



BOREHOLE No.: BH-9

ELEVATION: 218.4 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: E. Wierdsma

DATE: 15 April 2020

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

- SS - SPLIT SPOON
 AS - AUGER SAMPLE
 ST - SHELBY TUBE
 CS - CORE SAMPLE
 ▽ - WATER LEVEL

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) Water content (%) Atterberg limits (%) "N" Value (blows / 0.3 m)	Field Lab RQD CONE	COMMENTS
ft	m	0.0	GROUND SURFACE		%	%		N	10 20 30 40 50 60 70 80 90		
	0.2		TOPSOIL (150 mm)				1				
1			SANDY SILT - Light Brown Sandy Silt With Clay, Mottled, Wet, Loose	SS-1	60	19	1	4	×	○	
2							3				
3	1.0			SS-2	60	19	2				
4							3	5	×	○	
5							2				
6	1.7		SILTY CLAY - Brown Silty Clay, trace Sand, Mottled, Moist, Soft to Firm	SS-3	60	28	2				
7							2	5	×	○	
8							3				
9				SS-4	100	39	1				
10							1	3	×	○	
11	3.0		Brown Silty Clay with Sand, Wet, Very Soft	SS-5	100	36	1				
12							1	2	×	○	
13							1				
14							1				
15	4.0						1				
16	4.6		Grey	SS-6	100	42	1				
17							0	1	×	○	
18	5.0						1				
19							1				
20	6.0		Soft	SS-7	100	21	1				
21							1	4	×	○	
22							3				
23	7.0						2				
24											
25	7.6		TILL - Grey Sandy Silt, With Gravel, Trace Clay, Moist, Dense	SS-8	90	14	5				
26							13	29	○	×	
27	8.0						16				
	8.2		END OF BOREHOLE				31				

Water up to 2.4 m upon completion
 First encounter of groundwater seepage at 3.0 m
Grain Size Data
 SS-5:
 2% Gravel
 8% Sand
 90% Silt and Clay-sized Particles
 23% Between 5-75 um
Atterberg Limits
 LL = 40%
 PI = 22%

Borehole cave-in up to 5.8 m upon completion

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW, GP, J, GEOLOGIC.GDT 15/6/20



BOREHOLE No.: BH-10

ELEVATION: 216.2 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: E. Wierdsma

DATE: 15 April 2020

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

- ☒ SS - SPLIT SPOON
☒ AS - AUGER SAMPLE
☒ ST - SHELBY TUBE
☒ CS - CORE SAMPLE
 - WATER LEVEL

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) Water content (%) Atterberg limits (%) "N" Value (blows / 0.3 m)	Field Lab RQD CONE	COMMENTS
ft	m				%	%		N	10 20 30 40 50 60 70 80 90		
	0.0		GROUND SURFACE								
	0.2		TOPSOIL (150 mm)								
1			SANDY SILT - Brown Sandy Silt, Moist, Very Loose	SS-1	50	29	1	2	X		
2							1				
3			Loose				2				
4	1.0			SS-2	25	36	3	7	X		
5							4				
6			SILTY CLAY - Brown Silty Clay, trace Sand, Moist, Stiff	SS-3	75	22	5	13	X		
7	2.0						8				
8			Very Stiff				9				
9				SS-4	30	27	8	17	X		
10							9				
11	3.0		Stiff				3				
12				SS-5	100	25	4	9	X		
13							5				
14	4.0		Wet				4				
15							1				
16	4.6		Grey, Very Soft				1				
17				SS-6	100	26	1	2	X		
18	5.0						1				
19							1				
20							6				
21	6.0		Hard				10				
22				SS-7	25	22	24	34			
23							19				
24	6.7		END OF BOREHOLE								
25											
26	7.0										
27	8.0										

Grain Size Data

SS-3:
 0% Gravel
 9% Sand
 91% Silt and Clay-sized Particles
 33% Between 5-75 um

Water up to 3.5 m upon completion

First encounter of groundwater seepage at 4.0 m

Borehole cave-in up to 4.6 m upon completion

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS) 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW, GP, GEOLOGIC.GDT 15/6/20



BOREHOLE No.: BH-11

ELEVATION: 214.2 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: E. Wierdsma

DATE: 16 April 2020

DRILLING COMPANY: Landshark Drilling

METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

- SS - SPLIT SPOON
 AS - AUGER SAMPLE
 ST - SHELBY TUBE
 CS - CORE SAMPLE
 ▽ - WATER LEVEL

Depth	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery	Moisture Content	Blows per 6 in. / 15 cm	Penetration Index	Shear test (Cu) Sensitivity (S) Water content (%) Atterberg limits (%) "N" Value (blows / 0.3 m)	Field Lab RQD CONE	COMMENTS
ft	m	0.0	GROUND SURFACE		%	%		N	10 20 30 40 50 60 70 80 90		
			TOPSOIL (300 mm)								
1	0.3		SILTY SAND - Brown Silty Sand, Moist, Very Loose	SS-1	60	25	1	3	X	○	
2	0.5		SILTY CLAY - Light Brown Silty Clay, Trace Sand, Moist, Soft	SS-2	75	25	1	4	X	○	
3	1.0						1				
4							3				
5	1.5		Cobble (Inferred From Augers Grinding), Stiff	SS-3	90	21	6	14	X	○	
6	1.8		Wet				6				First encounter of groundwater seepage at 1.8 m
7	2.0						8				
8	2.3		Firm	SS-4	100	23	2	8	X	○	Water up to 2.4 m upon completion
9							4				
10	3.0		Stiff	SS-5	100	27	2	13	X	○	
11							2				
12	3.5		SILTY SAND - Light Brown Silty Sand, Wet, Compact				11				
13							12				
14	4.0										Borehole cave-in up to 4.0 m upon completion
15				SS-6A	100	19	3	10	○		Grain Size Data
16	4.9		SILTY CLAY - Light Brown Silty Clay, trace Sand, Moist, Stiff	SS-6B		20	2		○		SS-6A:
17	5.0						8				0% Gravel
18							5				91% Sand
19											9% Silt and Clay-sized Particles
20	6.0		Grey	SS-7	50	19	6	16	X	○	
21							6				
22	6.7		END OF BOREHOLE				10				
23	7.0						9				
24											
25											
26	8.0										
27											

BOREHOLE LOG GEOTECH (MULTIPLE DRILLERS), 11209539-01-DWG-20-06-01, VARGAS BOREHOLE LOGS, JM, EW, GP, J, GEOLOGIC.GDT, 15/6/20



BOREHOLE No.: BH-13
ELEVATION: 213.8 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: E. Wierdsma DATE: 16 April 2020

DRILLING COMPANY: Landshark Drilling METHOD: Solid Stem Augers and Spilt Spoons

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

LEGEND

	SS	- SPLIT SPOON
	AS	- AUGER SAMPLE
	ST	- SHELBY TUBE
	CS	- CORE SAMPLE
		- WATER LEVEL

[illegible]



TEST PIT No.: TP-1

ELEVATION: 247.8 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: Jamie McEachern

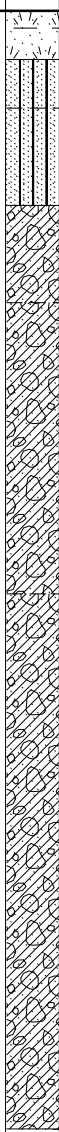
DATE: 6 March 2020

LEGEND

☐ GS - GRAB SAMPLE
☒ - WATER LEVEL

EXCAVATION COMPANY: Balterre Contracting Limited METHOD: Track Excavator

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content	Shear test (Cu) △ Field Sensitivity (S) □ Lab ○ Water content (%) H _p H _l Atterberg limits (%)											COMMENTS
ft	m						10	20	30	40	50	60	70	80	90			
		0.0		GROUND SURFACE		%												
		0.2		TOPSOIL (150 mm)													No seepage observed during the excavation of the test pit	
1		0.3		SANDY SILT - Reddish Brown Sandy Silt, Loose, Moist Occasional Cobbles	AS-1	28			○									
	0.5																	
2		0.6		TILL - Light Brown Silty Sand and Gravel, Compact, Moist	AS-2	5	○											
3		0.9		Boulders														
4																		
5	1.5																	
6		1.8		Light Brown Clayey Silt, Trace Gravel, Cobbles and Boulders, Dense, Moist	AS-3	19			○									
7	2.0																	
8	2.5																	
9																		
10	3.0																	
11																		
	3.5	3.5		END OF TEST PIT	AS-4	22			○									
12																		
13	4.0																	

TEST PIT LOG GEOTECH 11209539-01-DWG-20-03-31, VARGAS TESTPIT LOGS - GPJ GEOLOGIC.GDT 12/6/20

No seepage observed during the excavation of the test pit



TEST PIT No.: TP-3

ELEVATION: 223.2 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: Jamie McEachern

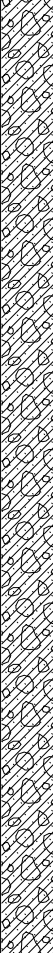
DATE: 6 March 2020

LEGEND

☐ GS - GRAB SAMPLE
☒ - WATER LEVEL

EXCAVATION COMPANY: Balterre Contracting Limited METHOD: Track Excavator

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content	Shear test (Cu) △ Field □ Lab ○ Water content (%) ▬ Atterberg limits (%) w_p w_l											COMMENTS
ft	m						10	20	30	40	50	60	70	80	90			
		0.0		GROUND SURFACE		%												
		0.2		TOPSOIL (150 mm)														
1		0.3		SANDY SILT - Reddish Brown Sandy Silt, Loose, Moist to Wet	AS-1	23		○										
	0.5			TILL - Light Brown Silty Sand, Compact, Moist														
2																		
3					AS-2	23		○										
	1.0																	
4																		
5	1.5																	
6																		
7	2.0				AS-3	22		○										
8																		
9	2.5																	
10	3.0				AS-4	23		○										
11	3.4				AS-5	20		○										
				END OF TEST PIT														
	3.5																	
12																		
13	4.0																	

 Groundwater seepage
 Observed at 2.1 m



TEST PIT No.: TP-4

ELEVATION: 216.0 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: Jamie McEachern

DATE: 6 March 2020

LEGEND

☐ GS - GRAB SAMPLE
☒ - WATER LEVEL

EXCAVATION COMPANY: Balterre Contracting Limited METHOD: Track Excavator

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content	Shear test (Cu) △ Field Sensitivity (S) □ Lab ○ Water content (%) ┌─┐ Atterberg limits (%) w _p w _l											COMMENTS
ft	m						10	20	30	40	50	60	70	80	90			
		0.0		GROUND SURFACE		%												
				TOPSOIL (150 mm)													No seepage observed during the excavation of the test pit	
1		0.3		SANDY SILT - Reddish Brown Sandy Silt, Loose, Moist	AS-1	28			○									
		0.4		TILL - Light Brown Silty Sand and Gravel, Compact, Moist														
2		0.5			AS-2	37				○								
3		1.0																
4																		
5		1.5			AS-3	26				○								
6		2.0																
7		2.5																
8																		
9		3.0																
10																		
11		3.4		END OF TEST PIT	AS-4	27				○								
		3.5																
12																		
13		4.0																



TEST PIT No.: TP-5

ELEVATION: 215.2 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: Jamie McEachern

DATE: 6 March 2020

LEGEND

☐ GS - GRAB SAMPLE
☒ - WATER LEVEL

EXCAVATION COMPANY: Balterre Contracting Limited METHOD: Track Excavator

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content	Shear test (Cu) △ Field Sensitivity (S) □ Lab ○ Water content (%) w _p w _L Atterberg limits (%)											COMMENTS
ft	m						10	20	30	40	50	60	70	80	90			
		0.0		GROUND SURFACE		%												
				TOPSOIL (150 mm)														
1		0.3		SANDY SILT - Reddish Brown Sandy Silt, Loose, Moist	AS-1	33			○									No seepage observed during the excavation of the test pit
	0.5																	
2																		
3		1.0			AS-2	28			○									
4																		
5		1.5			AS-3	20			○									
6																		
7		2.0																
8		2.5																
9		2.7		TILL - Light Brown Silty Sand and Gravel, Compact, Moist														
10		3.0		END OF TEST PIT	AS-4	16			○									
		3.0																
11																		
12		3.5																
13		4.0																

TEST PIT LOG GEOTECH 11209539-01-DWG-20-03-31, VARGAS TESTPIT LOGS - GPJ GEOLOGIC.GDT 12/6/20

No seepage observed during the excavation of the test pit



TEST PIT No.: TP-6

ELEVATION: 212.7 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Vargas Properties

PROJECT: Proposed Residential and Commercial Development

LOGGED BY: Jamie McEachern

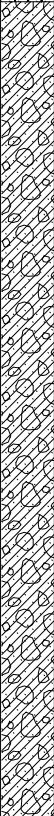
DATE: 6 March 2020

LEGEND

☐ GS - GRAB SAMPLE
☒ - WATER LEVEL

EXCAVATION COMPANY: Balterre Contracting Limited METHOD: Track Excavator

NOTES: Ground surface elevation interpolated from Topographic plan prepared by IBW Surveyors, File Name "P-0400 Topo_v4.dwg" dated Jan. 14, 2020

Depth		m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content	Shear test (Cu) △ Field Sensitivity (S) □ Lab ○ Water content (%) w _p w _l Atterberg limits (%)											COMMENTS	
ft	m						10	20	30	40	50	60	70	80	90				
		0.0		GROUND SURFACE		%													
		0.2		TOPSOIL (150 mm)															
1		0.5		SANDY SILT - Reddish Brown Sandy Silt, Loose, Moist	AS-1	18		○										No seepage observed during the excavation of the test pit	
2				TILL - Light Brown Silty Sand and Gravel, Compact, Moist															
3						AS-2	9		○										
4																			
5		1.5																	
6																			
7		2.0																	
8		2.5			AS-3	7		○											
9																			
10		3.0			AS-4	8		○											
		3.0		END OF TEST PIT															
11		3.5																	
12																			
13		4.0																	

TEST PIT LOG GEOTECH 11209539-01-DWG-20-03-31, VARGAS TESTPIT LOGS - GPJ GEOLOGIC.GDT 12/6/20

No seepage observed during the excavation of the test pit

Parameter	Monitoring Wells		Water Well	ODWS		
	BH-7	BH-13	W-3 (Water Well N of Site*)	MAC	IMAC	AO/OG
Magnesium	7.84	7.73	6.41	NS	NS	NS
Manganese	0.030	0.026	<0.001	NS	NS	0.05
Nitrite (N)	<0.1	<0.1	<0.1	1.0	NS	NS
Nitrate (N)	<0.1	<0.1	3.0	10	NS	NS
pH (unitless)	8.02	7.81	8.00	NS	NS	6.5 to 8.5
Potassium	1.4	1.3	0.9	NS	NS	NS
Sodium	4.1	4.0	6.7	NS	NS	200
Sulphate	7	7	4	NS	NS	500
Turbidity (N.T.U.)	17.8	1180	0.8	1	NS	5
Zinc	<0.005	<0.005	<0.005	NS	NS	5.0

Notes: All units in mg/L (i.e. parts per million) unless otherwise noted. MAC = maximum acceptable concentration (health related); IMAC = Interim MAC (insufficient data to establish MAC or not feasible to establish MAC to desired level); AO/OG = aesthetic objective or operational guideline (not health related). **Bolded value** exceeds ODWS. NS denotes No Standard. (*) See L-5 water well location on Enclosure B.4 in Appendix B.

