



**Summary of Proposed Amendments to the Trent Source
Protection Plan and Assessment Report –Colborne Municipal
Well System**

Pursuant to Section 34 of Ontario Regulation 287/07 of the Clean Water Act

June 22, 2021

The Township of Cramahe is revising the Wellhead Protection Area (WHPA) for the Colborne Well System due to the installation of a new well. These upgrades have resulted in the Proposed Amendments to the Trent Source Protection Plan (SPP) and Assessment Report (AR) (last updated and approved August 18, 2020) listed below and summarized and highlighted in yellow on the following pages.

List of Proposed Amendments

SPP

1. Summary of Amendments (second page): Updated.
2. Appendix 2: Updated Policy Applicability Map.
3. Appendix 5: Updated to include consultation activities for the Proposed Amendments.
4. Explanatory Document to be updated.

AR: Volume 1

1. Section 2.5.4.1.2: Added a paragraph describing the details of the updated Colborne well system.
2. Table 5.1-2: Updated well depth of well #1
3. Table 5.2-22: Updated geology listed for Colborne's well system to Overburden.
4. Section 5.2.2.8: Added a paragraph describing the updated modelling for Colborne's WHPA.
5. Table 5.4-3: Updated the threat totals for Colborne.
6. Table 5.2-24: Updated the range of vulnerability ratings, and range of vulnerability scores for Colborne.
7. Table 5.2-25: Updated the uncertainty ratings for Brighton, Colborne and Grafton.

AR: Volume 2

8. Appendix F, Groundwater Systems: Water Quality Risk Assessment, Vulnerability Assessment: Updated list of background reports

AR: Volume 3

9. Map 5-30a, Map 5-30b, Map 5-30c: Updated

Amendment 1: Summary of Amendments (second page of SPP)

As Per EBR Registry Number ###-####, the information Notice posted on the Environmental Bill of Rights describes the amendments approved by the Ministry of Environment, Conservation and Parks on (DATE) including:

- A revised wellhead protection area for the Colborne Municipal Well System; and,
- Revised assessment report maps.

Amendment 2: Appendix 2 – Policy Applicability Maps

To be provided.

Amendment 3: Appendix 5

Consultation on the Updated Assessment Report

Pre-consultation on the proposed amendments to the Trent Assessment Report to reflect changes to the Colborne Municipal Well System resulting from the decommissioning of one well and the installation of one replacement well was undertaken with Implementing Bodies from June 22, 2021 to July 23, 2021.

Public Consultation was undertaken from [####] to [####].

Consultation on the Updated Source Protection Plan

Pre-consultation on the proposed amendments to the Trent Source Protection Plan to reflect changes to the Colborne Municipal Well System resulting from the decommissioning of one well and the installation of one replacement well was undertaken with Implementing Bodies from June 22, 2021 to July 23, 2021.

Public consultation was undertaken [####] to [####].

Amendment 4: Explanatory Document

2.7 CONSULTATION ON NEW THREATS

In 2013, two additional technical studies were completed which identified new significant drinking water threats within the Trent Conservation Coalition Source Protection Region. The first was additional event based modeling for extreme events associated with the three Lake Ontario intakes (Bowmanville, Port Hope, and Cobourg); the second was wellhead protection area delineation for the Keene Heights drinking water system to include a new well dug in 2012. Both of these studies resulted in the identification of new significant drinking water threats and as such the relevant policies underwent additional public consultation to ensure the implementing bodies and impacted landowners were made aware of, and had an opportunity to comment on, the policies:

- Lake Ontario threats: Pre-consultation with municipalities and impacted landowners; formal public consultation period between November 18 and December 20, 2013
- Keene Heights threats: Pre-consultation with municipality; formal public consultation period between January 13 and February 14, 2014

In 2018, an updated groundwater model for the Norwood drinking water system was produced to include the decommissioning of one well, and two new wells to come online. This resulted in the delineation of a modified wellhead protection area (WHPA) and assignment of vulnerability scores to the modified WHPA. From this updated modelling, new significant drinking water threats within the Trent Conservation Coalition Source Protection Region were identified. There were no policy changes as a result of the amendments. Pre-consultation occurred between January 18, 2019 and February 28, 2019. Public consultation period occurred between March 28, 2019, and May 3, 2019.

In 2019, the wellhead protection areas were modified for the Pinewood Municipal Well System to reflect the new well and the decommissioning of two wells. This resulted in changes to the delineation and vulnerability of the wellhead protection area. No new significant drinking water threats within the Trent Conservation Coalition Source Protection Region were identified and no policies were changed as a result of these amendments. Pre-consultation occurred from October 21, 2019 and November 10, 2019. Public consultation occurred from December 9, 2019 to January 17, 2020.

