

Chapter 6: City of Kawartha Lakes

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City of Kawartha Lakes

6.1 Introduction

This chapter contains information on the Western Trent Municipal Residential Water Supply that services the Western Trent and Palmina subdivision. The Western Trent Municipal Residential Water Supply is referenced in the Terms of Reference as the Western Trent–Palmina Water Supply. The Western Trent Municipal Residential Water Supply system contains two wells, and is located within the Black-Severn River watershed of the South Georgian Bay-Lake Simcoe Source Protection Region (SGBLS SPR). A small portion of this system’s WHPA extends in the Lake Simcoe watershed of the SGBLS SPR. Genivar consultants have completed the work presented, which has also been reviewed by South Georgian Bay-Lake Simcoe Source Water Protection staff and members of the Technical Work Group or the Source Protection Committee. Genivar consultants have completed the work presented within this chapter, all of which was reviewed by South Georgian Bay-Lake Simcoe Source Protection Region staff, members of the Technical Working Group and the City of Kawartha Lakes staff.

The municipal system section begins with an introduction of the characteristics of the drinking water system. This includes an overview of the location, number of people served, and source of the water supply. The sections following the system introductions are comprised of a Vulnerability Assessment and Issues and Threats evaluation of the system. The Vulnerability Assessment includes the delineation of the Vulnerable Area(s) (Wellhead Protection Area), and the assignment of a Vulnerability Score for the delineated area. An Uncertainty Rating is also provided for the Vulnerable Area delineation and the Vulnerability Assessment as per Technical Rules 13-15 [Part I.4 – Uncertainty Analysis – Water Quality (MOE, 2008a)] to express the level of confidence in the results based on the information that was available for the study.

The Issues evaluation is intended to identify chemical parameters or pathogens in the raw drinking water that will limit the ability of the water to serve as a drinking water source either now, or in the future. Any Issues identified for the systems will be listed in this section, along with a map illustrating the Issues Contributing Area if an Issue is known. The Threats evaluation identifies potential Significant Drinking Water Threats within the delineated Vulnerable Areas. This process includes creating lists for Drinking Water Threats for Activities and Conditions, generating maps showing areas that are or would be Significant, Moderate, or Low Drinking Water Threats, and a final enumeration of Significant Drinking Water Threats.

For more information, readers are encouraged to read Chapter 5: Methods Overview as well as, the responsible consultant reports and memos (found in Appendix MO and K) for a more in depth description of the methods used, as well as the Glossary for any unfamiliar terms.

6.2 Drinking Water Systems-City of Kawartha Lakes

The City of Kawartha Lakes operates groundwater based water supplies in fifteen communities and does not have any surface water intakes within the SGBLS SPR. As shown in Table 6-1 and Figure 6-1, three of the groundwater supplies are within the South Georgian Bay-Lake Simcoe (SGBLS) Source Protection Region (SPR). The Woodville Municipal Residential Water Supply system and one of the wells in the Woods of Manilla Residential Water Supply system are located in the Lake Simcoe watershed (reported in Chapter 7 of Part 1 of this report) and the Western Trent Municipal Residential Water Supply is located in the Black-Severn River watershed of the SGBLS SPR. Table 6-1 also indicates the Source Protection Region and corresponding lead Source Protection Authority (SPA) for the municipal residential water supplies.

Table 0-1: Municipal Groundwater Supplies in the City of Kawartha Lakes

Local Municipality	Community Water Supply	Source Protection Region (SPR) & Source Protection Authority (SPA)	Location where entire Assessment can be obtained
City of Kawartha Lakes	Woodville	SGBLS SPR; Lakes Simcoe and Couchiching / Black River SPA	Lake Simcoe Assessment Report (Chapter 7)
City of Kawartha Lakes	Western Trent	SGBLS SPR; Lakes Simcoe and Couchiching / Black River SPA	This chapter
City of Kawartha Lakes	Victoria Glen	Trent Conservation Coalition (TCC) SPR; Kawartha Region CA	TCC – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Woodfield	TCC SPR; Kawartha Region CA	TCC – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Manorview Estates	TCC SPR; Kawartha Region CA	TCC – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Canadiana Shores	TCC SPR; Kawartha Region CA	TCC – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Janetville	TCC SPR; Kawartha Region CA	TCC – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Pleasant Point	TCC SPR; Kawartha Region CA	TCC – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	King’s Bay	TCC SPR; Kawartha Region CA	TCC – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Mariposa Estates	TCC SPR; Kawartha Region CA	TCC – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Sonya	TCC SPR; Kawartha Region CA	TCC – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Victoria Place	TCC SPR; Kawartha Region CA	TCC – Kawartha-Haliburton Assessment Report
City of Kawartha Lakes	Woods of Manilla	SGBLS SPR; Lake Simcoe and Couchiching-Black River SPA; TCC SPA; Kawartha Region CA	Lake Simcoe Assessment Report (Chapter 7)
City of Kawartha Lakes	Birch Point	TCC SPR; Otonabee Region CA	TCC – Otonabee-Peterborough Assessment Report
City of Kawartha Lakes	Pinewood	TCC SPR; Otonabee Region CA	TCC – Otonabee-Peterborough Assessment Report

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6.3 Western Trent Municipal Residential Water Supply

The Terms of Reference refers to this system as the Western Trent-Palmina Water Supply, however, the City of Kawartha Lakes refers to the system as the Western Trent Municipal Residential Water Supply and this designation is used throughout this report.

The Western Trent Municipal Residential Water Supply is obtained from two wells: Well 1 and Well 2. Well 1 (Palmina) has been in service since 1972. Well 2 (Western Trent) has been in service since 1973.

Well 1 (Palmina) operates under Permit To Take Water #6784-7JDRF5 which expires November 30, 2018. Under this Permit, Well 1 can operate at a maximum rate of 205 L/min (294 m³/day). Well 2 (Western Trent) operates under Permit To Take Water #7211-7JCMRV which expires November 30, 2018. Under this Permit, Well 2 can operate at a maximum rate of 273 L/min (392 m³/day).

In this area, the overburden is thin to non-existent. Overburden can include deep glaciolacustrine silts and clays, shallow glaciolacustrine sands and gravels, and sandy silt to silty sand tills. These wells are both drilled into bedrock and draw water from a permeable zone at the interface between the limestone Paleozoic bedrock and the lower Precambrian basement. This aquifer has been designated as the Western Trent Aquifer.

A granitic inlier of higher elevation is known to exist to the west of Canal Lake in the vicinity of the Western Trent wells. These features are thought to have been islands during the deposition of the older Paleozoic rock sequences. The contact between the Paleozoic rocks and the Precambrian rocks is often weathered and can include a regolith zone. This zone serves as the Western Trent Aquifer. These regolith zones are regionally extensive and often contain high porosity and enhanced fractures in the basement rocks that can conduct significant amounts of water and make this zone a good candidate for a water supply aquifer.

The geology presented in the well logs corresponds with the interpreted hydrostratigraphy, with little to no overburden, thick sequences of limestone, and the wells completed into the Precambrian basement rock.

The Western Trent WHPA delineation, supply Vulnerability and Threats Assessment was completed by GENIVAR, 2010c (hereafter referred to as 2010c) under contract of the City of Kawartha Lakes.

6.3.1 Groundwater Vulnerability Assessment

The Wellhead Protection Area (WHPA) is the primary Vulnerable Area delineated to ensure the protection of the municipal residential water supply wells. The Groundwater Vulnerability has been assessed to provide an indication, within the WHPA, which current (or future) Threats at the surface present the greatest risk to contaminate the water supply. The Vulnerability Analysis considers the WHPA and the Groundwater Vulnerability, as well as the potential for the vulnerability to be increased by man-made (anthropogenic) structures, through Transport Pathways, by developing a "Vulnerability Score" within the WHPA. Conversion of Vulnerability categories (High, Medium and Low) to Vulnerability Scores (10, 8, 6, 4 and 2) results in a new map for each WHPA that expresses the relative degree to which a Threat could affect the drinking water supply. A higher value Vulnerability Score will always be assigned to the immediate vicinity of the well and to any areas that are shown to be vulnerable.

The Groundwater Vulnerability for the Western Trent Municipal Residential Water Supply has been determined following the process outlined in the Technical Rules. The areas that contribute groundwater to the wells, as determined using the numerical groundwater flow model, were delineated as WHPA. The thickness and type of soil materials overlying the water supply aquifer was assessed and rated as either High, Medium, or Low Vulnerability. The potential for man-made structures to increase the Vulnerability were considered by locally increasing the Vulnerability Scores where these features were identified. The WHPA and the increased Vulnerability were then considered together as per the Technical Rules to determine a Vulnerability Score within the delineated WHPA for the Western Trent Municipal Residential Water Supply. The Vulnerability Scores are used in the Threats Assessment to identify areas where land use activities could result in a Significant, Moderate, or Low Threat to drinking water or to identify existing activities that are considered to present a Significant Threat.

Details of the methods for the Vulnerability Analysis are provided in Technical Memorandum B1 – Groundwater Vulnerability Assessment Methods (Appendix MO) and details of the work performed to assess the Groundwater Vulnerability in Western Trent are provided in Technical Memorandum E1 - Groundwater Vulnerability Assessment - Western Trent (Appendix K).

6.3.1.1 Wellhead Protection Area (WHPA) Delineation

The WHPA for the Western Trent Municipal Residential Water Supply wells as delineated in Technical Memorandum D1 (Appendix K) is shown in Figure 6a-1. WHPA-A has been added to include the 100 m radius from each municipal well. The WHPA were delineated using a 3-Dimensional numerical groundwater flow model.

The WHPA for the Western Trent Municipal Residential Water Supply wells represents the composite capture zones from three pumping scenarios. Each well was operated individually at the maximum PTTW rate and in the third scenario the wells were operated together to reflect the system maximum. The use of multiple pumping scenarios and the maximum permitted pumping rates to generate a composite WHPA is considered to reflect a conservative estimate of the maximum capture zones likely to be observed from these wells under planned future operating conditions.