The groundwater beneath the Site is relatively hard which is common in Southern Ontario due to overburden materials containing calcium. In general, the water quality is relatively good with no indication of organic pollution as evidenced by the lack of nitrite and nitrate.

4.2.5 Hydraulic Conductivity

Hydraulic conductivity (K) testing was completed at the monitoring wells installed in boreholes BH-4, BH-7 and BH-13. The testing consisted of falling and/or rising head testing and was completed by introducing a one-metre long slug within the well or by filling the monitoring well with potable water, and then measuring the water levels using a data logger programmed to record readings at three (3) second intervals. The data was analyzed using AQTESOLV and the Bouwer-Rice solution for each test (see Appendix C for solution data).

The K values for the hydraulic conductivity testing range from on the order of 10^{-3} to 10^{-5} cm/sec. The K values from the test data indicate that the monitoring wells were screened within medium (sand) to low (till) hydraulic conductivity units. The hydraulic conductivity testing suggests that excavations within these soils are expected to yield low to little water. However, increased amounts of water may be expected when pockets or layer of sand and/or gravel are intersected.

4.2.6 Infiltration Testing

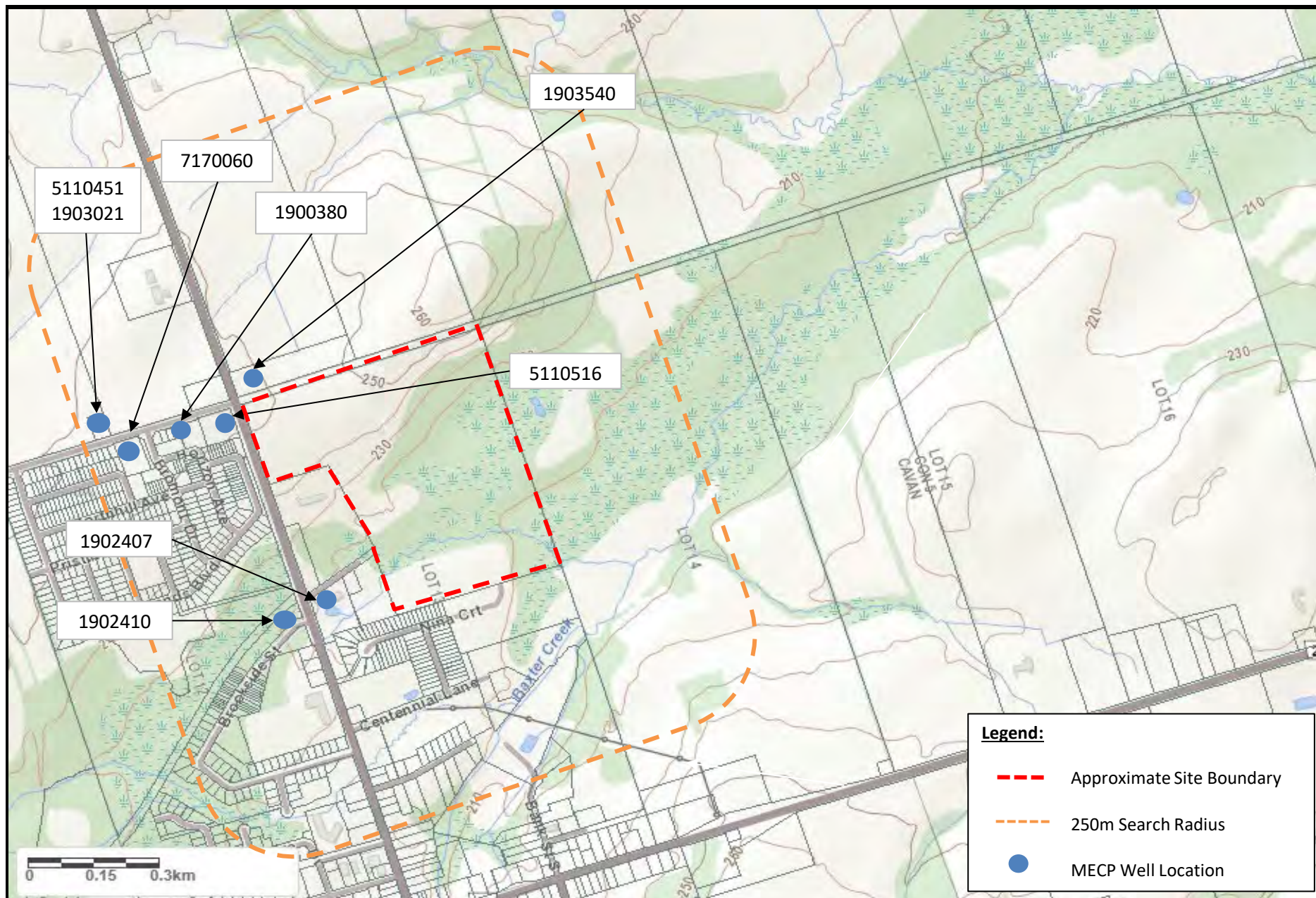
For purposes of Low Impact Development strategies, infiltration data of the shallow site soils is presented in this section. In-situ constant head permeameter tests were conducted at six (6) locations in test pits TP-2 (at 0.6 and 1.2 m depth), TP-5 (at 0.3 m depth), TP-6 (at 1.0 m depth), and near boreholes BH-4 (at 0.6 m depth) and BH-7 (at 0.6 m depth). The importance of infiltration is for the implementation of low impact development strategies to recharge precipitation into the ground at pre-development or near pre-development values. Infiltration testing was completed using an ETC Pask (constant head well) permeameter. The testing was not successful at test pits TP-1, TP-3, TP-4 due to unknown subsurface conditions that may have been related to clayey till, boulders or some other condition.

Based upon the infiltration testing conducted near test pits TP-2, TP-5 and TP-6, the upper vadose zone has a field saturated hydraulic conductivity ranging from 10^{-3} to 10^{-5} cm/sec (Appendix C). The infiltration test results provide preliminary infiltration values for the Site and are indicative of silty sand or sandy silt material. Although LIDs can be applied to any soil type, additional testing should be considered at the detailed design stage when infiltration areas are known.

Based on the Supplementary Guidelines to the Ontario Building Code 2012, this correlates to an infiltration rate in the order of 30 to 75 mm/hr. It is noted, however, that slight variations in the soil stratigraphy may cause variations in the permeability of the soil in both vertical and horizontal orientations.

Appendix B

MECP Well Records and Well Survey



Source: MECP Water Well Record Mapping, accessed online (<https://www.ontario.ca/environment-and-energy/map-well-records>)

Scale: Refer to Scale Bar Coordinate System: NAD 1983 UTM Zone 17			Vargas Development Proposed Residential Development Fallis Line, Millbrook, ON	11209539-01 June, 2020
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Well Location Plan

FIGURE B.1

APPENDIX B.2: WELL SUMMARY - OVERBURDEN BEDROCK

Well Record Summary

Vargas Development

Millbrook, ON

Well No.	Well Use	Water Found		Static Level		Pump Rate		Well Depth		Comments
		Feet	Metres	Feet	Metres	lgpm	L/min	Feet	Metres	
1900380	Domestic	53.0	16.2	39.0	11.9	22.0	100.1	54.0	16.5	Topsoil to 2', till to 20', clay with stones to 53', gravel to 54'
1902407	Domestic	121.0	36.9	0.0	0.0	16.0	72.8	121.0	36.9	Topsoil to 2', clay and stones to 110', clay with gravel and shale rock to 121'
1902410	Domestic	106.0	32.3	0.0	0.0	15.0	68.3	106.0	32.3	Topsoil to 2', clay to 100', gravel to 106'
5110451	Domestic	209	63.7	82	25.0	4.0	18.2	209	63.7	Clay and stones to 16', sand and gravel to 98', sand to 123', clay and gravel to 129', sand to 146', sand with gravel and clay to 208', shale to 209'
5110516	Domestic	115	35.1	49	14.9	6.0	27.3	119	36.3	Topsoil to 1', clay with stones to 37', gravel to 44', clay to 102', gravel and sand to 115', sand and gravel to 119'
717060	Domestic	208.0	63.4	175.0	53.3	10.0	45.5	208.0	63.4	Clay with stones to 15', sand and gravel to 38', clay to 110', clayey silt to 168', clay to 195', silty sand to 203', sand to 208'

Number of wells = 6

	Water Found		Static Level		Pump Rate		Well Depth	
	Feet	Metres	Feet	Metres	lgpm	L/min	Feet	Metres
AVERAGE	135.3	41.2	57.5	17.5	12.2	55.4	136.2	41.5
MAXIMUM	209.0	63.7	175.0	53.3	22.0	100.1	209.0	63.7
MINIMUM	53.0	16.2	0.0	0.0	4.0	18.2	54.0	16.5

APPENDIX B.3: WELL SUMMARY - DRILLED BEDROCK

Well Record Summary
Vargas Development
Millbrook, ON

	Well	Water Found		Static Level		Pump Rate		Well Depth		Depth to Bedrock		Comments
Well No.	Use	Feet	Metres	Feet	Metres	lgpm	L/min	Feet	Metres	Feet	Metres	
1903021	Domestic	216.0	65.8	66.0	20.1	3.0	13.7	237.0	72.2	215.0	65.5	Clay with stones to 130', clay with sand layers to 135', clay with stones to 215', limestone to 237'
1903540	Domestic	225.0	68.6	70.0	21.3	2.0	9.1	230.0	70.1	225.0	68.6	Topsoil to 1', clay and stones to 135', sand and clay to 144', sand and gravel to 155', sand and clay to 225', limestone to 230'

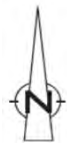
Number of wells = 2

	Water Found		Static Level		Pump Rate		Well Depth		Depth to Bedrock	
	Feet	Metres	Feet	Metres	lgpm	L/min	Feet	Metres	Feet	Metres
AVERAGE	220.5	67.2	68.0	20.7	2.5	11.4	233.5	71.2	220.0	67.1
MAXIMUM	225.0	68.6	70.0	21.3	3.0	13.7	237.0	72.2	225.0	68.6
MINIMUM	216.0	65.8	66.0	20.1	2.0	9.1	230.0	70.1	215.0	65.5



Source: Compiled from Google Earth. Aerial photo dated November 27, 2019

Scale:
Refer to Scale Bar
Coordinate System:
NAD 1983 UTM Zone 17



Geotechnical Investigation
Vargas Development
Proposed Residential Development
Fallis Line, Millbrook, ON

11209539-01
March, 2020

Well Survey Locations

Appendix B.3

APPENDIX B.4: WATER WELL INFORMATION SURVEY

PROJECT: 11209539-01, March 18 and 19, 2020

LOCATION: Fallis Line, Millbrook, ON

Address	Well ID for Map	Easting (m)	Northing (m)	Well Type	Top of Well (m)	Water Level (m)	Depth (m)	Quality	Quantity	Comments
893 Fallis Line	L-1	703391	4892952	Drilled	0.51	18.45	60.5	Methane gas and cloudy	No known issues	Municipally serviced as of 2018. Former well on property.
1 Buckland Drive	L-2	703925	4892576	--	--	--	--	--	--	Municipally serviced for past 30 years. On a well prior to that.
23 Buckland Drive	L-3	704025	4892662	Drilled	0.01	0.68		No known issues	'No known issues	Municipally serviced since 1986. Former well on property. Water sample collected (W-1).
917 County Road 10	L-4	703867	4892831	Dug	Unknown	Unknown	Unknown	No known issues	No known issues	Current Water Supply- no issues, plenty of water. Water sample collected from tap (W-2).
Onsite (North of Fallis Line)	L-5	7037730	4893143	Dug	0.015	5.15	Unknown	No known issues	No known issues	Current Water Supply- no issues, plenty of water. Water sample collected from tap (W-3).

UTM 11 7z 703510E
9R 4892781N
Elev. 9R 0825
Basin 24



RECEIVED
FEB 22 1954 19
GEOLOGICAL BRANCH
DEPARTMENT of MINES

No. 380

The Well Drillers Act
Department of Mines, Province of Ontario

Water Well Record

Durham Village, Town or City Cavan
RR # 3 Millbrook

Date Completed 9 Dec 53 Cost of Well (excluding pump)

Pipe and Casing Record

Pumping Test

Casing diameter(s) 6 1/2
Length(s) of casing(s) 54
Type of screen none
Length of screen
Distance from top of screen to ground level
Is well a gravel-wall type?
Date Dec 9
Static level 40
Pumping level 44
Pumping rate 220 GPM
Duration of test 2 hrs
Distance from cylinder or bowls to ground level

Water Record

Kind (fresh or mineral)	Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
fresh	53-54	Clear	14'
Quality (hard, soft, contains iron, sulphur, etc.) soft			
Appearance (clear, cloudy, coloured) clear			
For what purpose(s) is the water to be used? Farm stock			
How far is well from possible source of contamination? none			
What is the source of contamination?			
Enclose a copy of any mineral analysis that has been made of water.			

