAK EX. Q_i	DESIGN FLOW Q_d	LENGTH	PIPE SIZE	PIPE MATERIAL	GRADE USE m/m	CAPACITY n = 0.013	FULL FLOW VELOCITY	RATIO d:D	ACTUAL VELOCITY AT Q_d	CHECK	% FULL
DESCRIPTION	STREET	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	UNITS			POP.	AREA (A)	POP.	AREA (A)		AREA (A)	AREA (A)	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)		(%)	(L/s)	(m/s)		(m/s)		q/Q
				(Single)	(Town)	(Apt)		(ha)		(ha)		(ha)	(ha)														
Phase 4			CAP 4				0.0		0.0	0.00	4.50	3.60	3.60	0.0	2.9	0.0	2.9										
Phase 2A-1			CAP 4	112		462	1107.0	14.00	1107.0	14.00	3.77	2.50	2.50	16.9	2.0	0.2	19.1										
	Street DD	CAP 4	SA39				0.0		1107.0	14.00	3.77		6.10	16.9	4.9	0.2	22.1	18.4	250	PVC	0.50%	42.05	0.86	0.51	0.86	OK	52.5%
42	Turner Road	SA39	SA38	4			10.0	0.39	1117.0	14.39	3.77		6.10	17.1	4.9	0.2	22.2	64.8	250	PVC	0.40%	37.61	0.77	0.55	0.77	OK	59.0%
41	Turner Road	SA38	SA37	6			15.0	0.42	1132.0	14.81	3.76		6.10	17.3	4.9	0.2	22.4	64.8	250	PVC	0.40%	37.61	0.77	0.56	0.77	OK	59.6%
	Turner Road	SA37	SA15				0.0		1132.0	14.81	3.76		6.10	17.3	4.9	0.2	22.4	42.7	250	PVC	0.40%	37.61	0.77	0.56	0.77	OK	59.6%
Phase 2A-3			SA36	150	20		420.6	10.20	420.6	10.20	4.01		0.00	6.8	0.0	0.1	7.0										
40	Turner Road	SA36	SA35	13			32.5	0.73	453.1	10.93	4.00		0.00	7.3	0.0	0.2	7.5	103.2	200	PVC	0.40%	20.74	0.66	0.41	0.66	OK	36.1%
38	Turner Road	SA35	SA34	5			12.5	0.34	465.6	11.27	3.99		0.00	7.5	0.0	0.2	7.7	62.5	200	PVC	0.40%	20.74	0.66	0.42	0.66	OK	37.1%
37	Turner Road	SA34	SA33	6			15.0	0.44	480.6	11.71	3.98		0.00	7.8	0.0	0.2	7.9	44.2	200	PVC	0.40%	20.74	0.66	0.43	0.66	OK	38.2%
36	Turner Road	SA33	SA32	3			7.5	0.17	488.1	11.88	3.98		0.00	7.9	0.0	0.2	8.0	44.2	200	PVC	0.40%	20.74	0.66	0.43	0.66	OK	38.8%
35	Turner Road	SA32	SA15	2			5.0	0.12	493.1	12.00	3.98		0.00	7.9	0.0	0.2	8.1	65.4	200	PVC	0.40%	20.74	0.66	0.43	0.66	OK	39.2%
Phase 2A-2			CAP 3	133	143		658.5	12.70	658.5	12.70	3.91		0.00	10.4	0.0	0.2	10.6										
		CAP 3	SA15				0.0		658.5	12.70	3.91		0.00	10.4	0.0	0.2	10.6	18.3	300	PVC	0.40%	61.16	0.87	0.28	0.65	OK	17.4%
	Walker Road	SA15	SA14				0.0		2283.6	39.51	3.54		6.10	32.8	4.9	0.6	38.3	29.4	375	PVC	0.50%	123.98	1.12	0.38	1.12	OK	30.9%
32	Walker Road	SA14	SA13	6			15.0	0.65	2298.6	40.16	3.54		6.10	32.9	4.9	0.6	38.5	28.0	375	PVC	0.50%	123.98	1.12	0.38	1.12	OK	31.0%
31	Walker Road	SA13	SA12	4			10.0	0.29	2308.6	40.45	3.54		6.10	33.1	4.9	0.6	38.6	28.0	375	PVC	0.50%	123.98	1.12	0.38	1.12	OK	31.1%
30	Walker Road	SA12	SA11	15			37.5	0.90	2346.1	41.35	3.53		6.10	33.6	4.9	0.6	39.1	107.5	375	PVC	0.50%	123.98	1.12	0.39	1.12	OK	31.5%
29	Rorke Road	SA31	SA30	3			7.5	0.34	7.5	0.34	4.43		0.00	0.1	0.0	0.0	0.1	20.7	200	PVC	1.00%	32.80	1.04	0.03	0.12	VELOCITY	0.4%
28	Rorke Road	SA30	SA29	11			27.5	0.63	35.0	0.97	4.34		0.00	0.6	0.0	0.0	0.6	70.0	200	PVC	0.85%	30.24	0.96	0.10	0.39	VELOCITY	2.1%
27	Rorke Road	SA29	SA28	3			7.5	0.20	42.5	1.17	4.33		0.00	0.7	0.0	0.0	0.8	18.4	200	PVC	0.85%	30.24	0.96	0.11	0.43	VELOCITY	2.5%
26	Rorke Road	SA28	SA27	6			15.0	0.40	57.5	1.57	4.30		0.00	1.0	0.0	0.0	1.0	46.0	200	PVC	0.85%	30.24	0.96	0.12	0.46	VELOCITY	3.4%
25	Rorke Road	SA27	SA26	3			7.5	0.28	65.0	1.85	4.29		0.00	1.1	0.0	0.0	1.2	19.1	200	PVC	0.85%	30.24	0.96	0.13	0.47	VELOCITY	3.8%
	Rorke Road	SA26	SA25				0.0		65.0	1.85	4.29		0.00	1.1	0.0	0.0	1.2	19.1	200	PVC	0.85%	30.24	0.96	0.13	0.47	VELOCITY	3.8%
	Rorke Road	SA25	SA11				0.0		65.0	1.85	4.29		0.00	1.1	0.0	0.0	1.2	33.8	200	PVC	0.85%	30.24	0.96	0.13	0.47	VELOCITY	3.8%
16	Spafford Lane	SA23	SA22		8		18.2	0.22	18.2	0.22	4.39		0.00	0.3	0.0	0.0	0.3	23.4	200	PVC	0.80%	29.34	0.93	0.06	0.27	VELOCITY	1.1%
15	Spafford Lane	SA22	SA21		9		20.5	0.22	38.8	0.44	4.34		0.00	0.7	0.0	0.0	0.7	30.8	200	PVC	0.70%	27.44	0.87	0.11	0.39	VELOCITY	2.5%
14	Spafford Lane	SA21	SA20		12		27.4	0.34	66.1	0.78	4.29		0.00	1.1	0.0	0.0	1.2	40.5	200	PVC	0.75%	28.40	0.90	0.14	0.45	VELOCITY	4.1%
13	Spafford Lane	SA20	SA19		10		22.8	0.35	88.9	1.13	4.26		0.00	1.5	0.0	0.0	1.6	43.9	200	PVC	0.75%	28.40	0.90	0.16	0.48	VELOCITY	5.5%
12	Spafford Lane	SA19	SA18		20		45.6	0.47	134.5	1.60	4.21		0.00	2.3	0.0	0.0	2.3	65.2	200	PVC	0.50%	23.19	0.74	0.21	0.47	VELOCITY	10.0%
11	Spafford Lane	SA18	SA17		16		36.5	0.49	171.0	2.09	4.17		0.00	2.9	0.0	0.0	2.9	65.2	200	PVC	0.40%	20.74	0.66	0.25	0.47	VELOCITY	14.1%
17	Spafford Lane	SA17	SA16		6		13.7	0.25	184.7	2.34	4.16		0.00	3.1	0.0	0.0	3.1	71.1	200	PVC	0.40%	20.74	0.66	0.26	0.48	VELOCITY	15.2%
	Spafford Lane	SA16	SA11				0.0		184.7	2.34	4.16		0.00	3.1	0.0	0.0	3.1	10.4	200	PVC	0.40%	20.74	0.66	0.26	0.48	VELOCITY	15.2%
24	Walker Road	SA11	SA10		7		16.0	0.48	2611.8	46.02	3.49		6.10	37.0	4.9	0.7	42.6	63.1	375	PVC	0.50%	123.98	1.12	0.40	1.12	OK	34.3%
23	Walker Road	SA10	SA9	1	2		7.1	0.25	2618.8	46.27	3.49		6.10	37.0	4.9	0.7	42.7	29.9	375	PVC	0.50%	123.98	1.12	0.40	1.12	OK	34.4%
22 - Fields of Wellington	Grant Road	CAP 2	SA24	81	22		252.7	6.08	252.7	6.08	4.11		0.00	4.2	0.0	0.1	4.3	9.3	200	PVC	1.00%	32.80	1.04	0.24	0.72	OK	13.1%
21	Grant Road	SA24	SA9	4			10.0	0.26	262.7	6.34	4.10		0.00	4.4	0.0	0.1	4.5	78.7	200	PVC	1.00%	32.80	1.04	0.25	0.73	OK	13.6%
20	Walker Road	SA9	SA8	6			15.0	0.52	2896.5	53.13	3.46		6.10	40.5	4.9	0.8	46.3	44.2	375	PVC	0.50%	123.98	1.12	0.42	1.12	OK	37.3%
19	Walker Road	SA8	SA7	4			10.0	0.29	2906.5	53.42	3.45		6.10	40.7	4.9	0.8	46.4	44.3	375	PVC	0.50%	123.98	1.12	0.42	1.12	OK	37.4%
18	Walker Road	SA7	SA6	5			12.5	0.33	2919.0	53.75	3.45		6.10	40.8	4.9	0.8	46.6	31.6	375	PVC	0.50%	123.98	1.12	0.42	1.12	OK	37.6%
Phase 3A South			CAP 5	3	133	157	591.8	6.80	591.8	6.80	3.94	0.80	0.80	9.4	0.6	0.1	10.2										
	Street G - Phase 3	CAP 5	SA6				0.0		591.8	6.80	3.94		0.80	9.4	0.6	0.1	10.2	10.9	200	PVC	0.40%	20.74	0.66	0.49	0.66	OK	49.1%
8	Walker Road	SA6	SA5	10			25.0	0.60	3535.8	61.15	3.38		6.90	48.4	5.6	0.9	54.9	63.6	375	PVC	0.50%	123.98	1.12	0.47	1.12	OK	44.3%
7 - Fields of Wellington	Future - Phase 1B, 2B	CAP 1	SA5	38	62		236.4	5.54	236.4	5.54	4.12		0.00	3.9	0.0	0.1	4.0	10.9	200	PVC	1.00%	32.80	1.04	0.23	0.71	OK	12.3%
6	Walker Road	SA5	SA4	6			15.0	0.46	3787.1	67.15	3.35		6.90	51.5	5.6	1.0	58.0	42.9	375	PVC	0.50%	123.98	1.12	0.48	1.12	OK	46.8%

SANITARY SEWER DESIGN SHEET

Jewell Engineering Inc.
1 - 71 Millennium Parkway
Belleville, ON K8P 4Z5
Tel: 613-969-1111
Fax: 613-969-8988
Website: www.jewelleng.ca

Notes:
- Phase 3 East to connect to future sewer in Belleville Street
- Portion of Fields of Wellington Phases 1B & 2B to connect to trunk sewer
- Commercial flows include infiltration

Designed: Julie Humphries, C.E.T.
Checked: Bryon Keene, P.Eng.
Date: November 24, 2025

Project: Cork and Vine Community
Updated Full Buildout Concept

Peak Design Flow Calculation

Peak Design Flow (Q_d) = Peak Population Flow (Q_p) + Peak Extraneous Flow (Q_I)

$Q_d = Q_p + Q_I$

Where:

$Q_p = \frac{PqM}{86.4}$

$Q_I = IA$

$M = 1 + \frac{14}{4 + \sqrt{P}}$

q	Average daily per capita flow	350 L/d*cap
I	Unit of peak extraneous flow	1.27 m^3/d*ha
M	Harmon peaking factor (min = 2)	
P	Population in 1000's	
A	Area in hectares (ha)	

Population Flows (Persons/Unit)

Single Dwelling	(Single)	2.5
Townhouse	(Town)	2.28
Apartment	(Apt)	1.79

Commercial Flows

Average Commercial Flows	35 m^3/d*ha
Peaking Factor	2.0

Stamp

Pipe Capacity by Manning's Equation

Where:

$Q = \frac{1}{n} A R^{2/3} S^{1/2}$

A	Area of pipe in m^2	
R	Hydraulic radius = a/p	
P	Wetted perimeter	
S	Slope (m/m)	
n	Manning's friction coef.	use Actual V if d:D < 0.3

