DRINKING WATER SOURCE PROTECTION
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Public Consultation Summary

Caledon Village – Alton Drinking Water System

Technical Work Completed to comply with requirements under the *Clean Water Act, 2006*

July 25, 2019 – August 30, 2019

Public Consultation Extended to Wednesday, September 11, 2019

SUMMARY OF PROPOSED AMENDMENTS TO THE

CTC SOURCE PROTECTION PLAN AND CREDIT VALLEY ASSESSMENT REPORT

Pursuant to Section 34 of Ontario Regulation 287/07 of the Clean Water Act, 2006

July 25, 2019

The Region of Peel intends to add a new well to the Alton Wellfield in the Town of Caledon. The Alton Wellfield is part of the Caledon Village – Alton Drinking Water System. These proposed amendments incorporate the results of technical work completed to assess the vulnerable areas as outlined in the *Clean Water Act, 2006,* in proximity to the new Alton Well 4A. Further, these amendments identify potential drinking water threats which will need to be addressed through policies in the CTC Source Protection Plan should they exist through verification expected to take place during the public consultation period (July 25 – August 30, 2019).

Per Section 34 of Ontario Regulation 287/07 of the *Clean Water Act, 2006*, this document summarizes the sections of the report and mapping which have changed to reflect the proposed amendments (highlighted in yellow) listed in the attached Notices.

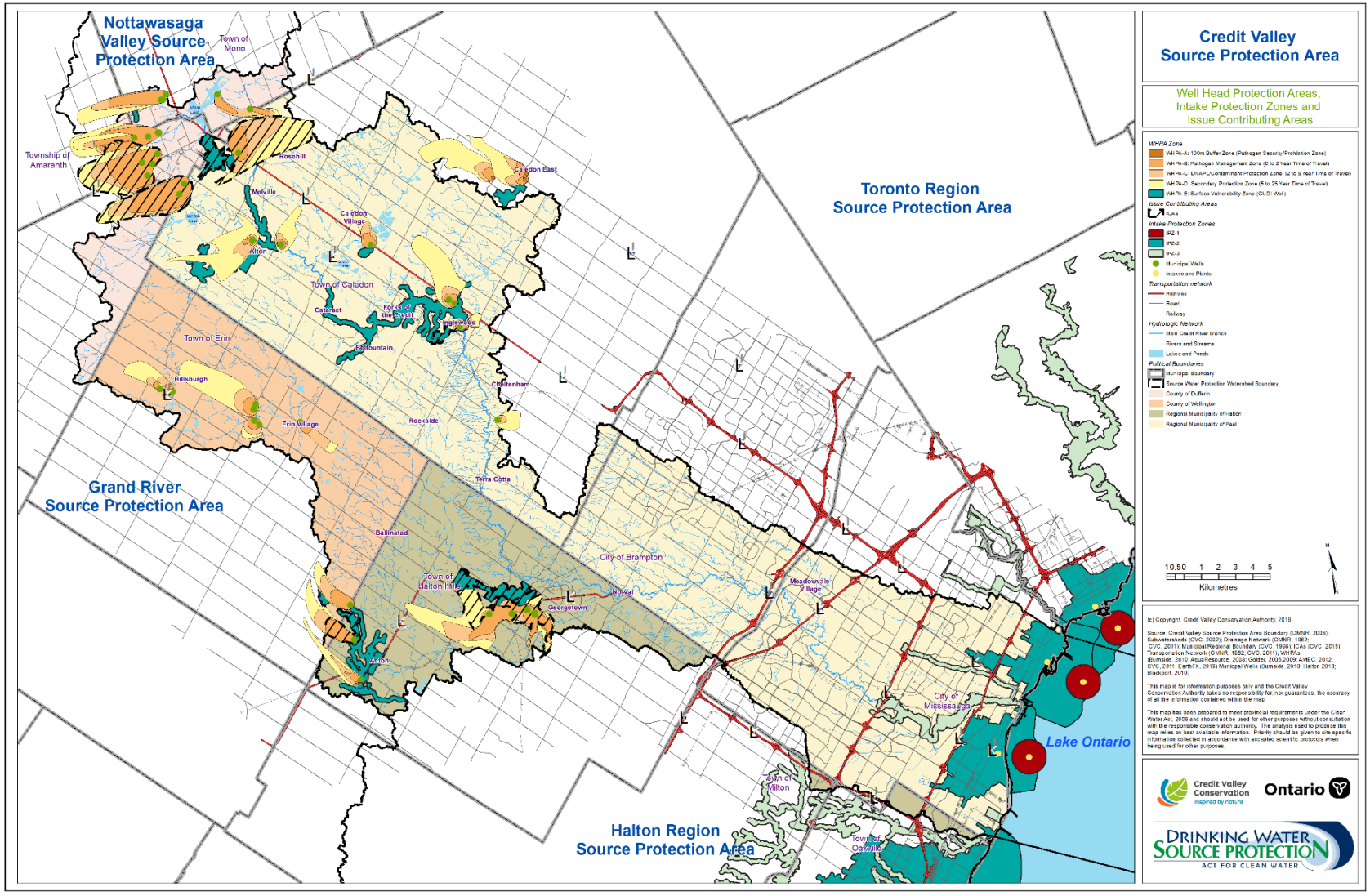


Figure ES:7: Wellhead Protection Areas, Intake Protection Zones, and Issue Contributing Areas

Section 2.3.2 - Municipal Groundwater Systems

Town of Caledon - Caledon Village – Alton Drinking Water System, Cheltenham & Inglewood Drinking Water Systems

The Town of Caledon is comprised of the Villages of Alton, Cheltenham, Inglewood and Caledon Village. The Regional Municipality of Peel provides municipal water through three drinking water systems comprising eight wells.

In 2007, the Caledon Village – Alton Drinking Water Supplies were connected and began to operate as a single water system (one drinking water system number) in March 2008. It services an average day demand of about 1,007 m^3/d (Region of Peel, 2009).

The Alton municipal supply consists of two wells (Alton Wells 3 and 4A), which draw water from confined surficial sand aquifers. Alton Well 4 was operational until December 2015 and was decommissioned in May 2019. A new well, Alton Well 4A, has been completed in the proximity of Well 4 and will allow the supply to continue operating with two wells.

Sodium hypochlorite is added for primary and secondary disinfection. Ultraviolet light is used to supplement the primary disinfection process. The treated water travels through a chlorine contact chamber before entering the water distribution system.

The Caledon Village supply comprises two wells (wells 3 and 4) that draw supply from confined and unconfined sand and gravel aquifers. Sodium hypochlorite is added for primary and secondary disinfection, and ultraviolet light disinfection is included to meet the primary disinfection requirements. Additionally, greensand filters are used at well 4 to remove iron.

The resulting water quality at the Caledon Village – Alton Drinking Water System meets the ODWS criteria and is suitable for human consumption.

The Inglewood Drinking Water System consists of three wells (ING-2, ING-3 and ING-4). ING-2 is a shallow well that sits in the floodplain of the Credit River in surficial sands. ING-3 and ING-4 are deeper wells located in coarse-grained overburden sediments within a buried bedrock valley (Matrix, 2017). The system services an average daily demand of about 405 m^3/d (Region of Peel, 2009).

In 2015, Peel Region began studies with the intent of replacing ING-2 with a deeper municipal water supply well. ING-4 was brought on-line in May 2019. ING-2 will be left connected to the system for one year, but not operated prior to being removed from the Inglewood Drinking Water System. ING-3 and ING-4 are expected to meet current and future demand in the Village of Inglewood.

Raw water from Inglewood is treated by adding sodium hypochlorite to oxidize the iron and the water is then filtered through greensand filters to remove the iron. The water is then treated with sodium hypochlorite for primary and secondary disinfection before entering the water distribution system. The resulting water quality at the Inglewood water system meets the *ODWS* criteria and is suitable for human consumption.

The Cheltenham Drinking Water System comprises two wells (Wells 1 and 2) completed within a deep bedrock valley system. It services the communities of Cheltenham and Terra Cotta, with an average day demand of about 240 m^3/d (Region of Peel, 2009).

At Cheltenham, sodium hypochlorite and potassium permanganate are applied to the raw water to oxidize the iron and manganese in solution. The water is then filtered through greensand media to

remove the iron and manganese and treated with sodium hypochlorite for primary and secondary disinfection. The resulting water quality at the Cheltenham Drinking Water System meets the ODWS criteria and is suitable for human consumption.

Section 2.4.7 - Groundwater Quality

Town of Caledon

The Regional Municipality of Peel owns and operates eight municipal wells in wellfields located in Alton, Caledon Village, Cheltenham and Inglewood. The Region also maintains a monitoring network to observe and safeguard municipal water quality at each wellfield.

The groundwater in the area, in general, is very hard and often exceeds the operational guideline range of 80-100 mg/L listed in the *Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, 2006* (ODWS). Water samples collected in 2006 ranged in hardness between 176 mg/L to 715 mg/L. Hardness is not a health-related parameter and therefore does not present a significant issue to the use of the groundwater as a source for municipal water supplies.

The groundwater in this area has naturally high concentrations of iron. The guideline for iron is considered an aesthetic objective, which means that it may impair the taste, smell or colour of the water or interfere with good water quality control practices. Iron concentrations exceeded the ODWS aesthetic objective of 0.3 mg/L at Cheltenham Wells 1 and 2, Caledon Village Well 4, and at Inglewood Well 3. Greensand filters have been installed in many of the wells with high iron concentrations, and they have proven to adequately remove iron from the raw water, thereby reducing the potential impacts on the aesthetics and treatment of the groundwater.

Manganese can be elevated as a result of reducing conditions and mineral deposits in the bedrock aquifer and exceeds the ODWS aesthetic objective of 0.05 mg/L at Cheltenham Wells 1 and 2. Manganese is not a health-related parameter. High levels may result in the staining of laundry and fixtures and may alter taste when used in beverages.

At the time of the initial water quality review required to comply with the Director's Technical Rules, 2009 the Regional Municipality of Peel maintained two wells at the Alton wellfield (Wells 3 and 4). Well 4 has now been decommissioned and is no longer in use. Future water quality trends can be assessed using data from Well 3 and the new well installed to replace Well 4, Well 4A.

Historical (1982 – 2009) trends for sodium, chloride, and nitrate (**Figures 2.36 - 2.38** and **Appendix B 1.7**) indicate the following:

- Nitrate concentrations (ODWS 10 mg/L) at the majority of Peel's wells typically ranged from non-detect to 3.0 mg/L;
- Chloride concentrations (ODWS 250 mg/L) at wells 3 and 4 have shown marked increases (from 50-100 mg/L) since 2000. Chloride concentrations at Caledon Village Well 4, Inglewood Well 3, and Cheltenham Wells 1 and 2 remained relatively stable and ranged between 10 and 50 mg/L; and
- Sodium concentrations (ODWS 200 mg/L) show similar trends to those of chloride, with relatively low increases at the majority of the wells. The most noticeable increase was observed at Alton wells 3 and 4 with orders of approximately 60 and 80 mg/L, respectively.

Nitrate and chloride concentrations at Alton Wells 3 and 4 remain well below the ODWS but monitoring wells nearby have shown markedly increasing trends since the late 1990s. Therefore, the region instituted an “early warning” monitoring program in the early 2000s to monitor for groundwater contaminants and water levels.

This program comprises the following:

- A series of early warning wells at each WHPA;
- Water level monitoring conducted on a quarterly basis;
- Water quality monitoring conducted on a semi-annual basis; and
- Water quality monitoring parameters geared to land-uses in the vicinity of each municipal well (i.e., petroleum parameters near gas stations).

The program has actively been used to ensure the continued integrity of the municipal drinking water supply and to inform a water quality management plan for the wells.