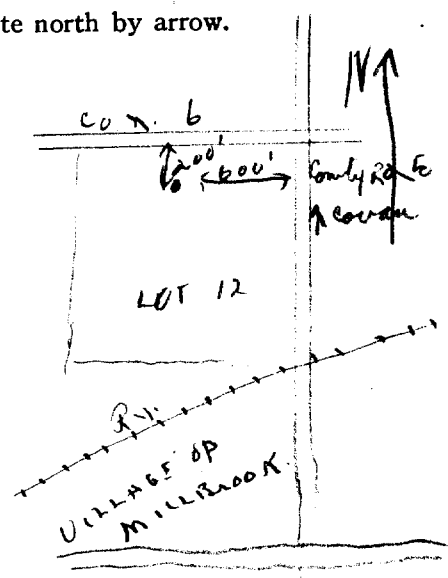
Well Log

Overburden and Bedrock Record

	From	To
	0 ft.	2. ft.
Top Soil		
Brown Soil	2	20
Blue clay + stones	20	53
Gravel	53	54

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Situation: Is well on upland, in valley, or on hillside? upland
Drilling Firm. J. H. Sanderson
Address. 131 Maria St. Peterborough
Name of Driller. J. H. Sanderson
Date. Feb 15 / 54
Licence Number. 209
Signature of Licensee J. H. Sanderson

UTM 17 Z 703098 E
9 R 4892378 N
Elev. 9 R 0720
Basin 24



RECEIVED
DEC 29 1954
GEOLOGICAL BRANCH
DEPARTMENT of MINES

19 No 2407

The Water-well Drillers Act, 1954
Department of Mines

Water-Well Record

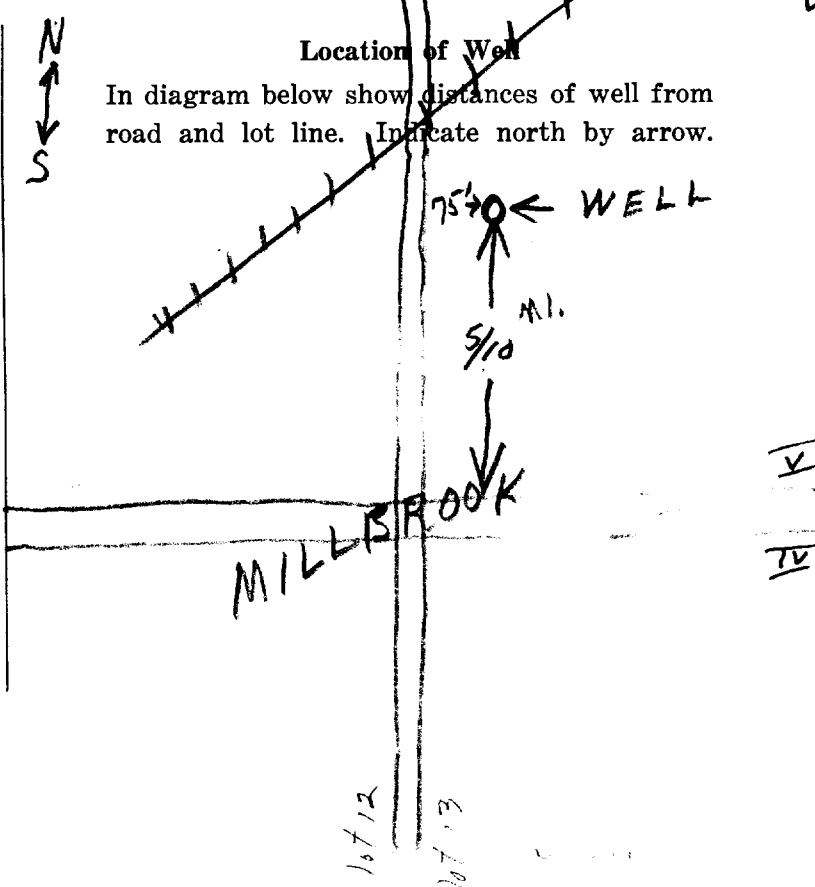
County or Territorial District Durham Township, Village, ~~Town or City~~ Millbrook
~~Village, Town or City~~ Millbrook
Address Millbrook
Date completed 1954 (day) (month) (year)

Pipe and Casing Record			Pumping Test		
Casing diameter(s) <u>6"</u>			Static level <u>flowing</u>		
Length(s) <u>121'</u>			Pumping rate <u>1000 gals per hr.</u>		
Type of screen			Pumping level <u>60'</u>		
Length of screen			Duration of test <u>1 hr.</u>		

Well Log			Water Record		
Overburden and Bedrock Record	From ft.	To ft.	Depth (s) at which water (s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
<u>Top soil</u>	<u>0</u>	<u>2'</u>	<u>121'</u>	<u>flows</u>	<u>fresh.</u>
<u>Blue clay + some stones</u>	<u>2'</u>	<u>110'</u>			
<u>clay, gravel + shale rock</u>	<u>110'</u>	<u>121'</u>			

For what purpose(s) is the water to be used? Domestic
Is water clear or cloudy? clear
Is well on upland, in valley, or on hillside? upland
Drilling firm H. N. Faulkner
Address 687 Water St. Peterboro
Name of Driller H. G. Lang
Address Sturgeon St. Ormiston
Licence Number 456

I certify that the foregoing statements of fact are true.
Date Dec. 19 H. G. Lang
Signature of Licensee





The Ontario Water Resources Commission Act

WATER WELL RECORD

31 D / 1 W

Water management in Ontario 1. PRINT ONLY IN SPACES PROVIDED

2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, VILLAGE	CON. BLOCK, TRACT, SURVEY, ETC.	LOT
11	1903021	19002	012
DATE COMPLETED			DAY 17 MO. 09 YR. 70
ELEVATION			RC. BASIN CODE
927.80			2.4

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
Brown	clay	stones	hard	0	22
Blue	clay	stones	hard	22	130
Blue	clay	sand layers	soft	130	135
Blue	clay	stones	hard	135	215
Grey	limestone		hard	215	237

31

32

41

WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER			
10-13	1 ☒ FRESH	3 ☐ SULPHUR	14	
	2 ☐ SALTY	4 ☐ MINERAL		
15-18	1 ☐ FRESH	3 ☐ SULPHUR	19	
	2 ☐ SALTY	4 ☐ MINERAL		
20-23	1 ☐ FRESH	3 ☐ SULPHUR	24	
	2 ☐ SALTY	4 ☐ MINERAL		
25-28	1 ☐ FRESH	3 ☐ SULPHUR	29	
	2 ☐ SALTY	4 ☐ MINERAL		
30-33	1 ☐ FRESH	3 ☐ SULPHUR	34	
	2 ☐ SALTY	4 ☐ MINERAL		

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
10-11	1 ☒ STEEL	12 .185	0	216
	2 ☐ GALVANIZED			
	3 ☐ CONCRETE			
	4 ☐ OPEN HOLE			
17-18	1 ☐ STEEL	19		20-23
	2 ☐ GALVANIZED			
	3 ☐ CONCRETE			
	4 ☐ OPEN HOLE			
24-25	1 ☐ STEEL	26		27-30
	2 ☐ GALVANIZED			
	3 ☐ CONCRETE			
	4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
	31-33	34-38
MATERIAL AND TYPE		DEPTH TO TOP OF SCREEN
		41-44
		FEET

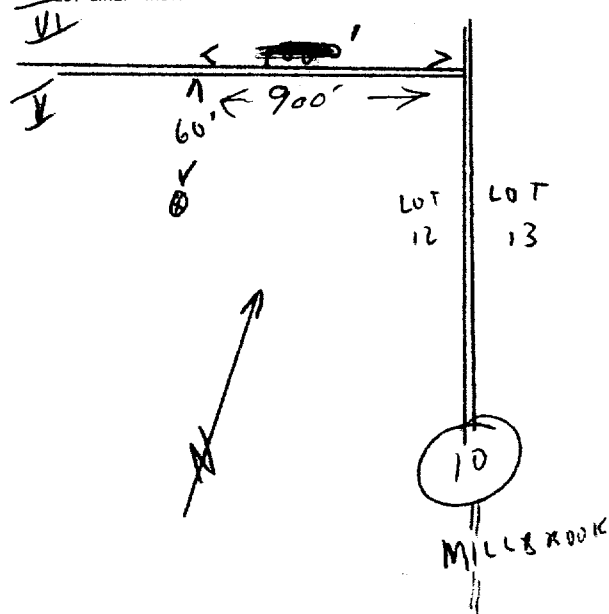
61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET		MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
FROM	TO	
10-13	14-17	
18-21	22-25	
26-29	30-33	

PUMPING TEST	71 PUMPING TEST METHOD	10 PUMPING RATE	11-14 DURATION OF PUMPING
	1 ☐ PUMP 2 ☒ BAILER	000.3 GPM.	15-16 HOURS 00 MINS.
	STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING
	19-21 066 FEET	22-24 230 FEET	15 MINUTES 26-28 100 FEET
	30-31 150 FEET	45 MINUTES 32-34 200 FEET	60 MINUTES 35-37 230 FEET
	IF FLOWING, GIVE RATE	38-41 PUMP INTAKE SET AT	WATER AT END OF TEST
			1 ☒ CLEAR 2 ☐ CLOUDY
	RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
	☐ SHALLOW ☒ DEEP	220 FEET	000.3 GPM.
	50-53	000.0 GPM./FT. SPECIFIC CAPACITY	

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL	54 1 ☒ WATER SUPPLY	5 ☐ ABANDONED, INSUFFICIENT SUPPLY
	2 ☐ OBSERVATION WELL	6 ☐ ABANDONED, POOR QUALITY
	3 ☐ TEST HOLE	7 ☐ UNFINISHED
WATER USE	55-56 1 ☒ DOMESTIC	5 ☐ COMMERCIAL
	2 ☐ STOCK	6 ☐ MUNICIPAL
	3 ☐ IRRIGATION	7 ☐ PUBLIC SUPPLY
METHOD OF DRILLING	4 ☐ INDUSTRIAL	8 ☐ COOLING OR AIR CONDITIONING
	1 ☒ CABLE TOOL	6 ☐ BORING
	2 ☐ ROTARY (CONVENTIONAL)	7 ☐ DIAMOND
	3 ☐ ROTARY (REVERSE)	8 ☐ JETTING
	4 ☐ ROTARY (AIR)	9 ☐ DRIVING
	5 ☐ AIR PERCUSSION	

CONTRACTOR	NAME OF WELL CONTRACTOR	LICENCE NUMBER
	4713	
	ADDRESS	
	NAME OF DRILLER OR BORER	LICENCE NUMBER
	SIGNATURE OF CONTRACTOR	SUBMISSION DATE
	DAY 18 MO. 9 YR. 70	

OFFICE USE ONLY	58 DATA SOURCE	59-62 CONTRACTOR	63-68 DATE RECEIVED
	1	4713	040271
	DATE OF INSPECTION	INSPECTOR	
	APR. 14/71	SC/J.B.	P/J.B.
	REMARKS:		

OWRC COPY



WATER WELL RECORD

310/1E

Water management in Ontario 1. PRINT ONLY IN SPACES PROVIDED

2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT Durham	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE Cavan	CON., BLOCK, TRACT, SURVEY, ETC. 6	LOT 013
DATE COMPLETED DAY 13 MO 7 YR 72		MUNICIPALITY 1903540	
ELEVATION 92900		BASIN CODE 5 24	

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
	top soil			0'	1'
brown	clay & stones & boulders			1'	45'
				45'	135'
grey	clay & stones			135'	144'
fine sand & grey clay				144'	155'
fine sand & gravel & grey clay				155'	170'
gravel fine sand & grey clay				170'	225'
fine sand, grey clay & gravel				225'	230'
grey	limestone rock				

31	0001 02	0045 00512	0135 00512	0144 0805	0155 081105	0170 1119805	1
32	0225 080511	0230 0215					

WATER RECORD			
WATER FOUND AT - FEET	KIND OF WATER		
225' 230'	1 FRESH 3 SULPHUR		
0225	2 SALTY 4 MINERAL		
15-18	1 FRESH 3 SULPHUR		
	2 SALTY 4 MINERAL		
20-23	1 FRESH 3 SULPHUR		
	2 SALTY 4 MINERAL		
25-28	1 FRESH 3 SULPHUR		
	2 SALTY 4 MINERAL		
30-33	1 FRESH 3 SULPHUR		
	2 SALTY 4 MINERAL		

CASING & OPEN HOLE RECORD			
INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
6 1/2	STEEL	12	0' 225'
6 1/2	GALVANIZED	12	225' 230'
6 1/2	CONCRETE	12	
6 1/2	OPEN HOLE	12	
06	STEEL	19	0230
	GALVANIZED	26	
	CONCRETE	26	
	OPEN HOLE	26	

SCREEN	
SIZE(S) OF OPENING (SLOT NO.)	DIAMETER
	31-33
	34-38
	39-40
	41-44
	45-48
	49-52
	53-56
	57-60

PLUGGING & SEALING RECORD	
DEPTH SET AT - FEET	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
FROM TO	
10-13	14-17
18-21	22-25
26-29	30-33

PUMPING TEST METHOD		PUMPING RATE	DURATION OF PUMPING
1 PUMP	2 BAILER	0002 GPM	08 HOURS 00 MINS.
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	1 PUMPING
070'	225'	15 MINUTES 210'	2 RECOVERY
		30 MINUTES 190'	
		45 MINUTES 175'	
		60 MINUTES 165'	
IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST	
		1 CLEAR 2 CLOUDY	
RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE	
1 SHALLOW 2 DEEP	225'	0002 GPM	
50-53 0002 GPM./FT. SPECIFIC CAPACITY			

FINAL STATUS OF WELL	
1 WATER SUPPLY	5 ABANDONED, INSUFFICIENT SUPPLY
2 OBSERVATION WELL	6 ABANDONED, POOR QUALITY
3 TEST HOLE	7 UNFINISHED
4 RECHARGE WELL	
WATER USE	
1 DOMESTIC	5 COMMERCIAL
2 STOCK	6 MUNICIPAL
3 IRRIGATION	7 PUBLIC SUPPLY
4 INDUSTRIAL	8 COOLING OR AIR CONDITIONING
OTHER	9 NOT USED
METHOD OF DRILLING	
1 CABLE TOOL	6 BORING
2 ROTARY (CONVENTIONAL)	7 DIAMOND
3 ROTARY (REVERSE)	8 JETTING
4 ROTARY (AIR)	9 DRIVING
5 AIR PERCUSSION	

LOCATION OF WELL	
IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.	
DRILLERS REMARKS:	

CONTRACTOR	
NAME OF WELL CONTRACTOR	LICENCE NUMBER
Stuart Stockdale Well Drilling	4814
ADDRESS	
R.R.#2, Peterborough	
NAME OF DRILLER OR BORER	LICENCE NUMBER
Ernest Seabrooke	4773
SIGNATURE OF CONTRACTOR	SUBMISSION DATE
Stuart Stockdale	DAY MO YR

OFFICE USE ONLY	
DATA SOURCE	CONTRACTOR
1	4814
DATE OF INSPECTION	INSPECTOR
27, 11, 73	K
REMARKS:	P 2
	WI

Address of Well Location (Street Number/Name) 893 Fallis Line		Township Caven	Lot pt. 12	Concession 5
County/District/Municipality Peterborough		City/Town/Village Millbrook	Province Ontario	Postal Code L0A 1G0
UTM Coordinates NAD 83	Zone 17	Easting 703452	Northings 4892976	Municipal Plan and Sublot Number

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
Brown	Clay	Stones	Hard	0	15
Brown	Sand	Gravel	Loose	15	38
Grey	Clay	Hard	Dense	38	110
Grey	Silt	Clay	Soft	110	168
Grey	Clay		Hard	168	195
Grey	Sand	Silt	Fine	195	203
Grey	Sand		Fine - Sharp	203	208

Annular Space			
Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m ³ /ft ³)
0	20	Wyoben	

Method of Construction	Well Use
☐ Cable Tool ☒ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Other, specify _____	☐ Public ☒ Domestic ☐ Livestock ☐ Industrial ☐ Other, specify _____

Construction Record - Casing				Status of Well	
Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To	
6 1/4	Steel	219	0	203	☒ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify _____ ☐ Other, specify _____

Construction Record - Screen				Status of Well	
Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To	
5 1/2	S. Steel	8	203	208	☐ Other, specify _____

Water Details		Hole Diameter	
Water found at Depth (m/ft)	Kind of Water: ☒ Fresh ☐ Untested	Depth (m/ft) From	To
208	☐ Gas ☐ Other, specify _____	0	20
			10

Business Name of Well Contractor Roger Boadway Ent., Ltd.		Well Contractor's Licence No. 114113
Business Address (Street Number/Name) P.O. Box 397, Sutton West		Municipality York
Province ON	Postal Code L0E1R0	Business E-mail Address boadwaywells@bellnet.ca
Bus. Telephone No. (inc. area code) 9057225362		
Name of Well Technician (Last Name, First Name) Boadway Grant		
Well Technician's Licence No. 0029		Date Submitted 2011/10/04