Check

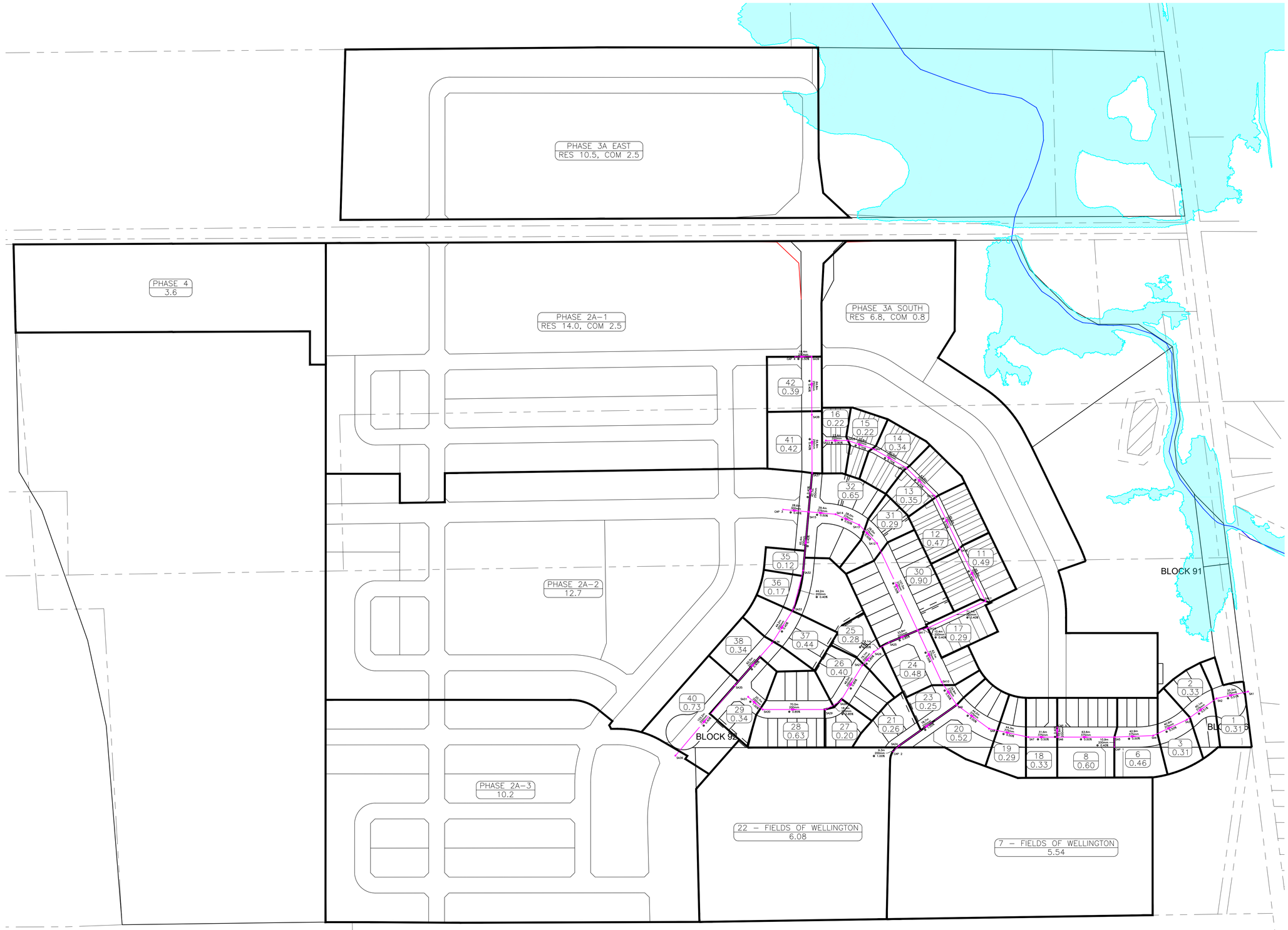
$Q_d \leq 0.8 \cdot (Pipe\ Capacity)$

$0.6 \leq V \leq 3.0$

LOCATION				PEAK FLOW CALCULATION													PROPOSED SEWER									
				RESIDENTIAL									COMMERCIAL													
				INDIVIDUAL					CUMULATIVE		RESID.	INDIVIDUAL	CUMULATIVE	POP.	COMMER.	PEAK	DESIGN									
				UNITS			POP.	AREA (A)	POP.	AREA (A)	PEAKING	AREA (A)	AREA (A)	FLOW	FLOW	EX.	FLOW	LENGTH	PIPE	PIPE	GRADE	CAPACITY	FULL FLOW	RATIO	ACTUAL VELOCITY		% FULL
DESCRIPTION	STREET	UPSTREAM MANHOLE	DOWNSTREAM MANHOLE	(Single)	(Town)	(Apt)		(ha)		(ha)	FACTOR M	(ha)	(ha)	Q_p (L/s)	Q_c (L/s)	Q_I (L/s)	Q_d (L/s)	(m)	SIZE (mm)	MATERIAL	USE m/m (%)	n = 0.013 (L/s)	VELOCITY (m/s)	d:D	AT Q_d (m/s)	CHECK	q/Q
3	Walker Road	SA4	SA3	3			7.5	0.31	3794.6	67.46	3.35		6.90	51.6	5.6	1.0	58.1	40.9	375	PVC	0.50%	123.98	1.12	0.48	1.12	OK	46.9%
2	Walker Road	SA3	SA2	5			12.5	0.33	3807.1	67.79	3.35		6.90	51.7	5.6	1.0	58.3	40.1	375	PVC	0.51%	125.21	1.13	0.48	1.13	OK	46.6%
1	Walker Road	SA2	SA1 (MH10)	3			7.5	0.31	3814.6	68.10	3.35		6.90	51.8	5.6	1.0	58.4	36.5	375	PVC	0.51%	125.21	1.13	0.48	1.13	OK	46.6%
Phase 3A East			SA1 (MH10)	25	26	562	1127.8	10.50	1127.8	10.50	3.77	2.50	2.50	17.2	2.0	0.2	19.4										
Millennium Trail	CCE	SA1 (MH10)	MH11				0.0		4942.4	78.60	3.25		9.40	65.1	7.6	1.2	73.8	70.8	525	PVC	0.20%	192.33	0.89	0.43	0.89	OK	38.4%
		MH11	MH12				0.0		4942.4	78.60	3.25		9.40	65.1	7.6	1.2	73.8	70.8	525	PVC	0.20%	192.33	0.89	0.43	0.89	OK	38.4%
		MH12	MH13				0.0		4942.4	78.60	3.25		9.40	65.1	7.6	1.2	73.8	66.0	525	PVC	0.20%	192.33	0.89	0.43	0.89	OK	38.4%
		MH13	MH14				0.0		4942.4	78.60	3.25		9.40	65.1	7.6	1.2	73.8	66.0	525	PVC	0.20%	192.33	0.89	0.43	0.89	OK	38.4%
		MH14	MH15				0.0		4942.4	78.60	3.25		9.40	65.1	7.6	1.2	73.8	68.2	525	PVC	0.20%	192.33	0.89	0.43	0.89	OK	38.4%
		MH15	MH16				0.0		4942.4	78.60	3.25		9.40	65.1	7.6	1.2	73.8	63.9	525	PVC	0.20%	192.33	0.89	0.43	0.89	OK	38.4%
	FOW	SA100	MH16	255	145	200	1326.1	26.91	1326.1	26.91	3.72		0.00	20.0	0.0	0.4	20.4	35.7	250	PVC	1.36%	69.35	1.41	0.37	1.41	OK	29.4%
		MH16	MH17				0.0		6268.5	105.51	3.15		9.40	80.1	7.6	1.6	89.2	33.1	525	PVC	0.20%	192.33	0.89	0.48	0.89	OK	46.4%
		MH17	MH18				0.0		6268.5	105.51	3.15		9.40	80.1	7.6	1.6	89.2	10.3	525	PVC	0.20%	192.33	0.89	0.48	0.89	OK	46.4%
		MH18	LS				0.0		6268.5	105.51	3.15		9.40	80.1	7.6	1.6	89.2	51.2	525	PVC	0.20%	192.33	0.89	0.48	0.89	OK	46.4%
							6268.5	105.51				9.40															

APPENDIX D:
SANITARY SEWER CATCHMENT PLANS

10/14/2025



F:\FTP\PROJECT FILES\1 CIVIL 3D PROJECT FILES\1704226 - KAITLIN CORP - WELLINGTON SUBDIVISION\3.1 SHEETS\1704226 - CT 1 (SANITARY) - 2025.10.10

GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY
3	05/20/2022	REVISED SANITARY ROUTE	JGH
4	07/29/2022	SECOND SUBMISSION	JGH
5	08/29/2022	ISSUED FOR ECA APPROVAL	JGH
6	12/02/2022	THIRD SUBMISSION	JGH
7	03/03/2023	FOURTH SUBMISSION	JGH
8	03/30/2023	4TH SUBMISSION & UPDATED LANDSCAPING	JGH
9	10/14/2025	REVISED PER DENSIFICATION	JGH

LEGEND

34 / 22.82 — CATCHMENT ID NUMBER / CATCHMENT AREA IN HECTARES

CATCHMENT BOUNDARY

BENCHMARK
SIB AT PROPERTY CORNER ADJACENT TO STREET D CUL-DE-SAC
N: 4 870 225.439 E: 311 428.891 Z: 91.186

JEWELL ENGINEERING

CORK AND VINE COMMUNITY
PHASE 1A

WELLINGTON, ONTARIO
PRINCE EDWARD COUNTY

CATCHMENT PLAN
SANITARY SEWER

DRAWN BY: JGH	PROJECT NO: 170-4226	
DESIGNED BY: JGH	DATE: October 2025	
CHECKED BY: BK	SCALE: HORIZONTAL - 1:2000 VERTICAL - N/A	
APPROVED BY: BK	CONTRACT NO:	DRAWING NO: CT-1

LOCATION						INDIVIDUAL	CUMULATIVE	INDIVIDUAL		CUMULATIVE		PEAK FLOW				PROPOSED SEWER					
STREET	MH	MH	Single Residential Units 2.5	Townhouse 2.28	Multi Unit 1.79	Residential Population	Cumulative Population	q flow Q (L/s)	Area A (hectares)	q flow Q (L/s)	Area A (hectares)	Peaking factor M	Peak Unit flow Q(p) (L/s)	Extraneous flow Q(i) (L/s)	design flow Q(d) (L/s)	Pipe size (mm)	Pipe Length (m)	Grade %	Pipe Capacity (L/s) n=0.013	Full flow velocity (m/s)	Actual velocity (m/s)	Utilized Pipe Capacity (%)
Fields of Wellington Development																					
Street T	SA74	SA73	14			35	35	0.13	0.99	0.13	0.99	4.00	0.52	0.1	0.7	200	104.3	1.00	32.8	1.04	0.39	2%
Street T	SA73	SA56	13			33	68	0.12	1.04	0.25	2.03	4.00	1.00	0.3	1.3	200	104.3	0.40	20.7	0.66	0.35	6%
Street T	SA72	SA56	5			13	13	0.05	0.94	0.05	0.94	4.00	0.19	0.1	0.3	200	101.3	1.74	43.2	1.38	0.40	1%
West Street	SA57	SA56				0	0	0.00	0.00	0.00	0.00	4.00	0.00	0.0	0.0	200	70.6	1.00	32.8	1.04	End Stub	End Stub
West Street	SA56	SA55			50	90	170	0.33	0.87	0.63	3.84	4.00	2.51	0.5	3.0	200	81.8	1.00	32.8	1.04	0.64	9%
Street E	SA71	SA70	14			35	35	0.13	0.78	0.13	0.78	4.00	0.52	0.1	0.6	200	104.2	1.00	32.8	1.04	0.39	2%
Street E	SA70	SA55	13			33	68	0.12	0.76	0.25	1.54	4.00	1.00	0.2	1.2	200	104.2	0.40	20.7	0.66	0.35	6%
West Street	SA55	SA54	0			0	237	0.00	1.40	0.88	6.78	4.00	3.51	0.9	4.5	200	80.9	0.50	23.2	0.74	0.52	19%
Street C	SA69	SA68	15			38	38	0.14	0.80	0.14	0.80	4.00	0.56	0.1	0.7	200	104.3	1.00	32.8	1.04	0.39	2%
Street C	SA68	SA54	14			35	73	0.13	0.75	0.27	1.55	4.00	1.07	0.2	1.3	200	104.3	0.40	20.7	0.66	0.35	6%
West Street	SA54	SA53	0			0	310	0.00	0.00	1.15	8.33	4.00	4.59	1.2	5.8	200	83.5	0.50	23.2	0.74	0.57	25%
Street D	SA64	SA65	12			30	30	0.11	0.61	0.11	0.61	4.00	0.44	0.1	0.5	200	67.8	1.00	32.8	1.04	0.36	2%
Street D	SA65	SA53	4			10	40	0.04	0.36	0.15	0.97	4.00	0.59	0.1	0.7	200	81.7	0.40	20.7	0.66	0.30	4%
West Street	SA53	SA51	4			10	360	0.04	0.34	1.33	9.64	4.00	5.33	1.3	6.7	200	90.0	0.60	25.4	0.81	0.63	26%
Street J	SA25	SA51	8			20	20	0.07	0.50	0.07	0.50	4.00	0.30	0.1	0.4	200	108.6	1.00	32.8	1.04	0.33	1%
West Street	SA51	SA50	6	9		36	415	0.13	0.61	1.54	10.75	4.00	6.15	1.5	7.7	200	66.6	1.15	35.2	1.12	0.87	22%
West Street	SA50	SA8	3	13		37	452	0.14	0.71	1.67	11.46	4.00	6.69	1.6	8.3	200	66.6	1.15	35.2	1.12	0.87	24%
West Street	SA8	SA7				0	452	0.00	0.00	1.67	11.46	4.00	6.69	1.6	8.3	200	27.1	0.40	20.7	0.66	0.60	40%
Lane G	SA63	SA62		19		43	43	0.16	0.56	0.16	0.56	4.00	0.64	0.1	0.7	200	114.6	1.00	32.8	1.04	0.42	2%
Lane G	SA62	SA11		17		39	82	0.14	0.45	0.30	1.01	4.00	1.22	0.1	1.4	200	120.0	0.40	20.7	0.66	0.37	7%
Street B	SA12	SA11	2			5	5	0.02	0.35	0.02	0.35	4.00	0.07	0.0	0.1	200	28.7	1.00	32.8	1.04	0.23	0%
Street B	SA11	SA10	3			8	95	0.03	0.44	0.35	1.80	4.00	1.40	0.3	1.7	200	48.0	0.40	20.7	0.66	0.39	8%
Street T	SA75	SA74	3			8	8	0.03	0.31	0.03	0.31	4.00	0.11	0.0	0.2	200	40	1.00	32.8	1.04	0.23	0%
Street A	SA74	SA71		12		27	35	0.10	0.44	0.13	0.75	4.00	0.52	0.1	0.6	200	81.7	0.40	20.7	0.66	0.28	3%
Street T	SA71	SA69		13		30	65	0.11	0.45	0.24	1.20	4.00	0.96	0.2	1.1	200	80.9	1.00	32.8	1.04	0.47	3%
Street F	SA69	SA67		11		25	90	0.09	0.45	0.33	1.65	4.00	1.33	0.2	1.6	200	83.5	1.00	32.8	1.04	0.52	5%
Street D	SA67	SA61	3			8	97	0.03	0.22	0.36	1.87	4.00	1.44	0.3	1.7	200	41.3	0.40	20.7	0.66	0.00	8%
Street D	SA53	SA66	12			30	30	0.11	0.80	0.11	0.80	4.00	0.44	0.1	0.6	200	104.3	1.00	32.8	1.04	0.39	2%
Street N	SA66	SA61	9			23	53	0.08	0.52	0.19	1.32	4.00	0.78	0.2	1.0	200	63	0.40	20.7	0.66	0.33	5%
Street H	SA61	SA60	8	19		63	213	0.23	0.91	0.79	4.10	4.00	3.15	0.6	3.7	200	116.3	0.50	23.2	0.74	0.52	16%
Street H	SA60	SA10	6	17		54	267	0.20	0.80	0.99	4.90	4.00	3.95	0.7	4.6	200	116.3	0.40	20.7	0.66	0.51	22%
Street B	SA10	SA9	10			25	386	0.09	0.98	1.43	7.68	4.00	5.72	1.1	6.8	200	81.0	1.00	32.8	1.04	0.81	21%
Street I	SA59	SA58	18			45	45	0.17	0.81	0.17	0.81	4.00	0.67	0.1	0.8	200	101.8	1.00	32.8	1.04	0.42	2%
Street A	SA58	SA9	10			25	70	0.09	0.55	0.26	1.36	4.00	1.04	0.2	1.2	200	101.8	0.40	20.7	0.66	0.35	6%
Street B	SA9	SA7	8			20	476	0.07	0.72	1.76	9.76	3.99	7.03	1.4	8.4	200	81.0	0.40	20.7	0.66	0.60	40%