The WHPA presented in Figure 6a-1 are different than those initially prepared by MEL (2004). The capture zones are now directed to primarily capture water flowing along the regional gradients from southeast to northwest. The capture zones also extend hydraulically down gradient to the northeast further than was previously observed. This appears to be related to the thicker layer of overburden materials interpreted between the municipal wells and Canal Lake. These changes in the WHPA are consistent with the use of a more complex model to delineate the WHPA and the use of higher pumping rates. Consideration of relatively thin contributing layers in the aquifer sequence resulted in a substantially larger contributing area for the wells. A water balance between recharge and water taking was obtained for the individual steady-state capture zones.

6.3.1.2 Groundwater Vulnerability

The Groundwater Vulnerability within the WHPA of the two municipal wells in Western Trent is shown in Figure 6a-2. The Groundwater Vulnerability was determined to be High based on the relative thinness of the overburden materials above the fractured rock. Observations from the numerical model outputs also confirmed that there may be potential for groundwater to move down to the well intakes within 25 years within the identified WHPA.

6.3.1.3 Transport Pathway Increase

Technical Memorandum E1 (Appendix K) documents the consideration of Transport Pathways to increase the Vulnerability Rating as per the Technical Rules. The Vulnerability Rating can be increased from Medium to High, Low to Medium, or from Low to High in accordance with the potential for artificial Transport Pathways (such as municipal infrastructure, building foundations, etc.) to increase the observed Vulnerability.

In accordance with the Technical Rules, the Vulnerability Rating of High cannot be increased further to consider Transport Pathways. No Vulnerability increase for Transport Pathways has been considered for the Western Trent Municipal Residential Water Supply. Figure 6a-2 is therefore proposed to be used as the Groundwater Vulnerability Rating for generating the Vulnerability Score for Western Trent.

6.3.1.4 WHPA-E/~~WHPA-F~~

The Western Trent wells are operated based on the assumption that they are GUDI (Groundwater Under the Direct Influence) and therefore a WHPA-E would be required by the Technical Rules. Technical Memorandum E2 (Appendix K) documents work performed to evaluate the requirement for a WHPA-E for these wells. Ultimately, a surface water feature that is capable of short-circuiting the modeled groundwater flow paths in the capture zone was not identified, with no surface water feature within 100m of the wells. Therefore, no WHPA-E has been delineated for the Western Trent Municipal Residential Water Supply.

6.3.1.5 Vulnerability Score

The WHPA zones for the Western Trent Municipal Residential Water Supply, as shown in Figure 6a-1, and the Groundwater Vulnerability, as shown in Figure 6a-2, were used to assign a Vulnerability Score by using the matrix from Table 5.3 (Chapter 5: Methods Overview, Section 5.2.4). Figure 6a-3 illustrates the Vulnerability Scores for the Western Trent Municipal Residential Water Supply. Figure 6a-3 is used to assess Drinking Water Threats in Section 6.3.3.

6.3.1.6 Uncertainty Rating

The Technical Rules require that an Uncertainty Rating of either High or Low be assigned with each Vulnerable Area as outlined in Technical Rules 13-15 (Part I.4 – Uncertainty Analysis – Water Quality (MOE¹, 2008a)). A component of the Uncertainty Rating is to be provided for the WHPA delineation by the technical peer review consultant. A second component of the Uncertainty Rating is to be provided in association with the Vulnerability Assessment.

The Uncertainty Rating associated with the WHPA delineation was assessed using a qualitative process outlined in Technical Memorandum B1 (Appendix MO) and described for the Western Trent Municipal Residential Water Supply in Technical Memorandum E1 (Appendix K). As mentioned above, a technical peer review consultant was also used to assess the uncertainty of the WHPA delineation.

The uncertainty delineation of the Western Trent WHPAs was determined by peer reviewers from Dillon Consulting using a standard scoring matrix (Table 1, Appendix MO). The Uncertainty Rating assigned for the Western Trent WHPAs is High. The full results of the WHPA delineation Peer Review process, for Western Trent is available in Appendix K and discussed in Chapter 5 (Methods Overview).

¹ Now, the Ministry of the Environment, Conservation and Parks (MECP)

The method for assigning the Uncertainty Rating considered the type, quantity, and quality of available data, the methods used to determine the vulnerability assessment components, and the nature of the groundwater flow system.

The Uncertainty Rating assigned for the Western Trent Municipal Residential Water Supply is High. In this case, the uncertainty rating reflects the nature of the fractured bedrock aquifer that is connected to the water supply aquifer and the quantity of data available to describe the water supply aquifer beneath and surrounding the delineated WHPA. The High Uncertainty Rating reflects the possibility that the potential variability in the actual subsurface conditions may result in an underestimate of the contributing areas, the travel time to the wells, or the protection provided by the soil materials overlying the aquifer. The assumptions made in the course of the analysis, including selection of hydraulic conductivity parameters, effective porosities maximum pumping rates, and K-factors for the AVI analysis are intended to be conservative and protective of the water supply. In the case of the Western Trent WHPA, an attempt was made to consider the potential influences of the quarry operations on the capture zones of the wells. Further assessment of the potential interaction between the quarry operations and the municipal residential wells is warranted.

Although a High Uncertainty Rating is recommended for the Vulnerability Assessment of the Western Trent Municipal Residential Water Supply, the work completed herein represents a meaningful increase in confidence relative to the previous WHPA delineation in 2004.

6.3.2 Drinking Water Issues Evaluation

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals or pathogen) in the raw drinking water that will limit the ability of the water to serve as a drinking water source either now, or in the future. To be considered a Drinking Water Issue, a parameter needs to be at a concentration that may result in the deterioration of the quality of the water for use as a source of drinking water or if there is a trend of increasing concentrations of the parameter and a continuation of that trend that would result in the deterioration of the quality of the water as a source of drinking water (Technical Rule 114(1)(a-b)). However, a parameter may not be considered an Issue in cases where it is naturally occurring or effective treatment is in place.

Available data describing measured chemical and pathogen water quality in raw and treated water for the Western Trent Municipal Residential Water Supply wells has been reviewed to identify Drinking Water Issues that are considered likely to result in a deterioration of the quality of water for use as a source of drinking water. Details of the Drinking Water Issues Evaluation for Western Trent are provided in Technical Memorandum E3 – Evaluation of Drinking Water Issues – Western Trent (Appendix K).

No Drinking Water Issues were identified for Well 1 and Well 2 of the Western Trent Municipal Residential Water Supply. The following are observed parameters that were considered but determined not to be Drinking Water Issues:

Nitrate concentrations display a slightly increasing trend but are not expected to exceed the ODWQS value within 50 years.

Coliforms and *E. coli* are typically absent in raw water but have been observed on rare occasions in low numbers that are not indicative of deterioration of the water quality. Treatment, in accordance with the GUDI requirements, is in place and is effective for pathogen parameters. Incidents of turbidity exceeding ODWQS objectives in the treated water are observed on rare occasions and are not persistent.

6.3.3 Drinking Water Threats Evaluation

An assessment of Drinking Water Threats for the Western Trent Municipal Residential Water Supply was completed in accordance with the detailed methodology presented in Technical Memo – B5 (Appendix MO). A Drinking Water Threat is defined as “an Activity, or Condition that adversely affects or has the potential to adversely affect, the quality and quantity of any water that is or may be used as a source of drinking water, and includes any Activity or Condition that is prescribed by the regulations as a drinking water threat.” An Activity is one or a series of related processes, natural or anthropogenic that occurs within a geographical area and may be related to a particular land use, whereas a Condition refers to the presence of a contaminant in the soil, sediment, or groundwater resulting from past activities. Therefore, it is not only presently existing Threats that must be regulated, but future ones as well.

The Drinking Water Threats assessment for the Western Trent Municipal Residential Water Supply builds on the information from the Vulnerability Analysis and Issues Evaluation and includes preparation of:

- A list of Drinking Water Threats for Activities,
- A list of Drinking Water Threats for Conditions,
- Maps showing areas that are or would be Significant, Moderate, or Low Drinking Water Threats for Activities,
- Maps showing areas that are or would be Significant, Moderate, or Low Drinking Water Threats for Conditions, and
- An enumeration of Drinking Water Threats.

6.3.3.1 List of Drinking Water Threats – Activities

The list of Prescribed Drinking Water Threats considered in the assessment for Western Trent Municipal Residential Water Supply is provided in Chapter 5, section 5.5.1.

No additional Drinking Water Threats were identified for consideration. No local circumstances for prescribed Threats were identified.

6.3.3.2 List of Drinking Water Threats – Conditions

The following information sources were consulted to identify existing Conditions that could affect the Western Trent Municipal Residential Water Supply system:

- Files provided by the Ministry of the Environment, [Conservation and Parks](#) local offices pertaining to licenses, and records of spills in the area of the delineated WHPA.
- Records available from the Ministry of the Environment, [Conservation and Parks](#) website containing registry of Brownfield Sites.
- Records from available technical studies and previous contaminant source inventories that identified situations that may qualify as conditions.
- Interviews of City of Kawartha Lakes staff to identify potential conditions within the identified WHPA for the drinking water supply.

No confirmed Conditions have been identified for the Western Trent Municipal Residential Water Supply. No potential Conditions have been identified for consideration at this time.