Results of Well Yield Testing			
After test of well yield, water was: ☒ Clear and sand free ☐ Other, specify _____		Draw Down	
If pumping discontinued, give reason:		Time (min)	Water Level (m/ft)
Pump intake set at (m/ft) 175		Static Level	75
Pumping rate (l/min / GPM) 10		1	1
Duration of pumping 1 hrs + _____ min		2	2
Final water level end of pumping (m/ft) 175		3	3
If flowing give rate (l/min / GPM)		4	4
Recommended pump depth (m/ft) 175		5	5
Recommended pump rate (l/min / GPM) 8		10	10
Well production (l/min / GPM) 10		15	15
Disinfected? ☒ Yes ☐ No		20	20
		25	25
		30	30
		40	40
		50	50
		60	60

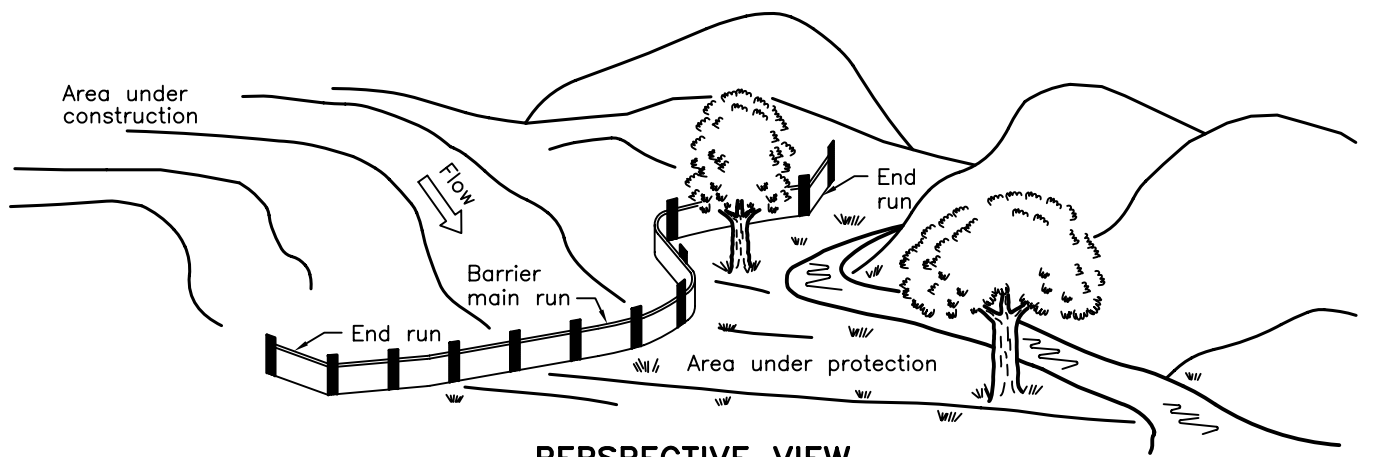
Map of Well Location

Please provide a map below following instructions on the back.

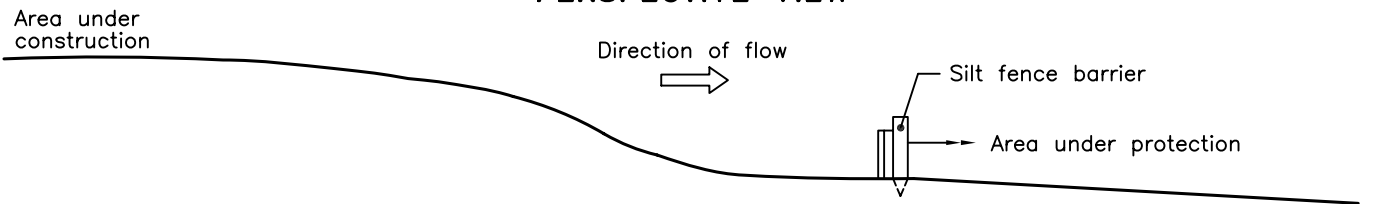
Well owner's information package delivered ☐ Yes ☒ No	Date Package Delivered Y Y Y Y M M D D 20110712	Date Work Completed 20110712
Ministry Use Only Audit No. z128143		Received OCT 14 2011

APPENDIX “I”

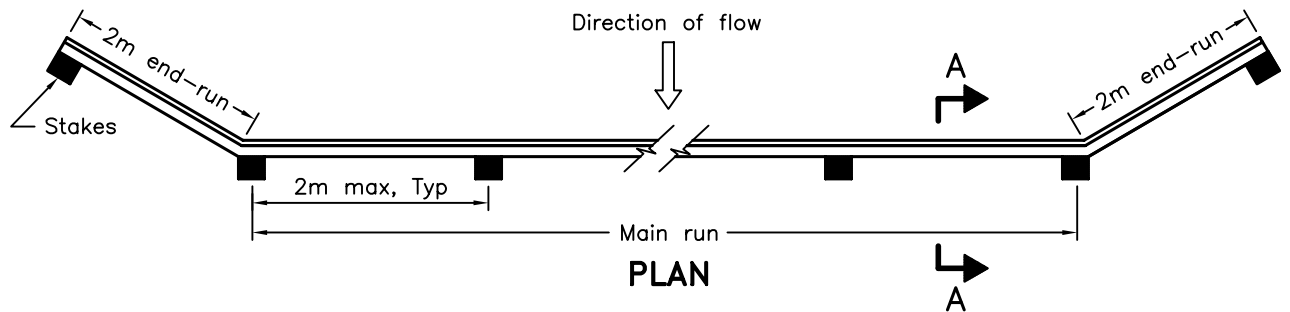
Erosion & Sediment Control Details



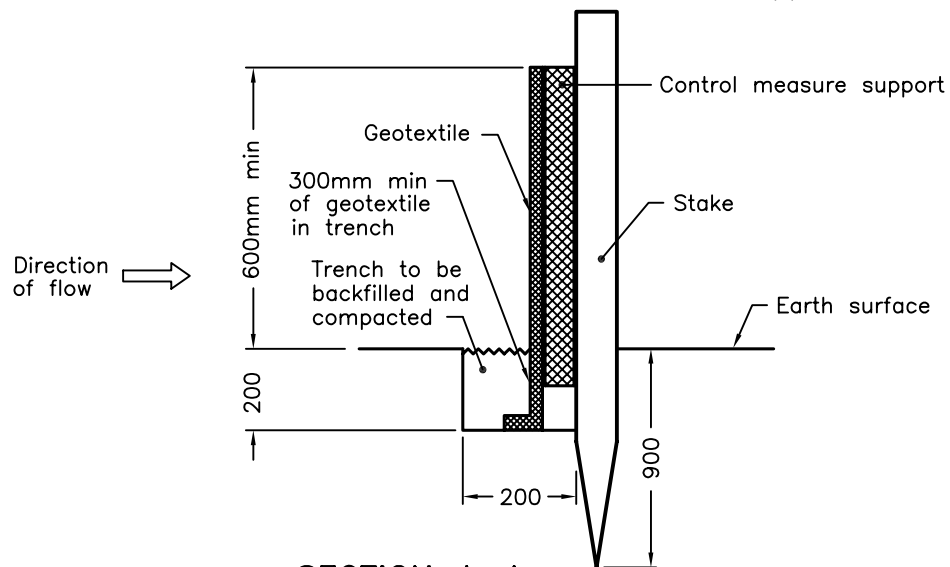
PERSPECTIVE VIEW



SECTION



PLAN



SECTION A-A

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

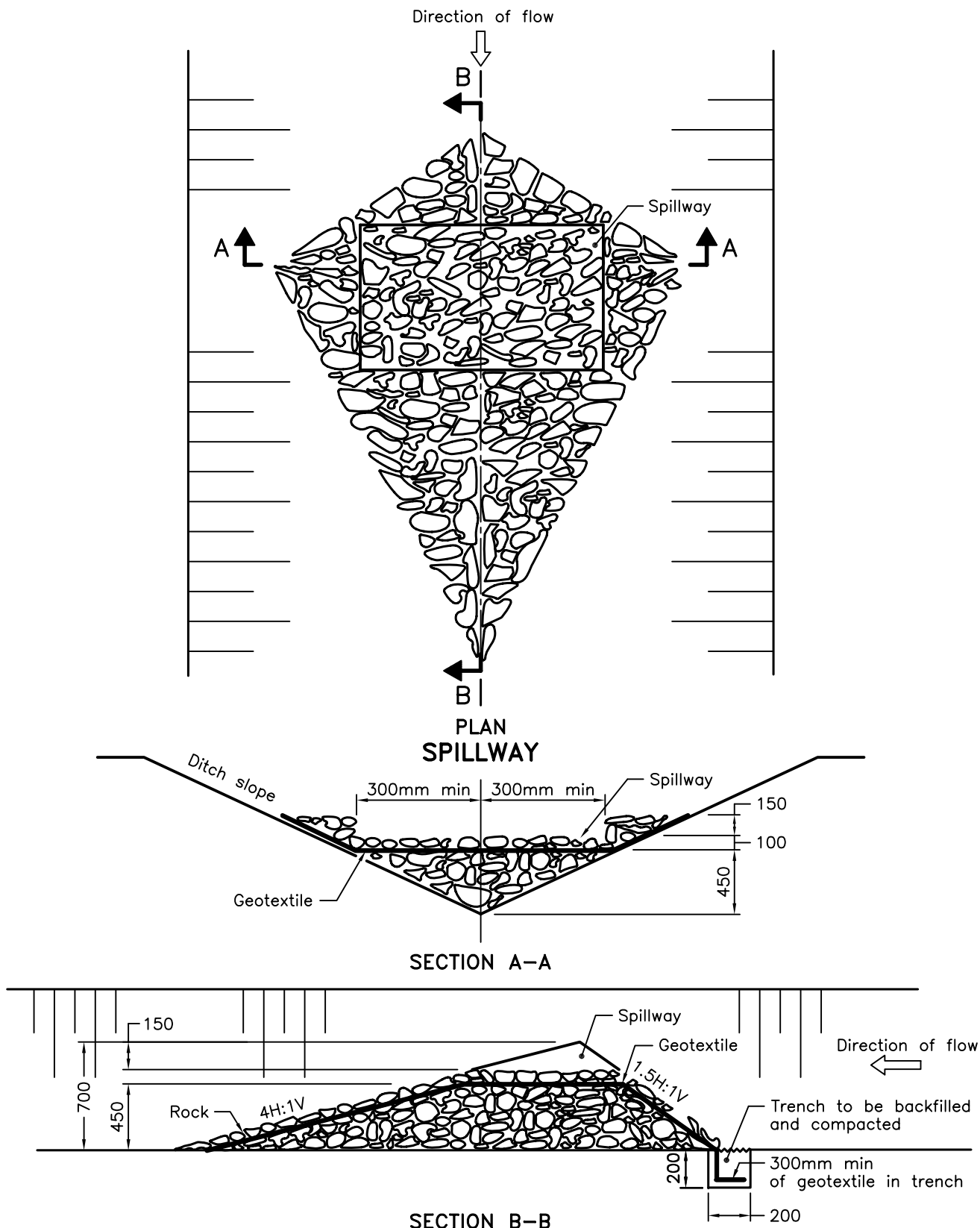
Nov 2006

Rev 1

**HEAVY-DUTY
SILT FENCE BARRIER**



OPSD 219.130



NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2006

Rev 1

ROCK FLOW CHECK DAM

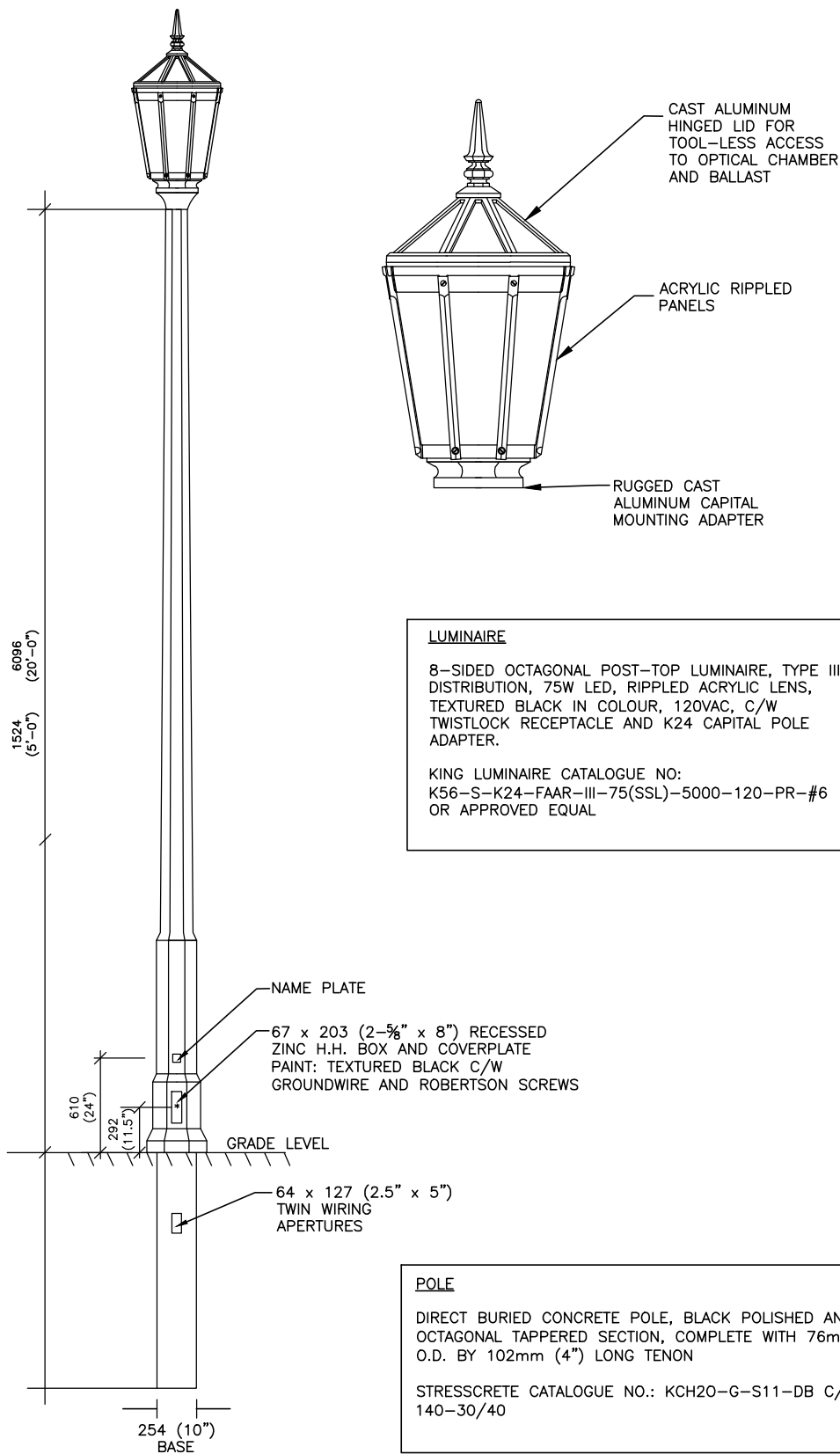
V-DITCH



OPSD 219.210

APPENDIX “J”