LOCATION						INDIVIDUAL	CUMULATIVE	INDIVIDUAL		CUMULATIVE		PEAK FLOW				PROPOSED SEWER					
STREET	MH	MH	Single Residential Units 2.5	Townhouse 2.28	Multi Unit 1.79	Residential Population	Cumulative Population	q flow Q (L/s)	Area A (hectares)	q flow Q (L/s)	Area A (hectares)	Peaking factor M	Peak Unit flow Q(p) (L/s)	Extraneous flow Q(i) (L/s)	design flow Q(d) (L/s)	Pipe size (mm)	Pipe Length (m)	Grade %	Pipe Capacity (L/s) n=0.013	Full flow velocity (m/s)	Actual velocity (m/s)	Utilized Pipe Capacity (%)
Fields of Wellington Development																					
Street B	SA14	SA13	3			8	8	0.03	0.31	0.03	0.31	4.00	0.11	0.0	0.2	200	37.8	1.00	32.8	1.04	0.23	0%
Street B	SA13	SA7	3			8	15	0.03	0.31	0.06	0.62	4.00	0.22	0.1	0.3	200	65.9	0.80	29.3	0.93	0.30	1%
West Street	SA7	SA6				0	943	0.00	0.15	3.49	21.99	3.82	13.33	3.1	16.4	200	67.3	1.00	32.8	1.04	1.04	50%
West Street	SA6	SA5	6			15	958	0.06	0.56	3.55	22.55	3.81	13.53	3.2	16.7	200	84.0	0.40	20.7	0.66	0.73	80%
West Street	SA5	SA4	3			8	966	0.03	0.43	3.58	22.98	3.81	13.63	3.2	16.8	200	120.0	1.20	35.9	1.14	1.09	47%
West Street	SA4	SA3			140	251	1217	0.93	2.14	4.51	25.12	3.74	16.87	3.5	20.4	250	100.0	0.40	37.6	0.77	0.77	54%
West Street	SA3	SA2			60	107	1324	0.40	1.79	4.90	26.91	3.72	18.23	3.8	22.0	250	55.6	0.60	46.0	0.94	0.90	48%
West Street Discharging to Millennium Trail	SA2	SA1 (Ex. MH#)				0	1324	0.00	0.00	4.90	26.91	3.72	18.23	3.8	22.0	250	47.4	1.70	77.5	1.58	1.33	28%
Street J	SA25	SA30	11			28	28	0.10	0.61	0.10	0.61	4.00	0.41	0.1	0.5	200	72.3	1.00	32.8	1.04	0.36	2%
Street J	SA30	SA29	12			30	58	0.11	0.84	0.21	1.45	4.00	0.85	0.2	1.1	200	77.7	0.40	20.7	0.66	0.34	5%
Street J	SA29	SA28	1			3	60	0.01	0.00	0.22	1.45	4.00	0.89	0.2	1.1	200	13.7	0.40	20.7	0.66	0.34	5%
Street J	SA28	SA27	7			18	78	0.06	0.56	0.29	2.01	4.00	1.15	0.3	1.4	200	73.0	1.00	32.8	1.04	0.52	4%
Street M	SA24	SA26	12			30	30	0.11	0.61	0.11	0.61	4.00	0.44	0.1	0.5	200	80.0	1.00	32.8	1.04	0.36	2%
Street M	SA26	SA27	10			25	55	0.09	0.61	0.20	1.22	4.00	0.81	0.2	1.0	200	80.0	0.90	31.1	0.99	0.45	3%
Street J	SA27	SA21	4			10	143	0.04	0.27	0.53	3.50	4.00	2.11	0.5	2.6	200	85.2	0.75	28.4	0.90	0.56	9%
Street L	SA25	SA24		11		25	25	0.09	0.47	0.09	0.47	4.00	0.37	0.1	0.4	200	84.0	1.00	32.8	1.04	0.36	1%
Street L	SA24	SA23		11		25	50	0.09	0.48	0.19	0.95	4.00	0.74	0.1	0.9	200	85.2	0.40	20.7	0.66	0.33	4%
Street B	SA23	SA22	12			30	80	0.11	0.74	0.30	1.69	4.00	1.19	0.2	1.4	200	81.0	0.40	20.7	0.66	0.37	7%
Street B	SA22	SA21	10			25	105	0.09	0.68	0.39	2.37	4.00	1.56	0.3	1.9	200	81.0	1.20	35.9	1.14	0.59	5%
Street B	SA21	SA20	2			5	253	0.02	0.21	0.94	6.08	4.00	3.74	0.9	4.6	200	35.7	1.35	38.1	1.21	0.75	12%
Street B Discharging to Country Club Estates	SA20	CCE SA28				0	253	0.00	0.00	0.94	6.08	4.00	3.74	0.9	4.6	200	13.3	0.40	20.7	0.66	0.51	22%
Lane G	SA43	SA42		10		23	23	0.08	0.45	0.08	0.45	4.00	0.34	0.1	0.4	200	101.5	1.45	39.5	1.26	0.40	1%
Lane G	SA42	SA33		8		18	41	0.07	0.40	0.15	0.85	4.00	0.61	0.1	0.7	200	100.0	0.90	31.1	0.99	0.40	2%
Street R	SA33	SA32	2			5	46	0.02	0.16	0.17	1.01	4.00	0.68	0.1	0.8	200	44.0	0.40	20.7	0.66	0.31	4%
Street P	SA41	SA40		18		41	41	0.15	0.94	0.15	0.94	4.00	0.61	0.1	0.7	200	92.5	1.45	39.5	1.26	0.47	2%
Street P	SA40	SA32		14		32	73	0.12	0.67	0.27	1.61	4.00	1.08	0.2	1.3	200	92.5	1.15	35.2	1.12	0.53	4%
Street R	SA32	SA31	8			20	139	0.07	0.46	0.51	3.08	4.00	2.06	0.4	2.5	200	84.6	0.60	25.4	0.81	0.50	10%
Street S	SA38	SA37	3			8	8	0.03	0.25	0.03	0.25	4.00	0.11	0.0	0.1	200	26.8	1.00	32.8	1.04	0.23	0%
Street N	SA39	SA37	4			10	10	0.04	0.29	0.04	0.29	4.00	0.15	0.0	0.2	200	69.1	0.95	32.0	1.02	0.26	1%
Street S	SA37	SA36	7	2		22	40	0.08	0.57	0.15	1.11	4.00	0.59	0.2	0.7	200	78.1	0.65	26.4	0.84	0.36	3%
Street S	SA36	SA35	2	3		12	51	0.04	0.24	0.19	1.35	4.00	0.76	0.2	1.0	200	30.2	1.00	32.8	1.04	0.44	3%
Street S	SA35	SA31	7	7		33	85	0.12	0.70	0.31	2.05	4.00	1.26	0.3	1.5	200	94.6	1.15	35.2	1.12	0.55	4%
Street R Discharging to Country Club Estates	SA31	(CCE SA5)	5			13	236	0.05	0.41	0.88	5.54	4.00	3.50	0.8	4.3	200	94.6	0.40	20.7	0.66	0.51	21%

POPULATION XXXX-XXXX / X X.XXha — FROM MH TO MH — SANITARY TRIBUTARY AREA

Benchmark

No.	Revision/Issue	Date

LICENSED PROFESSIONAL ENGINEER 06/27/2022 K.M. NIELISSEN 100155232 PROVINCE OF ONTARIO

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Client: KAITLIN CORPORATION

Project: FIELDS OF WELLINGTON SUBDIVISION

Drawing: SANITARY DRAINAGE AREAS

Drawn by: CDD	Checked by: KMN	Project No.
Designed by: JH	Approved by: KMN	Drawing No. SAN
Date: JUNE 2022		

Scale: 0 10 20 30 40 m 1:1500

APPENDIX E:
WELLINGTON MASTER SERVICING PLAN – TECHNICAL MEMO 1

Wellington Master Servicing Plan – Technical Memorandum 1

Population, Water Demand and Wastewater Flow Projection Review

FINAL

Corporation of the County of Prince Edward

RVA 184179

May 6, 2021

Wellington Master Servicing Plan
Population, Water Demand and Wastewater Flow Projection Review
Technical Memorandum 1

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1.0 INTRODUCTION

R.V. Anderson Associates Limited (RVA) was retained by the Corporation of the County of Prince Edward to complete a Master Servicing Plan for the Wellington Urban Area.

The purpose of this technical memorandum is to review relevant background information and recommend the population, water demands, and wastewater flows to be considered in the Wellington Master Servicing Plan.

1.1 Background Studies

The following documents were reviewed during the development of this Technical Memorandum:

- Prince Edward County - Official Plan, as amended
- Water and Wastewater Rate and Study and Connection Charges Update (Watson and Associates, 2015)
- Long Term Population, Housing and Employment Forecast and Capital Needs Assessment (Watson and Associates, 2013)
- Wellington Urban Centre Secondary Plan, as amended (IBI, 2013)
- Wellington Sanitary Sewer Capacity Analysis (RVA, 2018)
- 2008 – 2018 Prince Edward County Water and Wastewater Operations Data
- Prince Edward County Council Ledger
- Federal Census Data

2.0 DEVELOPMENT PROJECTIONS

2.1 Residential Population Projections

Federal census data (1996 to 2016) and other population studies were reviewed to generate an historic population profile and trend. Wellington has experienced consistent linear growth over this period, though rates have been on average 0.8%. Wellington also experiences a seasonal population influx, which can add an estimated 10 – 14% of its total population. At present, there is limited information regarding this seasonal demographic. Figure 2.1 illustrates the historical growth experienced in Wellington. If census data is extrapolated to 2020 using the same growth rate as prior years, Wellington would have a permanent population of 1970, a seasonal population influx of 219 and a total population of 2189. If the historic growth rate is maintained, then the permanent population could increase to 2118 by 2031 and 2378 by 2052. This

represents a conservative baseline growth option for Wellington, without any major changes in development.

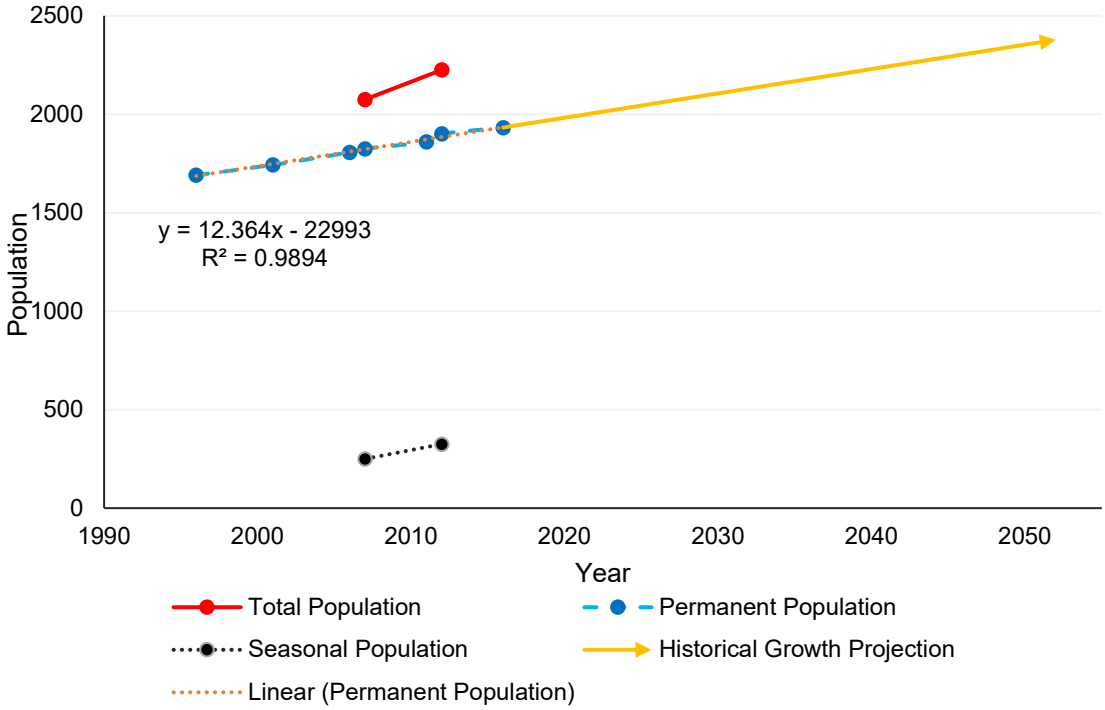

Figure 2.1 – Historical Population Trends in Wellington

A number of population projections exist for Wellington, all with a level of uncertainty regarding timelines for new developments being brought online and the occupancy density per unit. The Figure 2.2 illustrates the most recent projection (Watson and Associates, 2013), which indicates that new developments will stimulate growth rates significantly above current levels. This includes both new greenfield developments and redevelopment of properties within the village of Wellington. This projection indicates that by 2032 the total and permanent population of the Wellington Urban Center will increase to 4,200 and 3,625, respectively. This will increase linearly until buildout in 2066 with total and permanent population plateauing at 9600 and 8600, respectively. Based on this projection, the percentage of the seasonal population will remain within historical ranges (~10 %).