In 2019, the wellhead protection areas were modified for the Canadiana Shores Municipal Well System to reflect the new well and the decommissioning of one well. This resulted in changes to the delineation of the wellhead protection area. No new significant drinking water threats within the Trent Conservation Coalition Source Protection Region were identified and no policies were changed as a result of these amendments. Pre-consultation occurred from December 12, 2019 and January 10, 2020. Public consultation occurred from March 12, 2020, to April 20, 2020.

In 2021, the wellhead protection areas were modified for the Colborne Municipal Well System to reflect the installation of a new well. This resulted in changes to the delineation of the wellhead protection area. ### new significant drinking water threats within the Trent Conservation Coalition Source Protection Region were identified and no policies were changed as a result of these amendments. Pre-consultation occurred from June 22, 2021 to July 23, 2021. Public consultation occurred from ##### to #####.

Amendment 5: Update well information

2.5.4.1.2 Groundwater Systems

There are four existing municipal residential groundwater supply systems in the source protection area that obtain their water from groundwater sources. These systems serve about 9,600 people. Under the *Drinking-Water Systems Regulation (O. Reg. 170/03)*, half of these systems are classified as large municipal residential systems and the other half are classified as small municipal residential systems. These systems are discussed in detail in Chapter 5.

The Colborne residential drinking water system consists of wells 1 and 2. Well 2 is the duty well and well 1 is the backup well – used only when demand exceeds the capacity of well 2. Well 1 has experienced sanding problems and is replaced by well 1A, installed in 2016.

The average combined flow rate of the system was 926.7 m³/d during 2014-18. The maximum permitted capacity is 3283.2 m³/d for each well and upto 6566.4 m³/d with two wells operating.

Recent installation and testing of the new municipal well 1A has required updated groundwater modelling to determine time-of-travel based capture zones or wellhead protection areas (WHPAs), when the wells are pumping at their maximum permitted rates.

GUDI Wells

The Drinking-Water Systems Regulation (O. Reg. 170/03) under the Safe Drinking Water Act defines specific circumstances under which a groundwater supply is considered to be groundwater under the direct influence (GUDI) of surface water. These wells are more susceptible to contamination than non-GUDI wells because they can be affected by short-term water quality issues associated with surface water sources.

Amendment 6: Update to well information

Table 5.1-2 (cont.) Summary of Wells and Water Treatment Systems for Existing Municipal Residential Groundwater Systems in the Trent SPAs

System Name	Well(s)							Water Treatment System		
	Location	No. Wells	Depths (m)					GUDI Status	Disinfection	Other Available Treatment Details
			1	2	3	4	5			
Otonabee-Peterborough Source Protection Area										
Alpine Village	East of Bobcaygeon	2	82	100	NA	NA	NA	No	Sodium hypochlorite	2 µm cartridge filtration
Birch Point Estates	Birch Point	2	18.3	19.8	NA	NA	NA	No	Sodium hypochlorite	1 µm cartridge filtration
Buckhorn Lake Estates	Buckhorn	1	16.8	NA	NA	NA	NA	Yes	Sodium hypochlorite	Chemically assisted filtration (Kinetic Macrolite system)
Crystal Springs	Elgeti	2	19.8	26.5	NA	NA	NA	Yes ²	UV irradiation Sodium hypochlorite	
Keene Heights	Keene	2	20.9	26.5	NA	NA	NA	No	Sodium hypochlorite	Sodium silicate (iron sequestration)
Millbrook	Millbrook	3	30	30	31	NA	NA	No	Sodium hypochlorite	
Norwood	Norwood	4	25	21.3	30.5	30.5	NA	No	Sodium hypochlorite	Sodium hypochlorite; phosphate-based corrosion control
Pinewood	Pinewood	3	107	118	NA	NA	NA	No	Sodium hypochlorite	
Crowe Valley Source Protection Area										
Cardiff	Cardiff	1	13.4	NA	NA	NA	NA	Yes	Sodium hypochlorite	2 µm cartridge filter for iron removal
Dyno Estates	Dyno Estates	1	11.8	NA	NA	NA	NA	No	Sodium hypochlorite	
Havelock	Northeast side of Havelock	3	15.2	13.7	15	NA	NA	Yes	Wells 1&4: UV irradiation; Chlorine; Sodium hypochlorite Well 3: Chlorine; Sodium hypochlorite; UV irradiation	Well 3: Dual media filtration
Lower Trent Source Protection Area										
Grafton	Grafton	2	78	78	NA	NA	NA	No	Sodium hypochlorite	Sodium silicate (iron sequestration)
Brighton	Brighton	3	40	40	40	NA	NA	No	Gaseous chlorine	
Colborne	Colborne	2	70	72	NA	NA	NA	No	Sodium hypochlorite	Sodium silicate (iron sequestration)
Stirling	Stirling	5	6.4	13.1	16.1	13.2	13.2	Yes	UV irradiation; Sodium hypochlorite	