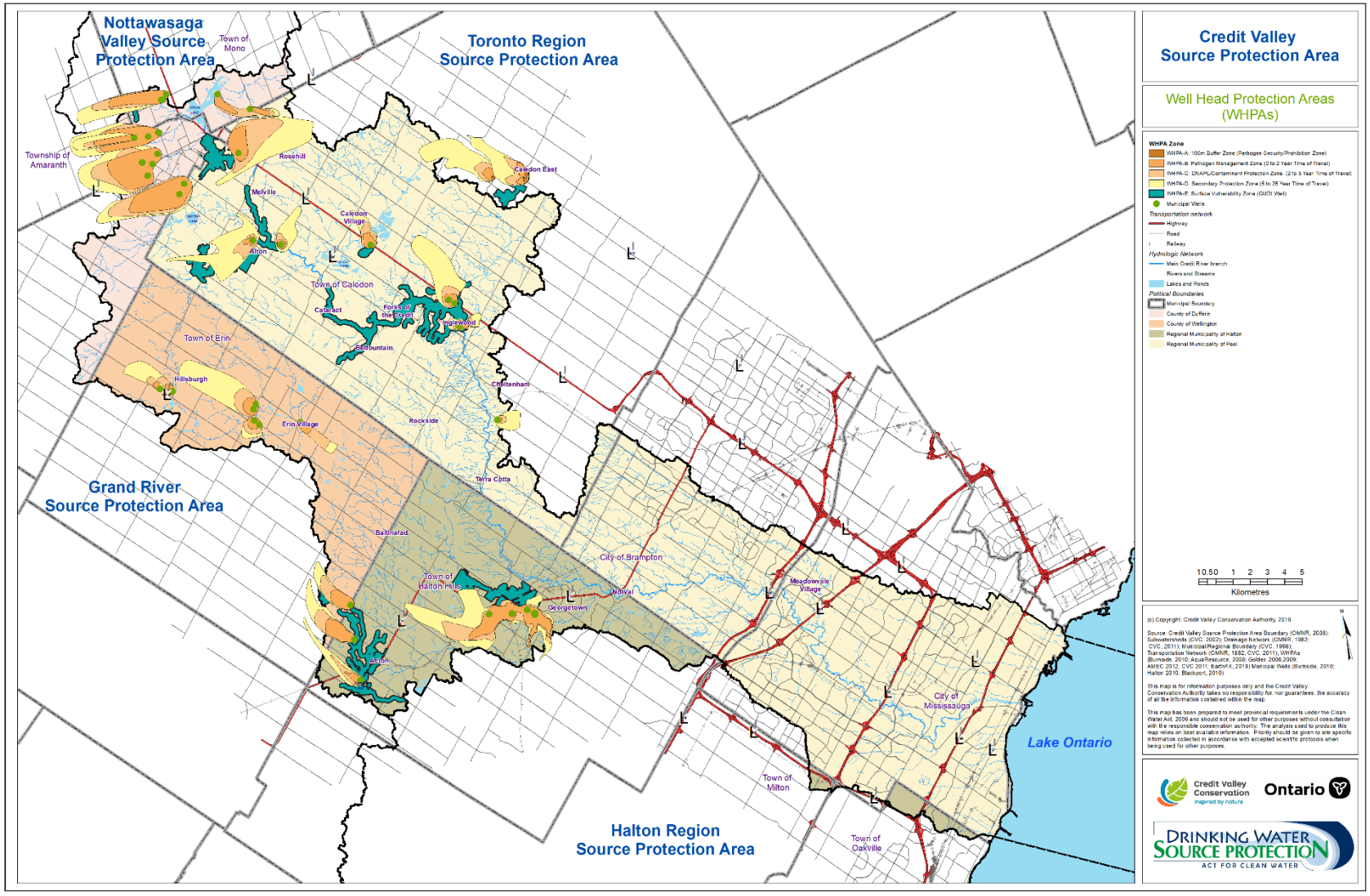


Figure 4.5: Wellhead Protection Areas (WHPAs)

CHAPTER 4 – ASSESSING VULNERABILITY OF DRINKING WATER SOURCES

4.8 REGIONAL MUNICIPALITY OF PEEL - TOWN OF CALEDON

The Town of Caledon is situated in the north eastern portion of the Credit River Watershed. Municipal water is supplied to the town by the Region of Peel through the following drinking water systems:

- Caledon Village – Alton (Alton Wells 3 and 4A; Caledon Village Wells 3 and 4);
- Inglewood – Wells 2, 3 and 4; and
- Cheltenham – Wells 1 and 2.

4.8.1 Geological Setting

Alton Wells 3 and 4A are in an unconfined sand and gravel aquifer, 15-25 metres below ground.

Caledon Village Well 4 (61-75 metres below ground) is in a confined gravel aquifer (bedrock valley infill) that forms part of a melt water channel running between Orangeville and Halton Hills, while Caledon Village Well 3 (29-35 metres below ground) is in an unconfined sand, and gravel aquifer.

The Village of Inglewood obtains its water from three municipal wells; Inglewood Wells 2, 3, and 4. Well 2 is shallow (6-8 metres below ground), while Wells 3 and 4 are deeper (50-55 metres below ground) in a buried valley aquifer.

Cheltenham Wells 1 and 2 are located in the Peel Plain, 45 to 55 metres below ground within a bedrock valley underlying the meltwater channel and the Halton Till deposits.

A summary of well depths and associated geological setting of Caledon's municipal wellfields is presented in **Appendix D2 (Table D-28)**.

4.8.2 Data Sources and Study Methodology

The WHPA delineations and vulnerability assessment are detailed in the following reports:

- Region of Peel WHPA Study for Municipal Residential Groundwater Systems located within the Credit River Watershed, AquaResource Inc., 2007;
- Wellhead Protection Area Delineations and Vulnerability Assessments for Alton 1-2 Standy by Wells, Cheltenham PW1/PW2 Amended PTTW, and Caledon Village Proposed Well 5 (TW2-05), AquaResources Inc., April 2008;
- Surface to Aquifer and Surface to Well Advection Time Wellhead Protection Areas in Credit Valley Watershed Caledon Village Wells 3 and 4, Inglewood Wells 1/2 and 3, Cheltenham PW1/ PW2, & Alton Wells 3 and 4, AquaResources Inc., April 2008;
- Transport Pathways Update to Vulnerability, Region of Peel, R.J. Burnside and Associates Ltd., May 2010;
- Inglewood Wellhead Protection Area Delineation Wells ING3 and ING4, Peel Region, Matrix Solutions Inc., February 2017;
- Vulnerability Assessment and Vulnerability Scoring for Inglewood Well 4, Region of Peel, Matrix Solutions Inc., August 2018; and

- Phase 1: Alton Wellhead Protection Area Delineation, Peel Water Resources Management Model, Region of Peel, Earthfx and GeoKamp Ltd., June 2019.

Documents published prior to 2015 were subjected to extensive peer review by municipal staff, the CVC, and private consultants, prior to acceptance by the CTC SPC, and inclusion in this Assessment Report. Additionally, the base models upon which the studies are premised, were also subject to independent peer review during previous (to source protection) studies for which they were initially developed. These reports contain the foundation technical data and information upon which this Assessment Report has been based. Reports prepared after 2015 to amend the Assessment Report to reflect wells being brought on-line were, at a minimum, prepared and/or reviewed by a qualified professional.

WHPA delineation was undertaken through computer-based three-dimensional groundwater flow modelling, using the FEFLOW (Finite Element Flow - WASY, 2006) code. The model was built upon data from previous initiatives (regional water budget studies; WHI 2002; WHI 2004), and the Tier 2 Water Budget, Aqua Resource Inc. (2009) (**Chapter 3**).

In 2019 a regional-scale numerical model of groundwater and surface water flow systems in Peel Region was initiated. Given the breadth of a study of this magnitude, there are multiple phases. Phase 1 includes the development of a steady-state groundwater flow model for Peel Region. The first application of the model is to delineate wellhead protection areas (WHPA) for the Alton Wellfield, using the USGS MODFLOW-NWT code. Eventually, this model will allow the vulnerable areas around all municipal wellfields to be refined.

To ensure that the model represents conditions at the local scale required that the regional model grid used for the Tier 2 water budget study be refined within the vicinity of the wellheads. A finer grid cell size provides for a more accurate representation of aquifer and stream properties, as well as the drawdown simulation near pumping wells.

4.8.3 WHPA A-D Delineation and Vulnerability Scoring

WHPAs B-D were delineated using backward and forward particle tracking analysis (**Chapter 4.3**), by pumping each well field to steady state, at its maximum permitted rate (**Appendix D2, Table D-30**). Rate selection considered future demand and growth projections for the Town of Caledon. The WHPAs for the Caledon Village-Alton, Inglewood and Cheltenham Drinking Water Systems are shown in **Figure 4.32, Figure 4.33,** and **Figure 4.34,** respectively. It should be noted that the WHPA-D for the Cheltenham wells 1 and 2 extends eastward across the CVSPA boundary into the TRSPA.

Groundwater vulnerability was assessed using the Surface to Well Advection Time (SWAT) method, which calculates travel time separately through the unsaturated zone (ground surface to the water table - UZAT), and the saturated zone (water table to the well screen - WWAT), then sums them. The SWAT methodology was selected since it is numerically consistent with the model used to delineate the WHPAs (i.e., it used the FEFLOW model for calculating travel times in the saturated zone).

Forward particle tracking was used to determine the saturated zone travel time (WWAT), while the unsaturated zone travel times (UZAT) were calculated independently within a GIS using modelled recharge rates, estimates of mobile water content and the thickness of the unsaturated zone.

The travel time through the unsaturated zone in the immediate vicinity of the wells are very low and assumed as zero. As such, the WWAT component of the SWAT was chosen to form the basis of the

analysis. A letter from the Director, MECP granting permission for this approach can be found in **Appendix D3**. The WWAT approach considers only the movement of water particles within the aquifer and assumes that the contaminant is introduced within this zone bypassing the unsaturated zone. It is therefore regarded as a conservative indicator of vulnerability.

Groundwater vulnerability was assessed as being high, medium or low, in keeping with *Technical Rule* 38 (2). The groundwater vulnerability in the vicinity of Caledon Village - Alton, Inglewood and Cheltenham WHPAs is shown on **Figure 4.35, Figure 4.36,** and **Figure 4.37** respectively**.**

WHPA vulnerability was scored by overlaying the groundwater vulnerability classification of the area (high, medium, low), on the delineated WHPAs (A to D), and applying a score, as shown in **Table 4.2**.

The vulnerability scores developed for the WHPAs are shown in **Figure 4.38**, **Figure 4.39**, and **Figure 4.40**, respectively.