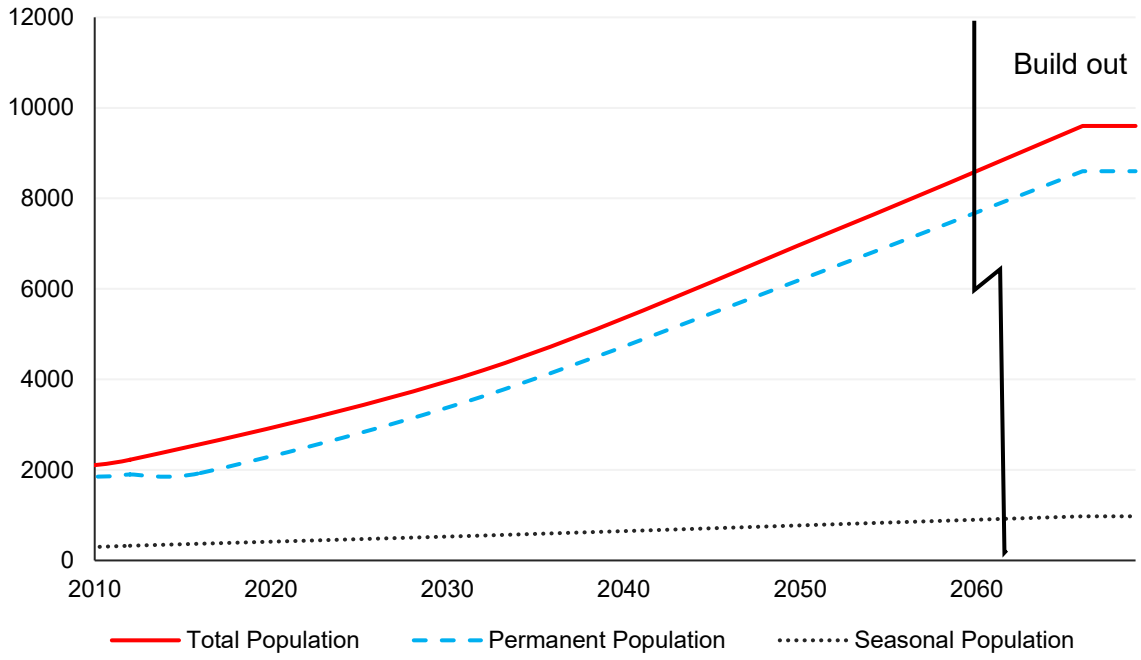

Figure 2.2 – Population Projections for Wellington (Watson and Associates, 2013)

The 2013 Watson and Associate projections were then compared to the Secondary Plan for the Wellington Urban Center (IBI, 2013). The Secondary Plan has a number of scenarios for permanent residents in 2031 which range between 2,548 and 5,085. These scenarios are also dependant on the timing of developments taking place and have been categorized in the following section and in Table 2.1.

Growth Scenario A

Scenario A assumes that, present population trends would continue, and the permanent population of Wellington would increase by 543 people to a total of 2,548 people.

- Permanent Population in 2031: 2,548
- New Residents: 543
- New Residential Units: 251
- New Residential Units per Year: 23

Growth Scenario B

Scenario B assumes that an increase in new units being constructed would occur, partially mirroring historical average. As such, Growth Scenario B assumes that the permanent population of Wellington would increase to a total of 3,589 people by 2031.

- Permanent Population in 2031: 3,589
- New Residents: 1,584
- New Residential Units: 726
- New Residential Units per Year: 66

Growth Scenario C

Scenario C assumes that all of the residential units in Wellington that are in various stages of planning approval at the County or are being considered for future development, are built out by 2031. As such, the permanent population of Wellington would increase to a total of 5,085 people by 2031.

- Permanent Population in 2031: 5,085
- New Residents: 3,080
- New Residential Units: 1,413
- New Residential Units per Year: 129

Since the creation of the Secondary Plan, the number and types of new developments have changed. Presently, there are four large developments planned (Wellington Bay Estates, Lakeside Estates (Schickedanz Development), Country Club Estates (Kaitlin Development) and Fields of Wellington (Hirschfield Development). These developments have the potential to increase the population of Wellington by 3,227 (As shown in Table 2.2); however, this increase would be over the development timeline, which is presently not defined. These would be developed on greenfield areas outside of the current servicing area. These population projections are in line with Growth Scenario C projections from the Wellington Secondary Plan; though, within the Wellington Secondary Plan there are no projections for seasonal residents.

In addition, there are several smaller properties (LCBO, Wellington Hotel, Maple Street, Twelve Trees, etc.) that are presently on the county ledgers. These are properties that either have tentative development plans in place or have the potential to be readily

developed. These properties are within the existing servicing area and could be readily connected. These properties have the potential to increase the population by 772 and in essence theses properties could be developed at any time. These have been isolated in the following Growth Scenario D, which is not contained in the Secondary Plan.

Growth Scenario D

Scenario D assumes that all of the Ledger Developments in Wellington could be built in the immediate future, prior to 2031; however, this only incorporates development within the existing urban area. As such, the permanent population of Wellington would increase to a total of 2,691 people.

- Imminent Permanent Population: 2,730
- New Residents: 772
- New Residential Units: 309
- New Residential Units per Year: 28

Table 2.1 summarizes the population forecast to 2031 based on the four growth scenarios from the Secondary Plan.

Table 2.1 – Secondary Plan and Ledger Growth Scenarios

Scenario	2031 Population	New Residential Units	New Units/Year
A	2,548	251	23
B	3,589	726	66
C	5,085	1,413	128
D	2,730	309	28

Table 2.2 below summarizes the known developments' plans and the associated population for the immediate growth horizon.

Table 2.2 – Proposed Additional Population Summary

Proposed Development	Phase 1 Equivalent Population	Phase 2 Equivalent Population	Total Equivalent Population
Wellington Bay Estates	348	558	906
Lakeside Estates (Schickedanz Development)	238		238
Country Club Estates (Kaitlin Development)	734	341	1075
Fields of Wellington (Hirschfield Development)	403	605	1008
Total - Large Developments	1722	1504	3227
Ledger Developments	772		772
Total	2495	1504	3999

Notes:
1. Unit types were interpreted from proposed development drawings and reports, as provided
2. Estimated populations calculated by multiplying the total number of units by their respective persons per unit figures as follows (Watson and Associates, 2013):
singles and semi's - 2.5 ppu
townhouses - 2.28 ppu
Apartments – 1.79 ppu

For the purposes of this Technical Memorandum #1, one growth option has been assumed, as directed by the County, as shown in Table 2.2. This growth options assumes the projections outlined in the Long-Term Population, Housing and Employment Forecast and Capital Needs Assessment (Watson and Associates, 2013) would be used, as previously shown in Figure 2.2. This represents a more comprehensive assessment of potential growth projections. In subsequent sections this option is referred to as the Watson and Associates Projection. In comparison to the Secondary Plan Scenarios (A – D), the Watson and Associates Projection is similar to Scenarios B, C and D which indicates that new development will occur above historical rates; however, growth will not be as aggressive as Scenarios C and D.

At the earliest, new developments could be built in **2020** with occupancy likely occurring in the following year. Growth prior to 2021 would therefore match historical rates. The County has also indicated that all new greenfield developments would initially be **25 building permits per year** for the first year. This is to ensure that the required infrastructure upgrades can be put into place prior to the full developments occurring.

In addition, the impact of non-permanent residents is currently contained in historical per capita data, with their relative proportion predicted to remain within historical averages. This allows the assumption that servicing projections based on permanent populations will also account for non-permanent residents. It has also been assumed that population growth within Wellington would remain within historical levels until 2020, after which increased development may occur.

For the purposes of setting a feasible implementation plan, the County included a 20-year phase of 2042, based on the projections from 2013 Watson and Associate Projections.

It should be stressed that timelines for the growth scenarios are subject to many different variables, which could result in an undefined period to reach buildout. Historic growth forecast will also be used to provide a baseline comparison for servicing needs.

Table 2.3 – Updated Population Projections

	Total[1]	Permanent	Seasonal[1]
2006 Population	2008	1807	201
2011 Population	2067	1860	207
2016 Population	2147	1932	215
Population as of 2020[2]	**2189**	**-**	**-**
Watson and Associates Projections, as implemented by The County			
Estimated Total Population of 2032[3]	**4200**	**-**	**-**
Estimated Total Population of 2042[3]	**6000**	**-**	**-**
Buildout [3]	**8,600**	**-**	**-**

Notes:
Population has been rounded. Does not account for deaths, migration or Census undercount.
1: Interpolated and extrapolated from Long Term Population, Housing and Employment Forecast and Capital Needs Assessment (Watson and Associates, 2015)
2: Extrapolated from Federal Census Data
3. Long Term Population, Housing and Employment Forecast and Capital Needs Assessment (Watson and Associates, 2013), as implemented by Prince Edward County. Numbers have been rounded for the use in the MSP.

2.2 Land Use Projections

The Wellington Secondary Plan identifies that at present, the majority of Wellington is residential with less than 10% of its land area designated as Industrial, Commercial or Institutional (ICI), with a total service area of **219 ha**. This land is presently intermixed within the existing residential areas, without any major differentiation. Current usage and generation rates of these areas are captured within historical per capital usage.

Presently, there is a total of **279 ha** allocated for residential development in the secondary plan, with **136 ha** at advanced planning stages for development by 2031 under growth Scenario C. The Watson and Associates Projection up to 2031 would proceed at a lower rate and only **70 ha** would be developed in this timeframe.

The Secondary Plan identifies that there are two areas that will be dedicated as an "employment area" for the development of ICI, one with **19.2** ha and the other with **8.8 ha**. The servicing needs of these areas must be considered separately; however, it is likely that ICI development would need to be limited at first to allow the required servicing upgrades. It is likely that the 19.2 ha area will be developed first after **2023** with the potential for completion by the 2031 timeline. The second 8.8 ha portion will likely be developed by 2052. The nature of these developments is currently unknown; however, it is likely to comprise commercial businesses and light industry, similar to other areas in the County. The lack of definition adds level uncertainty to future projections.

3.0 WATER SYSTEM AND WATER DEMANDS

3.1 Existing Water System

Wellington is presently serviced by the Wellington Water Treatment Plant, which uses Lake Ontario as its source water. The plant operates as a direct filtration system with a total rated capacity of 2,488 m^3/day (29 L/s) and reliable operating capacity of 1,225 m^3/day (14 L/s). Operational processes include coagulation, flocculation, filtration.

High Lift Capacity

- Four (4) (three (3) duty and one (1) standby, all in duty rotation) vertical turbine high lift pumps, with each having a rated capacity of 23 L/s (1987 m^3/day) at a TDH of 47 m
- Firm capacity of 32 L/s (2762 m^3/day) at a TDH of 47 m

Onsite Storage

- Twin Clearwell cells with dimensions of 6.12 m x 22.5 m x 4.7 m with a total storage volume of approximately 1,300 m^3
    - A minimum 1.5 m level must be maintained, without impacting disinfection requirements
    - Equates to 881 m^3 of effective storage, without replenishment

Offsite Storage

- Elevated Water tower with a total storage volume of 568 m^3

Fire protection and sample hydrants are located throughout the water distribution system.

3.2 Historical Water Demands

Daily "Operations Data" were provided by the County for the years 2009 through 2017. The data is appended in **Appendix 8**. The data lists the daily totalized flows from the Wellington Water Treatment Plant, into the distribution system.

The Average Day Demands for Wellington were calculated as follows:

> Sum of by monthly total high lift pumping station outflows
> Divided by 365 days

Historical Maximum Day Demands were determined by looking for the highest day demand recorded in the monthly summary sheets.

Figure 3.1 shows the historical water usage between 2008 – 2018, with overlaid meteorological data to corelate usage patterns. The system follows typically seasonal use patterns, with increased demand during warmer summer periods or after periods with limited precipitation. This seasonal pattern may also reflect the impact of summer tourism on the area.

Figure 3.2 shows a summary of key water usage parameters between 2008 – 2018. From the historical data, it can be seen that the average day demands in Wellington have remained relatively stable since 2011 (545 – 535 m^3/day). The per capita user demands have varied between 408 L/capita/day to 268 L/capita/day since 2009, with a decreasing trend present. This is consistent with the fact that the Wellington system is primarily comprised of residential users, has had little population change, and has had new water conservation measures causing a reduction in water use. The highest

maximum day demand to average day demand ratio, or Max Day Demand Factor was 2.82, with the typical Max Day Demand Factor over this period being 2.0.