Amendment 7: Colborne well system update

5.2.2.8 GRAFTON, COLBORNE, AND BRIGHTON MUNICIPAL WELL SYSTEMS

The Grafton, Colborne, and Brighton municipal well systems consist of a total of seven wells. These well systems were studied together because of the similarity in their geologic and hydrogeologic settings. Each of the seven wells obtains water from overburden sediments on the south slope of the Oak Ridges Moraine. Additional information about these well systems is provided in Table 5.2-1.

Table 5.2-1: Grafton, Colborne, and Brighton Municipal Well Systems

System	Aquifer Type	Geology	Classification	Groundwater Flow Model
Brighton	Unconfined	Overburden	non-GUDI	South Slope
Colborne	Confined	Overburden/Bedrock	non-GUDI	South Slope
Grafton	Confined	Overburden	non-GUDI	South Slope

Wellhead Protection Area Delineation

The WHPAs for the updated Colborne municipal well system were delineated based on time of travel assessed through the application of a 3D groundwater model, extracted from the existing “South Slope” model. This extraction process consisted of following refinements:

1. The model domain was reduced to focus on the Colborne wells. The northern boundary was set as the eastward flowing Cold Creek. The western boundary is the southward flowing Shelter Valley Creek. The eastern boundary is Smithville Creek west of Brighton and Lake Ontario is the southern boundary to the model domain. A constant head boundary was incorporated in the northwest extent of the model domain in the Thornhill Aquifer, representing groundwater flow-through from Oak Ridges Moraine in the north.
2. The model grid was refined around municipal wells, in order to better represent steeply declining groundwater elevations in the immediate vicinity of the municipal wells.
3. The transient mode of the groundwater model was used to simulate drawdowns from 2016 pumping tests. Model adjustments to improve results included increasing and decreasing hydraulic conductivity and storativity of layer 5 (Thornhill Aquifer Complex) and layer 4 (Lower Newmarket Till).
4. The updated model was run to determine new well capture zones under the maximum permitted rate (6566.4 m³/d), unlike the earlier model, which used 3283.2 m³/d, with both wells operating.

The WHPAs for the Grafton, Colborne, and Brighton municipal well systems were delineated based on time of travel determined through the application of a single three-dimensional groundwater flow model (the “South Slope” model). The model that represented the geologic system contained six geological layers: five in the overburden and one in the bedrock. The data source for the model was the Ministry of the Environment and Climate Change Water Well Information System database. The WHPAs delineated for Grafton, Colborne, and Brighton municipal well systems are shown on Maps 5-29a through 5-31a.

Vulnerability Assessment

Groundwater vulnerability was assessed for these systems using a water table to well advection time (WWAT) method. This is an application of the surface to well advection time (SWAT) method that does not include the travel time through the unsaturated zone (see Section 5.2.2)

Since unsaturated zone travel time (UZAT) was not included in the analysis of surface to well advection time (SWAT), the identification of transport pathways that could modify the groundwater vulnerability focused on identifying constructed pathways that could reduce travel times in the saturated zone. These included the following:

- Clusters of deep wells (more than 5 wells within 100 m) that were constructed prior to 1990 (when the *Ontario Wells Regulation (O. Reg. 903)* made under the *Ontario Water Resources Act* set out minimum standards for the construction and decommissioning of all types of wells)
- Gravel pits and quarries that breach the upper confining unit
- Landfills located in former pits and quarries that reach through the upper confining unit.

The results of the groundwater vulnerability assessment for the Grafton, Colborne, and Brighton municipal well systems are shown on Maps 5-29a through 5-31a. The range of groundwater vulnerability ratings in the WHPAs delineated for these systems is given in Table 5.2-24.