Typical Joint Utility Trench & Street Light Detail



**MILLBROOK SOUTH
EAST SUBDIVISION**

STREET LIGHT DETAIL

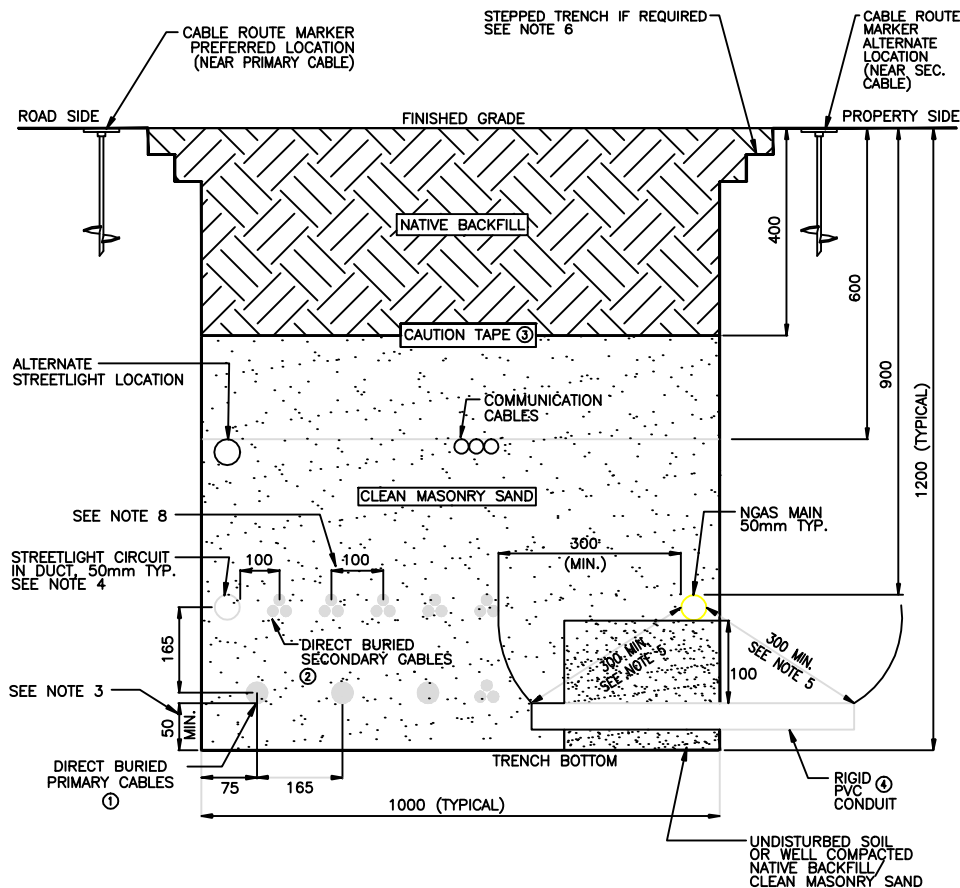


VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers

741 ROWNTREE DAIRY ROAD, SUITE 2, WOODBRIDGE, ONTARIO, L4L 5T9
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

SCALE	N.T.S.	PROJECT	19121
DATE	March, 2022	DRAWN BY	V.L.

FIGURE J1



NOTES:

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. ALL SEPARATIONS AND DEPTHS OF BURIAL ARE MINIMUM.
3. IN THE PRESENCE OF SHARP ROCK, DEBRIS OR RUBBLE, INCREASE SAND PADDING TO 100mm.
4. STREETLIGHT WIRE DUCT MAY BE INSTALLED AT A REDUCED BURIAL DEPTH, UP TO A MINIMUM DEPTH OF 600mm. SEPARATIONS TO SUPPLY CABLE BASED ON MAXIMUM STREETLIGHT DUCT DIAMETER OF 50mm.
5. MUST MAINTAIN 300mm MINIMUM FROM ALL EXPOSED SUPPLY CABLES TO GAS MAIN, WHEN CROSSING GAS MAIN AND IF 300mm OF CLEAR VERTICAL SEPARATION IS NOT ACHIEVABLE, SECONDARY CABLES SHALL BE INSTALLED IN SHORT LENGTH OF RIGID PVC CONDUIT.
6. CONSTRUCTION, STEPPING AND/OR SUPPORTING OF THE TRENCH WALL TO CONFORM TO THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT.
7. NON-REQUIRED CIRCUITS OR JOINT USE COMPONENTS MAY BE OMITTED PROVIDED THAT CLEARANCES AND SEPARATIONS ARE MAINTAINED. PRIMARY CABLES (IF PRESENT) MUST BE INSTALLED ON THE BOTTOM ROW OF SUPPLY CABLES. SECONDARY CABLE BUNDLES MAY BE SUBSTITUTED IN PLACE OF PRIMARY CABLE(S) WHEN REQUIRED.
8. INTERMITTENT CONTACT IS ALLOWABLE BETWEEN SECONDARY CABLES WHERE REQUIRED.

PART #	MASTER MATERIAL #	DESCRIPTION	QTY.
①	30010134 30008080	CABLE PRIMARY, 28KV, U/GROUND, 2/0 AWG, AL, 300 KCMIL, CU	
②	30005908 30005915	SERVICE CABLE, U/GROUND, 3/0AWG, 3 COND, AL SERVICE CABLE, U/GROUND, 250KCMIL, 3 COND, AL	
③	20002181	CAUTION TAPE	
④	30007542	RIGID PVC CONDUIT	

REFERENCES:

- SECTION 1 - DEFINITIONS
SECTION 3C - CONSTRUCTION GUIDE
SECTION 16 - MATERIALS

02	JULY 2011	GENERAL REVISIONS	PC	
Rev. No.	Issue Date	Revision	Drawn By	Approved By
			Chk	Date

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Hydro One Networks Inc.

Drawn: P. CIARMOLI Approved: * Date: JULY.20.2011

JOINT TRENCH - POWER, COMMUNICATION & GAS DISTRIBUTION LINES - TYPICAL

Dwg. No. **DU-03-206.1** Rev. **02**

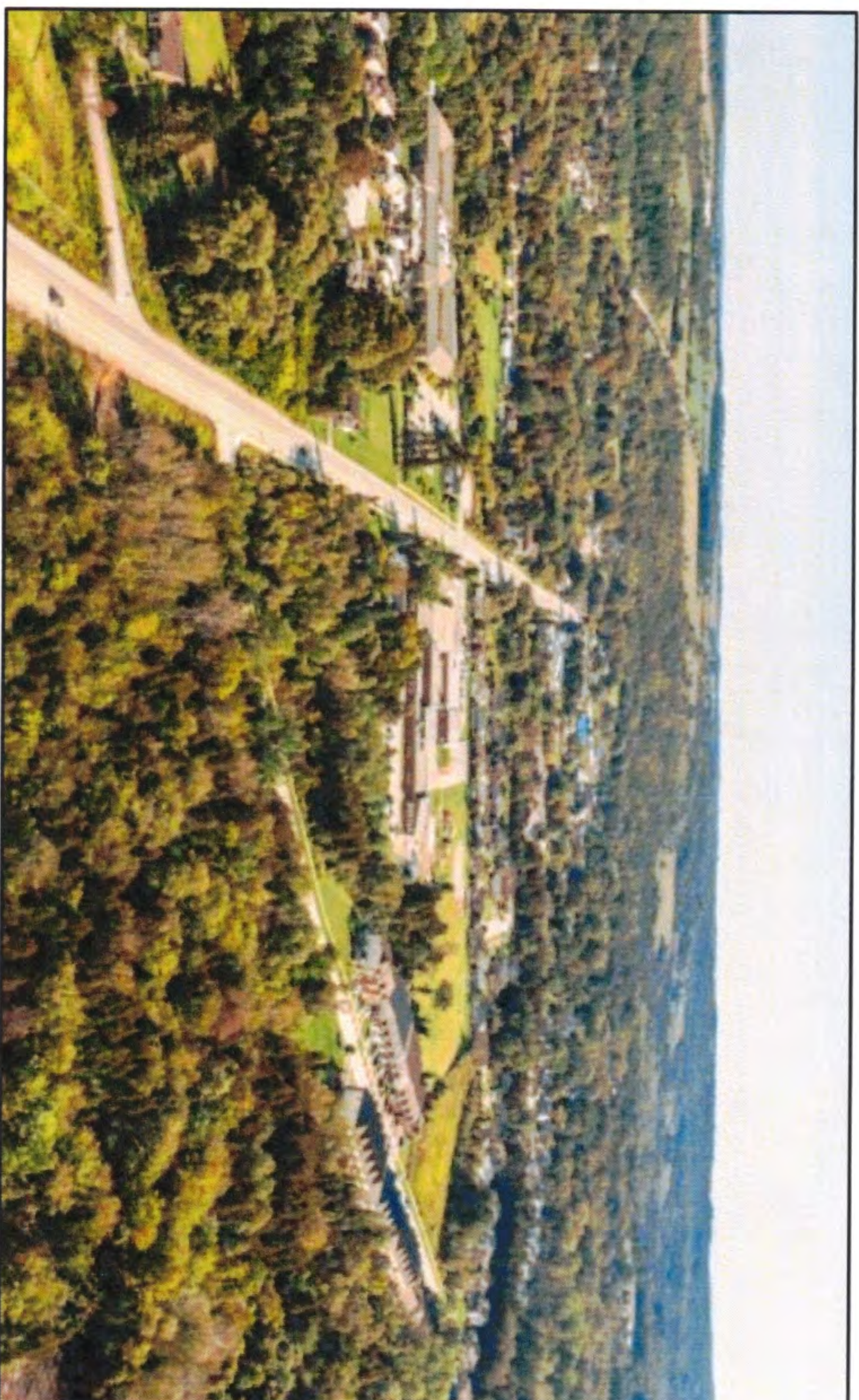
APPENDIX “K”

Growth Management Strategy & Master Servicing Study Update

Council Presentation

Township of Cavan Monaghan

October 18, 2021



Growth Management Strategy & Master Servicing Study Update



R.V. Anderson Associates Limited
engineering • environment • infrastructure



PURPOSE OF GROWTH MANAGEMENT STRATEGY (G.M.S.) UPDATE



- The Growth Plan (2019) now requires upper-tier municipalities to plan for long-term population and employment growth to the year 2051.
- To conform with the Growth Plan, upper-tier municipalities must have new Official Plans approved by July 2022.
- In addition to the above, Council have also requested that the scope of the G.M.S. be expanded to specially review Special Study Area No. 1 (SSA-1) as a potential location for future development in the Township over the long-term.
- As a part of this process, the Township of Cavan Monaghan is updating its population, housing and employment forecasts to include the 2041 to 2051 timeframe.

PETERBOROUGH COUNTY GROWTH FORECAST



Growth Plan Schedule 3 Growth Forecast for Peterborough County, 2016 to 2051

25,000
population

10,000
jobs

Annual
population
growth rate
of 1% and
employment
growth rate
of 1.4%

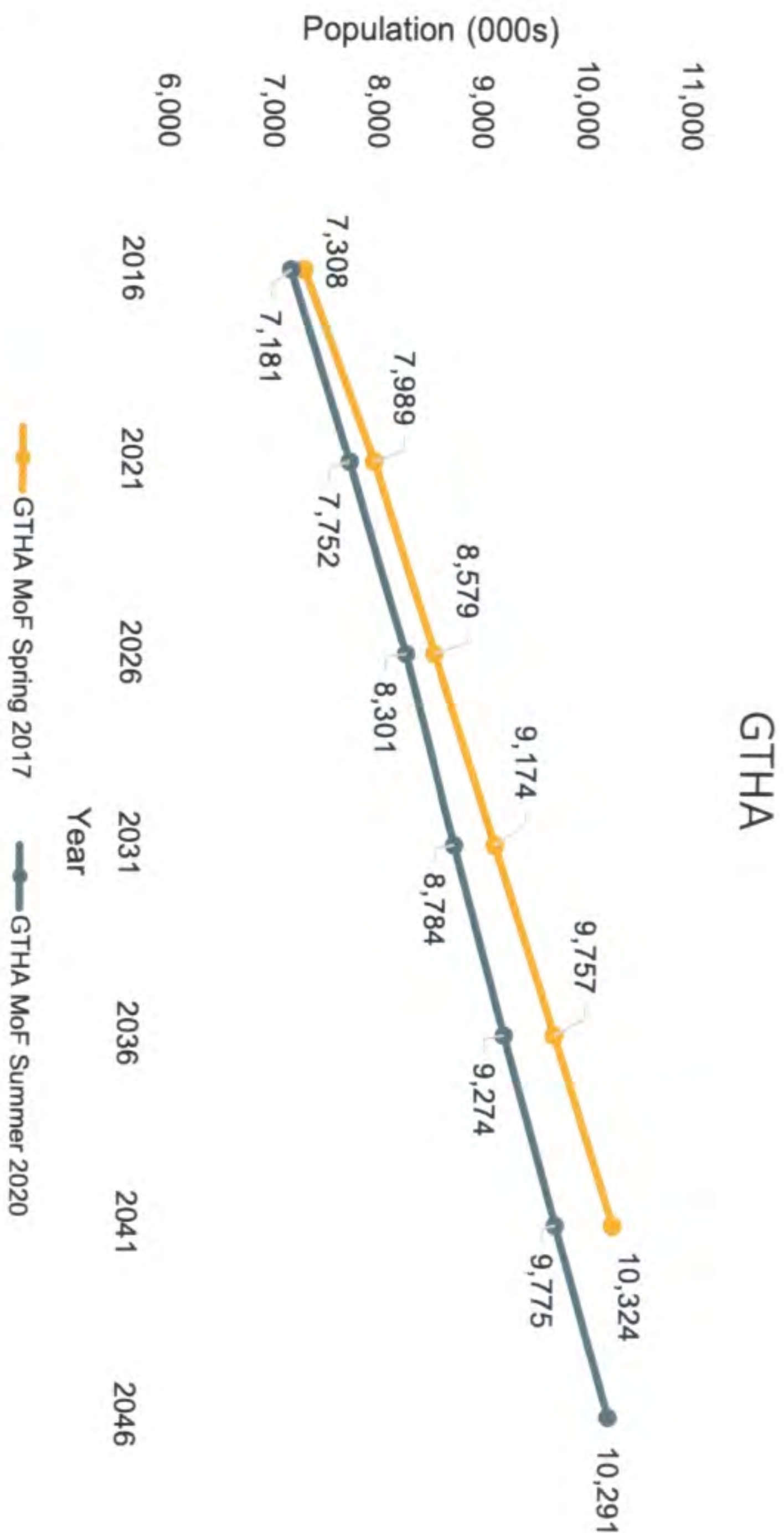
- Schedule 3 Growth Forecasts are to be treated as minimums.
- Higher growth forecast alternatives are permitted, providing that the Municipal Comprehensive Review (M.C.R.) demonstrate that the higher growth scenario meets the Growth Plan, 2020 policy objectives regarding housing choice and labour force supply.