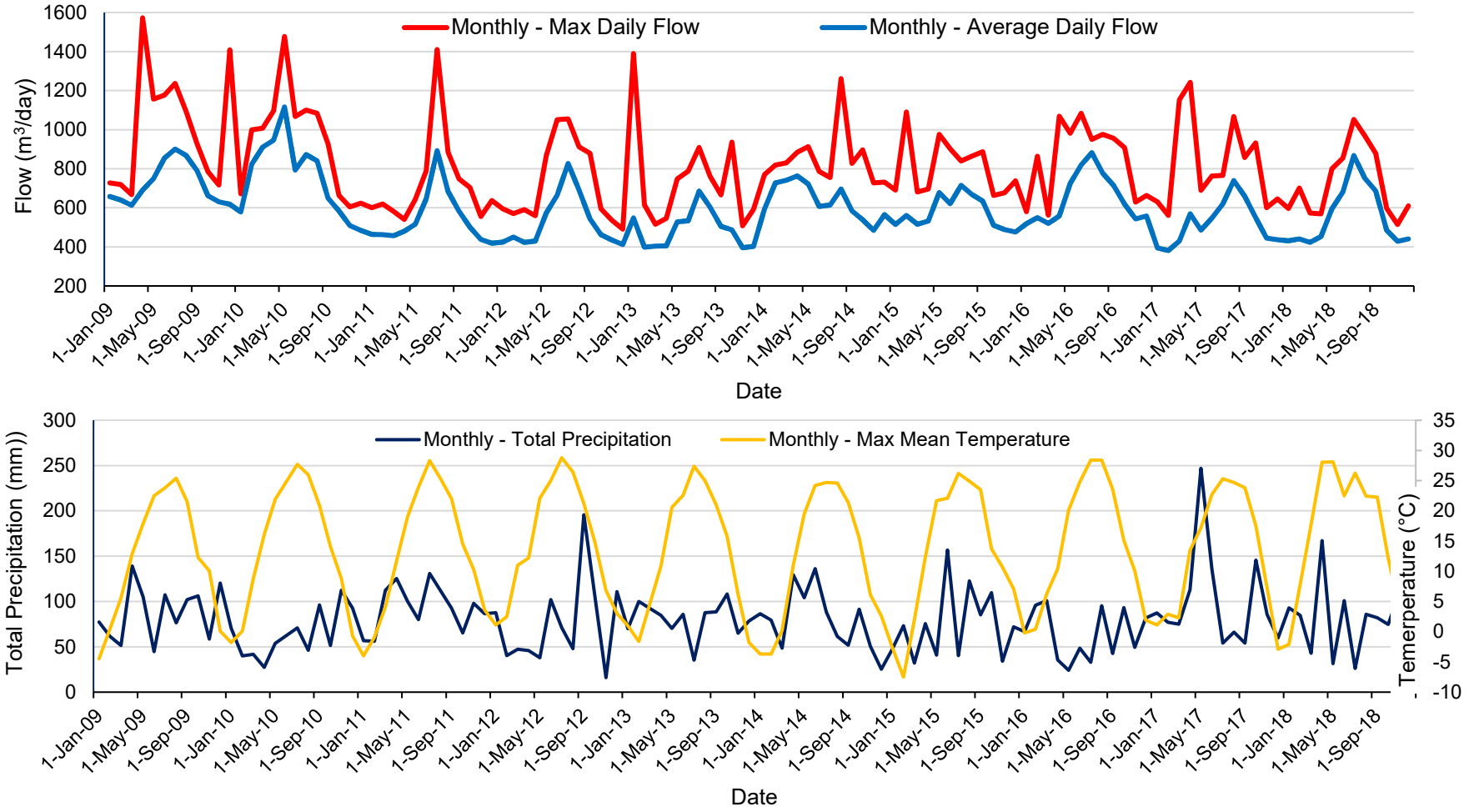

Figure 3.1 – Historical Wellington Water and Meteorological Data

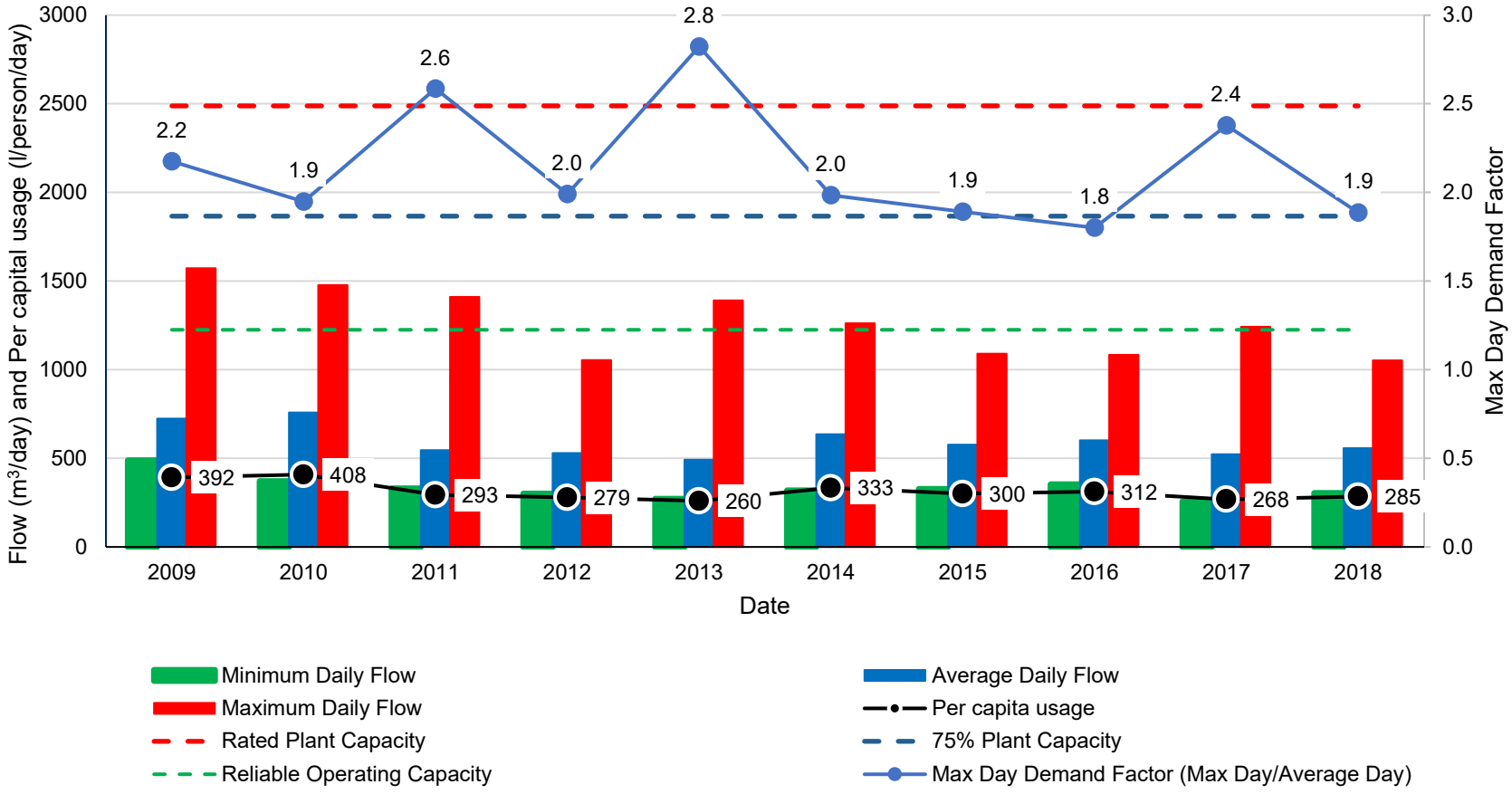

Figure 3.2 – Summarized Wellington Water Parameter

3.3 Future Demands

Table 3.1 provides a summary of water usage statistics for determining future projections. If available, historical values are compared to typical usage statistics for Ontario. Per capita usage for the Wellington system is within a typical range; however peaking factors show slightly more variance.

It is recommended that **320 L/capita/day** demands be used when calculating the water demands for the increased population in the year 2031 – 2052. This demand was selected based on historical data, though there is the potential for increased water efficiency and a continued reduction in per capita water demands. This higher value will also help to offset the unknown impact of increased tourism and non-seasonal residents.

There is presently no historical ICI data for Wellington and the nature of the proposed "employment areas" is uncertain. The MECP has a recommended range depending on the nature of the users, classed as either light or heavy industry; however, these two classes are quite broad in definition and can be inaccurate. Table 3.2 presents a range of historical ICI planning values from other Master Servicing Plans; however, at present, it is recommended to use the MECP light industry class of **35 m^3/ha/day** for projections, as to not constrain the type of ICI development that may occur and due to the lack of available data. These values can be updated in future to reflect actual usage rates.

Similar to the average day demands, we would recommend using community specific maximum day factors up to 2031. Therefore, we recommend the demand projections as follows:

- Max day/peak demand factor of **2.0** for residential areas based on typical values from the past 5 years of data
- Apply the maximum day factor of **3.0** to projected ICI demands

Table 3.1 – Water Usage Statistics used for Future Projections

	Unit	Value	Peak Factor	Peak Hour	Reference Source Note
Historical per capita use	L/capital/day	313	1.8 – 2.8		1
Typical per capita use	L/capital/day	270 - 450	2.0 – 2.25	3.0 – 3.38	2
Projected per capita use	**L/capital/day**	**320**	**2.0**	**3.38**	1
Typical use Industrial Parks	m^3/ha/day	35 – 55	2 – 4		2
Projected use Industrial Parks 2031	**m^3/ha/day**	**35**	**4**		2,3

Note:
Historical data for Wellington
MECP, 2008 Design Guidelines for Drinking Water Systems
Comparison ICI values from Table 3.2

Table 3.2 – Comparison ICI Demand Planning Values

Source	Unit	Light Industrial	Heavy Industrial	Commercial	Institutional	Other
MECP, 2008 Design Guidelines for Drinking Water Systems	m^3/ha/d	35	55			
MECP, 2008 Design Guidelines for Sewage Work	m^3/ha/d					28 - Commercial and tourist areas
Water Supply and Wastewater Servicing Master Plan Update, Town of Bradford West Gwillimbury	m^3/ha/d	2.2	60	2.2		5 - Blended water use rate (assuming heavy industrial land use at 5%) 8 - commercial and industrial development along HWY 400 employment area

Source	Unit	Light Industrial	Heavy Industrial	Commercial	Institutional	Other
City of Barrier Water Storage and Distribution Master Plan	m^3/ha/d	28				
City of Orillia Water System Master Plan Update	m^3/ha/d	36	36	28		
City of London Master Plan	m^3/ha/d	16	16	7	15	
Town of Innisfil Master Plan	m^3/ha/d	20				
South Collingwood Water Booster Station and Reservoir Design Report	m^3/ha/d	25				

Table 3.4 and Table 3.5 present the future water use projections for Wellington, with projections commencing in 2020.

Table 3.3 – Wellington Future Projections to 2032 – Water

Parameter	Demand Projection Value		Comments
2020 Daily Water Demands			
Wellington Population	2189	c	Extrapolated from Census data
Average Water Demand	700	m^3/d	Based on historical data
Max Day Water Demand	1401	m^3/d	Based on assumed max day factor of 2.0
Initial Permit Release	25	units/year	Based on initial release of 25 building permits
Initial Permit Release	2021	year	
2032 Residential Daily Water Demands			
Wellington Population	4200	c	PEC Projection
Average Population Increase per Year	168	c	
Average Units per Year	67	units	2.5 unit density
Historical Per Capita Demand	320	L/c/d	Planning Per Capita Demand
Max Day Demand Factor	2.0		Based on historical data
Average Water Demand	1344	m^3/d	
Max Water Demand	2688	m^3/d	
2032 ICI Average Day Water Demands			
Available Employment Land	19.2	ha	Allotted ICI area in Secondary Plan
Unit Demand	35	$m^3/ha/d$	
Per Capita Equivalent	109	c/ha	
Max Day Demand Factor	3.0		Average based on historical data
ICI Development Starts	2023	year	
New ICI Area per Year	2	ha/year	
Projected New Industrial Demand	672	m^3/d	Average
	2016	m^3/d	Max
Total 2032 Projected Demands			

Total 2032 Average Day Water Demand	**2016**	**m^3/d**	**Average**
Total 2032 Maximum Day Water Demand	**4704**	**m^3/d**	**Max**

Table 3.4 – Wellington Future Projections to 2042 – Water

Parameter	Demand Projection Value		Comments
2042 Residential Daily Water Demands			
Wellington Population	**6000**	**c**	**Based on Watson and Associates Projection**
Historical Per Capita Demand	**320**	**L/c/d**	**Planning Per Capita Demand**
Max Day Demand Factor	**2.0**		
Average Water Demand	**1920**	**m^3/d**	
Max Water Demand	**3840**	**m^3/d**	
2042 ICI Average Day Water Demands			
Available Employment Land	**28**	**ha**	**Allotted ICI area in Secondary Plan**
Unit Demand	**35**	**$m^3/ha/d$**	
Max Day Demand Factor	**3.0**		
Projected New Industrial Demand	**980**	**m^3/d**	**Average**
	2940	**m^3/d**	**Max**
Total 2042 Projected Demands			
Total 2042 Average Day Water Demand	**2900**	**m^3/d**	**Average**
Total 2042 Maximum Day Water Demand	**6780**	**m^3/d**	**Max**

Table 3.5 – Wellington Future Projections to Buildout – Water

Parameter	Demand Projection Value		Comments
Buildout Residential Daily Water Demands			
Wellington Population	**8600**		**Based on Watson and Associates Projection**
Historical Per Capita Demand	**320**	**L/c/d**	**Planning Per Capita Demand**
Max Day Demand Factor	**2.0**		
Average Water Demand	**2752**	**m^3/d**	

Max Water Demand	**5504**	**m^3/d**	
Buildout ICI Day Water Demands			
Available Employment Land	**28**	**ha**	**Allotted ICI area in Secondary Plan**
Unit Demand	**35**	**$m^3/ha/d$**	
Max Day Demand Factor	**3.0**		
Projected New Industrial Demand	**980**	**m^3/d**	**Average**
	2940	**m^3/d**	**Max**
Total Buildout Projected Demands			
Total Buildout Average Day Water Demand	**3732**	**m^3/d**	**Average**
Total Buildout Maximum Day Water Demand	**8444**	**m^3/d**	**Max**

Figure 3.3 illustrates the increase in water demand for baseline historical growth, and the Watson and Associates Projection, assuming a linear growth distribution. ICI demands have been isolated for each option. In terms of plant expansion, the County utilizes a 75% rated capacity trigger or a reliable operating capacity trigger to begin design proceedings. The reliable operating capacity represents one train out of service, which is the operationally sustainable level for average production. Historically, max day demands have exceeded the plants reliable operating capacity and continual operation at this rate would not be sustainable. The provision of addition treated water storage capacity could help to alleviate this issue.

For the baseline historical growth, the following could occur:

- Max day demand currently exceeds reliable operating capacity.

For the Watson and Associates Projection the following would occur:

- Max day residential demands without ICI development, would result in the 75% capacity trigger being reach in 2025/26.
    - Rated plant capacity would be exceeded after 2031.
- Residential demands with ICI development, would result in the 75% capacity trigger being reached in 2024.
    - Rated plant capacity would be exceeded by 2025.