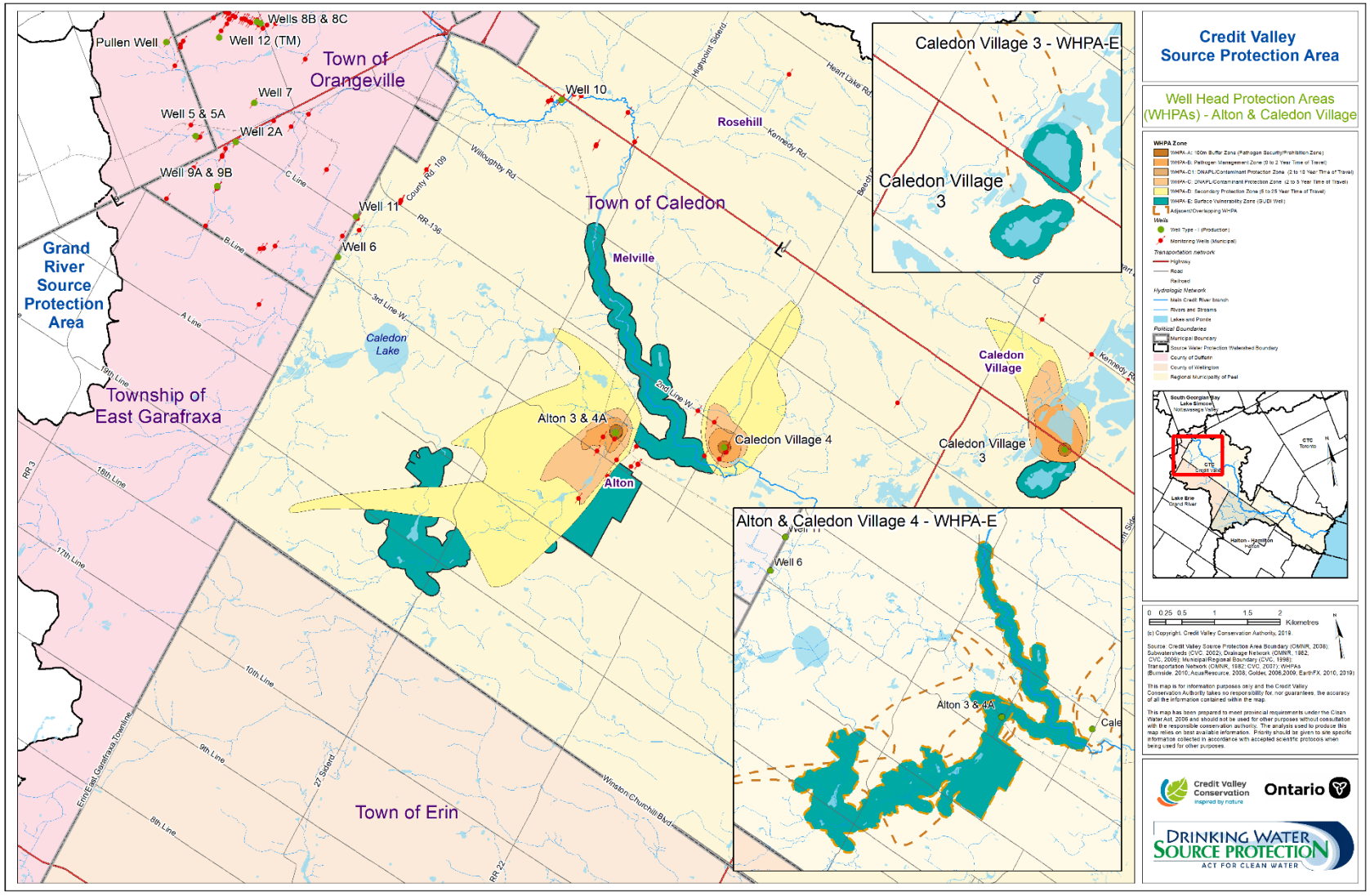


Figure 4.32: Wellhead Protection Areas (WHPAs) – Caledon Village – Alton

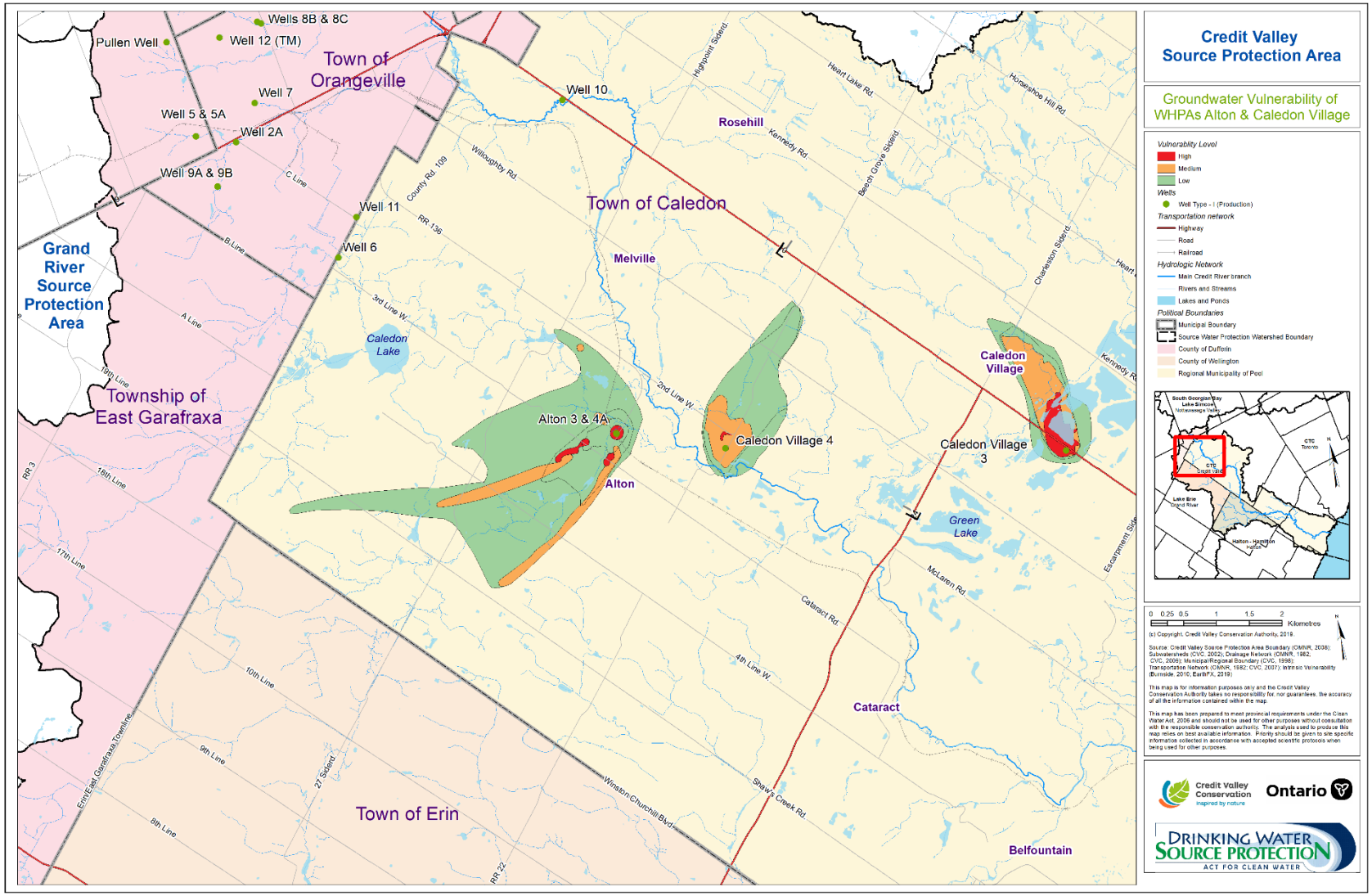


Figure 4.35: Groundwater Vulnerability of WHPAs — Caledon Village – Alton

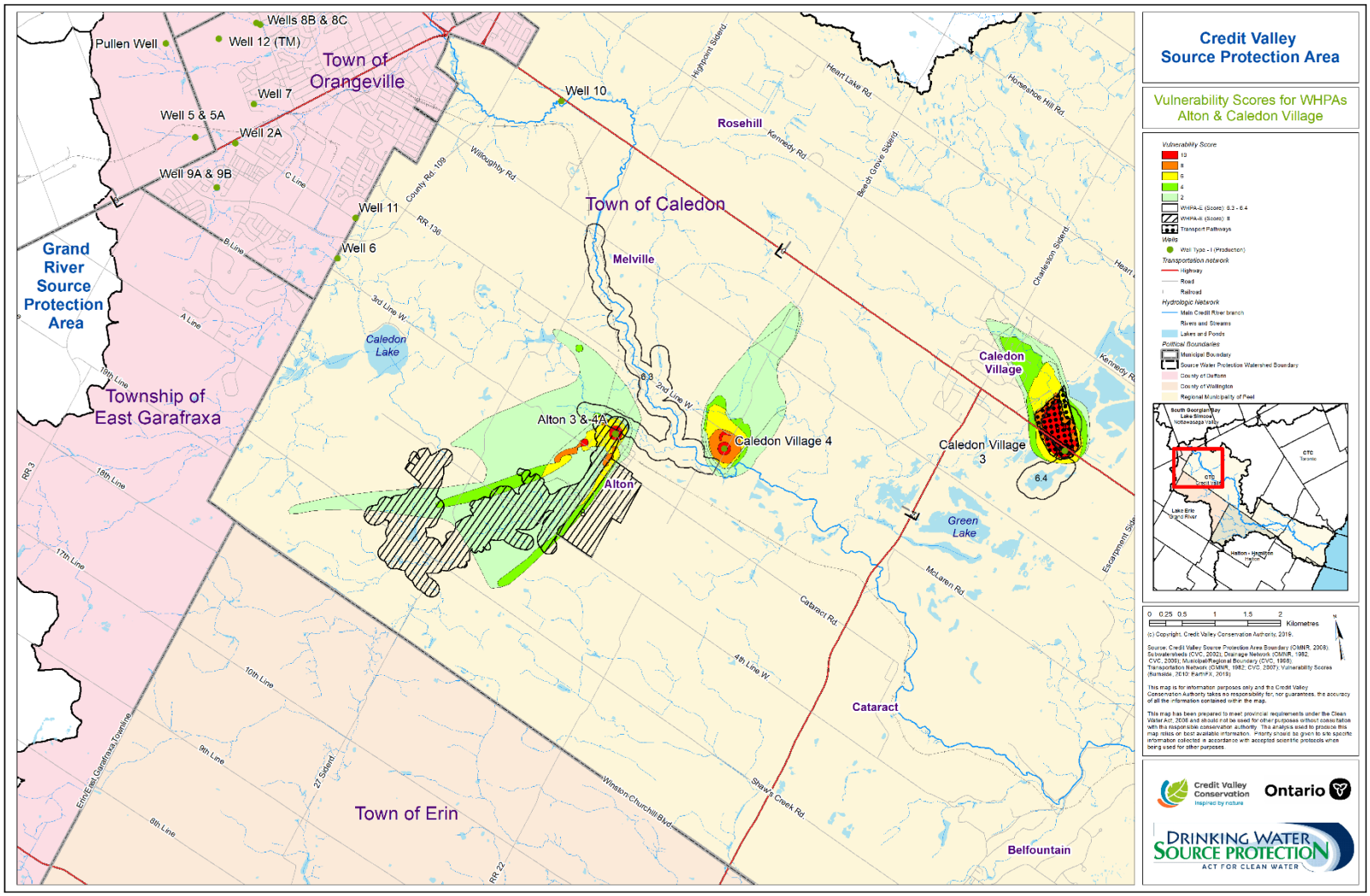


Figure 4.38: Vulnerability Scores for WHPAs - Caledon Village - Alton

4.8.4 WHPA-E Delineation and Vulnerability Scoring

The majority of WHPA-E delineations are described in the document "Transport Pathways Update to Vulnerability, Region of Peel" (R.J. Burnside and Associates Ltd., May 2010). For Alton Wells 3 and 4A, the WHPA-E delineation is outlined in Earthfx and GeoCamp (2019). The methodology used to delineate the WHPA-E is consistent with the approach used for an IPZ-2 (surface water intake) delineation.

The key tasks in delineating the WHPA-Es are identified in **Chapter 4.2**. Since the exact point of interaction was not defined for any of the wells, the closest surface water body to the wells were used as the starting point for the delineation.

Details on the calculation procedures, design assumptions and vulnerability scoring used in the derivation of WHPA-Es are summarized in **Appendix D2**. The WHPA-Es found at the Caledon Village-Alton and Inglewood Drinking Water Systems are shown in **Figure 4.32** and **Figure 4.33**, respectively. Vulnerability scores were assigned per the *Technical Rule*s as the product of the area vulnerability factor and the source vulnerability factor. WHPA-E vulnerability scores are provided in **Figure 4.38** and **Figure 4.39.**

4.8.5 Transport Pathways

The features studied within the context of this analysis are outlined in **Chapter 4.2**.

Gravel Pits/Aggregate Operations

Aggregate operations were identified in the WHPAs of Caledon Village Well 3 and in Alton Wells 3 and 4A. The aggregate operation in the WHPA of Caledon Village Well 3 consists of several pits that extend below water table, covering an area of approximately 20 hectares. Within the footprint of the sand and gravel pits, the entire overburden layer has been removed, resulting in the opening up of the underlying overburden, and the loss of the protective layers overlying the aquifer across the gravel pit. Therefore, the vulnerability rating within the area of the gravel pits was increased from low to medium for Alton Wells 3 and 4A, and from medium to high for Caledon Village Well 3.

4.8.6 Uncertainty Assessment

Alton and Cheltenham Wells

When the initial WHPA delineations were completed for incorporation into this Assessment Report, some peer reviewers highlighted concerns regarding the WHPA delineations and vulnerability assessment prepared for the Alton and Cheltenham wells. These concerns were associated with the variations in the shapes and size of the WHPAs compared to previous delineations (circa 2000), and the orientation of the WHPAs at Cheltenham. Based upon comments obtained through the peer review of the foundation reports and of the base models, Peel Region accepted the initial WHPA delineations, and in 2009 recommended that they be included in the Official Plan for the Town of Caledon. The Region was mindful of the concerns brought forward by these reviewers and recommended that the WHPAs be accepted pending further refinement of the groundwater flow model through the inclusion of additional data.

To assist with the collection of additional data, the Region initiated independent water quality monitoring programs with intensive data collection components, as follows:

- Re-evaluation of its Early Warning Wells (EWW) Monitoring program – installation of additional early warning wells to improve the resolution of the EWW network, including some in the vicinity of the Cheltenham and Alton municipal wells. This program commenced in early 2011; and
- Development of a Nitrate Management Plan for Alton which included the installation of boreholes and monitoring wells. This program was initiated in Fall 2010.

The data generated from these programs will be used when refining the geologic/hydrogeologic interpretations near the municipal wells and updating the groundwater flow model used to delineate the WHPAs. With the inclusion of improved data sets, there is the potential for alterations in the shape and size of the WHPAs. In respect of this, the CTC SPC agreed to accept the WHPAs as "interim" products, for inclusion in this Assessment Report, with the expressed condition that they be re-evaluated once the higher quality data becomes available.

General WHPA Delineation and Vulnerability Assessment

The dimensions of WHPA-A and the vulnerability scoring assigned, are set within the *Directors Technical Rules* (MOE, 2009). With WHPAs B through D there is an intrinsic level of uncertainty in the analysis, given the complexity of the study area and the paucity of data in certain instances. The vulnerability assessment also has a certain level of uncertainty associated with it.

The vulnerability assessment is a combination of several components each with their own uncertainty associated to them. These components include:

- The time of travel zones are based on the calibration match and the response of the capture zones within the sensitivity scenarios;
- The quality of the data used to calculate the vulnerability; and
- The vulnerability rating, which is often due to uncertainty associated with the understanding and conceptualization of the hydrostratigraphic groundwater system.

In some areas, the hydrostratigraphy is well understood, and therefore the resulting vulnerability mapping may be clear, leading to low uncertainty. In contrast, hydrogeologically complex areas may result in higher uncertainty. **Table 4.11** outlines the uncertainty estimated for each factor, at each municipal wellhead.

Uncertainty for the Peel Region WHPAs is summarized as follows:

- The WHPAs were delineated using a multiple scenario sensitivity analysis to account for variation in multiple parameters. The resulting WHPAs are conservative in nature with good calibration results therefore, the uncertainty can be considered low with the exception of Alton Wells 3 and 4A, and Cheltenham Wells.
- WWAT uncertainty was determined based on the groundwater model used to delineate the WHPAs and that these zones cannot be field verified.
- Detailed data sources were used to delineate the WHPA-Es resulting in low uncertainty.

Table 4.11: Uncertainty Assessment —Town of Caledon

	Uncertainty Type	WHPA-A	WHPA-B	WHPA-C	WHPA-D	WHPA-E
Alton Well 3	Delineation of WHPA	Low	High	High	High	Low
	Vulnerability assessment	Low	High	High	Low	Low
	Overall – Vulnerability Scores	**Low**	**High**	**High**	**Low**	**Low**
Alton Well 4A	Delineation of WHPA	Low	High	High	High	Low
	Vulnerability assessment	Low	High	High	High	Low
	Overall – Vulnerability Scores	**Low**	**High**	**High**	**High**	**Low**
Caledon Village Well 3	Delineation of WHPA	Low	Low	Low	Low	—
	Vulnerability assessment	Low	High	High	Low	—
	Overall – Vulnerability Scores	**Low**	**High**	**High**	**Low**	—
Caledon Village Well 4	Delineation of WHPA	Low	Low	Low	Low	—
	Vulnerability assessment	Low	High	Low	Low	—
	Overall – Vulnerability Scores	**Low**	**High**	**Low**	**Low**	**—**
Inglewood Well 2	Delineation of WHPA	Low	Low	Low	Low	Low
	Vulnerability assessment	Low	High	High	Low	Low
	Overall – Vulnerability Scores	**Low**	**High**	**High**	**Low**	**Low**
Inglewood Well 3	Delineation of WHPA	Low	Low	Low	Low	—
	Vulnerability assessment	Low	High	Low	Low	Low
	Overall – Vulnerability Scores	**Low**	**High**	**Low**	**Low**	**Low**
Inglewood Well 4	Delineation of WHPA	Low	Low	Low	Low	—
	Vulnerability assessment	Low	High	Low	Low	Low
	Overall – Vulnerability Scores	**Low**	**High**	**Low**	**Low**	**Low**
Cheltenham	Delineation of WHPA	Low	High	High	High	—
	Vulnerability assessment	Low	High	High	Low	Low
	Overall – Vulnerability Scores	**Low**	**High**	**High**	**Low**	

Table 5.10: Summary of Drinking Water Threats (Quality and Quantity) for the Credit Valley Source Protection Area

Municipality	Wells	Significant Drinking Water Threats	Total # of Parcels with Significant Drinking Water Threats
Town of Orangeville	Wells 2A, 5, 5A, 6, 7, 8B, 8C, 9A, 9B, 10, 11 and 12	2,728	2,495
Town of Mono	Cardinal Woods Wells 1, 3 and 4, Island Lake Wells TW1 and PW1, and Coles Wells 1 and 2	66	40
Township of Amaranth	Pullen Well	41	30
Town of Erin	Erin Wells 7 and 8	28	10
	Hillsburgh Wells H2 and H3	39	19
	Bel Erin Wells 1 and 2	223	104
Region of Halton	Acton 4th Line Well, Davidson Wells 1 and 2, and Prospect Park Wells 1 and 2	651	346
	Georgetown Lindsay Court Well 9, Princess Anne Wells 5 and 6, and Cedarvale Wells 1a, 3a, 4 and 4a	6,135	4,046
Region of Peel	Alton Wells 3 and 4A	170	51
	Caledon Village Wells 3 and 4	2	1
	Inglewood Wells 2, 3 and 4	54	35
	Cheltenham Wells 1 and 2	16	6
Total		**10,153**	**7,183**

5.5.6 Regional Municipality of Peel - Town of Caledon

The Region of Peel provides municipal water to Caledon through eight wells located at Alton, Caledon Village, Inglewood, and Cheltenham. The WHPA delineation and vulnerability assessment processes around the municipal wells are described in **Chapter 4.2**.

The issues evaluation and threats identification exercise originally undertaken within the WHPAs of the wells are detailed in the report "Issues Evaluation and Threats Assessment, Region of Peel" (R.J. Burnside & Associates Limited, May 2010). This report was subjected to extensive peer review by municipal staff and by the CVC prior to acceptance by the CTC SPC, and inclusion in the Assessment Report. This document contains the technical data and information upon which the threats enumerations in Tables 5.24 – 5.27 have been based. In preparation for Inglewood Well 4 to be brought on-line in 2019, a desktop exercise to identify existing significant drinking water threats associated with the new drinking water well, was completed. This exercise involved a review of MPAC classification and aerial photography. The same process was undertaken for Alton Well 4A in summer 2019. It is expected

that the results of this desktop exercise will be verified during public consultation to take place between July 25 and August 30, 2019.

Threats and Issues

The threats inventory was compiled using the data and information sources outlined in **Appendix E1**. Site specific verification of drinking water threats was not conducted as part of the original study by R.J. Burnside & Associates Limited (May 2010). Since 2012, the Region of Peel has undertaken work aimed at ground truthing significant threats in vulnerable zones around its municipal wells. This work has been detailed in the report "Region of Peel – Verification of Significant Drinking Water Quality Threats (Groundwater)" (R.J. Burnside & Associates Limited, August 2012) and the findings have been used to refine the threat counts in this report.

Table 5.24 to **Table 5.27** summarizes the number of significant threats around Peel's wellheads. Details of the evaluation of managed land threats are found in **Appendix E3**.

The areas where threats are or would be low, moderate or significant for chemicals, DNAPLs and pathogens are shown on **Figure 5.40** through **Figure 5.48**.

- **Alton** – A total of 170 significant threats have been identified. These threats are related to the potential activities in WHPA-A through C: storage and handling of DNAPLs (9); handling and storage of fuel (1), and to sewage disposal systems (4). Given the large geographic area that is covered by the WHPA-E there are several potential significant drinking water threats (156). These threats are attributed to agricultural activities and waste disposal. It is likely that this number will decrease following public consultation as the specific activities occurring on the landscape, if any, are verified.
- **Caledon Village**—A total of two significant threats have been identified, which are linked to the handling and storage of DNAPLs (1), and the handling and storage of fuel (1).
- **Inglewood**—A total of 54 significant threats have been identified, and are linked to sewage (7), waste disposal (20), agricultural activities (10), DNAPLs (9), organic solvents (3), and the handling and storage of fuel (5).
- **Cheltenham**—A total of 16 significant threats have been identified, and are linked to agricultural activities (10), waste disposal (2), and the handling and storage of fuel (4).

Septic systems are assumed to be used at all rural homes and buildings outside of the serviced areas of Inglewood. Septic systems that are not properly maintained can contribute to pathogen and chemical contamination in surface and groundwater. MPAC data were used to identify properties that had a building and were not municipally serviced. These parcels were assumed to have a septic system.

Septic effluent disposal systems may contribute nitrate to the groundwater. Many houses in the area may have water softeners due to the hardness of the groundwater. Backwashing softeners during maintenance can introduce high amounts of sodium chloride into septic systems that can also potentially contaminate the groundwater.

No record of status or inspections information for septic systems is available from the municipal records. It is known that septic systems are more likely to deteriorate in performance with age. In the absence of information on the status of these systems, it is assumed that water quality data from the area is indicative of the impact of these sources on the water supply.

The available water quality data (from 1982) were reviewed to assess whether contaminants are impacting or have the potential to impact the quality of water used as the source of the Region's municipal supply. A review of water quality data and information at Peel's wellheads has been presented in **Chapter 2.4**. Based on this review, only one issue was identified at the Region's drinking water systems. A pathogen issue was assigned to Inglewood Well 2.

Although not identified as an issue under the *Clean Water Act, 2006,* a review of water quality data at the Alton Wells 3 and 4 (decommissioned in 2019) show that sodium (Na) and chloride (Cl) concentrations are generally elevated with respect to the ODWS, suggesting impacts from road salt in the aquifer (**Figure 2.31** and **Figure 2.32**). There is, however, no identifiable increasing trend that would suggest that the concentrations may threaten the use of the wells for water supply in the future. The trends are thought to be reflective of seasonal variations in concentrations.

Table 5.24: Town of Caledon (Alton) — Enumerated Drinking Water Threats

Activity (or Threat Type)	Threats			
	Significant	Moderate	Low	Total
1) The establishment, operation, or maintenance of a waste disposal site within the meaning of Part V of the *Environmental Protection Act*	39	n/a	n/a	n/a
2) The establishment, operation, or maintenance of a system that collects, stores, transmits, treats or disposes of sewage	4	n/a	n/a	n/a
3) The application of agricultural source material to land	39	n/a	n/a	n/a
4) The storage of agricultural source material	0	n/a	n/a	n/a
5) The management of agricultural source material to land	0	n/a	n/a	n/a
6) The application of non-agricultural source material (NASM) to land	39	n/a	n/a	n/a
7) The handling and storage of non-agricultural source material NASM	0	n/a	n/a	n/a
8) The application of commercial fertilizer	0	n/a	n/a	n/a
9) The handling and storage of commercial fertilizer	0	n/a	n/a	n/a
10) The application of pesticide to land	0	n/a	n/a	n/a
11) The handling and storage of pesticide	0	n/a	n/a	n/a
12) The application of road salt	0	n/a	n/a	n/a
13) The handling and storage of road salt	0	n/a	n/a	n/a
14) The storage of snow	0	n/a	n/a	n/a
15) The handling and storage of fuel	1	n/a	n/a	n/a
16) The handling and storage of a dense non-aqueous phase liquid	9	n/a	n/a	n/a
17) The handling and storage of an organic solvent	0	n/a	n/a	n/a
18) The management of runoff that contains chemicals used in the de-icing of aircraft	0	n/a	n/a	n/a
19) An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body	n/a	n/a	n/a	n/a
20) An activity that reduces the recharge of an aquifer	n/a	n/a	n/a	n/a
21) The use of land as livestock grazing or pasturing land, an outdoor confinement area, or a farm-animal yard.	39	n/a	n/a	n/a
Total Threats	**170**	**n/a**	**n/a**	**n/a**
Total Parcels	**51**	**n/a**	**n/a**	**n/a**

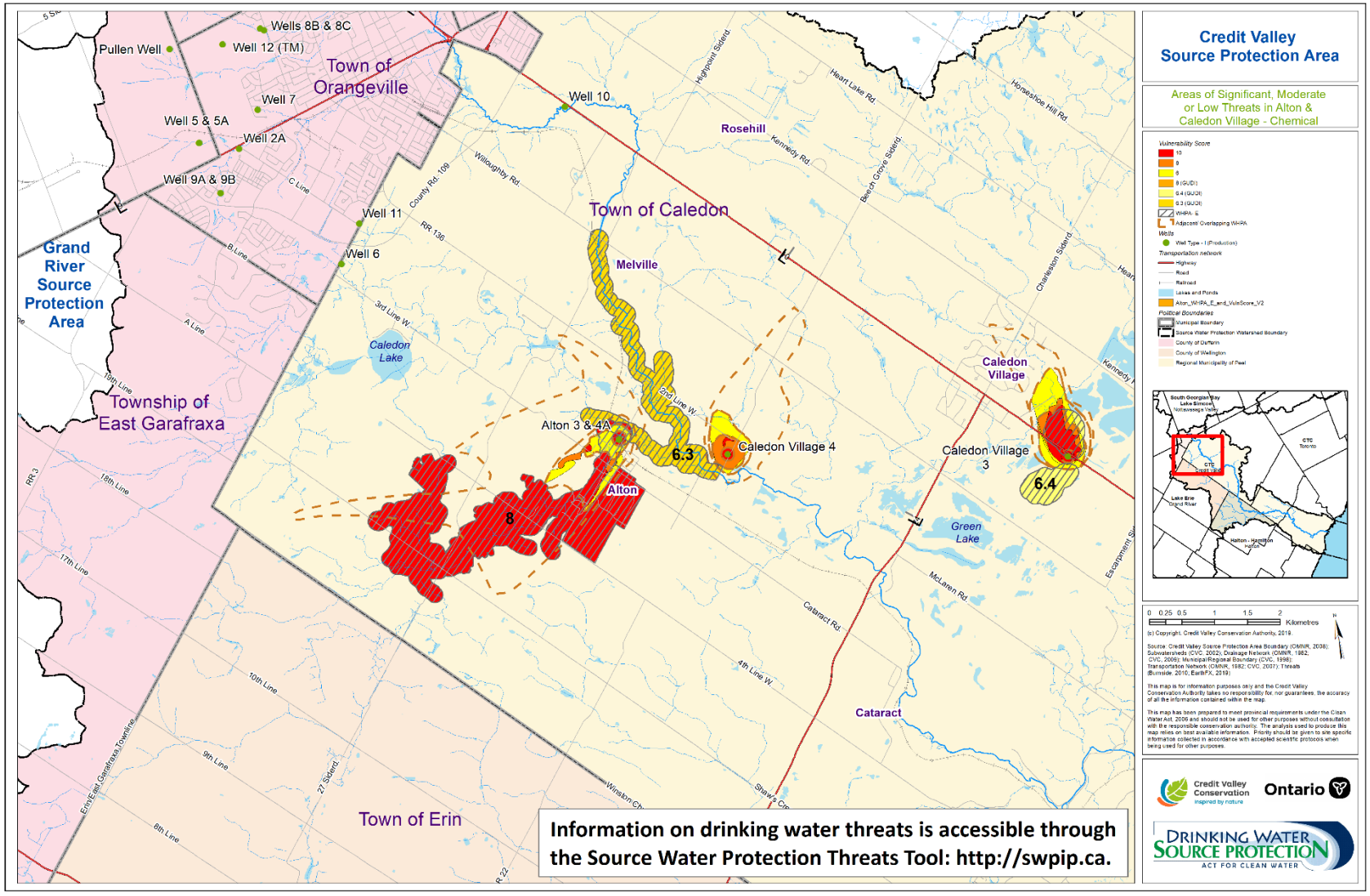


Figure 5.40: Areas of Significant, Moderate or Low Threats - Caledon Village - Alton – Chemicals

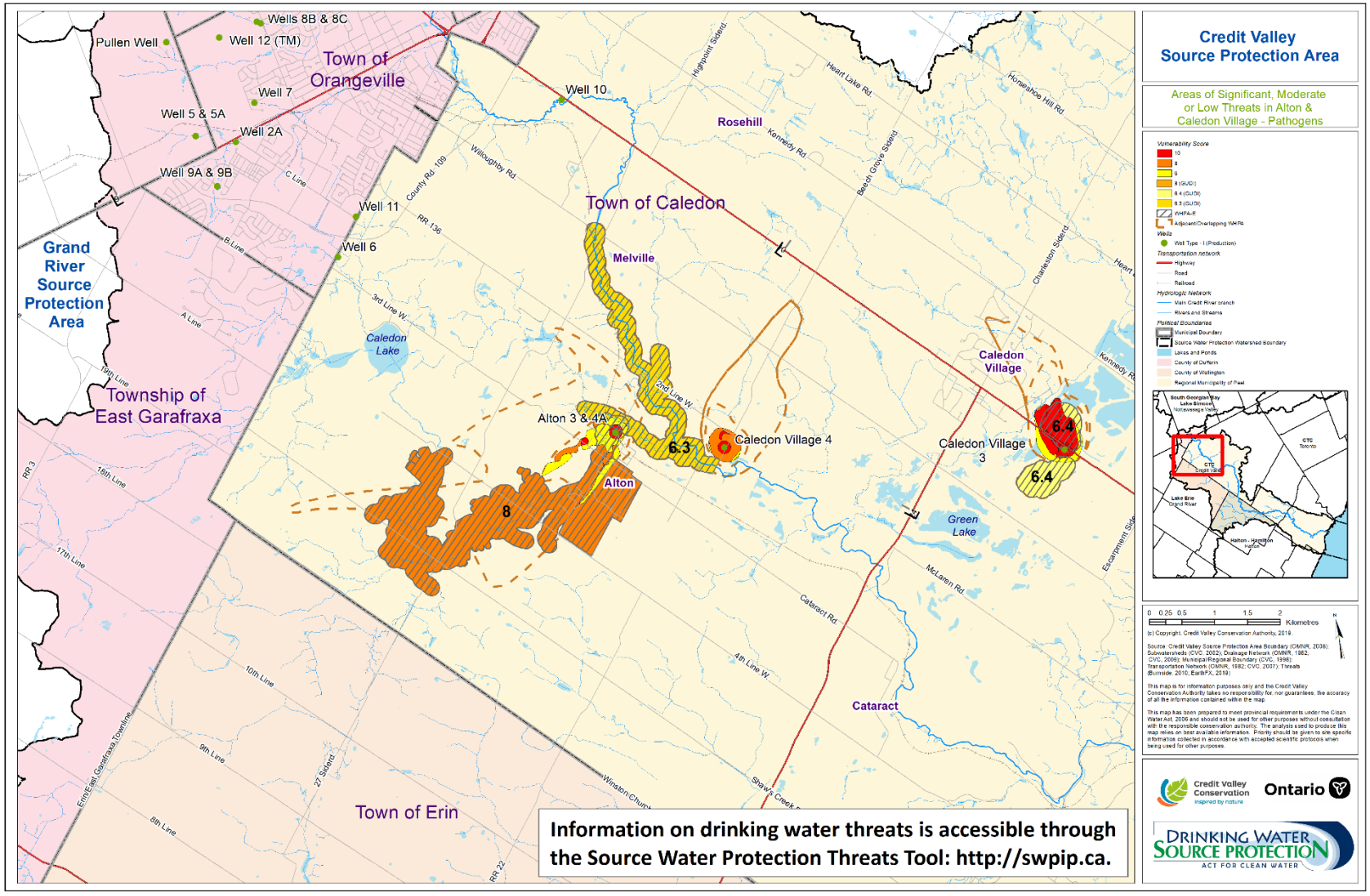


Figure 5.41: Areas of Significant, Moderate or Low Threats - Caledon Village - Alton – Pathogens

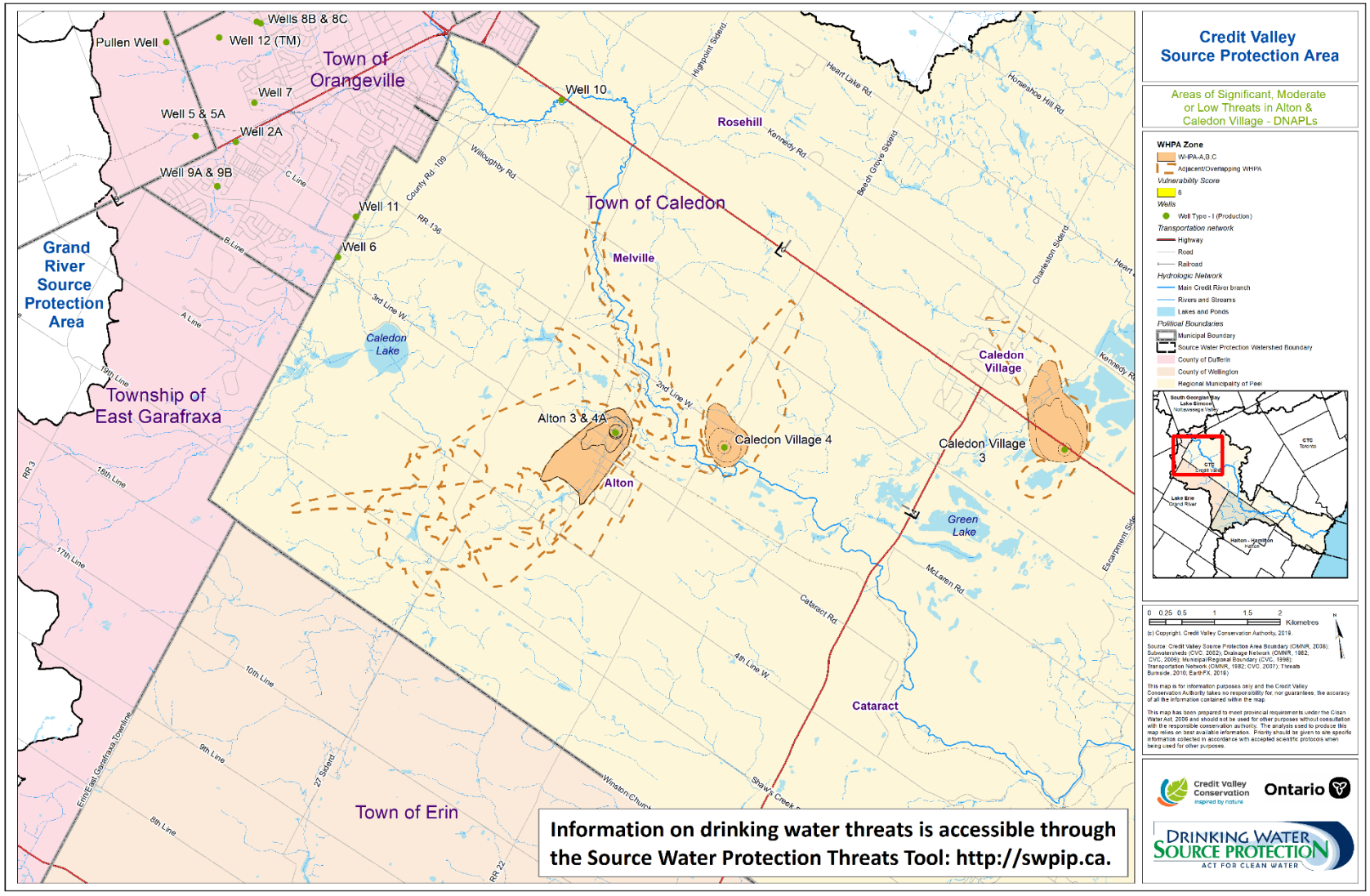


Figure 5.42: Areas of Significant, Moderate or Low Threats - Caledon Village – Alton – DNAPLs

SUMMARY

Threats to Water Quality – Groundwater

With respect to the groundwater, water quality issues relating to sodium (Na) and chloride (Cl) were identified in WHPAs of several municipal wells servicing the Town of Orangeville; issues relating to chloride (Cl) were identified for municipal wells servicing Georgetown; and issues relating to Nitrates ($N0_3$) were identified in one municipal well servicing Acton. In addition, a water quality issue related to pathogens was identified for the community of Inglewood. No conditions were identified in any of the WHPAs of municipal wells within the CVSPA. A total of 10,153 significant threats related to water quality have been identified in WHPAs in the CVSPA. They were located on 7,183 parcels of land as shown in **Table 5.44**.

Most of the significant threats in the CVSPA are related to issues identified in municipal wells serving the most populated urban centres: Acton, Georgetown, and Orangeville. These are areas in the middle and upper zones of the Credit River watershed where sizeable populations receive municipal water supplies sourced solely from groundwater.

Table 5.44: Significant Water Quality Threats Count in the CVSPA

Municipality	Wells	Significant Drinking Water Threats	Total # of Parcels with Significant Drinking Water Threats
Town of Orangeville	Wells 2A, 5, 5A, 6, 7, 8B, 8C, 9A, 9B, 10, 11 and 12	2,728	2,495
Town of Mono	Cardinal Woods Wells 1, 3 and 4, Island Lake Wells TW1 and PW1, and Coles Wells 1 and 2	66	40
Township of Amaranth	Pullen Well	41	30
Town of Erin	Erin Wells 7 and 8	28	10
	Hillsburgh Wells H2 and H3	39	19
	Bel Erin Wells 1 and 2	223	104
Region of Halton	Acton 4th Line Well, Davidson Wells 1 and 2, and Prospect Park Wells 1 and 2	651	346
	Georgetown Lindsay Court Well 9, Princess Anne Wells 5 and 6, and Cedarvale Wells 1a, 3a, 4 and 4a	6,135	4,046
Region of Peel	Alton Wells 3 and 4A	170	51
	Caledon Village Wells 3 and 4	2	1
	Inglewood Wells 2, 3 and 4	54	35
	Cheltenham Wells 1 and 2	16	6
Total		**10,153**	**7,183**

Note: Since the Pullen Well (Amaranth) and its WHPAs lie within the WHPAs for Orangeville Wells 8B, 8C and Well 12, a number of the threats and affected properties enumerated around the Pullen Well are also included in the threats count for Orangeville. Similar overlap occurs within Orangeville (WHPA & ICA), and between Mono's Coles wells and Orangeville Well 10 WHPAs. Given this, the total threat and parcel counts do not represent direct summations of the data shown for the individual municipalities.

CHAPTER 6 – SUMMARY, CONCLUSIONS, AND NEXT STEPS

6.1 SUMMARY AND CONCLUSIONS

The *Clean Water Act, 2006 (CWA)* and regulations aim to protect drinking water supplies in Ontario. The Act requires that we assess risks to all drinking water sources by completing an assessment report. This Assessment Report describes the physical features and water resources within the CVSPA jurisdiction. Using approved provincial methodologies, it delineates vulnerable areas and assesses specific activities on the landscape within these vulnerable areas as potential drinking water threats. The analysis follows the *Director's Technical Rules (*November 2009) prescribed by the Province. The various chapters in this Assessment Report have been completed to meet provincial requirements in the determination of any potential risk to drinking water supplies. Based on these discussions, the status and sustainability of drinking water can be determined, as required under the *CWA, 2006*. The vulnerable areas and threats identified in this Assessment Report are the focus of the source protection plan policies.

Municipal drinking water supplies in the CVSPA originate from both Lake Ontario and groundwater aquifers. The *Lake Ontario Collaborative Intakes Protection Zone Studies* (2009), assessed raw water quality data for the two municipal intakes in Lake Ontario that serve as drinking water sources for the lower zone of the CVSPA. Municipal driven wellhead protection area studies (2010), assessed raw water quality data for the municipal wells that serve as drinking water sources for the middle and upper zones of the CVSPA. In general, both the Lake Ontario and groundwater sourced water for the CVSPA were assessed as being of high quality and suitable for use as sources of municipal supplies.

The analyses of the Watershed Characterization component of the Assessment Report revealed some interesting trends in the quality of water used as a source for municipal supplies. In general, parameter concentrations remain comfortably below the Ontario Drinking Water Standards, indicating that both surface water and groundwater used as municipal drinking water sources tend to be of high quality. Several supply wells, however, have shown increases in sodium and chloride over time, which are thought to be associated with the application of road salt. Increasing nitrate levels were also observed in several wells, and thought to be linked to septic systems, pesticide and fertilizer application.

Surface water quality in the streams discharging into Lake Ontario show some elevated levels of chlorides, phosphorus, copper and nitrates as compared against ecosystem and aquatic life standards (*Canadian Water Quality Guidelines*). These contaminants are thought to be associated with the impact of urbanization and agricultural activities. With the exception of chlorides which are still below the provincial standards, the other parameters showed decreasing or no trend. The surface water in these streams is not used as a drinking water supply.

The Water Budget analysis in this Assessment Report assessed potential water quantity stress in both surface water (not including Lake Ontario) and groundwater. Tier 2 Water Budget analyses were undertaken for both surface water and groundwater resources. Groundwater sources provide approximately 11% of CVSPA's drinking water and supports vital ecosystem functions. The surface water in streams is important for supporting the ecosystem and is also used for irrigation and other non-drinking water purposes.

With respect to surface water, the vast majority of subwatersheds were found to be experiencing low stresses, with Fletcher's Creek (Subwatershed 15) being the only exception and identified as having a

moderate surface water stress level. Given that the stress does not impact municipal drinking water supplies - the focus of the *CWA* additional investigation and management will take place under the conservation authority's watershed protection programs.

With respect to groundwater, the majority of sub-watersheds were also found to be experiencing low stresses, with the exception of Black Creek (subwatershed 10), Silver Creek (subwatershed 11), and Orangeville (subwatershed 19) subwatersheds, which were each identified as having moderate groundwater stress level. Since these subwatersheds support municipal groundwater supplies, they each were required to undergo additional study at the Tier 3 level, per the provisions of the *CWA.* This work was completed, and the findings incorporated in **Chapter 3** of this Assessment Report.

Vulnerability was assessed and scored in the following vulnerable areas in CVSPA – Highly Vulnerable Aquifers (HVAs), Significant Groundwater Recharge Areas (SGRAs), Wellhead Protection Areas (WHPAs) and Intake Protection Zones (IPZs) following the *Director's Technical Rules* (November 2009). The Intake Protection Zones (IPZ-1s and IPZ-2s) were all ranked as having low vulnerability. The resulting HVA and SGRA analyses reflect the presence of many shallow aquifers that are naturally vulnerable. The vulnerability in the WHPAs was found to be highest in close proximity to municipal wellheads, decreasing with distance from the wellheads.

Transport pathway analyses were undertaken within the WHPAs only, and were premised on the occurrence of subsurface utilities, and of quarries and pits that extend below the water table.

Vulnerability is considered together with provincial hazard scores outlined in the Provincial Tables of Circumstances (November 2009) for the various activities and their associated chemicals and pathogens to determine a risk score. Using both the natural vulnerability and hazard scores, potential drinking water threats are ranked as significant, moderate, or low in each one of the vulnerable areas (HVAs, SGRAs, WHPAs, and IPZs). Significant threats must be addressed in the source protection plan and moderate and low threats may be addressed.

A threat is defined as an activity or condition that adversely affects or has the potential to adversely affect the quality or quantity of any water that is or may be used as a source of drinking water and includes an activity or condition that is prescribed by the Province through the *Technical Rules.* The methodology outlined in the *Technical Rules* directs what types of activities can be considered potential threats. The Provincial Tables of Circumstances (November 2009) assigns the level of drinking water threat to a specific circumstance. The circumstance includes the specific characteristic of the prescribed drinking water threat activity, the type of vulnerable area, and its vulnerability score. There was limited field verification of potential threat activities during the initial threats assessment. It is expected that this verification will take place during the development and implementation of the source protection plan.

In addition to identifying potential drinking water threat activities, existing water quality problems or increasing trends that suggest a future water quality problem must be evaluated – and may be labeled as "issues". The requirements to identify an issue are set out in *Technical Rules 114 - 117*. According to *Technical Rule 114.1* (a & b), issues may exist only in vulnerable areas associated with a municipal drinking water system.

The analyses identified no significant drinking water conditions, issues or threats related to quality of water in the HVAs or SGRAs.

With respect to the WHPAs, water quality issues relating to sodium (Na) were identified in WHPAs of municipal wells servicing the Town of Orangeville; issues relating to chloride (Cl) were identified in WHPAs of municipal wells servicing the Towns of Orangeville and Georgetown; and issues relating to pathogens were identified in municipal wells servicing the community of Inglewood. A water quality issue related to nitrate (NO^3) was identified in WHPAs of the Davidson wellfield of Acton. All threats related to issues were elevated to significant threats in the Issue Contributing Areas with the exception of septic systems governed under the *Building Code Act* only in Issue Contributing Areas for sodium or chloride.

With respect to drinking water supplies sourced from Lake Ontario**,** event-based modelling studies undertaken in the vulnerable area surrounding Lake Ontario intakes, resulted in the identification of three unique significant drinking water quality threats to the two intakes located in the CVSPA.

Under the *Director's Technical Rules*, water quantity threats must be assessed through the water budget process. The Great Lakes are exempt and there are no surface water intakes on the Credit River.

For municipal groundwater-based systems, the Tier 3 Water Budget completed for the municipalities of Orangeville, Mono and Amaranth identified 305 significant water quantity threats related to consumptive usage and to recharge reduction. A Tier 3 Water Budget completed for the municipalities of Acton and Georgetown has similarly identified 87 significant water quantity threats related to consumptive usage.

A total of 10,153 significant groundwater quality and quantity threats have been identified around municipal wellheads in the CVSPA. They were located on 7,183 parcels of land as shown in **Table 6.1** below.

Table 6.1: Significant Groundwater Threat (Quality and Quantity) Count in the CVSPA

Municipality	Wells	Significant Drinking Water Threats	Total # of Parcels with Significant Drinking Water Threats
Town of Orangeville	Wells 2A, 5, 5A, 6, 7, 8B, 8C, 9A, 9B, 10, 11 and 12	2,728	2,495
Town of Mono	Cardinal Woods Wells 1, 3 and 4, Island Lake Wells TW1 and PW1, and Coles Wells 1 and 2	66	40
Township of Amaranth	Pullen Well	41	30
Town of Erin	Erin Wells 7 and 8	28	10
	Hillsburgh Wells H2 and H3	39	19
	Bel Erin Wells 1 and 2	223	104
Region of Halton	Acton 4th Line Well, Davidson Wells 1 and 2, and Prospect Park Wells 1 and 2	651	346
	Georgetown Lindsay Court Well 9, Princess Anne Wells 5 and 6, and Cedarvale Wells 1a, 3a, 4 and 4a	6,135	4,046
Region of Peel	Alton Wells 3 and 4A	170	51
	Caledon Village Wells 3 and 4	2	1
	Inglewood Wells 2, 3 and 4	54	35
	Cheltenham Wells 1 and 2	16	6
	Total	**10,153**	**7,183**

APPENDIX D – ASSESSING VULNERABILITY OF DRINKING WATER SOURCES

D2.3 Municipal Water Quality - Wellhead Protection Areas (WHPAs)

D.2.3.5 Region of Peel – Town of Caledon

Table D2-28: Region of Peel Municipal Wells – Depths, Aquifer Setting

Well Field	Well ID	Depth (m)	Screen Interval (m below ground)	Formation Screened
Cheltenham	CHEL1	51.6	44.8 – 51.0	sand, gravel (confined)
	CHEL2	51.8	45.0 – 51.3	sand, gravel (confined)
Inglewood	ING2	9.4	6.0 – 7.9	sand (confined)
	ING3	54.7	48.9 – 54.7	sand, gravel (confined)
	ING4	60.0	53.5 – 58.5	sand, gravel (confined)
Caledon Village	CV3	36.1	29.0 – 35.1	sand, gravel (confined)
	CV4	75.9	61.3 – 75.9	sand (confined)
	AL3	22.2	15.3 – 20.8	sand, gravel (unconfined)
	AL4A	17.6	12.7 – 14.7	sand, gravel (unconfined)

Table D2-30: Municipal Pump Rates – Region of Peel, Town of Caledon

Well	Town of Caledon Pumping Rate (m^3/day); PTTW maximum unless otherwise noted
Alton Wells 3 & 4A	1047[1]
Inglewood Well 2	1296
Inglewood Well 3	1296[2]
Inglewood Well 4	1296[2]
Caledon Village Well 3	1964
Caledon Village Well 4	3273
Cheltenham Wells 1 & 2	1468

[1] Based on PTTW Daily Maximum water taking, Alton 3 and 4A can pump alternately to a maximum of 1047 m^3/day.
[2] ING3 and ING4 are not permitted to pump simultaneously.

Table D2-31: GUDI Status – Town of Caledon Municipal Wells

Well Fields	Well	Status
Cheltenham	1	Groundwater *
	2	Groundwater*
Inglewood	2	No study, assumed GUDI
	3	Groundwater **
	4	Groundwater ***
Caledon Village	3	GUDI with adequate in situ filtration**
	4	GUDI with adequate in situ filtration**
Alton	3	GUDI with adequate in situ filtration
	4A	GUDI with adequate in situ filtration

* R.J. Burnside & Associates, 2002
** Stantec Consulting Inc., 2002 a,b,c
*** Matrix, 2017

Table D2-32: WHPA – E Area Vulnerability Factor (V_a) Derivation – Town of Caledon

Well	Factors		Score	V_a
Alton Wells 3 & 4A	Surficial Geology	Glaciofluvial/alluvial/organics	1	8
	Slope	1%	0	
	Land Use	Residential, agricultural	1	
			2 of 3	
Caledon Village Well 3	Surficial Geology	Glaciofluvial deposits	1	8
	Slope	~0%	0	
	Land Use	Aggregate extraction	1	
			2 of 3	
Caledon Village Well 4	Surficial Geology	Glaciofluvial, organics	1	7
	Slope	~3%	0	
	Land Use	Natural some agricultural	0	
			1 of 3	
Inglewood Well 2	Surficial Geology	Till, alluvial, ice contact stratified drift	0	8
	Slope	~5.2%	1	
	Land Use	Residential, natural	1	
			2 of 3	

Table D2-33: WHPA-E Source Vulnerability Factor (V_s) Derivation – Town of Caledon

Well	Factors		Score	Vs
Alton Wells 3 & 4A	Intake Type	C	1.0	
	Well Depth	22.2 m and 25 m	0	1.0
	Water Body	Creek	1	
			2 of 2	
Caledon Village Well 3	Intake Type	D		
	Well Depth	36.1 m	0	0.8
	Water Body	Gravel pit ponds	0	
			0 of 2	
Caledon Village Well 4	Intake Type	C		
	Well Depth	75.9 m	0	0.9
	Water Body	Credit River	0	
			0 of 2	
Inglewood Well 2	Intake Type	C		
	Well Depth	9.4	1	0.9
	Water Body	Credit River	0	
			1 of 2	

Table D2-34: WHPA–E Vulnerability Scores for Wells in the Town of Caledon

Well	Area Vulnerability Factor	Source Vulnerability Factor	Vulnerability Score
Alton Wells 3 & 4A	8	1.0	8.0
Caledon Village Well 3	8	0.9	6.4
Caledon Village Well 4	7	0.9	6.3
Inglewood Well 2	8	0.9	7.2

D2.5 References

EarthFx Inc. and GeoKamp Ltd. (2019). *Phase 1: Alton Wellhead Protection Area Delineation, Peel Water Resources Management Model, Region of Peel*. June 2019. Toronto, ON: EarthFx.

APPENDIX E – DRINKING WATER THREATS ASSESSMENT

Table E3-4: Managed Lands – Region of Peel WHPAs

Well Field	WHPA	Managed Lands (ha)	% Managed Lands	% Agricultural Managed Lands	% Non - Agricultural Managed Lands
Alton Wells 3 & 4A	WHPA A	3.6	7.2%	0.0%	12.6%
	WHPA B	19.9	12.1%	0.0%	18.3%
	WHPA C	75.6	54.7%	0.9%	14.2%
	WHPA D	N/A	N/A	N/A	N/A
	WHPA E	435.2	33.1%	18.7%	13.3%
Caledon Village Well 3	WHPA A	0.0	0.0%	0.0%	0.0%
	WHPA B	0.0	0.0%	0.0%	0.0%
	WHPA C	0.0	0.0%	0.0%	0.0%
	WHPA D	N/A	N/A	N/A	N/A
	WHPA E	0.0	0.0%	0.0%	0.0%
Caledon Village Well 4	WHPA A	0.0	0.6%	0.0%	0.6%
	WHPA B	0.5	3.1%	0.0%	3.1%
	WHPA C	13.2	56.0%	0.0%	56.0%
	WHPA D	N/A	N/A	N/A	N/A
	WHPA E	36.9	19.7%	18.0%	1.7%
Cheltenham Wells 1 & 2	WHPA A	2.5	79.6%	32.2%	47.5%
	WHPA B	4.8	89.1%	76.1%	12.9%
	WHPA C	14.5	91.2%	91.1%	0.1%
	WHPA D	N/A	N/A	N/A	N/A
Inglewood Well 2	WHPA A	0.0	0.0%	0.0%	0.0%
	WHPA B	1.8	4.8%	0.3%	4.5%
	WHPA C	5.9	20.5%	0.6%	19.9%
	WHPA D	N/A	N/A	N/A	N/A
	WHPA E	282.3	26.6%	25.2%	1.5%
Inglewood Well 3	WHPA A	0.1	7.0%	7.0%	0.0%
	WHPA B	0.6	11.7%	5.4%	6.4%
	WHPA C	5.5	46.2%	41.3%	4.8%
	WHPA D	N/A	N/A	N/A	N/A
Inglewood Well 4	WHPA A	0	0%	0%	0%
	WHPA B	0	0%	0%	0%
	WHPA C	56	4%	4%	0%
	WHPA D	N/A	N/A	N/A	N/A

N/A - denotes area not evaluated since vulnerability score less than 6

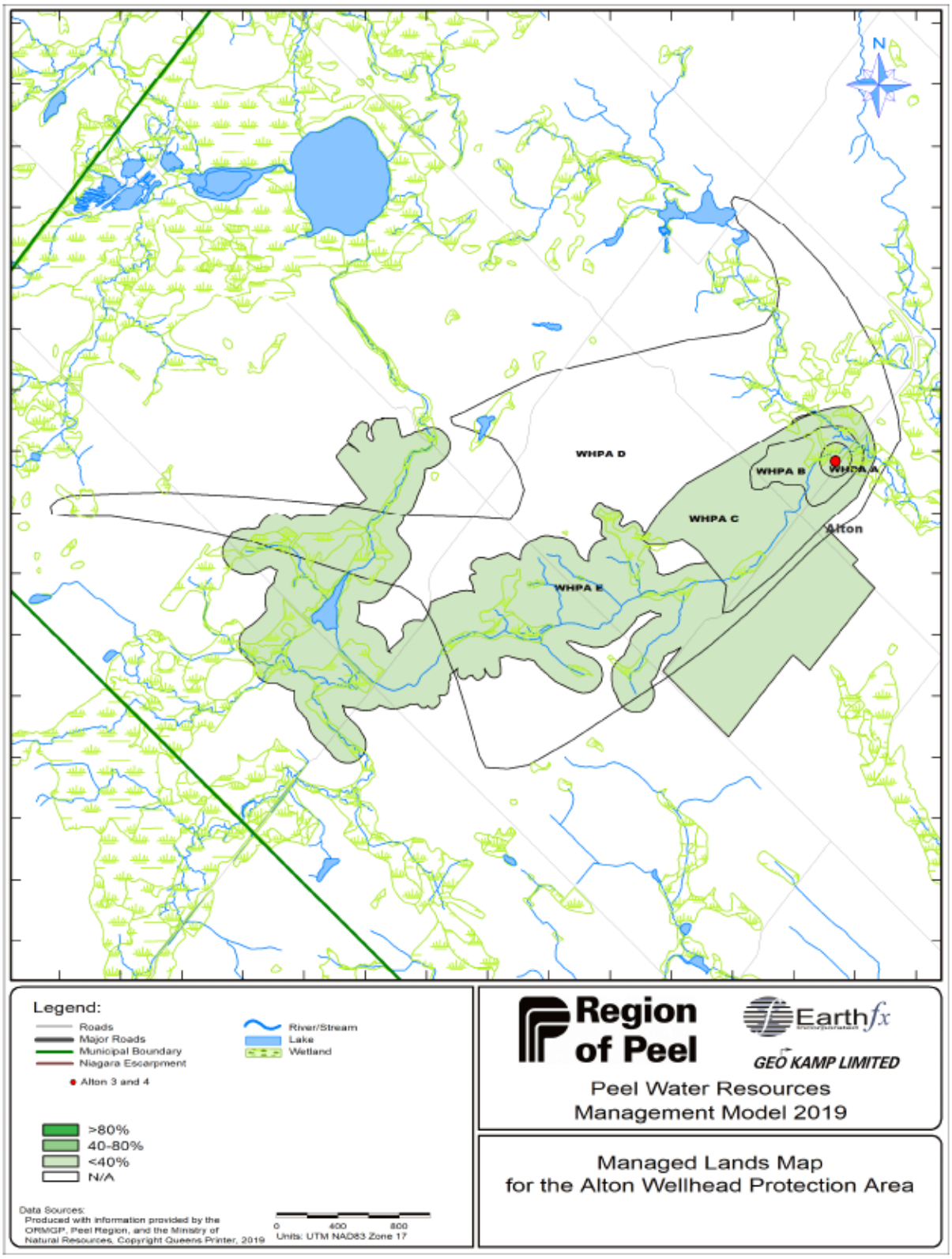


Figure E3-12: Percent Managed Land – Alton (EarthFx Inc. and GeoKamp Ltd. (2019))

Table E3-8: Livestock Density Analysis – Town of Caledon WHPAs

		Livestock Density	
Well Field	**WHPA**	**(NU/acre)**	**(NU/ha)**
Alton Wells 3 & 4A	WHPA A	0.0	0.0
	WHPA B	0.0	0.0
	WHPA C	0.0	0.0
	WHPA D	N/A	N/A
	WHPA E	0.35	0.14
Caledon Village Well 3	WHPA A	0.0	0.0
	WHPA B	0.0	0.0
	WHPA C	0.0	0.0
	WHPA D	N/A	N/A
	WHPA E	0.0	0.0
Caledon Village Well 4	WHPA A	0.0	0.0
	WHPA B	0.0	0.0
	WHPA C	0.0	0.0
	WHPA D	N/A	N/A
	WHPA E	0.1	0.2
Cheltenham Wells 1 & 2	WHPA A	0.6	1.4
	WHPA B	0.6	1.6
	WHPA C	0.5	1.2
	WHPA D	N/A	N/A
Inglewood Well 2	WHPA A	0.0	0.0
	WHPA B	0.0	26.5
	WHPA C	0.0	0.0
	WHPA D	0.3	0.8
	WHPA E	0.1	0.2
Inglewood Wells 3 & 4	WHPA A	0.0	0.0
	WHPA B	0.0	0.0
	WHPA C	0.0	0.0
	WHPA D	N/A	N/A

N/A - denotes area not evaluated since vulnerability score less than 6

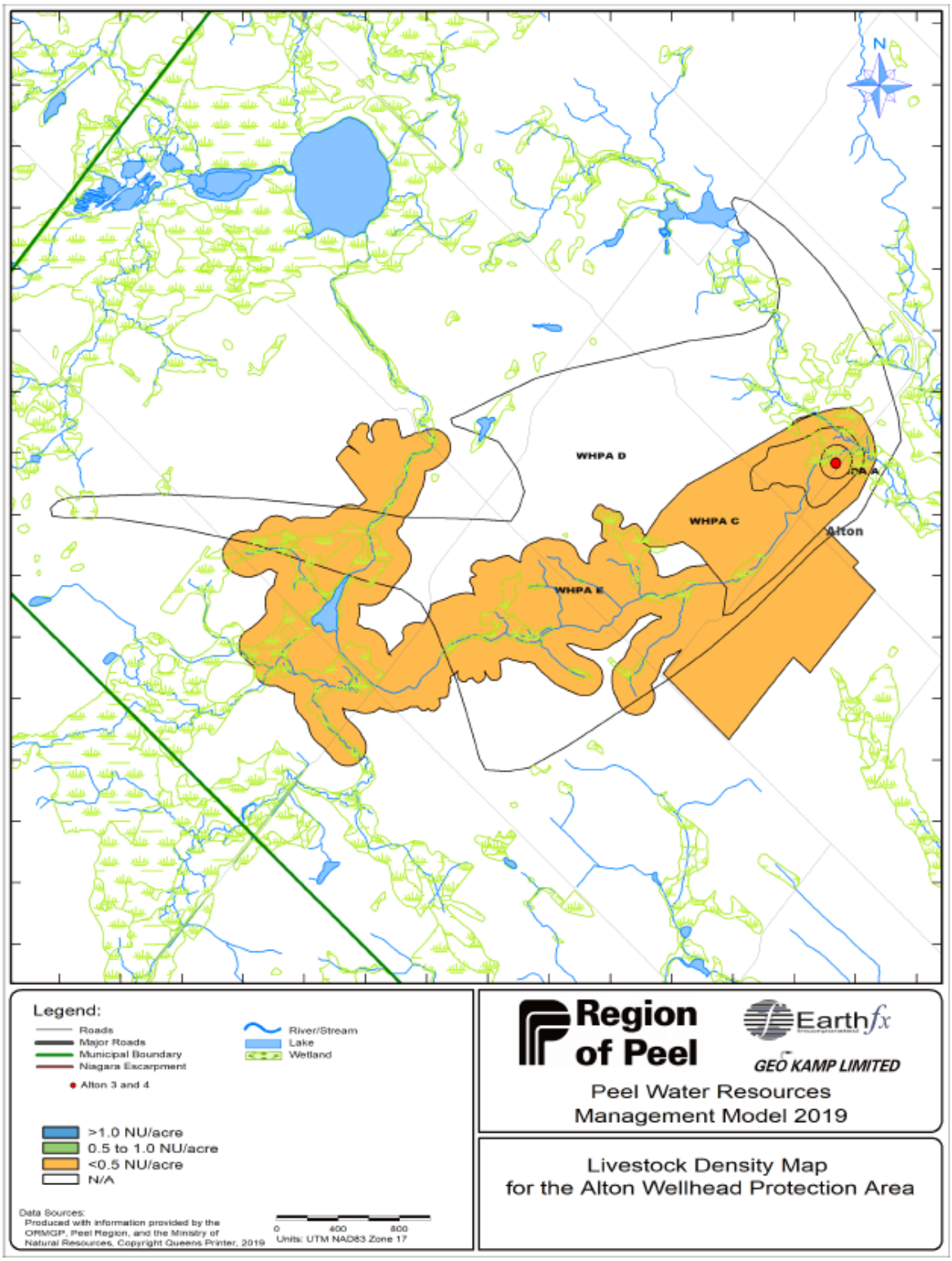


Figure E3-27: Livestock Density – Alton (EarthFx Inc. and GeoKamp Ltd. (2019))

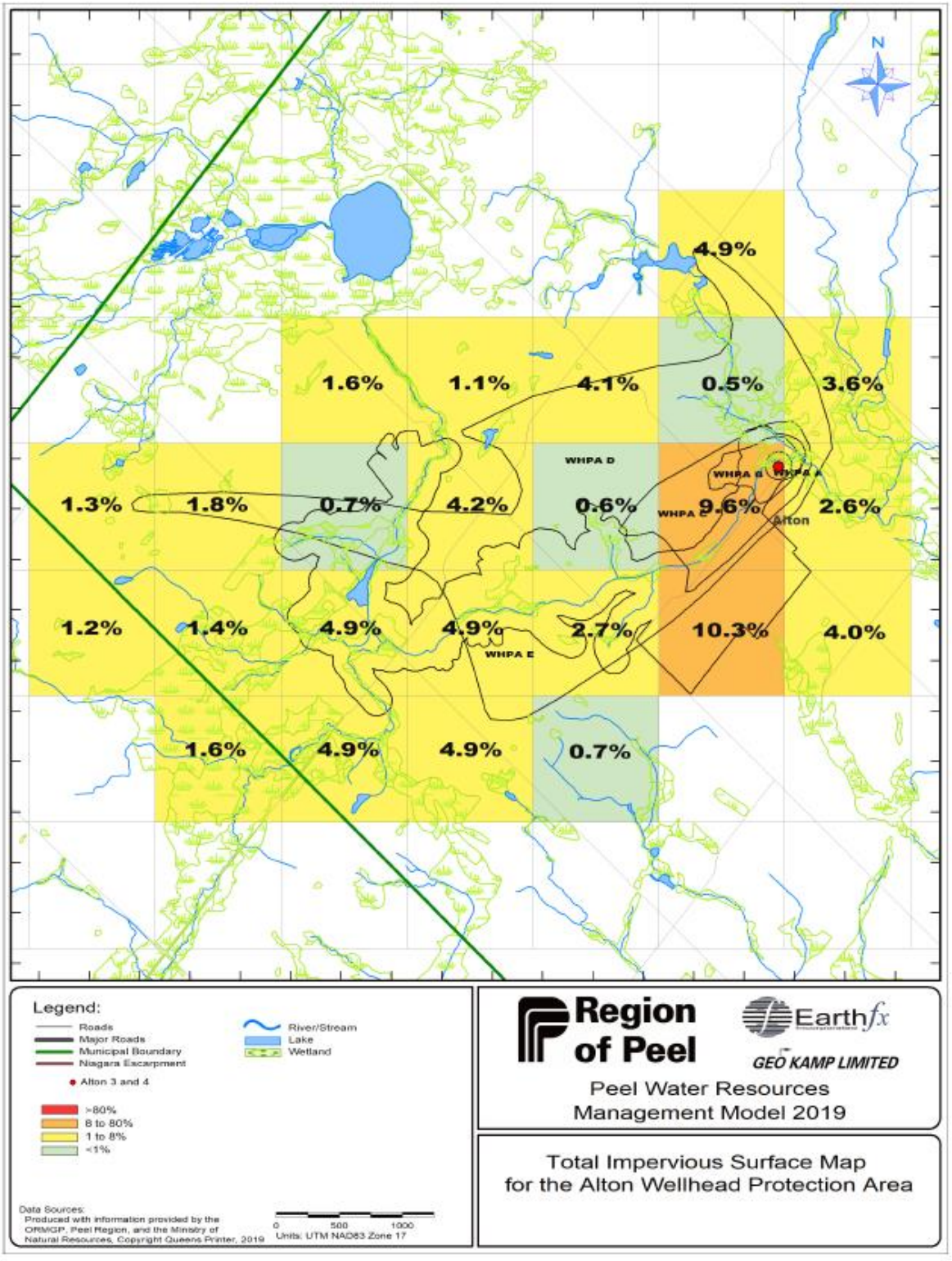
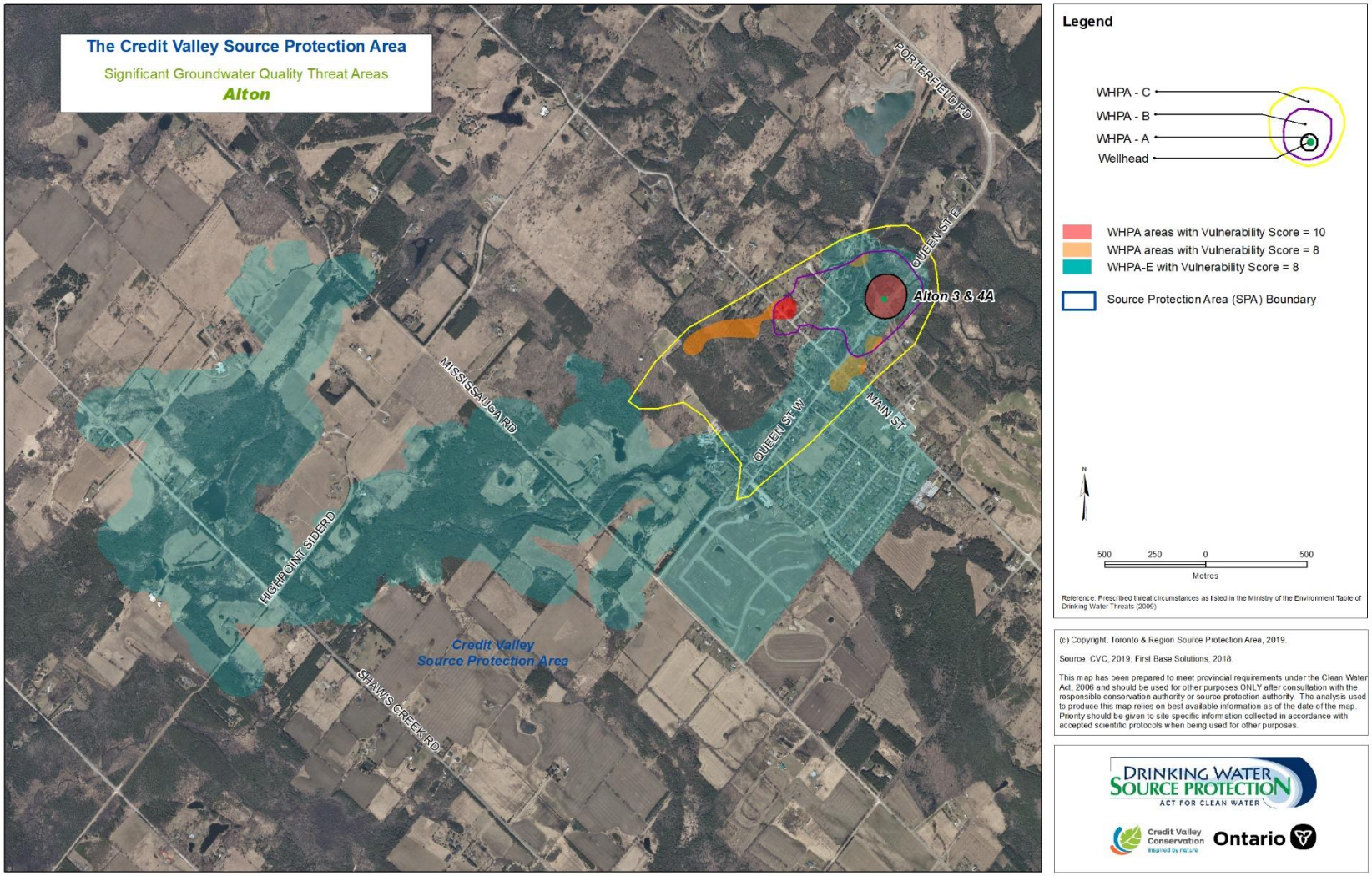
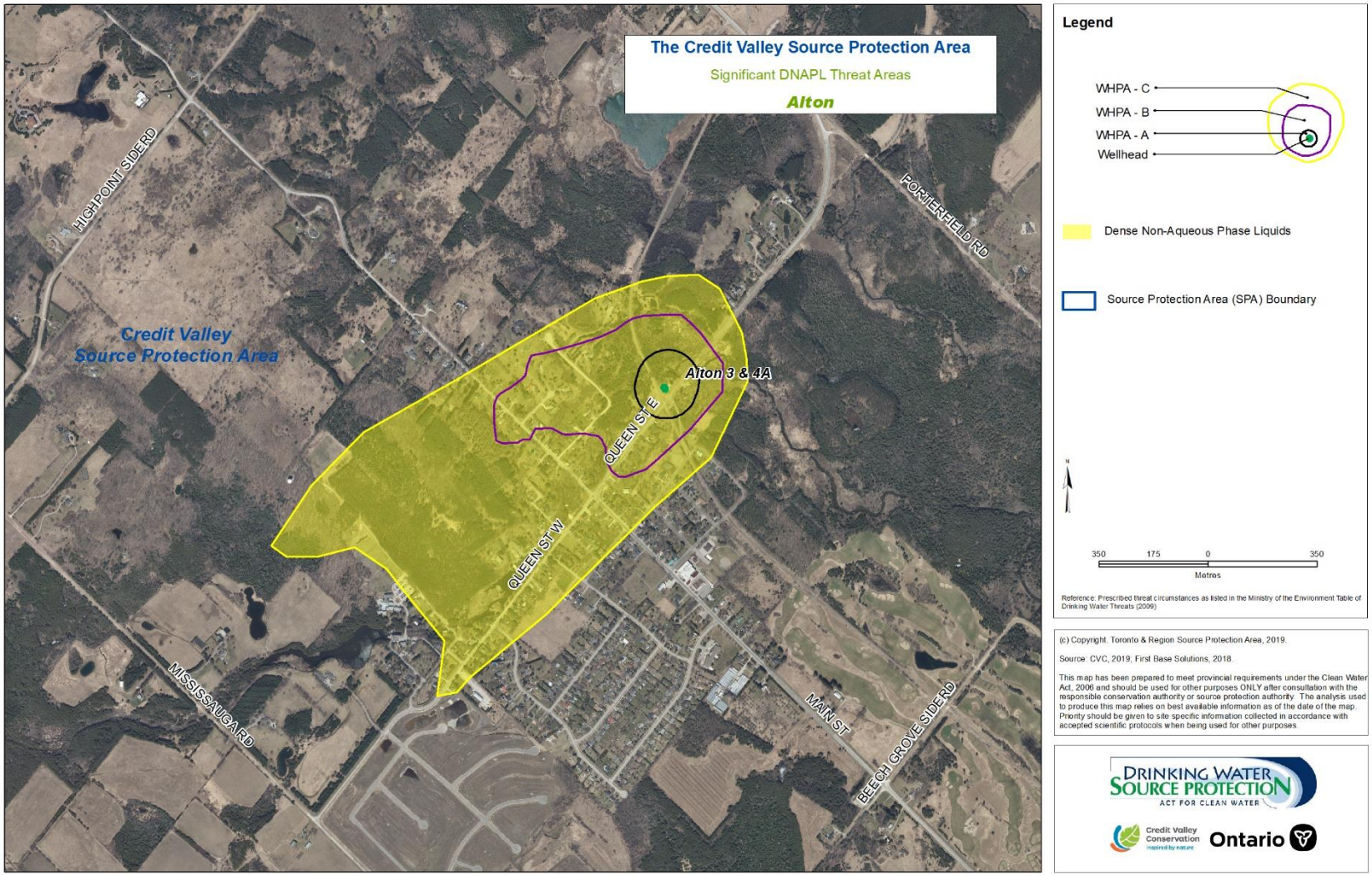


Figure E3-38: Impervious Surfaces – Alton (EarthFx Inc. and GeoKamp Ltd. (2019))



Map 1.7: Alton – Significant Groundwater Quality Threat Areas (CTC Source Protection Plan)



Map 2.7: Alton – Significant DNAPL Threat Areas (CTC Source Protection Plan)