6.3.3.3 Identifying Areas of Significant/Moderate/Low Threats – Activities

The areas where Activities are or would be Drinking Water Threats are illustrated on a series of maps based on the Vulnerability Scores and Vulnerable Area delineations. [The maps combined with the Technical Rules threat circumstances can be used to correlate activities that are or would be Drinking Water Threats with the Vulnerability Scores. The circumstances can be found at: <https://threats.swpip.ca/>. The maps include references to a series of tables prepared by MOE to correlate activities that are or would be Drinking Water Threats with the Vulnerability Scores. The tables can be found at: <http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php>](#)

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6.3.3.3.1 Pathogen Parameters

[The Key Table on Figure 6a-4 and the Technical Rules](#) can be used in conjunction with the Vulnerability Scores to identify the areas where activities associated with pathogen Threats are or would be Significant or Moderate Drinking Water Threats for the Western Trent Municipal Residential Water Supply. Activities that are or would be Significant Drinking Water Threats for

pathogens can be observed within the areas where the Vulnerability Score is 10. Pathogens can also only be a Significant, Moderate or Low Threat within WHPA-A and WHPA-B.

6.3.3.3.2 Chemical Parameters

~~The Key Table on~~ Figure 6a-5 ~~and the Technical Rules~~ can be used in conjunction with the Vulnerability Scores to identify the areas where activities associated with chemical threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Western Trent Municipal Residential Water Supply. Activities that are or would be Significant Drinking Water Threats for chemicals can be observed within areas where the Vulnerability Score is equal to or greater than 10.

6.3.3.3.3 DNAPL Chemical Parameters

Figure 6a-6 illustrates the area of the 5-year time-of-travel zone (WHPA-C) and areas with a Vulnerability Score of 6, where activities associated with DNAPL parameters are considered to be a Significant Drinking Water Threat for the Western Trent Municipal Residential Water Supply. ~~The Key Table on~~ Figure 6a-6 ~~and the Technical Rules~~ can be used to can be used to identify the circumstances in which these Activities would be Significant or Moderate Drinking Water Threats.

6.3.3.4 Identifying Areas of Significant/Moderate/Low Threats – Conditions

Further to Section 6.3.3.2, no Conditions have been confirmed within the WHPA for the Western Trent Municipal Residential Water Supply.

A Condition or potential Condition that has not been identified would potentially be a Significant, Moderate, or Low Threat to Drinking Water based on the combination of Hazard Rating and Vulnerability Rating as described in Section 5.5.5 (Chapter 5: Methods Overview) and Technical -Memorandum A5 (Appendix MO). The Hazard Rating is dependent on whether there is evidence the Condition is causing off-site contamination, and whether the Condition is located on the same property as the supply well.

A Condition would be a threat to municipal drinking water in the following situations:

- **Significant:** where the Vulnerability Score is ≥ 8 and there is evidence that the Condition is causing off-site contamination, and/or that the Condition is located on the same property as the supply well.
- **Moderate:** (1) where the Vulnerability Score ≥ 6 and < 8 , and there is evidence that the Condition is causing off-site contamination, and/or that the Condition is located on the

same property as the supply well; or (2) Where the Vulnerability Score is 10, and there is no evidence of off-site contamination.

- **Low:** where the Vulnerability Score ≥ 8 and < 10 and there is no evidence of off-site contamination.

Figure 6a-3 illustrates the Vulnerability Score map for the Western Trent Municipal Residential Water Supply that can be used to determine where a Condition is or would be a Significant, Moderate or Low Threat to Drinking Water.

6.3.3.5 Enumerating Drinking Water Threats

6.3.3.5

The number of Significant Drinking Water Threats for the Western Trent Municipal Residential Water Supply has been determined using the methodology outlined in Technical Memorandum B5 (Appendix MO) and refined using the methodology outlined in Chapter 5 (Section 5.5.6.4) of this Assessment Report. There are no Significant Threats associated with Conditions or Drinking Water Issues.

Table 6-2 documents the refined enumeration of existing activities that are considered to be potential Significant Drinking Water Threats within the WHPA for the Western Trent Municipal Residential Water Supply. Significant Drinking Water Threats were only identified within areas where the Vulnerability Score is 10.

Activities that are considered to be potential Significant Drinking Water Threats were identified in association with 172 land parcels in the WHPA for the Western Trent Municipal Residential Water Supply. The identified Significant Threats on 168 parcels (98%) relate to private homes or businesses with private individual sewage disposal systems. One Significant Drinking Water Threat was assigned to the WHPA, where the vulnerability score was 10 for potential residential storage of fuel (home heating oil). This Threat sub-category has been represented as a single threat for the vulnerable area, rather than the individual properties (see SGBLS 2010). Within the vulnerable area there are 167 residential parcels where storage of fuel for home heating purposes may be occurring. The activities on three (3) parcels are associated with agricultural land use and include using land for livestock grazing or pasturing.

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Table 0-2: Number of Significant Drinking Water Threats for the Western Trent Municipal Residential Water Supply.

Threat Number	Threat	Significant threat counts Number of threats
1.	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act.	0
2.	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	168
3.	The application of agricultural source material to land.	0
4.	The storage of agricultural source material to land.	0
5.	The management of agricultural source material.	0
6.	The application of non-agricultural source material to land.	0
7.	The handling and storage of non-agricultural source material.	0
8.	The application of commercial fertilizer to land.	0
9.	The handling and storage of commercial fertilizer to land.	0
10.	The application of pesticide to land.	10
11.	The handling and storage of pesticide.	0
12.	The application of road salt.	0
13.	The handling and storage of road salt.	0
14.	The storage of snow.	0

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Threat Number	Threat	Significant threat counts* Number of threats
15.	The handling and storage of fuel.	1
16.	The handling and storage of dense non-aqueous phase liquid.	0
17.	The handling and storage of an organic solvent.	0
18.	The management of runoff that contains chemicals used in the de-icing of aircraft.	0
19.	An activity that takes water from an aquifer or a surface water body without returning the water taken to the safe aquifer or surface water body.	0
20.	Any activity that reduces the recharge of an aquifer.	0
21.	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard.	3
<u>22.</u>	<u>The establishment and operation of a liquid hydrocarbon pipeline</u>	<u>0</u>
-	Totals:	17 32 * <u>significant threats</u> <u>(on 173 properties)</u>

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*3 verified existing Threats and 169 potential Threats that require further verification (2015)

6.3.3.5.1 Managed Lands

Technical Rule 16(9) ~~(August 2009)~~ requires the Assessment Report to include maps showing the location of Managed Lands and the percentage of Managed Lands within a Vulnerable Area, including WHPA-A, -B, -C, -D, and -E. This mapping is not required where the Vulnerability Scores for the area are less than the Vulnerability Score necessary for the Activity to be considered a Threat in ~~the Technical Rules, the Table of Drinking Water Threats.~~

Managed Lands were identified and the Managed Lands proportions were determined for the Western Trent WHPA as outlined in Technical Memorandum B-5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 6.3.3.5). The Managed Lands are used in the identification of threat activities associated with the application of Agricultural Source Material, Non-Agricultural Source Material and commercial fertilizer.

Figure 6a-7 illustrates the location and proportion of Managed Lands within the delineated WHPA zones for the Western Trent Municipal Residential Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D.

6.3.3.5.2 Livestock Density

Technical Rule 16(10) ~~(August 2009)~~ requires the Assessment Report to include maps showing the livestock density within WHPA-A, -B, -C, -D, and -E. This mapping is not required where the Vulnerability Scores for the area are less than the Vulnerability Score necessary for the Activity to be considered a Threat in ~~the Technical Rules, the Table of Drinking Water Threats.~~

The Livestock Density was determined for the Western Trent WHPA as outlined in Technical Memorandum B5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 6.3.3.5). Nutrient units per farm are used in the identification of Threat activities associated with the storage of Agricultural Source Material, and the grazing and/or confinement of livestock.

Figure 6a-8 illustrates the distribution of Livestock Density within the delineated WHPA zones for the Western Trent Municipal Residential Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D. The Livestock Density figure reflects the distribution of Agricultural Managed Lands as determined in accordance with Technical Memorandum B5 (Appendix MO).