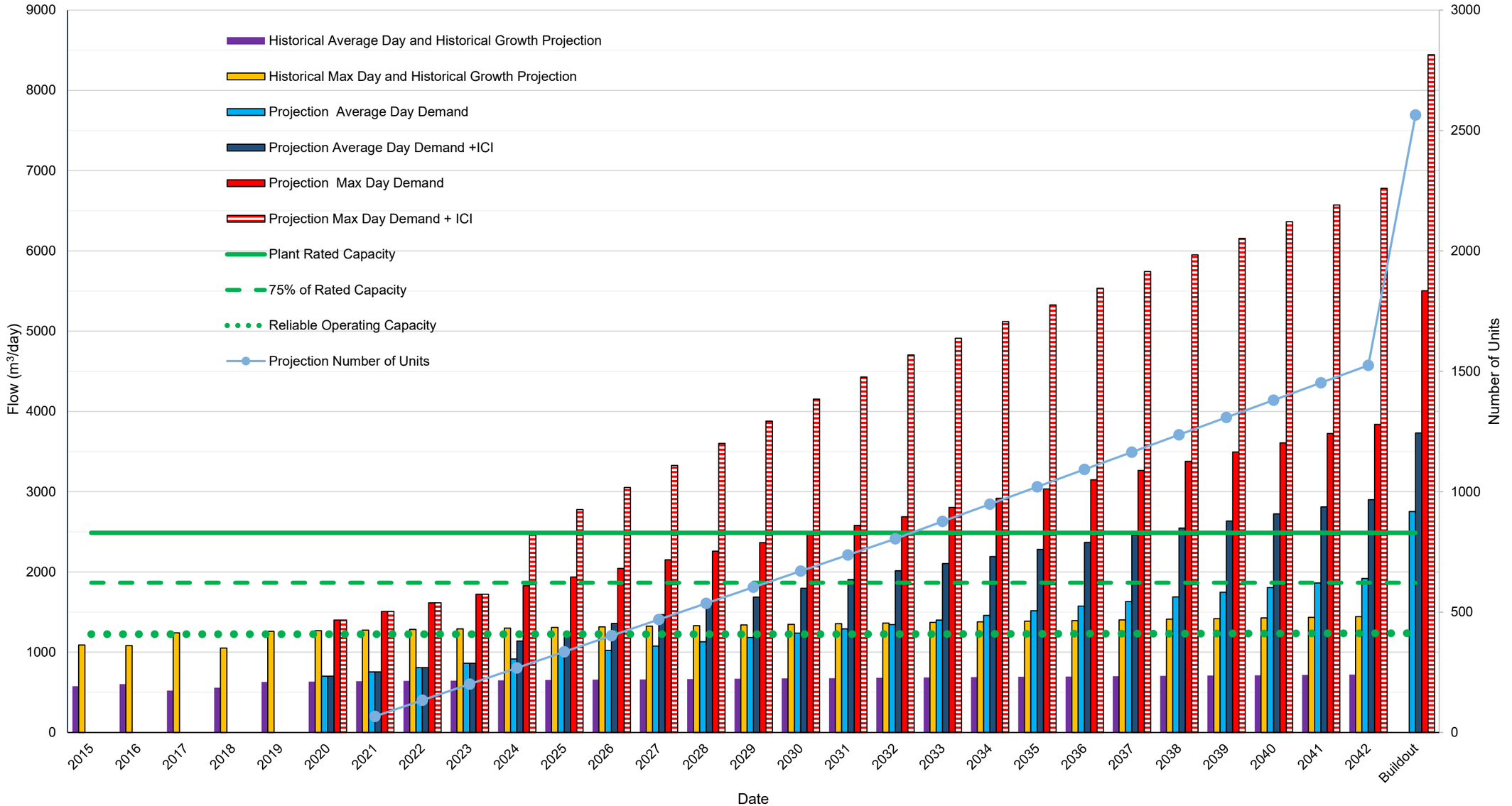

Figure 3.3 – Wellington Water Projections

3.4 Distribution system

The primary goals of the optimized distribution system should aim to satisfy the following criteria:

- Provide the MECP recommended pressures as much as possible throughout the distribution system:
    - Normal operating pressure ranges from 350 kPa to 480 kPa (50 to 70 psi) under maximum day flow conditions
    - Maximum pressures in general should not exceed 700 kPa (100 psi)
    - Minimum pressure of 275 kPa (40 psi) under peak hour demand conditions
    - Minimum pressure of 140 kPa (20 psi) under maximum day plus fire flow conditions.

3.5 Fire flow

3.5.1 Ministry of the Environment, Conservation and Parks Guidelines

Fire protection is a municipal responsibility and the municipality may elect to provide for higher fire flow requirements or entirely forgo fire protection by way of the drinking-water distribution system; however, the MECP Guidelines for Drinking Water Systems (2008) provides the following general guidance to municipalities, which many municipalities adopt and these are summarized in Table 3.6.

Table 3.6 – MECP Fire Flow Guidelines

Equivalent Population	Suggested Fire Flow (L/s)	Duration (hours)
500 – 1,000	38	2
1,000	64	2
1,500	79	2
2,000	95	2
3,000	110	2
4,000	125	2
5,000	144	2
6,000	159	3
10,000	189	3

3.5.2 Fire Underwriters Survey

The MECP Guidelines note that the above flows may not fulfill the fire protection requirements of the municipality's insurance company or the Fire Underwriters Survey, and therefore for fire flow requirements, the latest edition of the Fire Underwriters Survey document should be referenced.

The Fire Underwriters Survey (FUS) published a booklet in 1999 entitled: "Water Supply for Public Fire Protection" which contains a methodology that can be used to aid in estimating fire flow requirements for municipal fire protection on a building by building basis, based on materials of construction, size, fire protection, proximity to other buildings, etc.

Some example ranges of fire flows for various land uses are summarized in Table 3.7.

Table 3.7 – FUS Fire Flow Guidelines

Exposure Distance	Suggested Required Fire Flow (L/s)
Detached one family and small two-family dwellings less than 2 stories in height (Less than 3 m separation)	100 L/s *(masonry construction) Wood frame construction with a separation <3 m to be considered one fire area*
Detached one family and small two-family dwellings less than 2 stories in height (3 to 10 m separation)	67
Detached one family and small two-family dwellings less than 2 stories in height (10 to 30 m separation)	50
Detached one family and small two-family dwellings less than 2 stories in height (Greater than 30 m separation)	33
Modern townhouse groups	100 – 167
Apartment building	117 – 250
Institutional building	83 – 250
Industrial park	233
Commercial shopping centers	200 – 367
Warehouse	333 – 420
Old congested 2 and 3 family apartment buildings with less than 3 m separation running the length of a block	233 – 417

For the current stage of this Master Servicing Plan, it is recommended to use the MECP recommended fire flows, which are typical of other municipalities in Ontario. If ICI

development proceeds FUS requirements can be adjusted to reflect actual requirements.

The fire flow requirements for the ICI and residential blocks should be reassessed when further information is available. Design and construction approaches can help to reduce the flow requirements to be within a similar range as residential requirements. This includes the use of fire resistive construction, separation distances, firewalls or compartments, reassessment of occupancy hazard and sprinkler design.

In addition, the mechanical engineer for these buildings and developments will complete the required analyses for fire protection, and the architect will design fire separation methods per the determined fire flow rate, in order to meet municipally available flows and pressures.

3.5.3 Recommended Water Storage Volume

Fire protection is a municipal responsibility, and the following approach is recommended by the MECP to calculate required treated water storage volume, with the results shown in Table 3.8:

Total Treated Water Storage Requirement = A + B + C

Where:

A = Fire Storage

B = Equalization Storage (25% of maximum day demand)

C = Emergency Storage (25% of (A + B)).

Table 3.8 – MECP Water Storage Volumes – Based Watson and Associates Population Projections

3.5.4

Year	Population Category	Conditions			
		A	B	C	
		Fire Storage (m^3)	Equalization Storage (m^3)	Emergency Storage (m^3)	Total Volume (m^3)
2020	2000	684	350	259	1293
2021	2000	684	377	265	1326
2022	3000	792	404	299	1495
2023	3000	792	431	306	1528
2024	3000	792	625	354	1772
2025	3000	792	694	372	1858
2026	3000	792	763	389	1944
2027	3000	792	832	406	2030
2028	4000	900	901	450	2251
2029	4000	900	970	467	2337
2030	4000	900	1038	485	2423
2031	4000	900	1107	502	2509
2032	4000	900	1176	519	2595
2042	6000	1717	1695	853	4265
Buildout	8600	1928	2111	1010	5049
2032-Industrial Park[2]		2516	1176	923	4615
2042-Industrial Park[2]		2516	1695	1053	5264
Buildout-Industrial Park[2]		2516	2111	1157	5784

Note:
1.Values without industrial park FUS requirements unless stated.
2.With Industrial park FUS requirements

3.5.5 Storage Recommendations

Currently, the Wellington system does not have adequate storage capacity to accommodate future growth and additional storage will be required. One potential

alternative is the replacement of the current elevated tank with a larger model. Another item to consider is the fire flow requirements for the industrial area skews the sizing and should be reviewed in future.

The transition of the distribution system to the new elevated tank may need to make accommodations for the new pressure regime. This may require consideration for pressure zones within the distribution system and increases in distribution systems leaks. One option that has been proposed by the PEC to minimize the impact on end users is the rollout of new flowmeters with pressure regulating valves to limit the impact of pressure increases on older domestic plumbing.

4.0 WASTEWATER SYSTEM AND WASTEWATER GENERATION

4.1 Existing System

The Wellington WWTP has a rated capacity of 1,500 m^3/day (17.4 L/s) and a peak hydraulic capacity of 4,550 m^3/day (52.7 L/s). The system operates and the collection system's pumping stations are summarized in Table 4.1.

Table 4.1 – Sanitary Sewer System Pumping Capacities

Pump Station	# Pumps	Rated Capacity
Belleville Street PS	2	30.3 L/s @ 13.7 m TDH
Wharf Street PS	2	34.1 L/s @ 11.6 m TDH
WWTP	3	29.5 L/s @ 6.7 m TDH

4.2 Historical Generation Rates

Figure 4.1 – show the historical water usage between 2013 – 2018, with overlaid water consumption and precipitation data to correlate flows. It is evident that the system flow rates are being impacted by wet weather events, with monthly precipitation often mirrored in the monthly wastewater flow data. Since 2017, there have been an increase in months with elevated precipitation totals (greater than 100 mm), with five peaks recorded between 2017 – 2018 and only three similar events occurring in prior years.

Figure 4.2 shows a summary of key wastewater parameters between 2013 – 2018. The system has seen an increase in flows over this period, likely tied to higher volume precipitation events in recent years.

Average and max day flows have increased since 2013 and it appears that the rated capacity of the plant is exceeded during these events. Annual average day flows have ranged between 699 – 949 m^3/day with an increasing trend present. The plants 4 years running average is 770 m^3/day. For a few weeks during the spring season the flows often exceeds the rated capacity requiring the system to bypass the treatment system

When comparing ratios of wastewater generated to water used, the values have increased from 1.0 in 2013 to a high of 1.8 in 2017. This further supports that a significant amount of inflow and infiltration is occurring during wet weather/precipitation events. This has led to an increase in per capital generation rates from 343 to 488 L/capita/day, with 4 year running average of 399 L/capital/day; however, this is not reflective of water usage data. Return rates of potable water into the sanitary system in July, August and September were found to range between 55% to 100%, with an average of 80%. The highest maximum day flows to average day flows, or Peaking Factor was 5.5, with the Average Peaking Factor of 3.4 over this period. Elevated peaking factors are linked to precipitation events and do not reflect actual wastewater generation rates. Water usage (monthly average and maximum) has an inconsistent trend with the corresponding wastewater generation rates.