Amendment 8: Update to threats table

Table 5.4-2: Summary of Significant Threats for Groundwater Systems in the Trent Source Protection Areas (Listed by System)

Drinking Water Threats		Minden	Lutterworth Pines	Cardiff	Dyno Estates	Alpine Village	Buckhorn Lake Estates	Norwood	Blackstock	Greenbank	Port Perry	Havelock	Grafton	Colborne	Brighton	Crystal Springs	Keene Heights	Millbrook	Stirling	Fraserville	Birch Point	Canadiana Shores	Janetville	Kings Bay	Manorview	Mariposa Estates	Victoria Glen	Pleasant Point	Pinewood	Sonya	Victoria Place	Woodfield	Woods of Manilla	TOTAL	
No.	Prescribed Drinking Water Threats																																		
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the <i>Environmental Protection Act</i>	1					1				1																								3
2	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage	1	13	2	7	52	21	10	43	16	3	14	1	2	4	4	18	1		3	41	29	15	2	34	21		20	25	15	29	15	5	466	
3	The application of agricultural source material to land				3		2	1	5		1				2	2			39	1			1	2		10	3		1		1	1	1	76	
4	The storage of agricultural source material						2	1	1							1			7				1	2							1			16	
5	The management of agricultural source material																																		0
6	The application of non-agricultural source material to land								1																										1
7	The handling and storage of non-agricultural source material																																		0
8	The application of commercial fertilizer to land								32	5													1								8			46	
9	The handling and storage of commercial fertilizer																							2											2
10	The application of pesticide to land				2			1	5		2				2	3			1				1	4	1	2	3		1		1	1	1	31	
11	The handling and storage of pesticide						1	1																2											4
12	The application of road salt																																		0
13	The handling and storage of road salt																																		0
14	The storage of snow																																		0
15	The handling and storage of fuel	5	1	1	7	33		8	17	14	2	14				3	2	11	25		32	27		21	29	19		19		14	12	14	330		
16	The handling and storage of a dense non-aqueous phase liquid						2	2			9																				1			14	
17	The handling and storage of an organic solvent	1																																	1
18	The management of runoff that contains chemicals used in the de-icing of aircraft																																		0
21	The use of land as livestock grazing or pasturing land, an outdoor confinement area, or a farm-animal yard						2	1	1				1		2				34	1			1	2			1			1	1		48		
Total No. Significant Prescribed Drinking Water Threats		8	14	3	14	90	21	28	98	47	5	41	1	3	8	15	20	12	106	5	73	56	20	37	64	52	7	39	27	37	44	34	7	1036	
Total No. Parcels Affected by Significant Prescribed Drinking Water Threats		6	13	2	7	54	21	22	33	21	3	28	1	2	6	7	18	12	64	4	41	29	15	23	35	31	3	20	26	15	30	16	6	614	
Local Drinking Water Threats																																			
None																																			0
TOTAL (All Significant Drinking Water Threats)																																			
Total No. Significant Drinking Water Threats		8	14	3	14	90	21	28	98	47	5	41	1	3	8	15	20	12	106	5	73	56	20	37	64	52	7	39	27	37	44	34	7	1036	

Total No. Parcels Affected by Significant Drinking Water Threats	6	13	2	7	54	21	22	33	21	3	28	1	2	6	7	18	12	64	4	41	29	15	23	35	31	3	20	26	15	30	16	6	614
--	---	----	---	---	----	----	----	----	----	---	----	---	---	---	---	----	----	----	---	----	----	----	----	----	----	---	----	----	----	----	----	---	-----

Note: the total number of affected parcels may be less than the total number of drinking water threats because more than one threat may occur on some parcels

- **To be updated upon desktop exercise and windshield survey.**

Amendment 9: Update vulnerability scores

Table 5.2-3: Vulnerability Scores for Grafton, Colborne, and Brighton Municipal Well Systems

System	Transport Pathways By WHPA					Range of Groundwater Vulnerability Ratings by WHPA				Range of Vulnerability Scores By WHPA				
	A	B	C	D	E	A	B	C	D	A	B	C	D	E
Brighton	-	-	Q	Q	N/A	High	High	Low-High	Low-Med	10	10	6-8	2-6	-
Colborne	-	-	Q	L / Q	N/A	High Low-med	Low-High Med	Low-Med	Low-Med	10	6-10	2-8	2-4	-
Grafton	-	-	-	-	-	Low	Low	Low-Med	Low	10	6	2-4	2	-

¹ Q = Quarry; L = Landfill

Amendment 10: Update uncertainty ratings

Table 5.2-4: Uncertainty Ratings for Grafton, Colborne, and Brighton Municipal Well Systems

System	Uncertainty Ratings for WHPA Delineation					Uncertainty Ratings for Assignment of Vulnerability					Final Uncertainty Rating				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Brighton	Low	High Low	High Low	High Low	N/A	High	High	High	High	N/A	Low	High	High	High	N/A
Colborne	Low	High Low	High Low	High Low	N/A	High	High	High	High	N/A	Low	High	High	High	N/A
Grafton	Low	High Low	High Low	High Low	N/A	High	High	High	High	N/A	Low	High	High	High	N/A