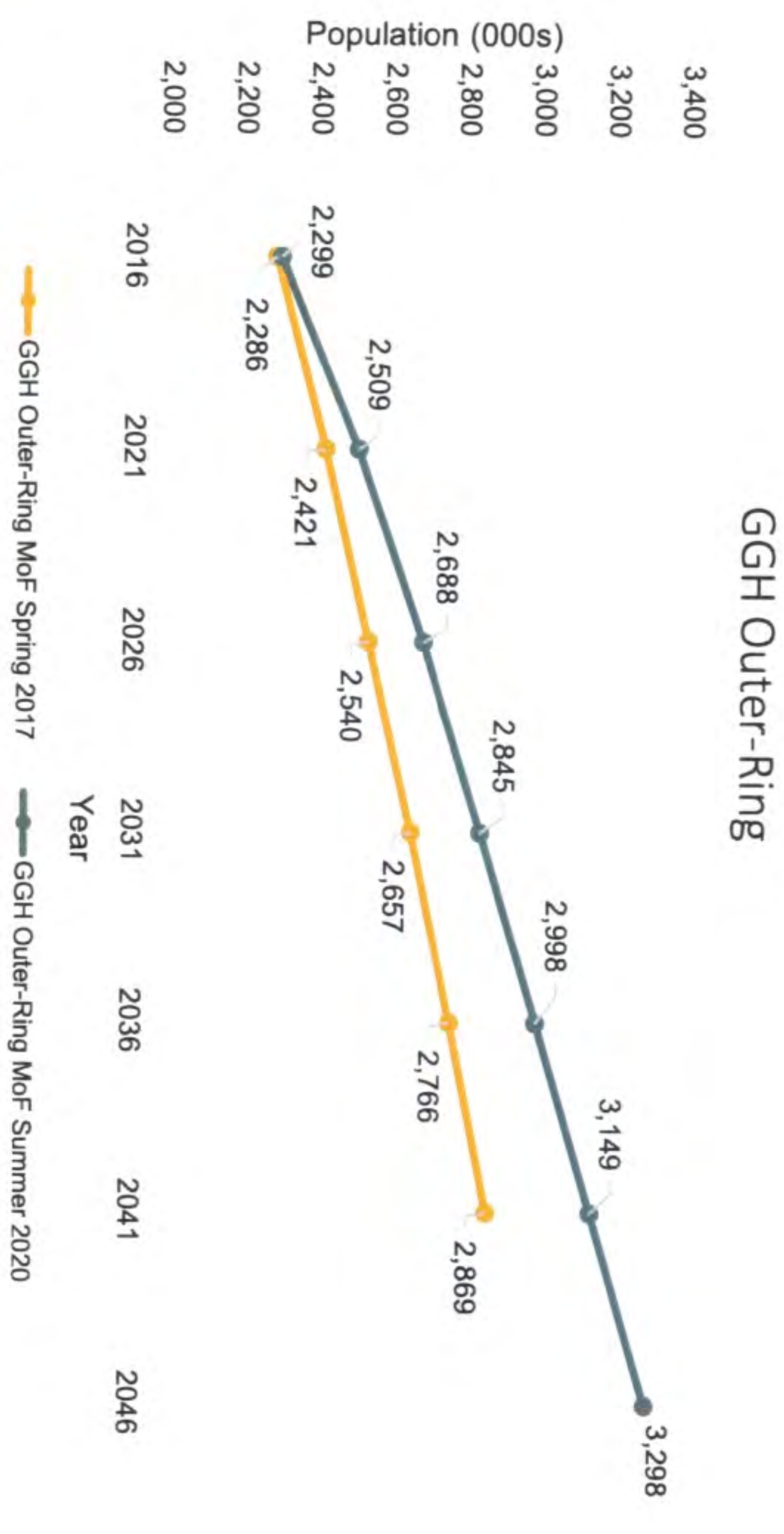


PETERBOROUGH COUNTY GROWTH DRIVERS AND DISRUPTORS

GTHA and GGH Outer Ring Ministry of Finance Population Forecasts

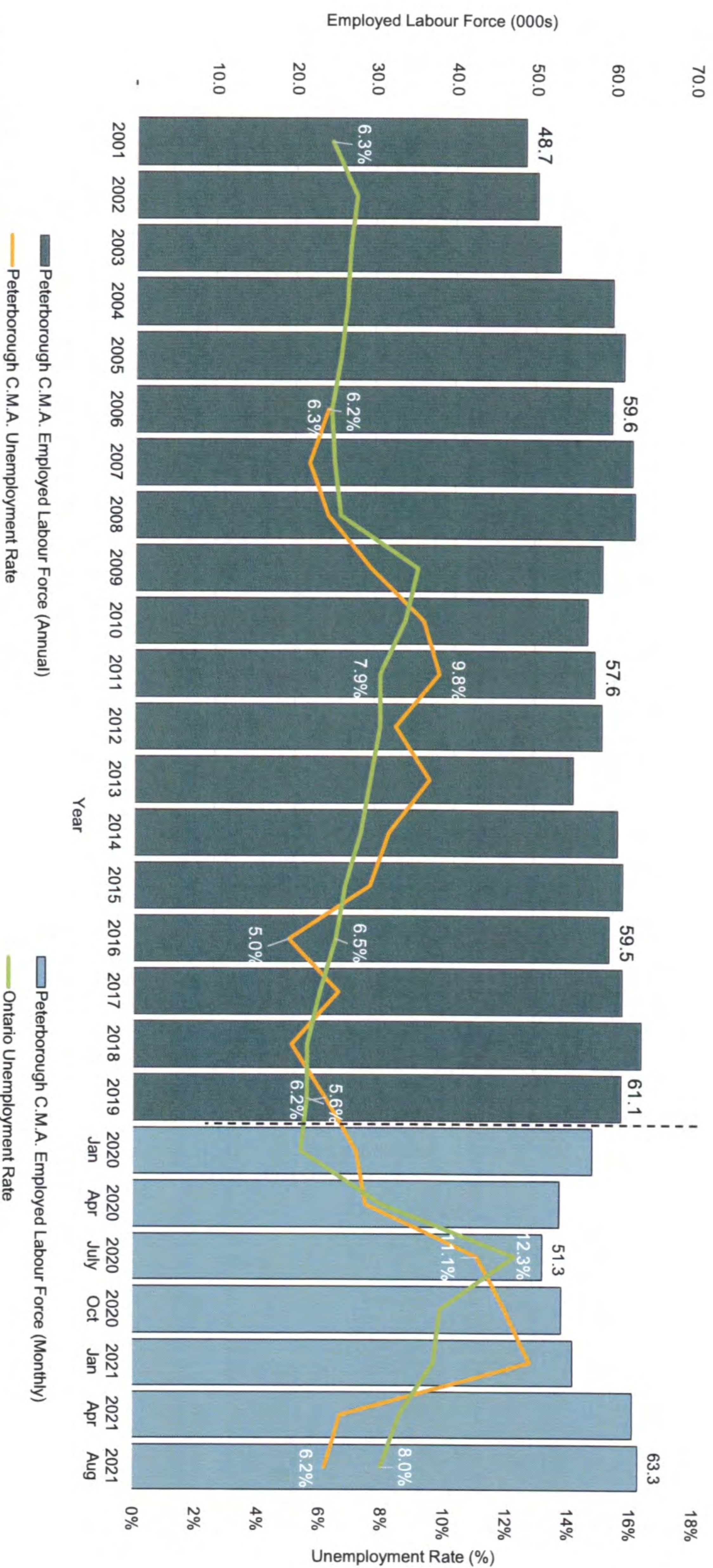


Source: Derived from Ministry of Finance Ontario Population Projections Spring 2017 and Summer 2020 releases, by Watson & Associates Economists Ltd., 2020.



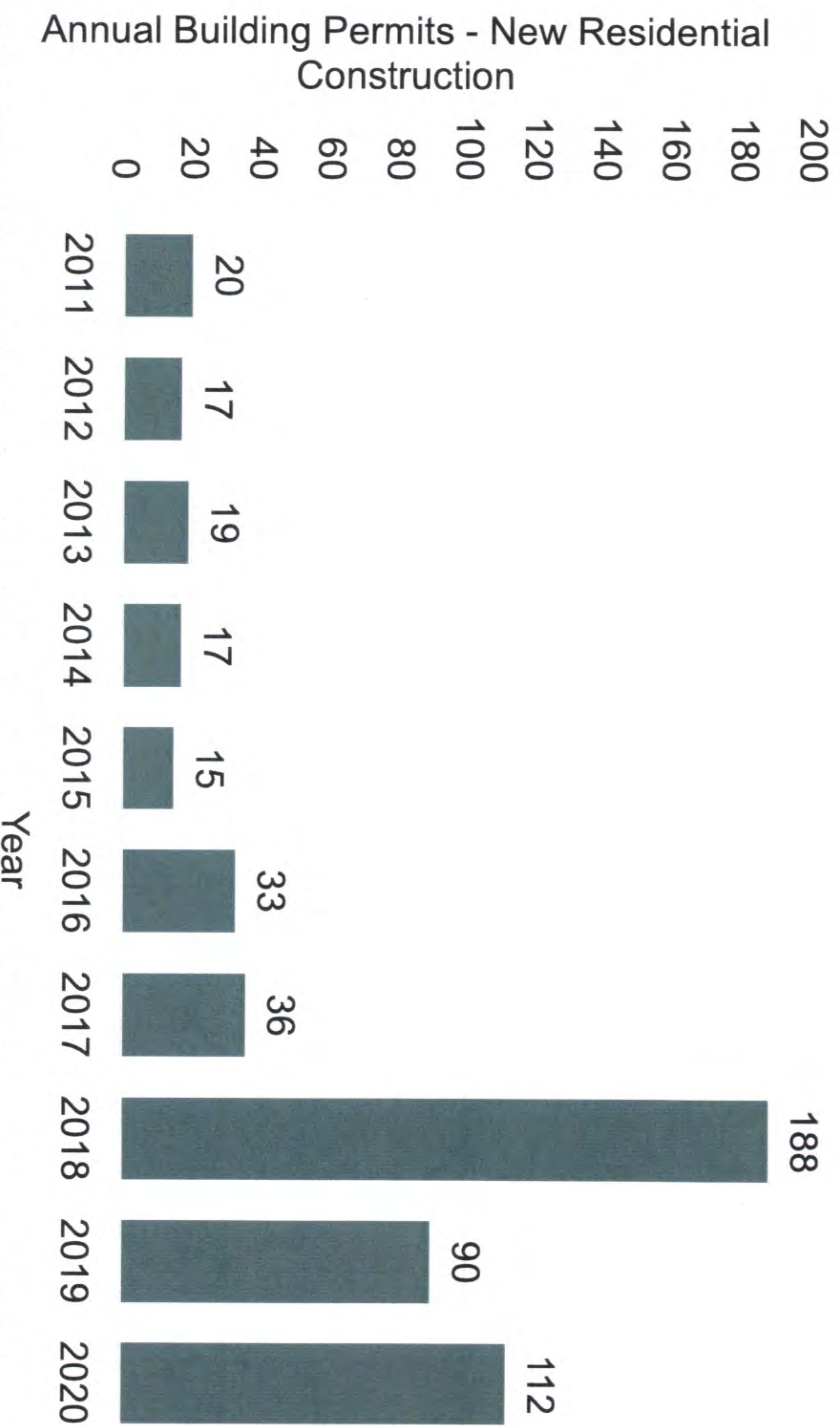
Source: Derived from Ministry of Finance Ontario Population Projections Spring 2017 and Summer 2020 releases by Watson & Associates Economists Ltd., 2020.

5 PETERBOROUGH C.M.A. LABOUR FORCE TRENDS, 2006 TO 2021 YTD



Note: Statistics Canada Labour Force Survey and Census labour force statistics may differ.
Source: Statistics Canada Data Tables 14-10-0098-01 and 14-10-0380-01. By Watson & Associates Economists Ltd., 2021.

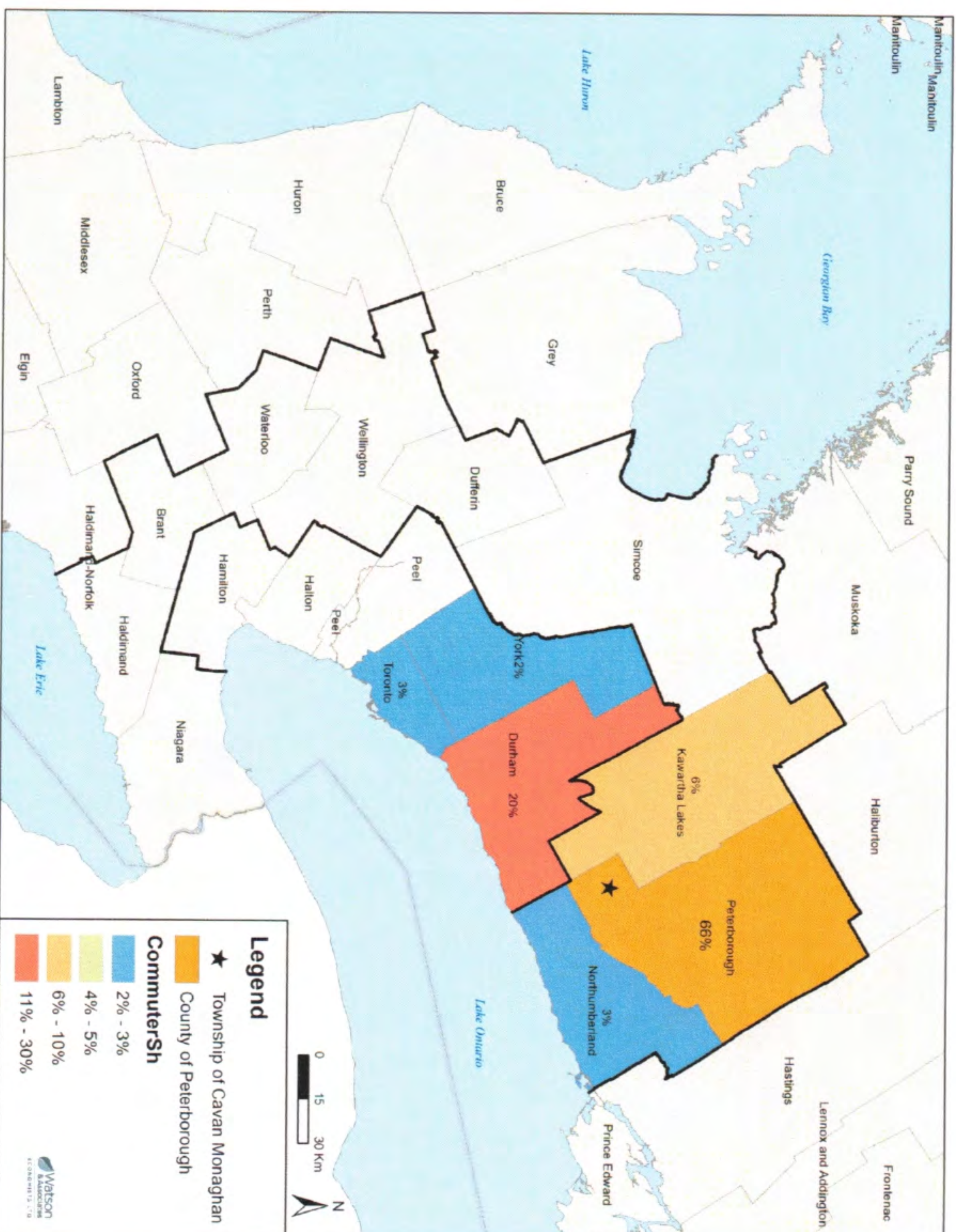
6 CAVAN MONAGHAN HISTORICAL BUILDING PERMIT ACTIVITY, 2011 TO 2020



Source: 2011 to 2014 from Statistics Canada monthly building permit data and 2015 to 2020 from the Township of Cavan Monaghan. Figure by Watson & Associates Economists Ltd., 2021.
Note: Building permit activity does not account for demolitions.