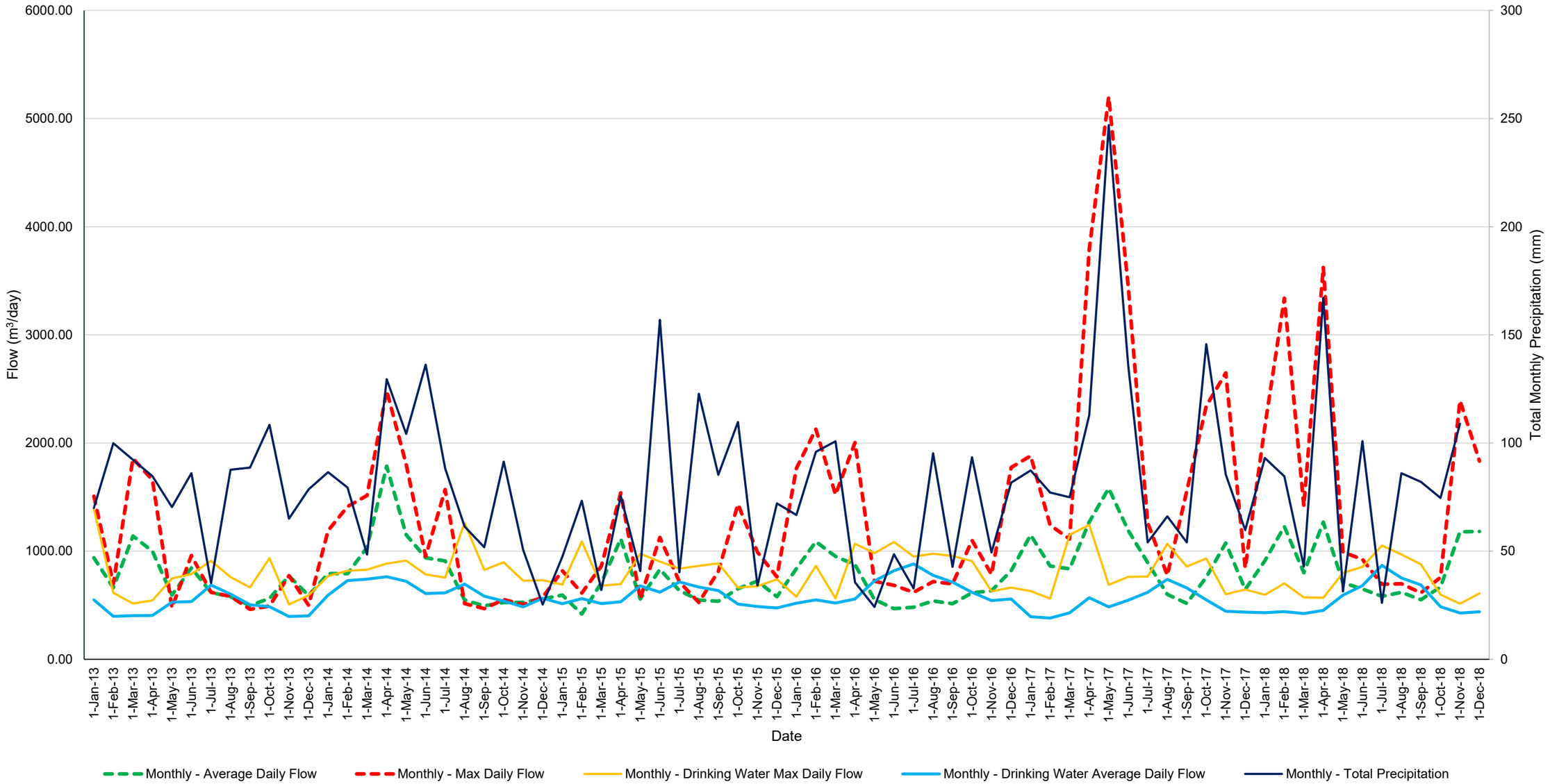

Figure 4.1 – Historical Wellington Wastewater Data

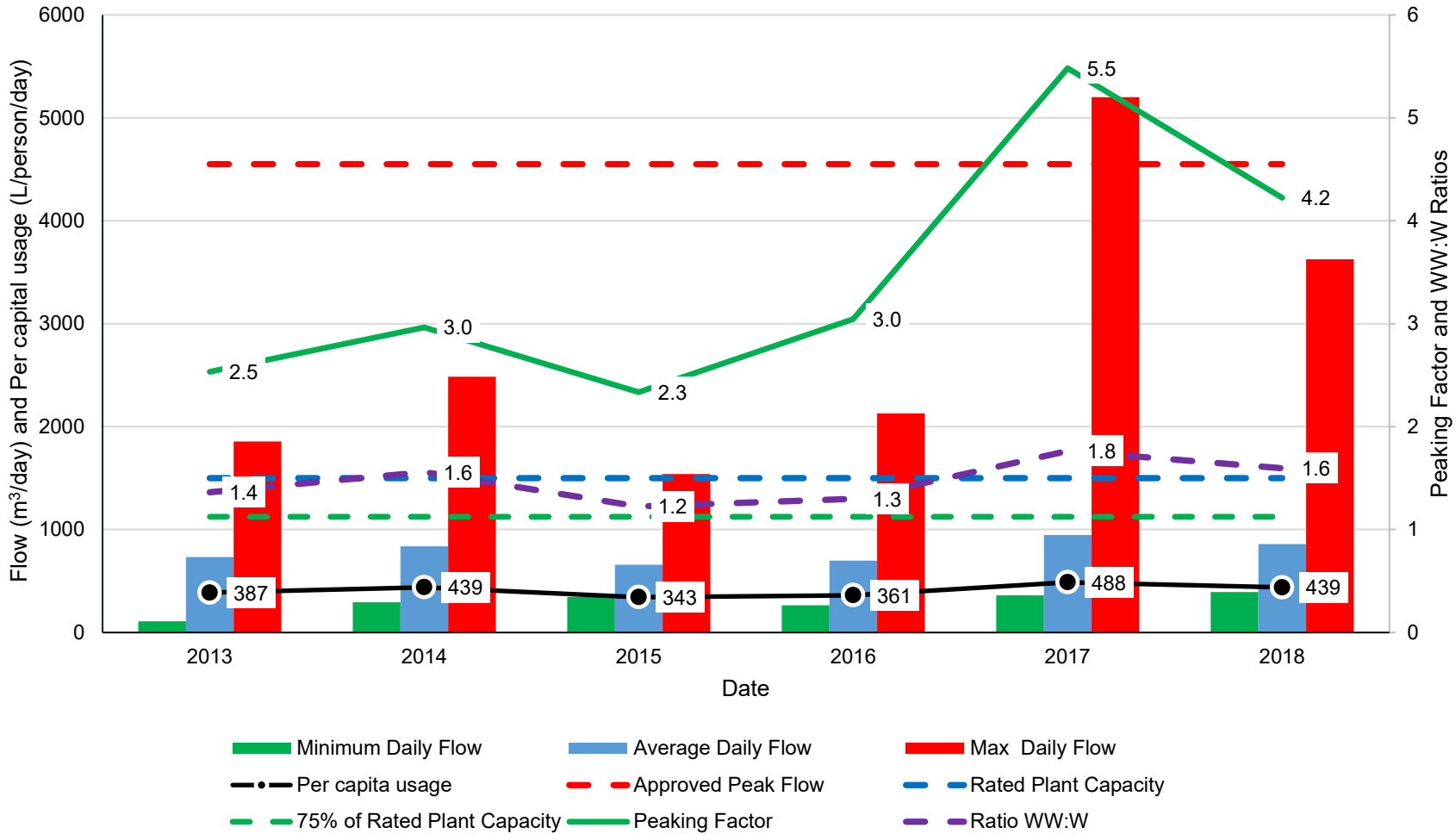

Figure 4.2 – Summarized Wellington Wastewater Parameters

4.3 Future Wastewater Flowrates

Table 4.2 provides a summary of wastewater statistics for determining future projections. If available, historical values are compared to typical rate statistics for Ontario. Per capita usage for the Wellington system is within a typical range, though the system is current heavily influenced by inflow and infiltration events.

Historic per capita flows are **400 L/capita/day** (inclusive of I&I); however, actual per capita flows are **260 L/capita/day** (80% return rate of water use, exclusive of I&I) and this latter value will be used for both existing and new developments.

Due to the impact of inflow and infiltration on community specific maximum day factors it is recommended to use the Harmon formula to calculate peaking factors. Peaking factors have the tendency to decrease as a community's population increases.

There is presently no historical ICI data for Wellington and the nature of the proposed development park is uncertain. The MECP does not recommend going below **28 m^3/ha/day**; and it should match expected water usage. At present, it is recommended to match the proposed water usage until the nature of the development is better defined.

It is recommended to use an average inflow and infiltration (I&I) allowance of **1.27 m^3/ha/day** for new and existing residential areas and a value of **1.27 m^3/ha/day** for the new ICI areas. These values were calibrated based on historical Wellington data and are below typical average inflow and infiltration values (MOE, 2008)

It is recommended to use a peak inflow and infiltration allowance of **21.40 m^3/ha/day** for existing areas and a value of **4.75 m^3/ha/day** (MOE, 1984) for the new residential and ICI areas. Existing values were calibrated based on historical Wellington data and there is the potential for these values to be reduced if inflow and infiltration into the sanitary system is addressed. New values are based on the higher range of MOE guidelines, which is equivalent to **500 L/capita/day.** Although new construction methods can in theory achieve lower I&I rates, often in practice this does not occur and likely, as the system ages I&I increases. In addition, sewers should be designed with the capability to accommodate **24.19 m^3/ha/day** (0.28 L/s/ha), to accommodate peak I&I events (ICLR, 2017). A pending update to the MECP design criteria for sanitary sewers is proposing I&I flows of 0.25 L/s/ha. To be conservative, this report uses the I&I flow of 0.28 L/s/ha from the Guidelines for Design of Sanitary Sewage Systems (MOE, 1985).

Table 4.2 – Wastewater Generation Statistics used for Future Projections

	Unit	Value	Peak Factor	Reference Source
Historical per capita rates	L/capital/day	343 - 488	2.3 – 5.5	1
Typical per capita rates	L/capital/day	225 - 570	Varies	2
Projection per capita use	**L/capital/day**	**260**	**Harmon**	
Typical rates ICI	m^3/ha/day	28 – 55	2 – 4	3,4
Projection ICI	**m^3/ha/day**	**35**	**2.0**	**3,4**
Historical average I&I	m^3/ha/day	**1.27**		1
Typical I&I	m^3/ha/day	**3.72**		4,5
Projection average I&I (New and existing)	**m^3/ha/day**	**1.27**		**1**
Historical peak I&I	m^3/ha/day	21.40		1
Typical peak I&I	m^3/ha/day	**10.24 – 24.19**		4,5
Projection peak I&I (existing)	**m^3/ha/day**	**21.40**		**1**
Projection peak I&I (new)	**m^3/ha/day**	**4.75**		**5**
Projection peak I&I (sewer design)	**L/s/ha**	**0.28**		**5**

Note:

1. *Historical data for Wellington*
2. *MECP, 2008, Design Guidelines for Sewage Works*
3. *MECP, 2008 Design Guidelines for Drinking Water Systems*
4. *NRC, 2003, National Guide to Sustainable Municipal Infrastructure -Infiltration/Inflow Control/Reduction for Wastewater Collection Systems*
5. *MOE, 1985, Design Guidelines for Sanitary Sewage Systems. A pending update to the MECP design criteria for sanitary sewers is proposing I&I flows of 0.25L/s/ha. To be conservative, this report uses the 0.28L/s/ha from the 1984 MOE design guidelines.*

Table 4.3, Table 4.4 and Table 4.5 present the future wastewater use projections for Wellington, with projections commencing in 2020. A few of these numbers were updated since the original version of TM#1 and the data shown in the Public Information Centre (PIC) Panels #1 and #2. The main changes include a more realistic approach to future I&I flow rate and maximum day flow calculations. Under the full build out scenario, the average day flow remains the same (e.g. approximately 3,900 m^3/day), however the peak day flow is reduced to 10,440 m^3/day instead of 16,900 m^3/day. The peak hour flow is estimated at 18,000 m^3/day. This means that the footprint of the ultimate wastewater treatment plant may be a bit smaller than originally presented in the PIC panels and could have some reduction to the capital cost. However, the full benefits of the flow update would be best realized if the County incorporated an equalization tank strategy with the long term WWTP strategy, as it will help to optimize the process treatment sizes for secondary clarifiers, UV and tertiary treatment processes while still accounting for peak flows.

Table 4.3 – Wellington Future Projections to 2032 – Wastewater

Parameter	Demand Projection Value		Comments
2020 Average Day Flows			
Wellington Population	2189		Extrapolated from Census data
Historical Per Capita Flow (Includes ICI and I&I)	400	L/c/d	4-yr Running Average
Historical Per Capita Flow (excluding I&I)	260	L/c/d	80% return rate
Peaking Factor	3.55		Harmon - for sewers
Historical Average I&I	140	L/c/d	Average based on historical data
Typical Peak I&I	1162	L/c/d	Average peak based on historical data
Future Peak I&I	500	L/c/d	Peak based on (MOE guidelines, 1984) - New area only
Historical Peak I&I	2116	L/c/d	Peak based on historical data
Current Area Serviced	219	ha	
Average Wastewater Generation Rate	876	m^3/d	Average based on historical data
Typical Peak Wastewater Generation Rate	4567	m^3/d	Average peak based on historical data
Peak Wastewater Generation Rate	5202	m^3/d	Peak based on historical data
Average I&I Rate	1.40	$m^3/ha/d$	Average based on historical data (for new and exisitng)
Typical Peak I&I	11.61	$m^3/ha/d$	Peak based on historical data
Future Peak I&I	5.25	$m^3/ha/d$	Peak based on (MOE guidelines, 1984) - New area only
Historical Peak I&I	21.15	$m^3/ha/d$	Peak based on historical data
2032 Residential Flows			
Wellington Population	4200		PEC Projection
Population Increase per Year	168	c	
Average Units per Year	67	units	2.5 unit density
Projected Per Capita Flow	260	L/c/d	
Peaking Factor	3.31		Harmon - for sewers
Average Day Flow	1092	m^3/d	
Peak Day Flow	3619	m^3/d	For sewers
2032 New ICI Flows			
Available Employment Land	19.2	ha	Based on Secondary Plan
Unit Rate	35	$m^3/ha/d$	MECP “Light Industry”
Per Capita Equivalent	135	c/ha	
Peaking Factor	2.00		Typical
ICI Development Starts	2023	year	
New ICI Area per Year	2	ha/year	
Average Day Flow	672	m^3/d	
Peak Day Flow	1344	m^3/d	
2032 Average Inflow and Infiltration (I&I)			
New Residential Area	136	ha	Prorated area
Residential I&I Rate	1.40	$m^3/ha/day$	Calibrated based on historical data
Residential I&I	497	m^3/d	
New ICI Area	19.2	ha	Allotted ICI area in Secondary Plan
ICI I&I Rate	1.399	$m^3/ha/day$	Calibrated based on historical data

ICI I&I	**27**	**m^3/d**	
Total	**524**	**m^3/d**	
2032 Peak Inflow and Infiltration (I&I)			
New Residential Area	**136**	**ha**	**Proposed Developments**
Residential I&I Rate	**5.25**	**m3/ha/d**	**Peak based on (MOE guidelines, 1984) - New area only**
Residential I&I	**5348**	**m^3/d**	**New and existing at differing rates - refer to 2020 table**
New ICI Area	**19.2**	**ha**	**Allotted ICI area in Secondary Plan**
ICI I&I Rate	**5.250**	**m3/ha/d**	**Peak based on (MOE guidelines, 1984) - New area only**
ICI I&I	**101**	**m^3/d**	
Total	**5449**	**m^3/d**	
2032 Projected Flows			
2031 Average Day without ICI	**1589**	**m^3/d**	
2032 Per Capita Average Day without ICI	**378**	**L/c/d**	
2032 Average Day with ICI	**2288**	**m^3/d**	
2032 Per Capita Average Day with ICI	**545**	**L/c/d**	
2032 Peak Day (Residential and Peak I&I)	**6440**	**m^3/d**	
2032 Peak Day (Residential, Peak ICI and Peak I&I)	**7885**	**m^3/d**	

Table 4.4 – Wellington Future Projections to 2042 – Wastewater

2042 Residential Flows			
Parameter	**Value**		**Comments**
Wellington Population	6000	c	Based on Watson and Associates Projection
Peaking Factor	3.17		Harmon - for sewers
Projected Per Capita Flow	260	L/c/d	
Average Day Flow	1560	m3/d	
Peak Day Flow	4946	m3/d	For sewers
2042 ICI Day Flows			
Available Employment Land	28	ha	Allotted ICI area in Secondary Plan
Unit Rate	35	m3/ha/d	
Per Capita Equivalent	135	c/ha	
Peaking Factor	2.00		Typical
Average Day Flow	980	m3/d	
Peak Day Flow	1960	m3/d	
2042 Average Inflow and Infiltration (I&I)			
Residential Area	195	ha	Prorated area
Residential I&I Rate	1.40	m3/ha/day	Calibrated based on historical data
Residential I&I	579	m3/d	
ICI Area	28	ha	Allotted ICI area in Secondary Plan
ICI I&I Rate	1.399	m3/ha/day	Calibrated based on historical data
ICI I&I	39	m3/d	
Total	618	m3/d	
2042 Peak Inflow and Infiltration (I&I)			
Residential Area	195	ha	Allotted residential area in Secondary Plan
Residential I&I Rate	5.3	m3/ha/d	Peak based on (MOE guidelines, 1984) - New area only
Residential I&I	5654	m3/d	New and existing at differing rates - refer to 2020 table
ICI Area	28	ha	Allotted ICI area in Secondary Plan
ICI I&I Rate	5.3	m3/ha/d	Peak based on (MOE guidelines, 1984) - New area only
ICI I&I	147	m3/d	
Total	5801	m3/d	
2042 Projected Flows			
2042 Average Day without ICI	2139	m3/d	
2042 Per Capita Average Day without ICI	356	L/c/d	
2042 Average Day with ICI	3158	m3/d	
2042 Per Capita Average Day with ICI	526	L/c/d	
2042 Peak Day (Residential and I&I)	7214	m3/d	
2042 Peak Day (Residential, Peak ICI and I&I)	9321	m3/d	