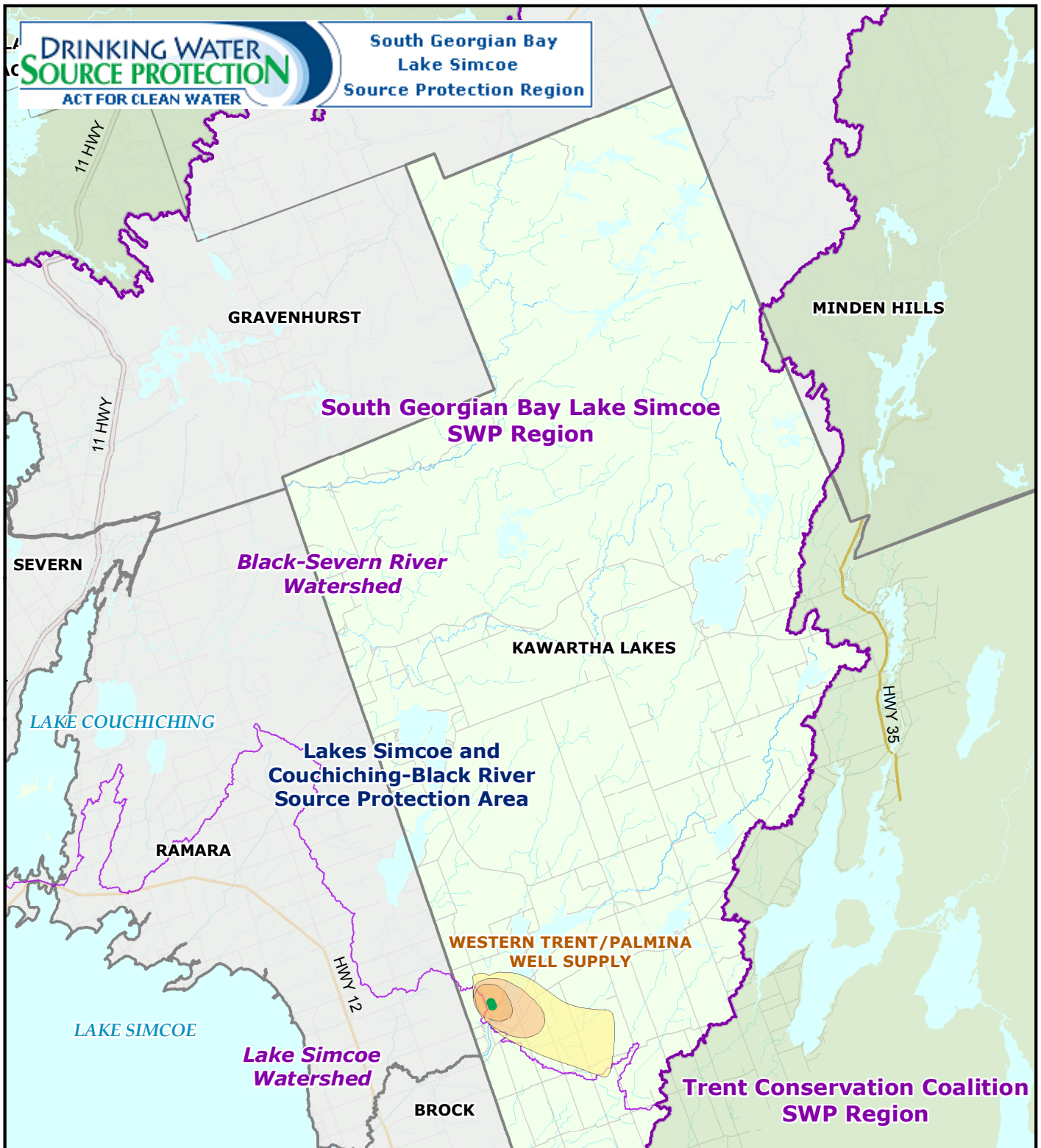
6.3.3.5.3 Impervious Surfaces

Technical Rule 16(11) ~~(August 2009)~~ requires the Assessment Report to include maps showing the percentage of surface area where road salt could be applied to Impervious Surfaces within WHPA-A, -B, -C, -D, and -E. This mapping is not required where the Vulnerability Scores for the

area are less than the Vulnerability Score necessary for the Activity to be considered a Threat in [Technical Rules](#)~~the Table of Drinking Water Threats~~.

The proportion of Impervious Surfaces within the Western Trent WHPA was determined in accordance with the methodology in Technical Memorandum B5 (Appendix MO). [Methodology in Technical Memorandum A5.1 \(Appendix MO\) was used in 2023 to update the proportion of Impervious Surfaces within the delineated WHPA zones using the 2021 Technical Rules](#). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 6.3.3.5). The Impervious Surfaces are used in the identification of threat activities associated with the application of winter de-icing agents (salt).

Figure 6a-9 illustrates the distribution of Impervious Surfaces within the delineated WHPA zones for the Western Trent Municipal Residential Water Supply where vulnerability scores were greater than 6 for WHPA-A to WHPA-D.



- Municipal Supply Well in City of Kawartha Lakes
- WHPA-A (100m)
- WHPA-B (2 years time of travel)
- WHPA-C (5 years time of travel)
- WHPA-D (25 years time of travel)
- SWP Watershed Region
- SWP Watershed Area
- Upper Tier Municipality
- Lower Tier Municipality

**Drinking Water System
Vulnerable Areas in
City of Kawartha Lakes**

Created by: LSRCA
Date: 2010-10-15

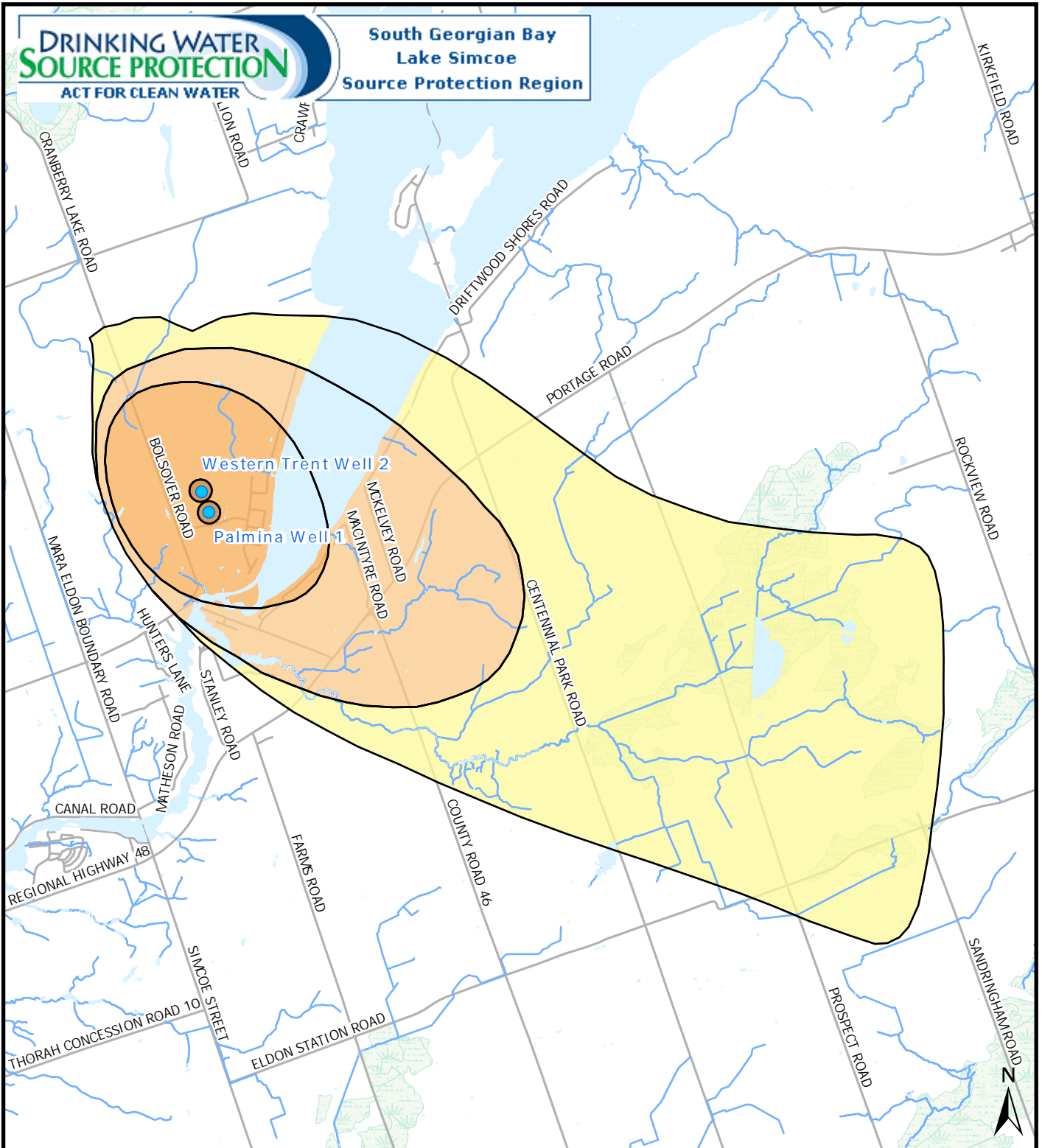







Scale: 1:300,000
0 2 4 6 8km
UTM Zone 17N, NAD83

This map was produced by the Lake Simcoe Region Conservation Authority, lead agency of the South Georgian Bay Lake Simcoe Region Source Protection Region. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.



Figure 6-1

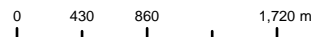


-  MUNICIPAL WELL LOCATION
-  WHPA-A: 100m RADIUS
-  WHPA-B: 2-YEAR TIME-OF-TRAVEL
-  WHPA-C: 5-YEAR TIME-OF-TRAVEL
-  WHPA-D: 25-YEAR TIME-OF-TRAVEL