REGIONAL CONTEXT

- Township of Cavan Monaghan Commuter-Shed



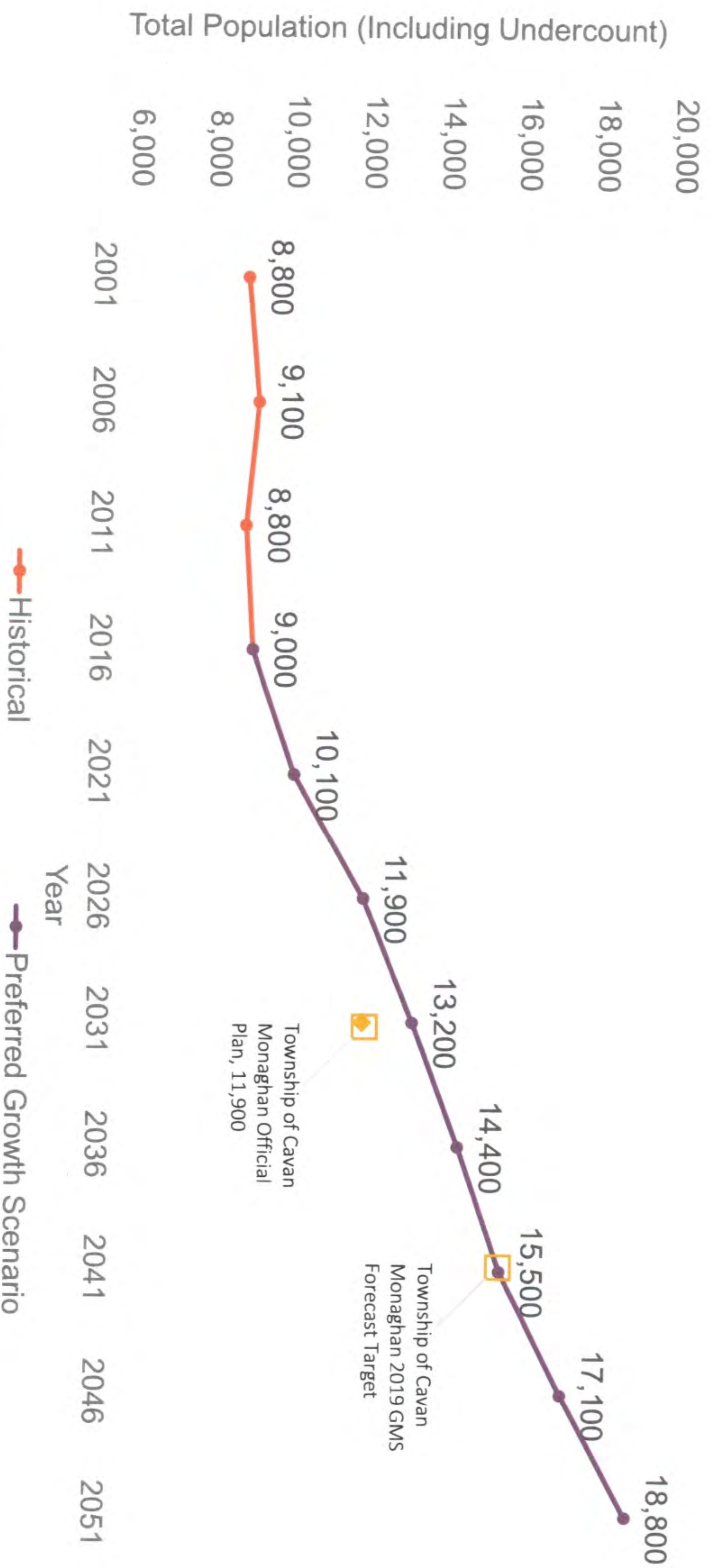
- 1,078,000 increase in Primary Commuter Shed jobs from 2016-2051.
- 1.1% Annual employment growth rate 2016-2051.
- Primary commuter shed is 95% of the Townships' total commuter shed.

Township of Cavan Monaghan Primary Commuter Shed Employment Forecast			
2016	2051	2016-2051	
2,435,000	3,513,000	1,078,000	

Preliminary Population, Housing, and Employment Forecasts

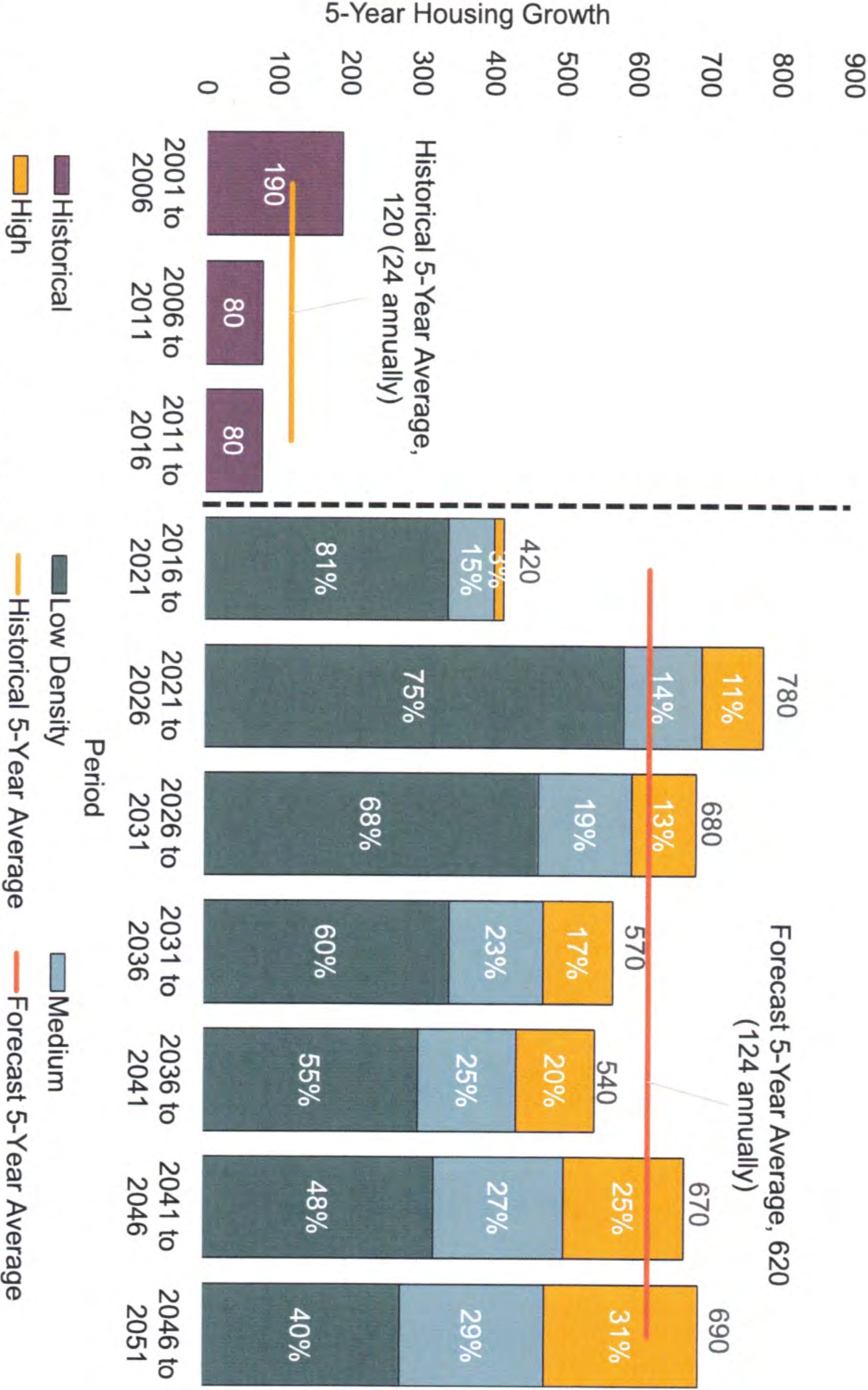


TOWNSHIP OF CAVAN MONAGHAN POPULATION GROWTH SCENARIOS, 2016 TO 2051



Source: 2001 to 2016 from Statistics Canada Census. Forecast by Watson & Associates Economists Ltd., 2021.
Note: Population includes the net Census undercount estimated at 2.5%.

CAVAN MONAGHAN HOUSING FORECAST BY TYPE, 2016 TO 2051

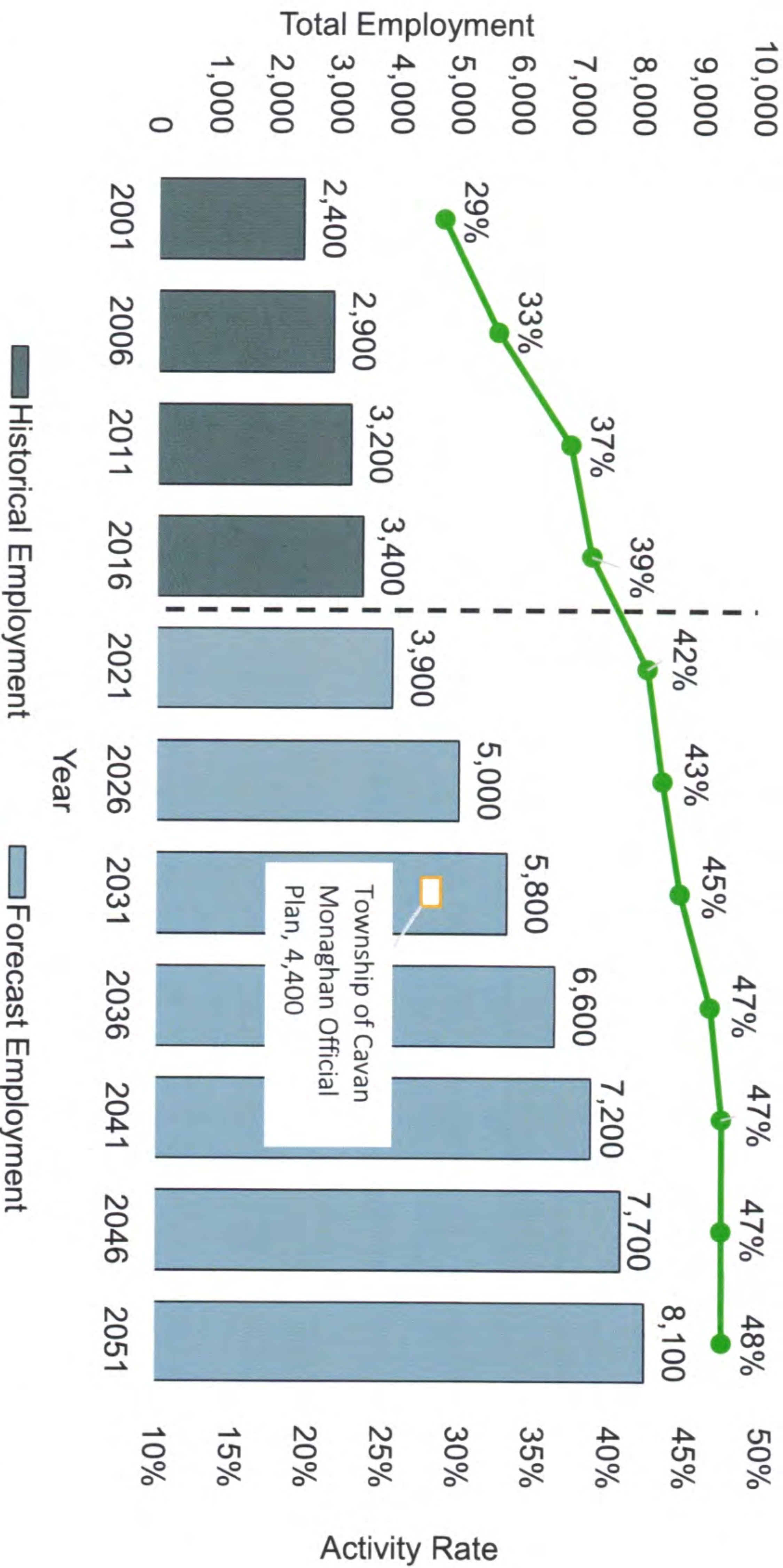


Source: Statistics Canada Census, 2001 to 2016. Forecast by Watson & Associates Economists Ltd., 2021.

TOWNSHIP OF CAVAN MONAGHAN INTENSIFICATION OUTLOOK



TOWNSHIP OF CAVAN MONAGHAN EMPLOYMENT FORECAST, 2016 TO 2051



Source: 2001 to 2016 from Statistics Canada place of work data including work at home and no fixed place of work. Forecast by Watson & Associates Economists Ltd., 2021.
Note: Numbers have been rounded.

TOWNSHIP OF CAVAN MONAGHAN

GROWTH FORECAST, 2016 TO 2051



Total Population (Including Undercount) ¹	Historical		Incremental Growth 2001-2016	Forecast			Incremental Growth 2016-2051	Annual Growth Rate	
	2001	2016		2031	2041	2051		2001-2016	2016-2051
Peterborough County	56,600	57,200	600			82,000	24,800	0.1%	1.0%
Township of Cavan Monaghan	8,800	9,000	200	13,200	15,500	18,800	9,800	0.2%	2.1%
Cavan Monaghan Growth Share of Peterborough County			33%				40%		

¹ Includes the net Census undercount estimated at 2.5%.

Total Employment ¹	Historical		Incremental Growth 2001-2016	Forecast			Incremental Growth 2016-2051	Annual Growth Rate	
	2001	2016		2031	2041	2051		2001-2016	2016-2051
Peterborough County	15,000	15,900	900			26,000	10,100	0.4%	1.4%
Township of Cavan Monaghan	2,400	3,400	1,000	5,800	7,200	8,700	5,300	2.3%	2.7%
Cavan Monaghan Growth Share of Peterborough County			111%				52%		

¹ Includes 'no fixed place of work' employment.