Table 4.5 – Wellington Future Projections to Buildout – Wastewater

Buildout Residential Flows			
Parameter	**Value**		**Comments**
Wellington Population	8600	c	Based on Watson and Associates Projection
Peaking Factor	3.02		Harmon - for sewers
Projected Per Capita Flow	260	L/c/d	
Average Day Flow	2236	m^3/d	
Peak Day Flow	6751	m^3/d	For sewers
Buildout ICI Day Flows			
Available Employment Land	28	ha	Allotted ICI area in Secondary Plan
Unit Rate	35	$m^3/ha/d$	
Per Capita Equivalent	135	c/ha	
Peaking Factor	2.00		Typical
Average Day Flow	980	m^3/d	
Peak Day Flow	1960	m^3/d	
Buildout Average Inflow and Infiltration (I&I)			
Residential Area	279	ha	Allotted residential area in Secondary Plan
Residential I&I Rate	1.399	$m^3/ha/day$	Calibrated based on historical data
Residential I&I	697	m^3/d	Calibrated based on historical data
ICI Area	28	ha	Allotted ICI area in Secondary Plan
ICI I&I Rate	1.399	$m^3/ha/day$	Calibrated based on historical data
ICI I&I	39	m^3/d	
Total	736	m^3/d	
Buildout Peak Inflow and Infiltration (I&I)			
Residential Area	279	ha	Allotted residential area in Secondary Plan
Residential I&I Rate	5.25	m3/ha/d	Peak based on (MOE guidelines, 1984) - New area only
Residential I&I	6097	m^3/d	New and existing at differing rates - refer to 2020 table
ICI Area	28	ha	Allotted ICI area in Secondary Plan
ICI I&I Rate	5.25	m3/ha/d	Peak based on (MOE guidelines, 1984) - New area only
ICI I&I	147	m^3/d	
Total	6244	m^3/d	
Buildout Projected Flows			
Buildout Average Day without ICI	2933	m^3/d	
Buildout Per Capita Average Day without ICI	341	L/c/d	
Buildout Average Day with ICI	3952	m^3/d	
Buildout Per Capita Average Day with ICI	460	L/c/d	
Buildout Peak Day (Residential and I&I)	8333	m^3/d	
Buildout Peak Day (Residential, Peak ICI and I&I)	10440	m^3/d	

Peak Day Flow Factor	**2.6**	**m^3/d**	
Peak Hour Flow Factor to Peak Day Flow Factor	**1.7**	**m^3/d**	**WEF guidelines based on average capacity**
Peak Hour Flow Factor	**4.6**	**m^3/d**	
Peak Hourly Flow	**18021**	**m^3/d**	

Figure 4.3 illustrates the increase in wastewater flows for historical growth, and the Watson and Associates Projection, and ICI demands have also been isolated for each option. In terms of plant expansion, the County utilizes a 75% of the rated capacity trigger to begin design. Of particular note is that the plant is currently at the threshold of the capacity trigger, based on peak flows. In recent years the plant has also had a number of flow events that have exceeded the peak flow capacity of the plant.

For the baseline historical growth, the following could occur:

- Current peak flows exceed peak plant capacity.
- During certain periods of the year the average day flows exceed the rated capacity.

For the Watson and Associates Projection the following could occur:

- Current peak flows exceed peak hydraulic capacity
- Residential flows without ICI development would exceed 75% of the rated plant capacity by 2027.
    - Rated capacity would be exceeded after 2031/32
    - With ICI included, rated capacity would also be exceeded by 2025/26

This indicates that modifications to the wastewater treatment plant will be required to accommodate additional wastewater flows or new development needs to be limited until the wastewater treatment is upgraded. The immediate concern is addressing the plants capacity to handle peak flows. County staff have indicated that the existing treatment trains are not used to their full rated capacity, however the treatment process have hydraulic limitations and experience partial treatment bypasses during wet weather events.

The impacts of Inflow and infiltration is also significant concern and should be addressed and the following should be completed:

- Carry out a prolonged flow study.
- Identify the major problem areas and fix significant issues, as system wide rehabilitation may be cost prohibitive.

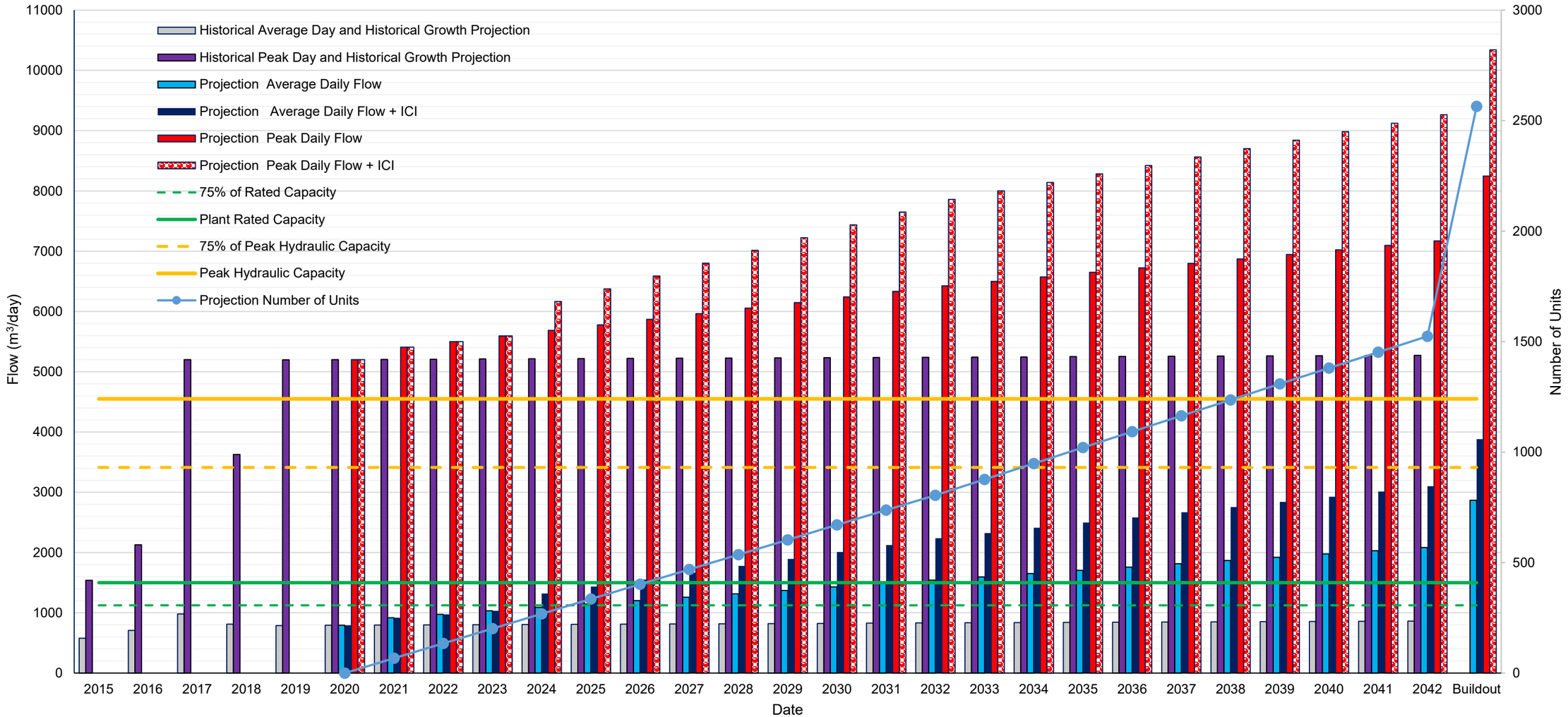

Figure 4.3 – Wellington Wastewater Projection

5.0 SUMMARY

Historical Growth projection:

Water

- Historically, max day demands have exceeded the water treatment plant's reliable operating capacity and continual operation at this rate would not be sustainable. The provision of additional treated water storage capacity could help to alleviate this issue in the short term.
- With historic growth projections the water treatment plant could continue to satisfy demands beyond 2031; however, it would be operating above the reliable operating capacity continuously.
- Storage is currently in deficit and should be addressed.

Wastewater

- Wastewater treatment plant's peak capacity historically exceeded
    - Inflow and infiltration significantly contribute to wastewater flows
    - Historical incidents of average day flows (averaged over a month) had exceeded the wastewater treatment plant's rated capacity, leading to bypass events.
    - Historically, peak day flows exceeded the wastewater treatment plant's peak capacity, leading to bypass events.
- With historic growth projections the wastewater treatment plant could continue to satisfy average days flows to beyond 2031; however, the industry standard is to begin planning for expansion when the wastewater treatment plant reaches 75-80% of its rated capacity, which would be reached much sooner than 2031. In addition, the peak flow limitations are a current problem that need to be addressed immediately before additional flows can be added, as it will further exacerbate the current bypass issues.

General Servicing

Should the County wish to take immediate steps to allow for a limited number of additional housing units, it would require addressing the water storage issue and shaving

the peak wastewater flows by reducing inflow and infiltration going to the wastewater treatment plant. The number of additional units feasible under this step would depend on how much of the peak flows can be reduced below the WWTP's rated capacity. The next step to accommodate more housing units would be to increase the redundancy at the water treatment plant (one additional train) and implement an interim solution for the wastewater treatment plant to take handle more peak flows during wet weather events. However, these would be short-term solutions to allow for limited number of housing units. The preferred alternatives for long term, sustainable servicing would still be required to accommodate growth. Additional information and details of this is covered under Technical Memorandum No. 2 and the Implementation Plan of the final Master Servicing Report.

Servicing projections for Watson and Associates Projection:

Water

- Average residential demands without ICI development would exceed the reliable operating capacity by 2031.
- Average residential demands with ICI development would exceed the reliable operating capacity by 2026.
- Residential demands without ICI development, would result in the 75% rated capacity trigger being reach in 2026.
    - Existing plant rated capacity would be exceeded after 2031.
- Residential demands with ICI development, would result in the 75% rated capacity trigger being reached in 2024.
    - Existing plant rated capacity would be exceeded by 2025.
- Treatment capacity requirements
    - 4700 m^3/day for 2032 requirements
    - 6800 m^3/day for 2042 requirements
    - 8500 m^3/day for buildout requirements
- Current water storage requirements.

- 5049 m^3 required to satisfy residential buildout requirements (based on FUS)
- 5784 m^3 required to satisfy residential and ICI buildout requirements (based on FUS)

Wastewater

- Residential flows, without ICI development, would exceed 75% of the rated plant capacity by 2024.
  - Ex. rated capacity would be exceeded by 2031/2032
  - With ICI included, existing rated capacity would be exceeded by 2025/2026
- Treatment capacity requirements
  - 2,300 m^3/d 2032 for average day flows
  - 7,900 m^3/d 2032 for peak day flows
  - 3,100 m^3/d 2042 for average day flows
  - 9,300 m^3/d 2042 for peak day flows
  - 3,900 m^3/d Buildout for average day flows
  - 10,440 m^3/d Buildout for peak day flows
  - 18,000 m^3/d Buildout for peak hourly flows

Phasing and implementation to be developed to satisfy water and wastewater servicing requirements. Certain elements may need to be sized for future servicing requirements (2042, buildout, etc.) due to phasing constraints. In addition, the phased approach requires that servicing is constructed in advance of the servicing requirements (i.e. services for 2032 requirements need to be operational prior to 2032).

It should be noted that for both projections, there is uncertainty regarding the nature and development timelines for the “employment areas”, which have a significant contribution to servicing requirements. In future, these values should be updated when the ICI developments are better defined.

The values and timelines in this technical memorandum will be carried forward for further review; however, the projections from The Watson and Associate Report and Secondary

Plan have identified growth rates which are well above historic values. Given the magnitude of growth projected it may be prudent to size servicing in a phased/staged manner to accommodate for lower than expected growth.

Respectfully submitted,

R.V. ANDERSON ASSOCIATES LIMITED

Rika Law, P.Eng., PMP
Project Manager

6.0 REFERENCES

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R.V. Anderson, "Wellington Sanitary Sewer Capacity Analysis", Toronto. Ontario, 2018

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ICLR, "Project to Address Unacceptable Inflow and Infiltration (I/I) in New Subdivisions, Toronto, Ontario, 2017.

National Guide to Sustainable Municipal Infrastructure Infiltration/Inflow, “Control/Reduction for Wastewater Collection Systems”, Ottawa, Ontario, 2003

Watson and Associates,” Long Term Population, Housing and Employment Forecast and Capital Needs Assessment”, Mississauga. Ontario, 2013

Watson and Associates,” Water and Wastewater Rate and Study and Connection Charges Update”, Mississauga. Ontario, 2015

APPENDIX F:
AVERAGE CAPITA USE AGREEMENT

Julie Humphries

From: Bryon Keene
Sent: October 14, 2025 4:15 PM
To: Robert MacDonald
Cc: Julie Humphries
Subject: RE: Cork and Vine - Wellington - Servicing Questions

Hi Robert,
OK. That's what we'll use.

Bryon

From: Robert MacDonald <rmacdonald@pecounty.on.ca>
Sent: Tuesday, October 14, 2025 3:43 PM
To: Bryon Keene <bryon@jewelleng.ca>
Subject: RE: Cork and Vine - Wellington - Servicing Questions

Bryon,

In Kaitlin's prepayment agreement, it says that water will be 320lpd and sanitary will be 350lpd, so we will use those numbers.

Regards,

Robert MacDonald, P.Eng.
Development Engineer
Department of Development Services
The Corporation of the County of Prince Edward
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rmacdonald@pecounty.on.ca

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From: Bryon Keene <bryon@jewelleng.ca>
Sent: October 14, 2025 1:37 PM
To: Robert MacDonald <rmacdonald@pecounty.on.ca>
Subject: Cork and Vine - Wellington - Servicing Questions

Hi Robert,
We are updating our servicing report for the Cork and Vine Subdivision and wanted to verify the per capita sanitary and water demands. The Master Servicing Study on your website states:

Water:	320L/person/day
Sanitary:	260L/person/day
Infiltration:	1.27m^3/ha/day

Is this what you wish for us to use in our spreadsheets and models for the local design?

Thanks
Bryon

Bryon Keene, P.Eng.
Senior Water Resources Engineer

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