**WELLHEAD PROTECTION AREAS -
WESTERN TRENT**

Created by: LSRCA, 2025-09-09

Scale 1: 50,000



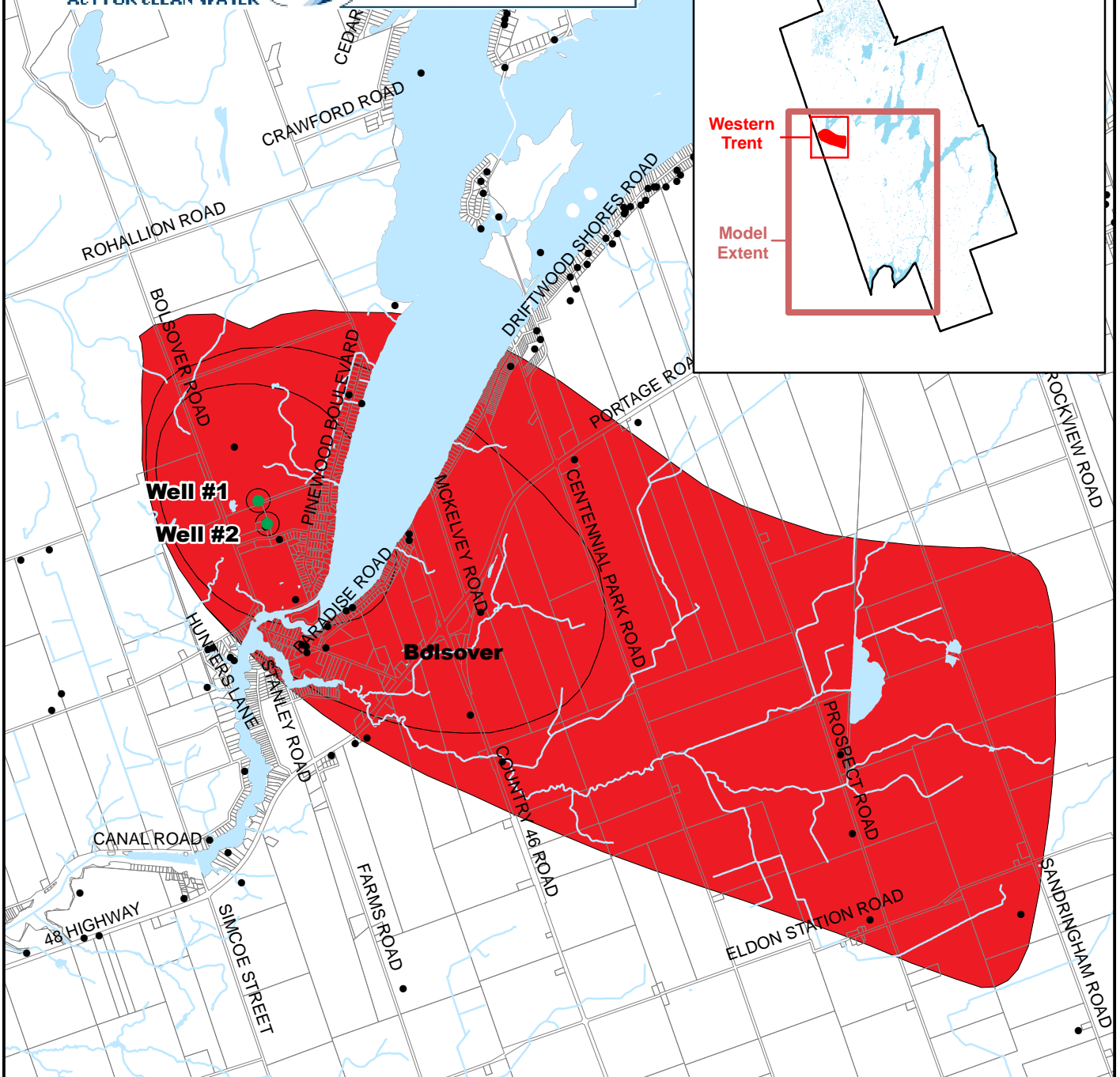
UTM Zone 17N, NAD83



This map was produced by the Lake Simcoe Region Conservation Authority, lead agency of the South Georgian Bay Lake Simcoe Region Source Protection Region. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.



Figure 6a-1



LEGEND

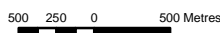
- MUNICIPAL WELL LOCATION
- WELL (MOE WATER WELL RECORD DATABASE)

AQUIFER VULNERABILITY INDEX

- HIGH
- MEDIUM
- LOW



Note: Outlines of WHPA A, B, C, and D shown for reference.



GROUNDWATER VULNERABILITY - WESTERN TRENT

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: JUNE 2010

SCALE: 1:50000

PROJECT: 0-071967.15

FILE. NO.:0-07196715F5-3

This map was produced for the South Georgian Bay Lake Simcoe Source Protection Region for the purposes of completing the South Georgian Bay Lake Simcoe Assessment Report. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.



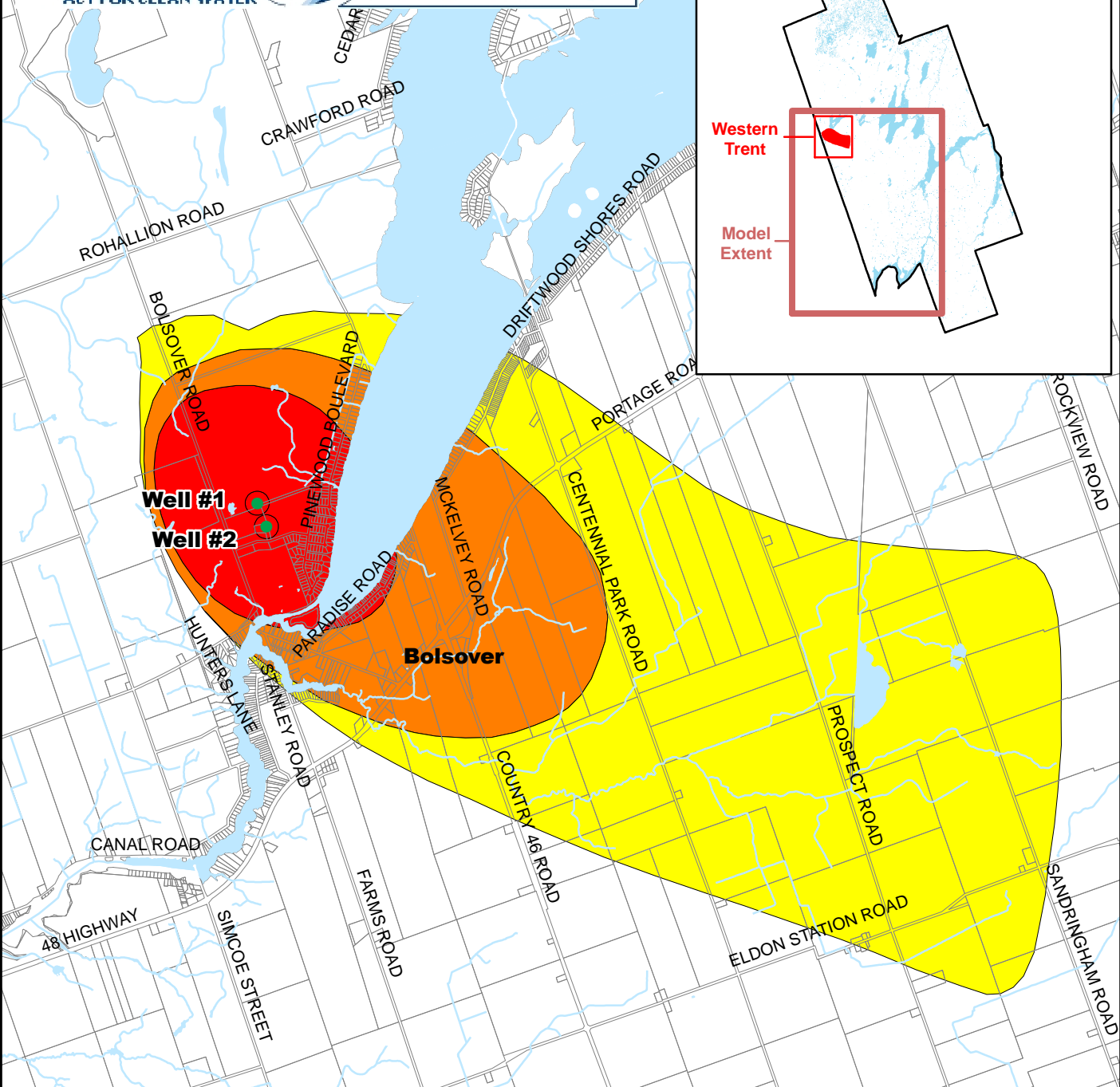
GENIVAR



Ontario

FIGURE

6a-2



LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6
- 4
- 2



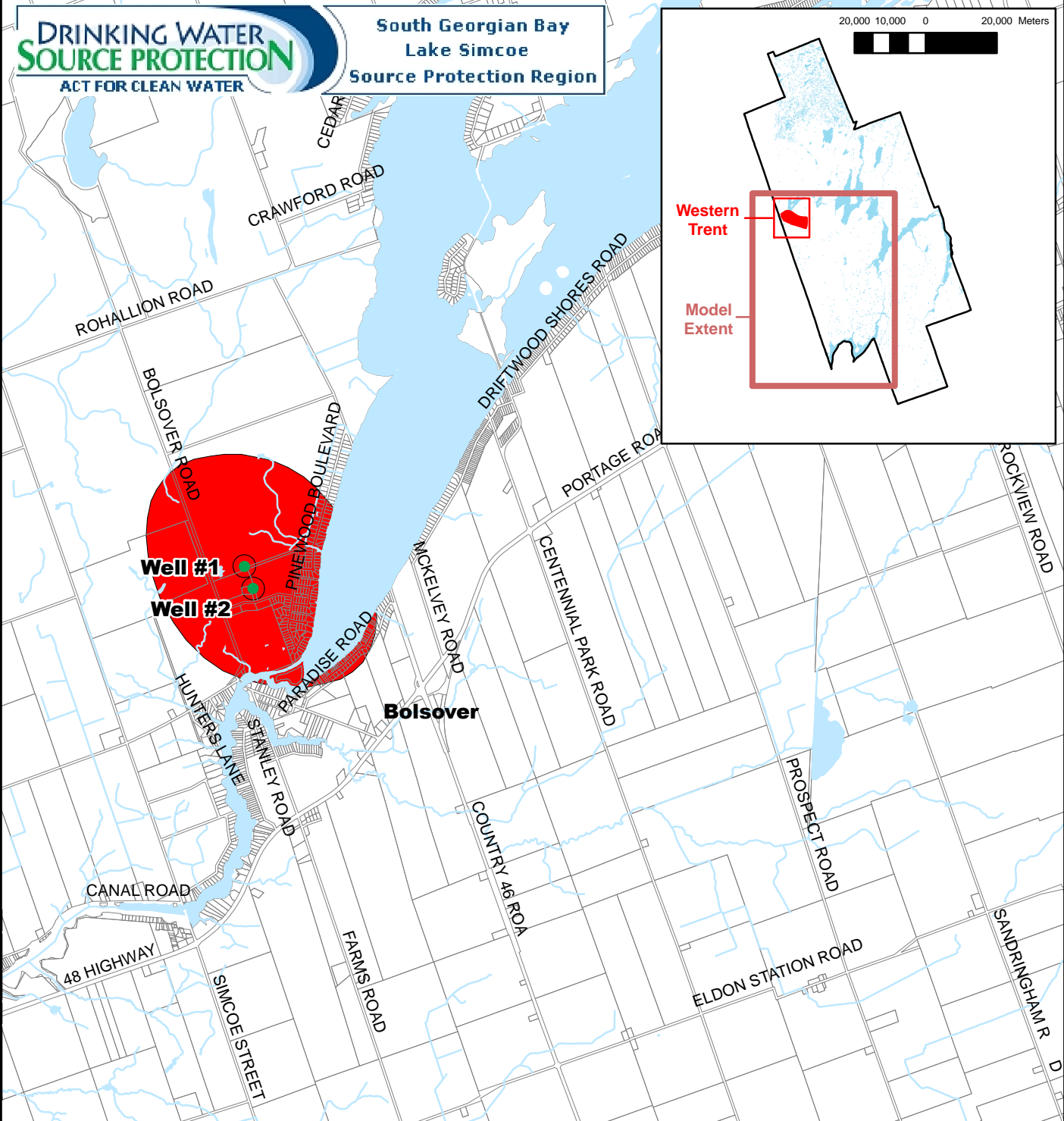
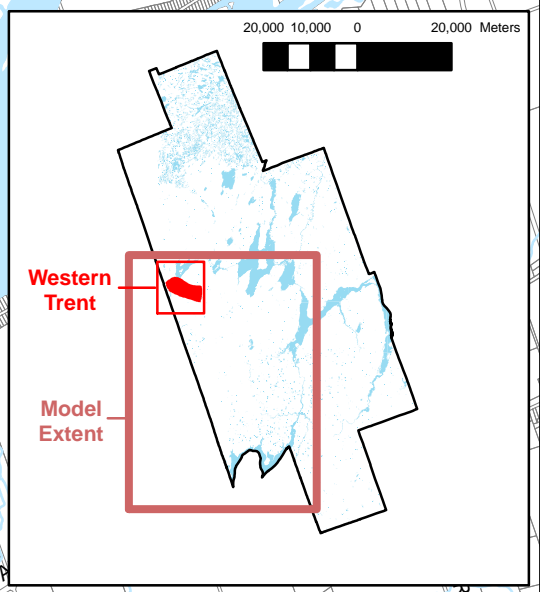
500 250 0 500 Metres

VULNERABILITY SCORE - WESTERN TRENT

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: JUNE 2010	SCALE: 1:50000
PROJECT: 0-071967.15	FILE. NO.:0-07196715F5-4

This map was produced for the South Georgian Bay Lake Simcoe Source Protection Region for the purposes of completing the South Georgian Bay Lake Simcoe Assessment Report. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.



LEGEND
 ● MUNICIPAL WELL LOCATION
 VULNERABILITY SCORING
 ■ 10



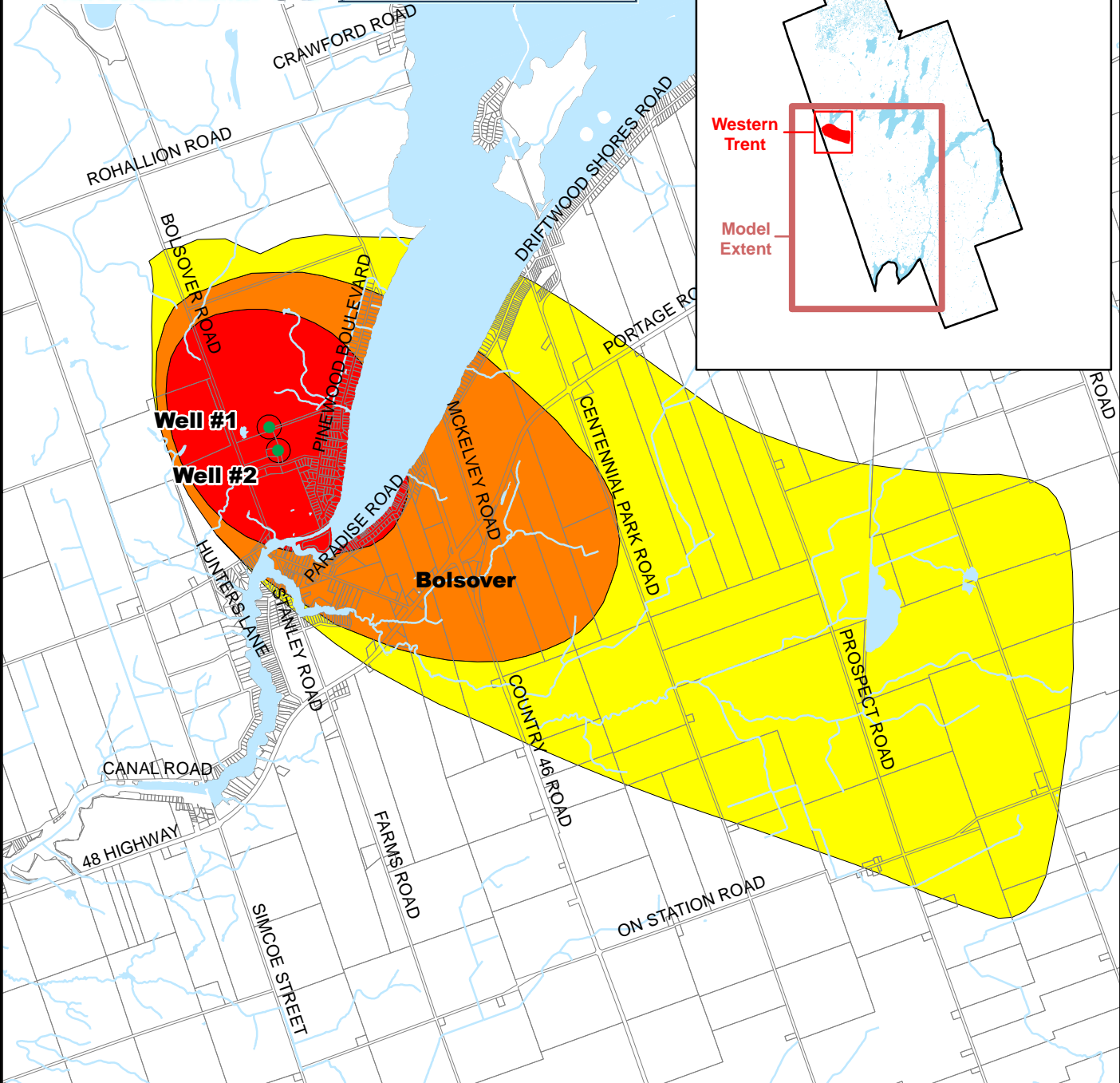
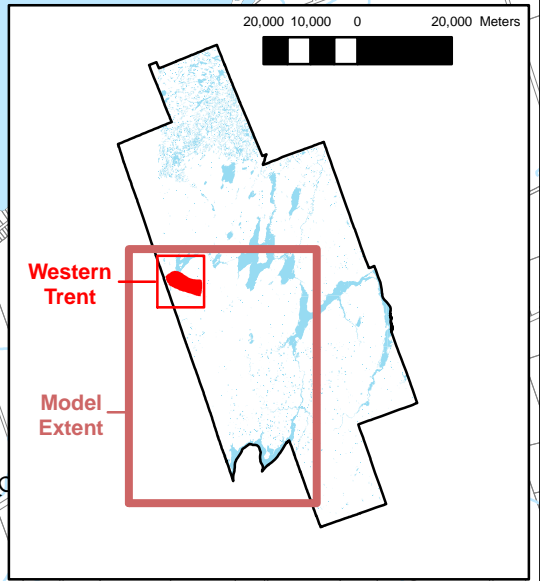
AREAS WHERE PATHOGENS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - WESTERN TRENT

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

This figure is to be used to identify the areas where a landuse activity is or would be a drinking water threat based on the Technical Rules. The key table is intended to correlate the vulnerability score with circumstances that are significant, moderate, or low threats in the Table of Drinking Water Threats. The table shows the number of circumstances and references the table designation in the Provincial Tables of Circumstances for each threat category.

DATE: AUGUST 2010	SCALE: 1:50000
PROJECT: 0-071967.15	FILE. NO.:0-07196715F5-5

This map was produced for the South Georgian Bay Lake Simcoe Source Protection Region for the purposes of completing the South Georgian Bay Lake Simcoe Assessment Report. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.



LEGEND

- MUNICIPAL WELL LOCATION
- VULNERABILITY SCORING**
- 10
- 8
- 6



AREAS WHERE CHEMICALS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - WESTERN-TRENT

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

This figure is to be used to identify the areas where a landuse activity is or would be a drinking water threat based on the Technical Rules. The key table is intended to correlate the vulnerability score with circumstances that are significant, moderate, or low threats in the Table of Drinking Water Threats. The table shows the number of circumstances and references the table designation in the Provincial Tables of Circumstances for each threat category.

DATE: AUGUST 2010

SCALE: 1:50000

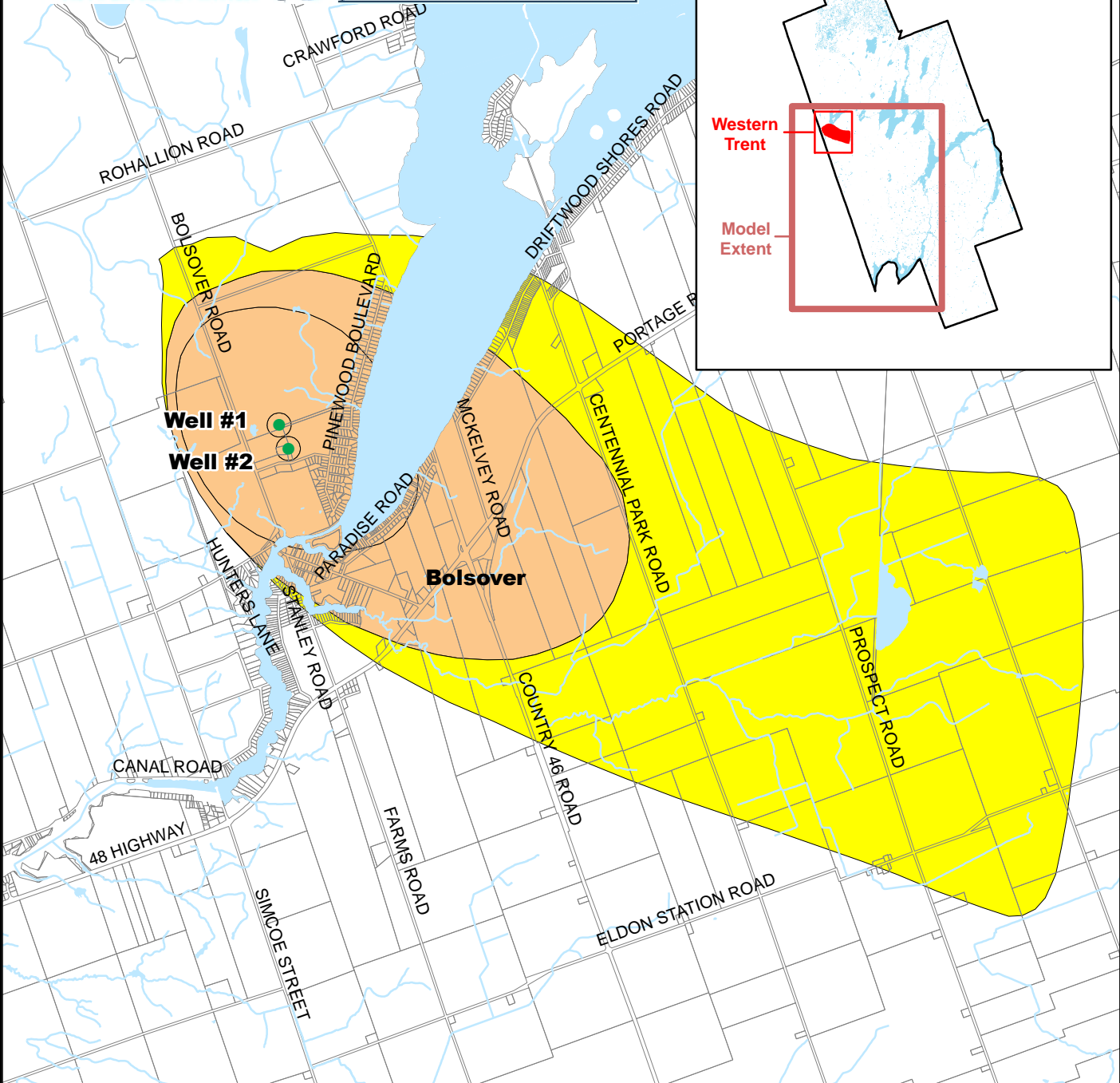
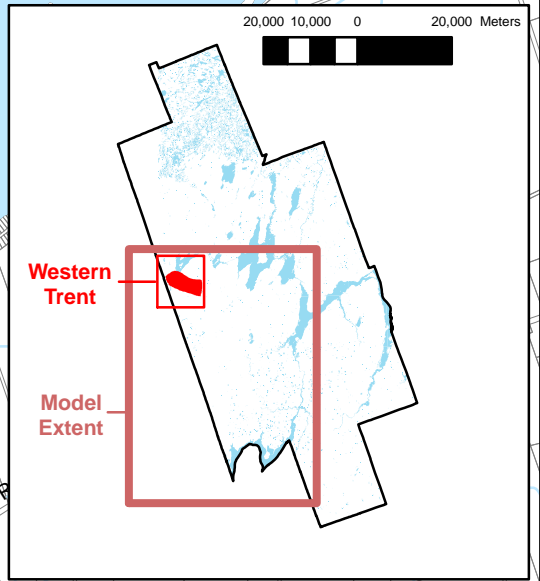
PROJECT: 0-071967.15

FILE. NO.:0-07196715F5-6

This map was produced for the South Georgian Bay Lake Simcoe Source Protection Region for the purposes of completing the South Georgian Bay Lake Simcoe Assessment Report. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.



FIGURE
6a-5



LEGEND

- MUNICIPAL WELL LOCATION
- WHPA-C: 5-YEAR TIME-OF-TRAVEL
- VULNERABILITY SCORING**
- 6



500 250 0 500 Metres

AREAS WHERE DNAPLS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - WESTERN TRENT

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

This figure is to be used to identify the areas where a landuse activity is or would be a drinking water threat based on the Technical Rules. The key table is intended to correlate the vulnerability score with circumstances that are significant, moderate, or low threats in the Table of Drinking Water Threats. The table shows the number of circumstances and references the table designation in the Provincial Tables of Circumstances for each threat category.

DATE: AUGUST 2010

SCALE: 1:50000

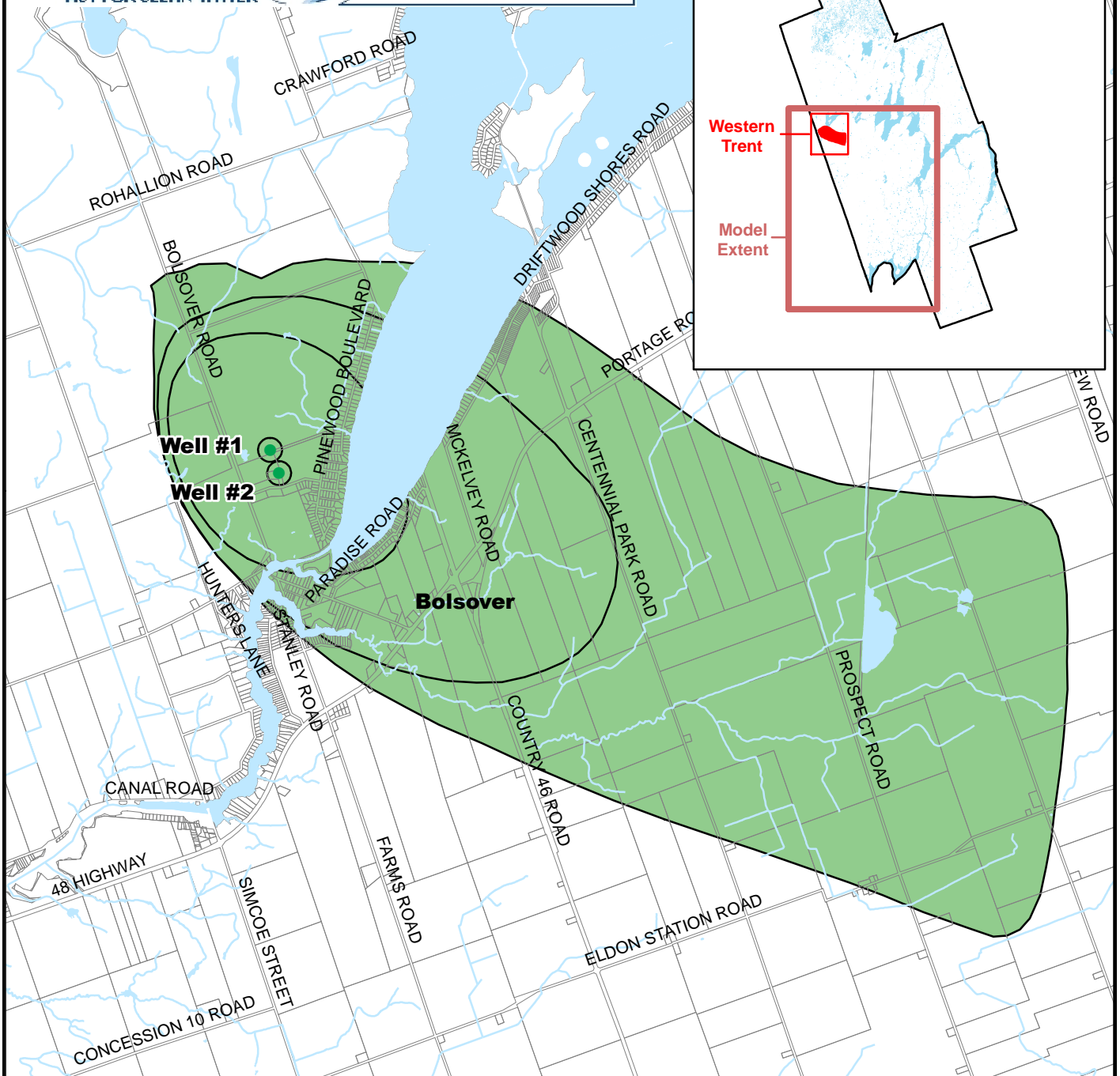
PROJECT: 0-071967.15

FILE. NO.:0-07196715F5-7

This map was produced for the South Georgian Bay Lake Simcoe Source Protection Region for the purposes of completing the South Georgian Bay Lake Simcoe Assessment Report. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.



FIGURE
6a-6



Legend

- MUNICIPAL WELL LOCATION
- MANAGED LANDS (<40%)
- MANAGED LANDS (40-80%)
- MANAGED LANDS (>80%)



500 250 0 500 Metres

MANAGED LANDS - WESTERN TRENT

ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

The Managed Land proportion is illustrated for the parts of WHPA A-D where the vulnerability score is greater than 6.

DATE: JUNE 2010

SCALE: 1:50000

PROJECT: 0-071967.15

FILE. NO.: 0-07196715F5-8

This map was produced for the South Georgian Bay Lake Simcoe Source Protection Region for the purposes of completing the South Georgian Bay Lake Simcoe Assessment Report. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.



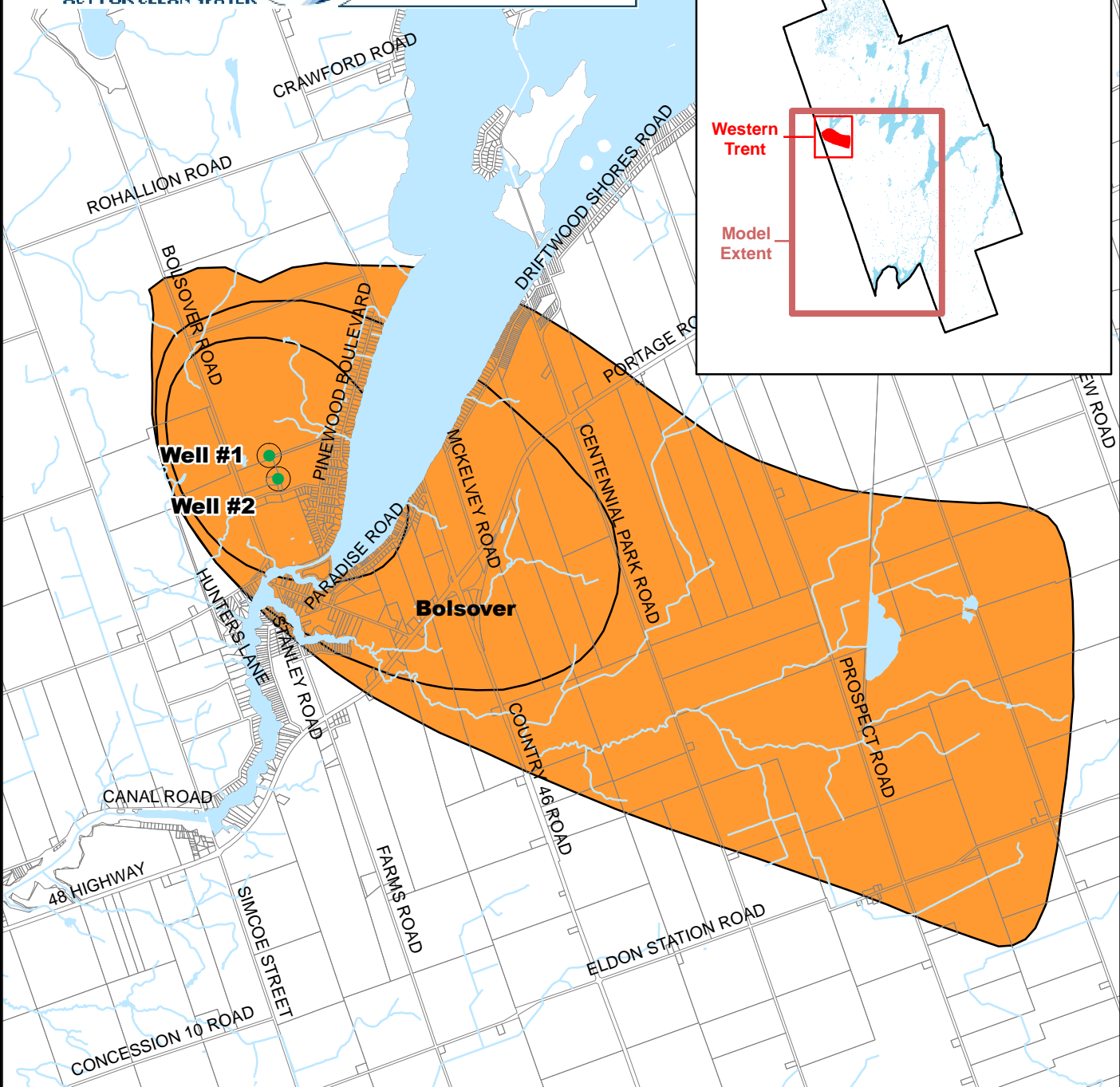
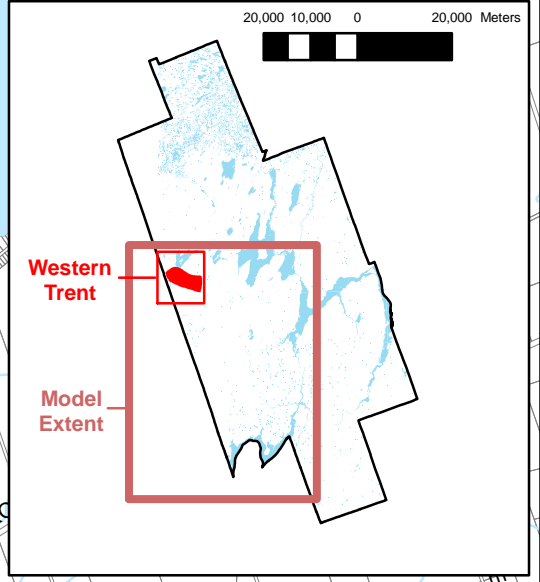
GENIVAR



Ontario

FIGURE

6a-7



Legend

- MUNICIPAL WELL LOCATION
- LIVESTOCK DENSITY (<math>< 0.5</math> NUTRIENT UNITS/ACRE)
- LIVESTOCK DENSITY (0.5-1.0 NUTRIENT UNITS/ACRE)
- LIVESTOCK DENSITY (>1.0 NUTRIENT UNITS/ACRE)

500 250 0 500 Metres

LIVESTOCK DENSITY - WESTERN TRENT

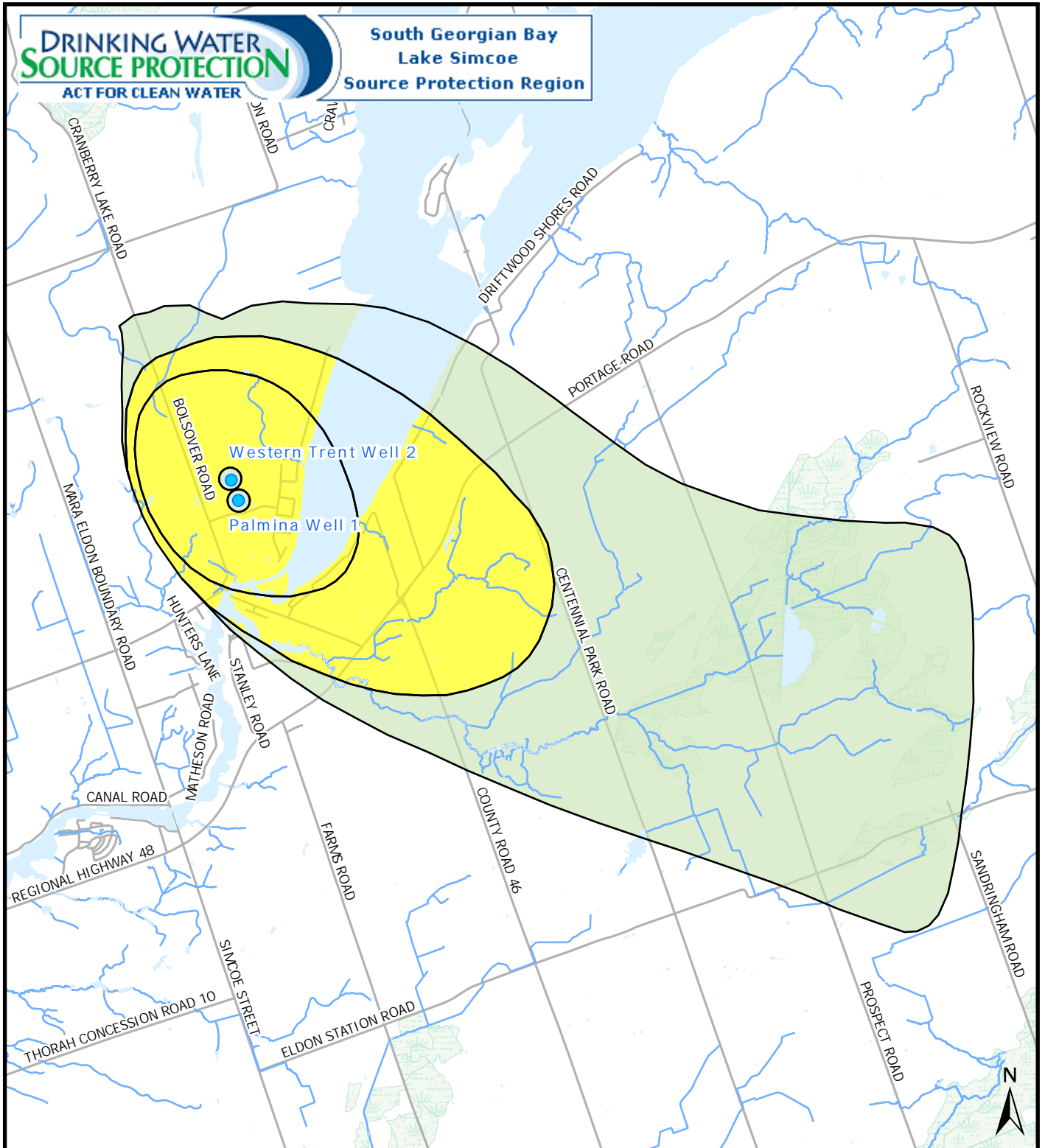
ASSESSMENT OF DRINKING WATER THREATS
MUNICIPAL GROUNDWATER SUPPLIES
The City of Kawartha Lakes

DATE: JUNE 2010 SCALE: 1:50000

PROJECT: 0-071967.15 FILE. NO.: 0-07196715F5-9

The Livestock Density proportion is illustrated for the parts of WHPA A-D where the vulnerability score is greater than 6.

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● Well

Impervious Surfaces in WHPA

- < 1%
- = 1 - < 6%
- = 6 - < 8%
- = 8 - < 30%
- > 30%

Impervious Surfaces - Western Trent
WHPA

Created by: LSRCA, 2025-08-05

Scale 1: 50,000

0 430 860 1,720 m

UTM Zone 17N, NAD83



This map was produced by the Lake Simcoe Region Conservation Authority, lead agency of the South Georgian Bay Lake Simcoe Region Source Protection Region. Base data have been compiled from various sources, under data sharing agreements. While every effort has been made to accurately depict the base data, errors may exist.



Figure 6a-9