Milbrook Master Servicing to 2041

OUTLINE

- Existing Conditions of Facilities (2019)
- Servicing of Short-Term Growth (~2026)
- Servicing of Long-Term Growth (2041)
- Growth Beyond 2041
- Questions and Comments

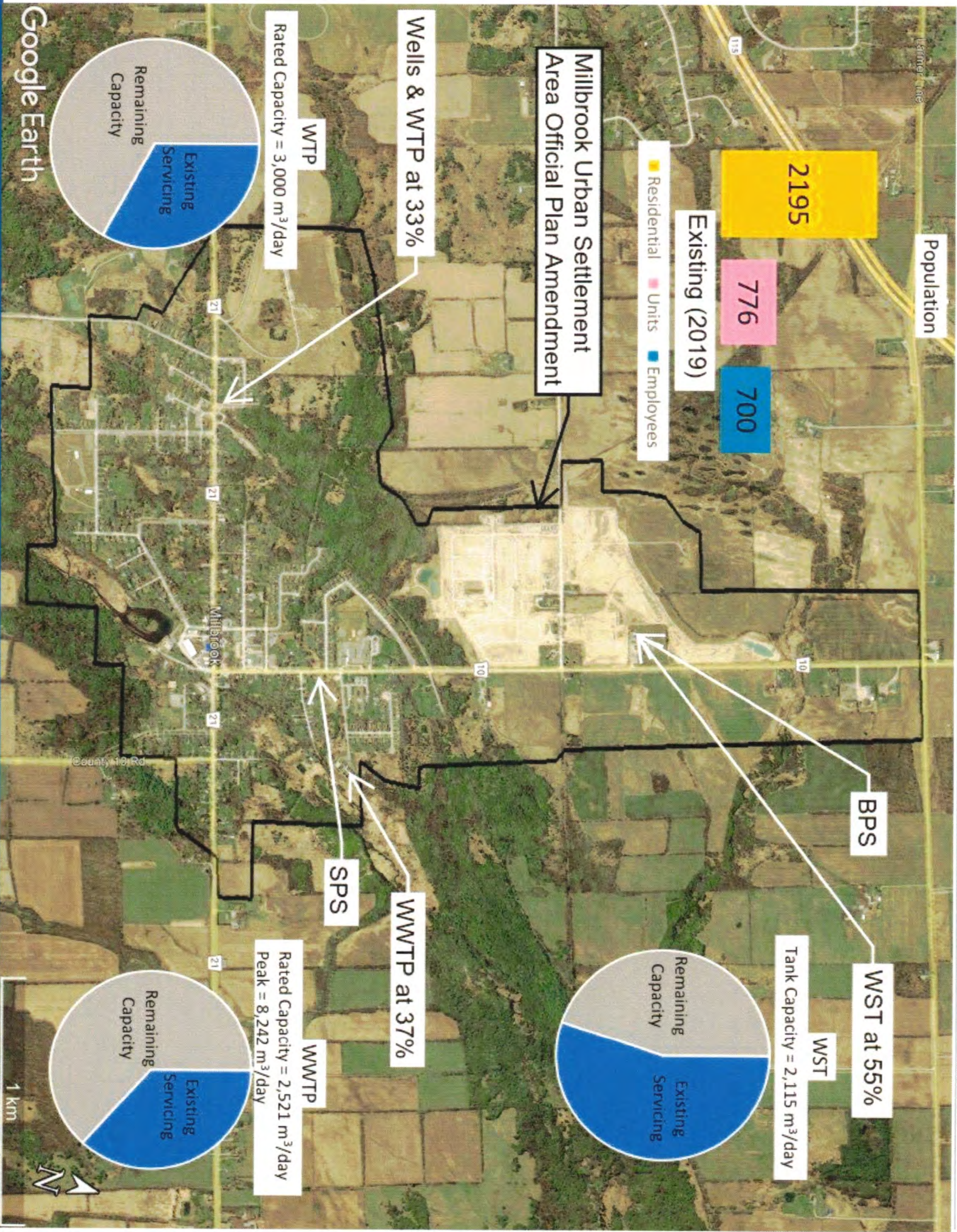
ACRONYMS

- TCM: Township of Cavan Monaghan
- WWTP: Wastewater Treatment Plant
- WTP: Water Treatment Plant
- WST: Water Storage Tank
- SPS: Sewage Pumping Station
- BPS: Booster Pumping Station
- ICI: Institutional, Commercial and Industrial

EXISTING CONDITIONS OF FACILITIES (2019)

- Servicing for:
 - 776 residential units
 - 2,195 residential population
 - 700 employees
- Servicing usage:
 - WWTP operating at 31% of rated capacity 2,521 m³/day and 37% of peak capacity of 8,242 m³/day
 - WTP operating at 33% of 3,000 m³/day rated capacity
 - WST operating at 55% of 2,115 m³ storage volume

EXISTING CONDITIONS OF FACILITIES (2019)



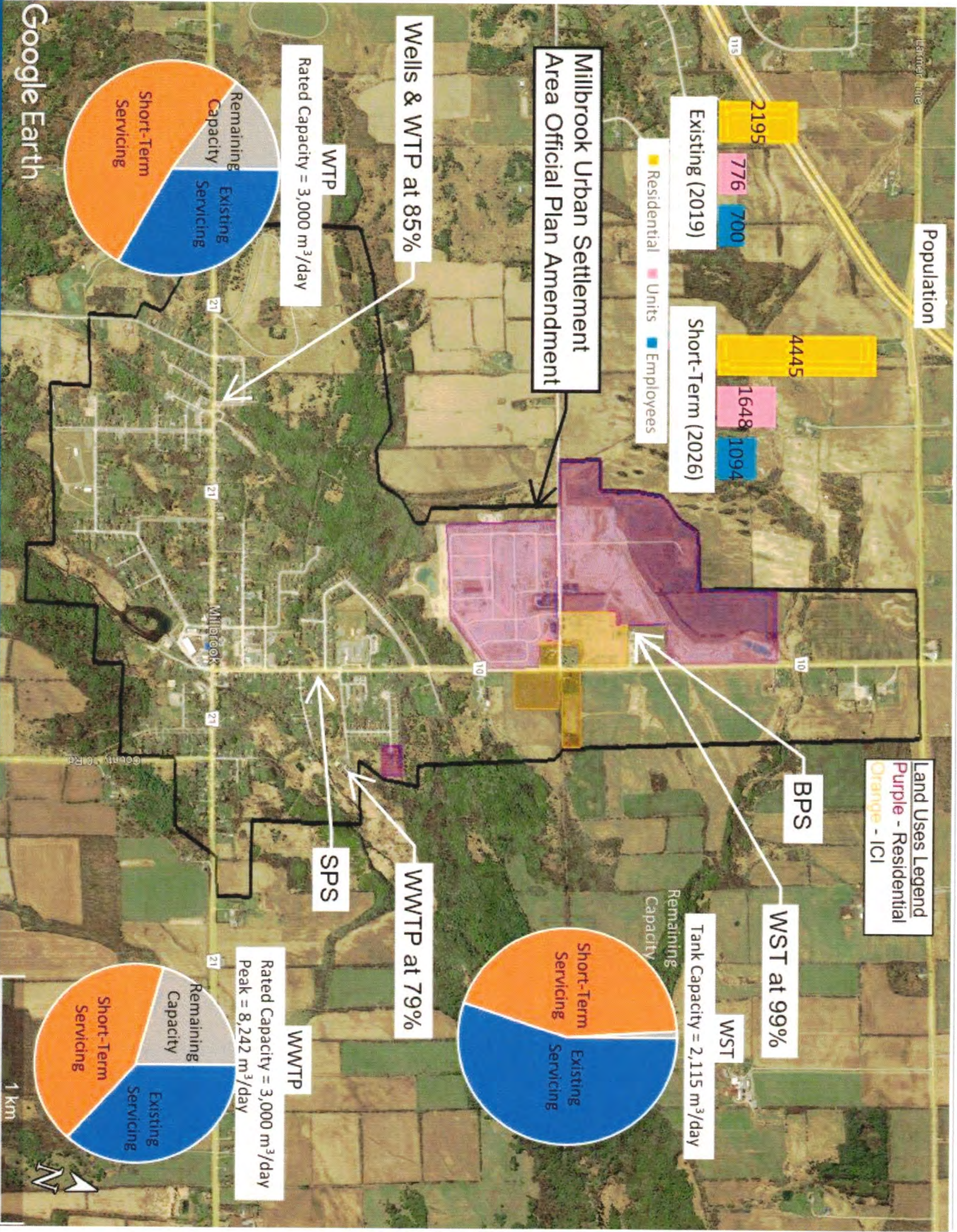
SERVICING OF SHORT-TERM GROWTH (~2026)

- Planned and in progress growth includes:
 - Towerhill South (345 units)
 - Towerhill North (718 units)
 - Coldbrook Drive (former Nina Court) (32 units)
 - Various ICI properties
- Servicing for:
 - 1,648 residential units (872 additional from existing)
 - 4,445 residential population (2,250 additional from existing)
 - 1,094 employees (394 additional from existing)

SERVICING OF SHORT-TERM GROWTH (~2026)

- Required facility upgrades:
 - Stress testing and re-rating the WWTP to 3,000 m³/day (with associated upgrades)
 - Possible upgrades to Tupper St. SPS
 - Booster Pumping Station capacity expansion
 - No further Class EA is required prior to design and construction, unless land acquisition or bldg. expansions are required
 - Total preliminary cost estimate (engineering + capital) of ~\$1.4M (Anticipated to be funded by Development Charges)
- Servicing usage:
 - WWTP operating at 37% of 3,000 m³/day rated capacity and 79% of 8,242 m³/day peak capacity
 - WTP operating at 85% of 3,000 m³/day rated capacity
 - WST operating at 99% of 2,115 m³ storage volume

SERVICING OF SHORT-TERM GROWTH (~2026)



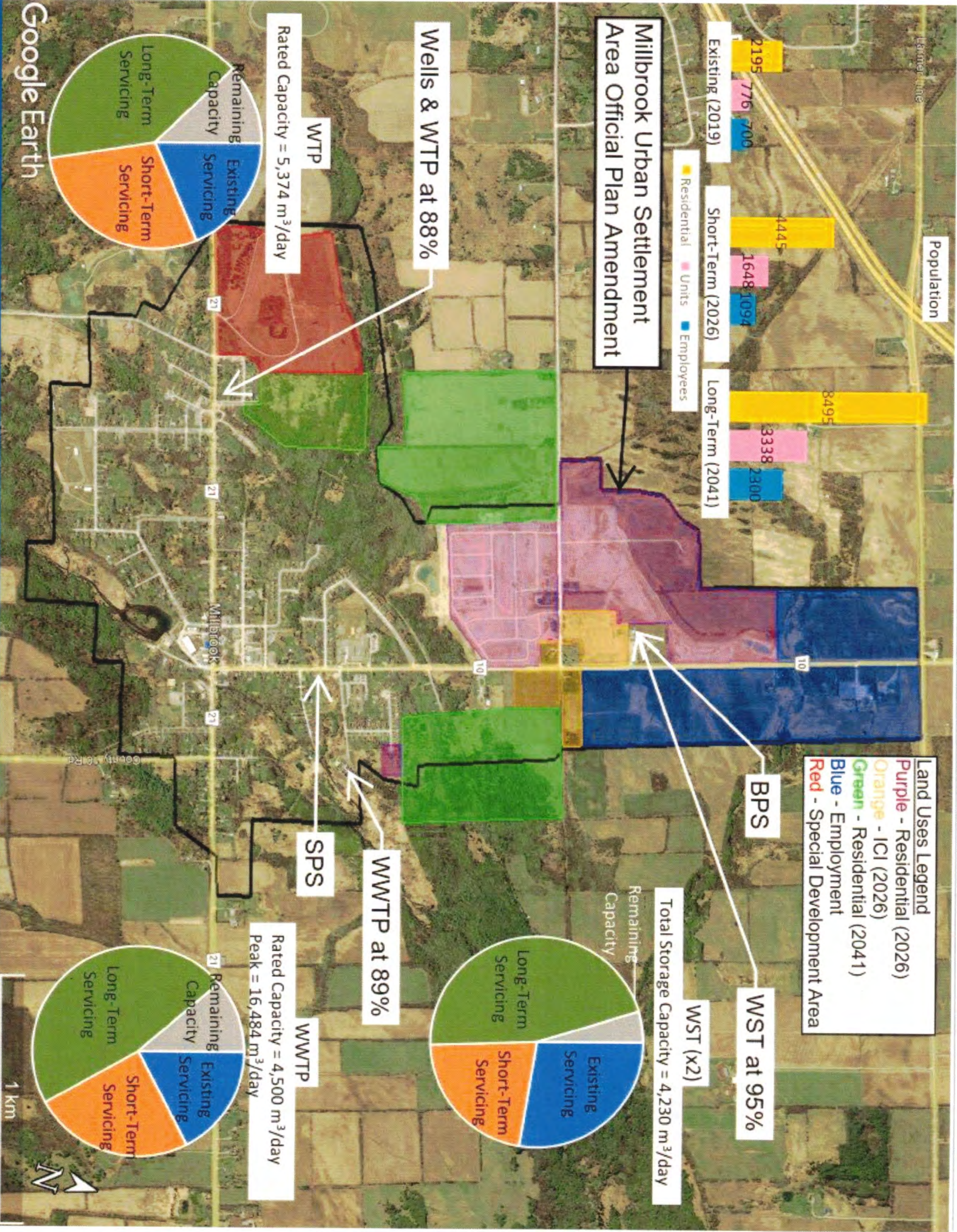
SERVICING OF LONG-TERM GROWTH (2041)

- Active and anticipated applications:
 - Fallis Line East (244 units) - active
 - Fallis Line West (696 units) - active
 - Turner Street (85 units) - active
 - Duke Street (192 units) - anticipated
 - Downtown intensification - ongoing
 - Northern employment areas – anticipated
- Servicing for:
 - 3,338 residential units (1,690 additional from 2026; 2,562 additional from existing)
 - 8,495 residential population (4,050 additional from 2026; 6,300 additional from existing)
 - 2,300 employees (1,206 additional from 2026; 1,600 additional from existing)

SERVICING OF LONG-TERM GROWTH (2041)

- Required facility upgrades:
 - WWTP expansion (addition of 3rd train)
 - Potential new SPS for North employment lands
 - Groundwater exploration, WTP expansion (well supply and treatment)
 - New BPS (depending where growth occurs)
 - Construction of new 2,115 m³ WST (location dependent on where growth occurs)
 - These upgrades will require another Class EA prior to design and construction
 - Total project (engineering + capital) cost estimate of ~\$38M (Anticipated to be funded by Development Charges)
- Servicing usage:
 - WWTP operating at 89% of expanded rated capacity of 4,500 m³/day
 - WTP operating at 88% of expanded rated capacity of 5,374 m³/day
 - WSTs operating at 95% of both tanks, with a total storage volume of 4,230 m³

SERVICING OF LONG-TERM GROWTH (2041)



GROWTH BEYOND 2041

- Baxter creek assimilative capacity cannot support additional wastewater effluent beyond 2041 based on the current regulation requirements and limit of technology
 - Therefore, it will prevent any additional growth in Millbrook
 - However, the design criteria and technology may change over time and can be reassessed in future
- Millbrook groundwater supply source (well field) near its capacity
- Forecasted Township of Cavan Monaghan growth will need to occur outside of Millbrook
- Further investigation and discussions are needed to consider growth beyond 2041 and where that might be located

NEXT STEPS

- Public Works to provide an updated report to Council on next steps.
- Peterborough County will be providing an update on local municipal growth projections on October 29th.
- Watson and Township Staff will work with Peterborough County to discuss the growth and land needs to 2051 in the Township of Cavan Monaghan.
- After these discussions, Watson will finalize the updated GMS that Staff will bring back to Council at a later date.
- Upcoming Water and Wastewater Master Servicing Study Public Information Centre at a later date.
- Public works to provide final Master Servicing recommendations to Council at a later date.



MILLBROOK SOUTH EAST
SUBDIVISION

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
741 DOWRIES QUAY ROAD, UNIT 2 WOODBINE, ONTARIO, L4L 1B1
TEL: (905) 544-0554 FAX: (905) 544-0555 E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PRELIMINARY SITE SERVICING
AND GRADING PLAN

Surveyed by:	Checked by: P.E.S.	Project No:
Drawn by: V.L.	Approved by: D.O.	19121
Designed by: V.L.	Date:	Drawing No:
		PSG-1
Scale: 1:750		Sheet No: