# Chapter 11: Township of Oro-Medonte

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# 11 Township of Oro-Medonte

## 11.1 Introduction

This chapter contains information on five drinking water systems for the Township of Oro-Medontethat are located within the Lakes Simcoe and Couchiching-Black River Source Protection Area. Various 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. In this chapter, each of the groundwater systems is discussed separately for easier readability.

Each 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 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. This report has been updated to account for the addition of one municipal supply well to the Maplewood Estates Well Supply system. The updated information is current up to and inclusive of November 2022.

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 OM) for a more in depth description of the methods used, as well as the Glossary for any unfamiliar terms.

## 11.2 Drinking Water Systems

The Township of Oro-Medonte, located in the middle and northern portion of Simcoe County, operates groundwater-based water supplies in twelve (12) communities and no surface intakes. As shown in Table 11-1 and in Figure 11-1 all of the groundwater supplies are within the South Georgian Bay-Lake Simcoe (SGBLS) Source Protection Region (SPR).

Table 11-1 also indicates the Source Protection Region and corresponding lead Source Protection Authority (SPA) for all of the drinking water systems for (or municipal water supply systems) in Oro-Medonte.

**Table 11-1: Municipal Groundwater Supplies in the Township of Oro-Medonte**

| Local Municipality | Community Water Supply | Drinking Water Information System Number | Source Water Body / Aquifer | Number of Intakes/ Wells | Source Protection Region (SPR) & Source Protection Authority (SPA) | Location where entire Assessment can be obtained |
|---|---|---|---|---|---|---|
| Township of Oro-Medonte | Canterbury Subdivision | 220007454 | Confined overburden aquifer (A2) | 2 | **SPR:** SGBLS<br>**SPA:** Lake Simcoe | This chapter |
| Township of Oro-Medonte | Cedar Brook Subdivision | 220006936 | Confined overburden aquifer (A2) | 2 | **SPR:** SGBLS<br>**SPA:** Lake Simcoe | This chapter |
| Township of Oro-Medonte | Harbourwood | 220006703 | Confined overburden aquifer (A3, A4) | 2 | **SPR:** SGBLS<br>**SPA:** Lake Simcoe | This chapter |
| Township of Oro-Medonte | Maplewood Estates | 220004135 | Confined overburden aquifer (A4) | 1 | **SPR:** SGBLS<br>**SPA:** Lake Simcoe | This chapter |
| Township of Oro-Medonte | Shanty Bay | 220005198 | Confined overburden aquifer (A2, A3) | 3 | **SPR:** SGBLS<br>**SPA:** Lake Simcoe | This chapter |
| Township of Oro-Medonte | Craighurst | 250001322 | Confined overburden aquifer (A1-SA4, A2) | 3 | **SPR:** SGBLS<br>**SPA:** Nottawasaga Valley | Nottawasaga Valley Assessment Report (Chapter 15) |
| Township of Oro-Medonte | Horseshoe Highlands Subdivision | 250001402 | Confined overburden aquifer (A2, A1-SA4) | 3 | **SPR:** SGBLS<br>**SPA:** Severn Sound | Severn Sound Assessment Report (Chapter 9) |
| Township of Oro-Medonte | Medonte Hills | 220003920 | Confined overburden aquifer (A1-SA4) | 2 | **SPR:** SGBLS<br>**SPA:** Severn Sound | Severn Sound Assessment Report (Chapter 9) |
| Township of Oro-Medonte | Robin Crest | 220010752 | Confined overburden aquifer (A1-SA4) | 2 | **SPR:** SGBLS<br>**SPA:** Severn Sound | Severn Sound Assessment Report (Chapter 9) |
| Township of Oro-Medonte | Sugar Bush | 220001518 | Confined overburden aquifer (A2, A3) | 3 | **SPR:** SGBLS<br>**SPA:** Severn Sound | Severn Sound Assessment Report (Chapter 9) |
| Township of Oro-Medonte | Warminster | 220005125 | Confined overburden aquifer (A1-SA3) | 2 | **SPR:** SGBLS<br>**SPA:** Severn Sound | Severn Sound Assessment Report (Chapter 9) |

While still in the Township of Oro-Medonte and within the SGBLS Source Protection Region, over half of the water supply systems are located outside of the Lake Simcoe watershed. Information on the Craighurst Water Supply (located in the Nottawasaga Valley watershed) can be found in the Nottawasaga Valley Assessment Report, Chapter 15. Information on the Horseshoe Highlands Subdivision, Medonte Hills, Robin Crest, Sugar Bush, Braestone, and Warminster Water Supply systems (located in the Severn Sound watershed) can be found in the Severn Sound Assessment Report, Chapter 9.

Also, WHPAs from five systems, all within the SGBLS SPR, cross into the Township of Oro-Medonte (Table 11-2). WHPAs from the Barrie (City of Barrie) and Hillsdale (Township of Springwater) water supplies extend east over the border into Oro-Medonte. See Chapter 8 of this report for Barrie and Chapter 16 (Hillsdale) of the Nottawasaga Valley Assessment Report for more information. WHPAs from the Orillia (City of Orillia), and Bass Lake Woodlands and Coldwater (Township of Severn) cross their municipalities' borders into Oro-Medonte. For more information on these three systems see the Severn Sound Assessment Report, Chapters 6 and 10 respectively.

**Table 11-2: WHPA that cross into the Township of Oro-Medonte in the SGBLS SPR.**

| Local Municipality that WHPA extends into | Municipality where wellhead is located | Name of Water Supply | Source Protection Region & Source Protection Authority (SPA) | Location where entire Assessment can be obtained |
|---|---|---|---|---|
| Township of Oro-Medonte | The City of Barrie | Barrie | SGBLS SPR & Lakes Simcoe and Couchiching/Black River SPA | This report (Chapter 9) |
| Township of Oro-Medonte | The Township of Springwater | Hillsdale | SGBLS SPR & Nottawasaga Valley SPA | Nottawasaga Valley Assessment Report (Chapter 16) |
| Township of Oro-Medonte | The City of Orilla | Orillia | SGBLS SPR & Severn Sound SPA | Severn Sound Assessment Report (Chapter 6) |

| Local Municipality that WHPA extends into | Municipality where wellhead is located | Name of Water Supply | Source Protection Region & Source Protection Authority (SPA) | Location where entire Assessment can be obtained |
|---|---|---|---|---|
| Township of Oro-Medonte | The Township of Severn | Bass Lake Woodlands | SGBLS SPR & Severn Sound SPA | Severn Sound Assessment Report (Chapter 10) |
| Township of Oro-Medonte | The Township of Severn | Coldwater | SGBLS SPR & Severn Sound SPA | Severn Sound Assessment Report (Chapter 10 |

## 11.3 Canterbury Subdivision Well Supply

The Canterbury Water Supply is located in the southern part of the Township of Oro-Medonte at #1 Somerset Blvd., approximately 180 m north of Ridge Road and 12 m west of Line 7 South. The Canterbury Water Supply consists of two water supply wells, Well 1 and Well 2, that serve an estimated population of 81 (17 lots) in the Canterbury subdivision based on 2001 data. Both wells have been in operation since 1983.

According to the Permit to Take Water (PTTW) # 92-P3028, issued on December 18 2001 and which expires on December 15 2011, the rated capacity for the maximum flow rate into the treatment system is 208 $m^3$/day or 104 $m^3$/day for each well.

Both wells were drilled into a sand and gravel aquifer. Well 1 was constructed with a nominal 203 mm diameter steel casing from surface to a depth of 49.7 m with a 1.5 m long 203 mm diameter 25-slot telescoping stainless steel screen. Well 2 was constructed with a nominal 203 mm diameter steel casing from surface to a depth of 49.4 m, with a 203 mm diameter 14-slot telescoping stainless steel screen set from 49.4 to 51.5 mgbl and 53.3 to 54.9 mbgl.

The Canterbury wells are constructed into the confined aquifer composed of sand and gravel which is present at depth west of the Canterbury Water Supply and to the south in the Harbourwood Water Supply area and may also exist to the east as a thin deposit overlying the bedrock. The aquifer pinches out to the east but is interpreted to extend to the north beyond Highway 11 and the airport. The well records indicate that approximately 40-45 m of confining materials of variable composition (clay, silty sand, sandy till) locally overlie the municipal aquifer layer.

The screen interval for Well 1 and Well 2 has been assigned to the A2 Aquifer in the draft regional hydrostratigraphic model prepared by Golder and Aquaresource (2009). The Groundwater Vulnerability rating will be determined for the A2 Aquifer.

Information presented for the Canterbury Subdivision section of this Chapter is based on the Genivar 2010a report.

### 11.3.1 Groundwater Vulnerability Assessment

The Wellhead Protection Area (WHPA) is the primary Vulnerable Area delineated to ensure the protection of the municipal 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 Canterbury Water Supply has been delineated following the process recommended in the Technical Rules (MOE, 2008a). The areas that were determined to contribute groundwater to the wells within 25 years were delineated as WHPA. The Groundwater Vulnerability within the WHPA was assessed and included consideration of the effects of man-made structures that may increase the vulnerability. The WHPA and the Vulnerability were considered together as per the Technical Rules to determine a Vulnerability Score for the Canterbury WHPA. Details of the methods for the Vulnerability Analysis are provided in Technical Memorandum A1 – Groundwater Vulnerability Assessment Methods (Appendix MO).

#### 11.3.1.1 Wellhead Protection Area (WHPA) Delineation

The WHPA for the Canterbury wells was delineated in 2005 by Golder using a 2-dimensional analytical groundwater flow model. An updated survey of well locations was commissioned by SGBLS in 2009 to provide improved accuracy for delineation of the WHPA. A minor translation was required to adjust the Canterbury well locations and the WHPA. The updated well locations and the WHPA are shown in Figure 11a-1. WHPA delineation and adjustment details are documented in Genivar, 2010a.

WHPA-A has been added to include the 100 m radius from each municipal well. The Golder (2005) study delineated time-of-travel zones (TOT) for 50 days, 2 years, 10 years and 25 years. WHPA-C, representing the 5-year TOT zone, was estimated under this study as per Technical Memorandum A2 – 5 year time-of-travel Estimation Methods (Appendix MO).

The WHPA reflect groundwater flow from northwest to southeast. This is reasonable based on available data describing regional groundwater flow patterns toward Lake Simcoe.

#### 11.3.1.2 Groundwater Vulnerability

The Canterbury wells draw water from a confined overburden aquifer layer (regional aquifer system A2). The Groundwater Vulnerability for the aquifer in the area was determined using the regional Aquifer Vulnerability Index (AVI) methods outlined in Technical Memorandum A1 – Groundwater Vulnerability Assessment Methods (Appendix MO). The regional Groundwater

Vulnerability is illustrated in Technical Memorandum B1 – Regional Groundwater Vulnerability Mapping (Appendix MO).

The Groundwater Vulnerability within the WHPA of the two municipal wells in the Canterbury Water Supply is shown in Figure 11a-2. The Groundwater Vulnerability for the municipal water supply aquifers within the WHPA is considered to be Low.

#### 11.3.1.3 Transport Pathway Increase

Technical Memorandum A3 (Appendix MO) 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 to increase the observed vulnerability.

Private wells, and particularly wells that either do not contain seals that will prevent water from moving down around the outside of the well pipe or wells that are no longer used and/or that have not been sealed, present the greatest potential for increasing the rated Vulnerability. The available data from the Provincial Water Well Information System (WWIS) database was screened to identify wells that penetrate to the water supply aquifers and have the potential to increase the Vulnerability of the natural stratigraphic profile. There is potential that other wells may exist that are not included in the database, particularly in areas now serviced by municipal water that formerly obtained water supply from private wells.

Potential Transport Pathways were located at two locations within the Canterbury WHPA. One pathway is associated with a private well within WHPA-D and one is associated with a gravel pit at the outer margin of WHPA-D. These areas are small. The Vulnerability at these locations can therefore be increased from Low to Medium. The identified Transport Pathways do not affect the Assessment of Drinking Water Threats.

#### 11.3.1.4 WHPA-E

None of the wells in this study have been identified as Groundwater Under the Direct Influence (GUDI), therefore delineation of a WHPA-E was not required.

#### 11.3.1.5 Vulnerability Score

The WHPA zones for Canterbury water supply, as shown in Figure 11a-1, and the Groundwater Vulnerability, as shown in Figure 11a-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 11a-3 illustrates the Vulnerability Scores for the Canterbury WHPA. Figure 11a-3 will be used to assess Drinking Water Threats in Section 11.3.3.

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

The assessment of the uncertainty for the Vulnerability Assessment considers the type, quantity, and quality of available data, the methods used to determine the Groundwater Vulnerability, and the nature of the groundwater flow system.

The Uncertainty Rating assigned for the Vulnerability Assessment Component for the Canterbury WHPA is High. The Vulnerability Rating for the Canterbury Water Supply has been determined using decisions and assumptions that would err on the conservative side (higher Vulnerability Scores). In this case, the High Uncertainty Rating reflects that additional data to describe the continuity, thickness, and types of soils within the delineated WHPA could potentially be used to improve the understanding of local hydrostratigraphy and to increase the confidence in the Vulnerability Analysis. For further information, refer to Technical Memorandum A1.

### 11.3.2 Drinking Water Issues Evaluation

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals 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. 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 raw water quality and treated water quality for the Canterbury Water Supply have 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 the Canterbury Water Supply are provided in Technical Memorandum L1 – Drinking Water Issues Evaluation – Oro-Medonte (Appendix OM).

***No Drinking Water Issues were identified for the Canterbury Water Supply.***

Several parameters were observed on occasion or in low concentrations that are consistently less than the Ontario Drinking Water Quality Standard (ODWQS) values. Trends of increasing concentrations that would exceed the ODWQS value within 50 years were not observed.

The occasional presence of coliform bacteria in raw or treated water is not considered to represent a specific Drinking Water Issue as these parameters have only been rarely observed under circumstances that are not considered to be persistent. Iron concentrations occasionally exceed aesthetic objectives at the wells. Aesthetic/operational parameters that exceed guidelines include organic nitrogen and turbidity, which are likely to be naturally-occurring.

### 11.3.3 Drinking Water Threats Evaluation

An assessment of Drinking Water Threats for the Canterbury Water Supply was completed in accordance with the detailed methodology presented in Technical Memo – A5 (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 Canterbury Water Supply builds on the information from the Vulnerability Analysis and Issues Evaluation and includes the 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.

#### 11.3.3.1 List of Drinking Water Threats – Activities

The list of Prescribed Drinking Water Threats considered in the assessment for the Canterbury Drinking 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.***

#### 11.3.3.2 List of Drinking Water Threats – Conditions

Methods used to assess Conditions are described in Technical Memorandum A5 (Appendix MO). The following information sources were consulted to identify existing Conditions that could affect the Canterbury 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 Township of Oro-Medonte staff to identify potential conditions within the identified WHPA for the drinking water supply.

***No confirmed Conditions have been identified for the Canterbury Water Supply. No potential Conditions have been identified for consideration at this time.***

#### 11.3.3.3 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 table of drinking water threat circumstances can be used to correlate activities that are or would be Drinking Water Threats with the Vulnerability Scores. The tables can be found at: https://swpip.ca/

##### 11.3.3.3.1 Pathogen Parameters

The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11a-4 c to identify the areas where Activities associated with pathogen Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Canterbury 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.

#### 11.3.3.3.2 Chemical Parameters

The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11a-5 to identify the areas where Activities associated with chemical Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Canterbury 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 8.

#### 11.3.3.3.3 DNAPL Chemical Parameters

Figure 11a-6 illustrates the area of the 5-year time-of-travel zone (WHPA-C) and areas with a Vulnerability Score of at least 6, where Activities associated with DNAPL parameters are considered to be a Significant Drinking Water Threat for the Canterbury Water Supply. The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11a-6 to identify the circumstances in which these Activities associated with DNAPL threats would be Significant Drinking Water Threats.

### 11.3.3.4 Identifying Areas of Significant/Moderate/Low Threats – Conditions

Further to Section 11.3.3.2, no Conditions have been confirmed within the WHPA for the Canterbury 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 11a-3 illustrates the Vulnerability Score map for Canterbury Water Supply that can be used to determine where a Condition is or would be a Significant, Moderate or Low Threat to Drinking Water.

#### 11.3.3.5 Enumerating Drinking Water Threats

The number of Significant Drinking Water Threats for the Canterbury Water Supply has been determined using the methodology outlined in Technical Memorandum A5 (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 11-3 documents the refined enumeration of existing and potential activities that are considered to be Significant Drinking Water Threats within the WHPA for the Canterbury Water Supply.

Sixteen (16) activities that are considered to be Significant Drinking Water Threats were identified in association with fourteen (14) land parcels in the WHPA for the Canterbury Water Supply. Eleven (11) parcels are identified as having Significant Threat Activities relating to residential land use via the use of private individual sewage disposal systems. One (1) threat activity and parcel has been included to represent the potential for subsurface storage of fuel for home heating purposes within the area where the Vulnerability Score is 10. There are 13 residential parcels within this area. Two (2) parcels have been identified for potential application of pesticide to land. One (1) parcel was identified as having Threats related to application of commercial fertilizer to land and for use of land as livestock grazing or pasturing land.

It is acknowledged that the Lake Simcoe Regional Airport, the City of Barrie Wastewater Lagoons, and the County of Simcoe Landfill Site # 11 have properties that fall within the WHPA for the Canterbury subdivision. However, the activities occurring on these lands are within a Low vulnerability area. Therefore, these properties cannot be considered a Significant Threat.

**Table 11-3: Number of Significant Drinking Water Threats for the Canterbury Drinking Water Supply.**

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

| Threat Number | Threat | Significant threat counts Number of threats | Significant threat counts Number of parcels |
|---|---|---|---|
| 11. | The handling and storage of pesticide. | 0 | 0 |
| 12. | The application of road salt. | 0 | 0 |
| 13. | The handling and storage of road salt. | 0 | 0 |
| 14. | The storage of snow. | 0 | 0 |
| 15. | The handling and storage of fuel. | 1 | 1 |
| 16. | The handling and storage of dense non-aqueous phase liquid. | 0 | 0 |
| 17. | The handling and storage of an organic solvent. | 0 | 0 |
| 18. | The management of runoff that contains chemicals used in the de-icing of aircraft. | 0 | 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 | 0 |
| 20. | Any activity that reduces the recharge of an aquifer. | 0 | 0 |
| 21. | The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard. | 1 | 1 |
| 22. | The establishment and operation of a liquid hydrocarbon pipeline | 0 | 0 |
| - | Totals: | *16 | 14 |

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

Note for the table above: The number of parcels identified will typically be less than the number of significant threats as multiple threats can be observed per parcel

#### 11.3.3.5.1 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 Part XII of the Technical Rules (December 2021).

Managed Lands were identified and the Managed Lands proportions were determined for the WHPA of the Canterbury Water Supply as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.3.3.5). 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 11a-7 illustrates the proportion of Managed Lands within the delineated WHPA zones for the Canterbury Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D.

#### 11.3.3.5.2 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 Part XII of the Technical Rules (December 2021).

The Livestock Density was determined for the delineated WHPA zones of the Canterbury Water Supply as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.3.3.5). 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 11a-8 illustrates the distribution of Livestock Density within the delineated WHPA zones for the Canterbury Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D. The Livestock Density was estimated for the identified Agricultural Managed Lands as determined in accordance with Technical Memorandum A5 (Appendix MO).

#### 11.3.3.5.3 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 Part XII of the Technical Rules (December 2021).

The proportion of Impervious Surfaces within the delineated WHPA zones for the Canterbury Water Supply was determined in accordance with the methodology in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.3.3.5). The Impervious Surfaces are used in the identification of threat activities associated with the application of winter de-icing agents (salt).

Figure 11a-9 illustrates the distribution of Impervious Surfaces within the delineated WHPA zones for the Canterbury Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D.

## 11.4 Cedar Brook Subdivision Well Supply

The Cedar Brook Water Supply is located in the southern part of the Township of Oro-Medonte in the community of Hawkestone. The Cedar Brook Water Supply consists of two water supply wells: Well 1 and Well 2. The wells are located approximately 20 m south of the Ridge Road and 250 m west of the 11$^{th}$ Line South. The wells serve the Cedar Brook subdivision which services an estimated population of 68 (24 lots) based on 2001 data. The wells were drilled and have been in operation since 1962 and 1964, respectively.

According to the Permit to Take Water (PTTW) # 4817-6HJPXP, issued on October 31 2005 and which expires on December 15 2011, the rated capacity for the maximum flow rate into the treatment system and for each of the wells (since they are operated at alternating times) is 196.4 $m^3$/day.

Well 1 was constructed with a nominal 152 mm diameter steel casing to a depth of 37.2 m and a nominal 152 mm diameter 1.8 m long 25 and 18-slot stainless steel screen. Well 2 was constructed with a nominal 203 mm diameter steel casing to a depth of 47.2 m. The well record indicates that no screen was installed in the well. The well reportedly flowed at the time of construction.

The Cedar Brook wells are completed in the confined aquifer which is locally present between approximately 200 to 210 masl. This aquifer appears to be thin in the vicinity of the wellfield and may pinch out laterally to the west and east. The thickness of the aquifer apparently increases to the north; however some well records located approximately 6 km to the north of the wellfield indicate that the aquifer pinches out. The driller's log refers to the aquifer material as "boulder clay". The aquifer is locally overlain by approximately 40 m of aquitard materials consisting mainly of clay with boulders and is underlain by approximately 20 m of aquitard material described on driller's logs mainly as sandy clay.

The screen interval for Well 1 and Well 2 has been assigned to the A2 Aquifer in the draft regional hydrostratigraphic model prepared by Golder and Aquaresource (2009). The Groundwater Vulnerability rating will be determined for the A2 Aquifer.

Information presented for the Cedar Brook section of this Chapter is based on the Genivar 2010a report.

### 11.4.1 Groundwater Vulnerability Assessment

The Wellhead Protection Area (WHPA) is the primary Vulnerable Area delineated to ensure the protection of the municipal 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 Cedar Brook Water Supply has been delineated following the process recommended in the Technical Rules (MOE, 2008a). The areas that were determined to contribute groundwater to the wells within 25 years were delineated as WHPA. The Groundwater Vulnerability within the WHPA was assessed and included consideration of the effects of man-made structures that may increase the vulnerability. The WHPA and the Vulnerability were considered together as per the Technical Rules to determine a Vulnerability Score for the Cedar Brook WHPA. Details of the methods for the Vulnerability Analysis are provided in Technical Memorandum A1 – Groundwater Vulnerability Assessment Methods (Appendix MO).

#### 11.4.1.1 Wellhead Protection Area (WHPA) Delineation

The WHPA for the Cedar Brook wells were delineated in 2005 by Golder using a 2-dimensional analytical groundwater flow model. An updated survey of well locations was commissioned by SGBLS in 2009 to provide improved accuracy for delineation of the WHPA. A minor translation was required to adjust the Cedar Brook well locations and the WHPA. The updated well locations and the WHPA are shown in Figure 11b-1. WHPA delineation and adjustment details are documented in Genivar, 2010a.

WHPA-A has been added to include the 100 m radius from each municipal well. The Golder (2005) study delineated time-of-travel zones (TOT) for 50 days, 2 years, 10 years, and 25 years. WHPA-C, representing the 5 year TOT zone, was estimated under this study as per Technical Memorandum A2 – 5 year time-of-travel Estimation Methods (Appendix MO).

The WHPA reflects groundwater flow from northwest to southeast. This is reasonable based on available data describing regional groundwater flow patterns toward Lake Simcoe.

#### 11.4.1.2 Groundwater Vulnerability

The Cedar Brook wells draw water from a confined overburden aquifer layer (regional aquifer system A2). The Groundwater Vulnerability for the aquifer in the area to the northwest of Lake

Simcoe was determined using the regional Aquifer Vulnerability Index (AVI) methods outlined in Technical Memorandum A1 – Groundwater Vulnerability Assessment Methods (Appendix MO). The regional Groundwater Vulnerability is illustrated in Technical Memorandum B1 – Regional Groundwater Vulnerability Mapping.

The Groundwater Vulnerability within the WHPA of the three municipal wells in the Cedar Brook Water Supply is shown in Figure 11b-2. The Groundwater Vulnerability for the municipal water supply aquifers within the WHPA is considered to be Low.

#### 11.4.1.3 Transport Pathway Increase

Technical Memorandum A3 (Appendix MO) 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 to increase the observed vulnerability.

Private wells, and particularly wells that either do not contain seals that will prevent water from moving down around the outside of the well pipe or wells that are no longer used and/or that have not been sealed, present the greatest potential for increasing the rated Vulnerability. The available data from the Provincial Water Well Information System (WWIS) database was screened to identify wells that penetrate to the water supply aquifers and have the potential to increase the Vulnerability of the natural stratigraphic profile. There is potential that other wells may exist that are not included in the database, particularly in areas now serviced by municipal water that formerly obtained water supply from private wells.

No wells were identified within the Cedar Brook WHPA that are considered to have the potential to be a Transport Pathway. The Groundwater Vulnerability map (Figure 11b-2) is therefore proposed to be used to generate the Vulnerability Scores.

#### 11.4.1.4 WHPA-E

None of the wells in this study have been identified as Groundwater Under the Direct Influence (GUDI), therefore delineation of a WHPA-E was not required.

#### 11.4.1.5 Vulnerability Score

The WHPA zones for the Cedar Brook Water Supply, as shown in Figure 11b-1, and the Groundwater Vulnerability, as shown in Figure 11b-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 11b-3 illustrates the Vulnerability Scores for the Cedar Brook WHPA. Figure 11b-3 will be used to assess Drinking Water Threats in Section 11.4.3.

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

The assessment of the uncertainty for the Vulnerability Assessment considers the type, quantity, and quality of available data, the methods used to determine the Groundwater Vulnerability, and the nature of the groundwater flow system.

The Uncertainty Rating assigned for the Vulnerability Assessment Component for the Cedar Brook WHPA is High. The Vulnerability Rating for the Cedar Brook Water Supply has been determined using decisions and assumptions that would err on the conservative side (higher Vulnerability Scores). In this case, the High Uncertainty Rating reflects that additional data to describe the continuity, thickness, and types of soils within the delineated WHPA could potentially be used to improve the understanding of local hydrostratigraphy and to increase the confidence in the Vulnerability Analysis. For further information, refer to Technical Memorandum A1.

### 11.4.2 Drinking Water Issues Evaluation

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals 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. 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 raw water quality and treated water quality for the Cedar Brook Water Supply have 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 the Township of Oro-Medonte Groundwater are provided in Technical Memorandum L1 – Drinking Water Issues Evaluation – Oro-Medonte (Appendix OM).

***No Drinking Water Issues were identified for the Cedar Brook Water Supply.***

Several parameters were observed on occasion or in low concentrations that are consistently less than the Ontario Drinking Water Quality Standard (ODWQS) values. Trends of increasing concentrations that would exceed the ODWQS value within 50 years were not observed.

The occasional presence of coliform bacteria in raw or treated water is not considered to represent a specific Drinking Water Issue as these parameters have only been rarely observed under circumstances that are not considered to be persistent. Iron concentrations occasionally exceed aesthetic objectives at Well #1 and Well #2. Aesthetic/operational parameters that exceed guidelines include organic nitrogen and turbidity which are likely to be naturally-occurring.

### 11.4.3 Drinking Water Threats Evaluation

An assessment of Drinking Water Threats for the Cedar Brook Water Supply was completed in accordance with the detailed methodology presented in Technical Memo – A5 (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 Cedar Brook Water Supply builds on the information from the Vulnerability Analysis and Issues Evaluation and includes the 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.

#### 11.4.3.1 List of Drinking Water Threats – Activities

The list of Prescribed Drinking Water Threats considered in the assessment for the Cedar Brook Drinking 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.***

#### 11.4.3.2 List of Drinking Water Threats – Conditions

Methods used to assess Conditions are described in Technical Memorandum A5 (Appendix MO). The following information sources were consulted to identify existing Conditions that could affect the Cedar Brook 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 Township of Oro-Medonte staff to identify potential conditions within the identified WHPA for the drinking water supply.

***No confirmed Conditions have been identified for the Cedar Brook Water Supply. No potential Conditions have been identified for consideration at this time.***

#### 11.4.3.3 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 table of drinking water threat circumstances can be used to correlate activities that are or would be Drinking Water Threats with the Vulnerability Scores. The tables can be found at: https://swpip.ca/ Pathogen Parameters

The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11b-4 to identify the areas where Activities associated with pathogen Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Cedar Brook

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.

#### 11.4.3.3.1 Chemical Parameters

The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11b-5 to identify the areas where Activities associated with chemical Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Cedar Brook 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 8.

#### 11.4.3.3.2 DNAPL Chemical Parameters

Figure 11b-6 illustrates the area of the 5-year time-of-travel zone (WHPA-C) and areas with a Vulnerability Score of at least 6, where Activities associated with DNAPL parameters are considered to be a Significant Drinking Water Threat for the Cedar Brook Water Supply. The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11b-6 to identify the circumstances in which these Activities associated with DNAPL threats would be Significant Drinking Water Threats.

### 11.4.3.4 Identifying Areas of Significant/Moderate/Low Threats – Conditions

Further to Section 11.4.3.2 no Conditions have been confirmed within the WHPA for the Cedar Brook 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 11b-3 illustrates the Vulnerability Score map for Cedar Brook well supply that can be used to determine where a Condition is or would be a Significant, Moderate, or Low Threat to Drinking Water.

#### 11.4.3.5 Enumerating Drinking Water Threats

The number of Significant Drinking Water Threats for the Cedar Brook Water Supply has been determined using the methodology outlined in Technical Memorandum A5 (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 11-4 documents the enumeration of existing and potential activities that are considered to be Significant Drinking Water Threats within the WHPA for the Cedar Brook Water Supply.

Sixteen (16) activities that are considered to be Significant Drinking Water Threats were identified in association with 16 land parcels in the WHPA for the Cedar Brook Water Supply. Fifteen (15) parcels are identified as having significant threat activities relating to residential land use via the use of private individual sewage disposal systems. One (1) threat activity and parcel has been included to represent the potential for subsurface storage of fuel for home heating purposes within the area where the Vulnerability Score is 10. There are 18 residential parcels within this area.

**Table 11-4: Number of Significant Drinking Water Threats for the Cedar Brook Drinking Water Supply.**

| Threat Number | Threat | Significant threat counts Number of threats | Significant threat counts Number of parcels |
|---|---|---|---|
| 1. | The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act. | 0 | 0 |

| Threat Number | Threat | Significant threat counts Number of threats | Significant threat counts Number of parcels |
|---|---|---|---|
| 2. | The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage. | 15 | 15 |
| 3. | The application of agricultural source material to land. | 0 | 0 |
| 4. | The storage of agricultural source material to land. | 0 | 0 |
| 5. | The management of agricultural source material. | 0 | 0 |
| 6. | The application of non-agricultural source material to land. | 0 | 0 |
| 7. | The handling and storage of non-agricultural source material. | 0 | 0 |
| 8. | The application of commercial fertilizer to land. | 0 | 0 |
| 9. | The handling and storage of commercial fertilizer to land. | 0 | 0 |
| 10. | The application of pesticide to land. | 0 | 0 |
| 11. | The handling and storage of pesticide. | 0 | 0 |
| 12. | The application of road salt. | 0 | 0 |
| 13. | The handling and storage of road salt. | 0 | 0 |
| 14. | The storage of snow. | 0 | 0 |

| Threat Number | Threat | Significant threat counts Number of threats | Significant threat counts Number of parcels |
|---|---|---|---|
| 15. | The handling and storage of fuel. | 1 | 1 |
| 16. | The handling and storage of dense non-aqueous phase liquid. | 0 | 0 |
| 17. | The handling and storage of an organic solvent. | 0 | 0 |
| 18. | The management of runoff that contains chemicals used in the de-icing of aircraft. | 0 | 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 | 0 |
| 20. | Any activity that reduces the recharge of an aquifer. | 0 | 0 |
| 21. | The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard. | 0 | 0 |
| 22. | The establishment and operation of a liquid hydrocarbon pipeline | 0 | 0 |
| - | Totals: | *16 | 16 |

*15 verified Threats and 1 potential Threat that requires further verification (2015)

#### 11.4.3.5.1 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 Part XII of the Technical Rules (December 2021).

Managed Lands were identified and the managed lands proportions were determined for the WHPA of the Cedar Brook Water Supply as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.4.3.5). 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 11b-7 illustrates the location and proportion of Managed Lands within the delineated WHPA zones for the Cedar Brook Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D.

#### 11.4.3.5.2 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 Part XII of the Technical Rules (December 2021).

The Livestock Density was determined for the delineated WHPA zones of the Cedar Brook Water Supply as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.4.3.5). 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 11b-8 illustrates the distribution of Livestock Density within the delineated WHPA zones for the Cedar Brook Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D. The Livestock Density was estimated for the identified Agricultural Managed Lands as determined in accordance with Technical Memorandum A5 (Appendix MO).

#### 11.4.3.5.3 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 Part XII of the Technical Rules (December 2021).

The proportion of Impervious Surfaces within the delineated WHPA zones for the Cedar Brook Water Supply was determined in accordance with the methodology in Technical Memorandum

A5 (Appendix MO).The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.4.3.5). The Impervious Surfaces are used in the identification of threat activities associated with the application of winter de-icing agents (salt).

Figure 11b-9 illustrates the distribution of Impervious Surfaces within the delineated WHPA zones for the Cedar Brook Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D.

## 11.5 Harbourwood Well Supply

The Harbourwood Water Supply is located in the southern part of the Township of Oro-Medonte on Lake Simcoe. The Harbourwood Water Supply consists of two water supply wells: Well 2 and Well 3. Well 2 is located near the pumping station and Well 3 is located approximately 90 m north of the pumping station. The wells serve an estimated population of 272 (130 lots) in the Harbourwood subdivision based on 2001 data. The wells have been in operation since 1977 and 2005, respectively.

According to the Permit to Take Water (PTTW) # 8643-6HKK9K, issued on February 17 2006 and which expires on January 31 2014, the rated capacity for the maximum flow rate into the treatment system 921 $m^3$/day.

Both wells were drilled into a confined aquifer system. Well 2 is a nominal 229 mm diameter steel cased well constructed to a total depth of 63.1 m. The well has an 8.2 m long 16 and 25-slot telescoping stainless steel screen. Well 3 was constructed to replace Well 1 and has a nominal 203 mm diameter steel casing from surface to a depth of 70.1 m and a nominal 178 mm diameter and 18, 25, and 30-slot stainless steel screen in three 1.2 m lengths (screen set from 70.1 to 73.7 mbgl).

The screen intervals for Well 2 and Well 3 have been assigned to the A3 Aquifer and the A4 Aquifer respectively, in the draft regional hydrostratigraphic model prepared by Golder and Aquaresource (2009). The Groundwater Vulnerability rating will be determined for the A3 and A4 Aquifers.

Information presented for the Harbourwood section of this Chapter is based on Genivar 2010a report.

### 11.5.1 Groundwater Vulnerability Assessment

The Wellhead Protection Area (WHPA) is the primary Vulnerable Area delineated to ensure the protection of the municipal 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 Harbourwood Water Supply has been delineated following the process recommended in the Technical Rules (MOE, 2008a). The areas that were determined to contribute groundwater to the wells within 25 years were delineated as WHPA. The Groundwater Vulnerability within the WHPA was assessed and included consideration for the effects of man-made structures that may increase the vulnerability. The WHPA and the Vulnerability were considered together as per the Technical Rules to determine a Vulnerability Score for the Harbourwood WHPA. Details of the methods for the Vulnerability Analysis are provided in Technical Memorandum A1 – Groundwater Vulnerability Assessment Methods (Appendix MO).

#### 11.5.1.1 Wellhead Protection Area (WHPA) Delineation

The WHPA for the Harbourwood wells were delineated in 2005 by Golder using a 2-dimensional analytical groundwater flow model. An updated survey of well locations was commissioned by LSRCA in 2009 to provide improved accuracy for delineation of the WHPA. A minor translation was required to adjust the Harbourwood well locations and the WHPA. The updated well locations and the WHPA are shown in Figure 11c-1. WHPA delineation and adjustment details are documented in Genivar, 2010a.

WHPA-A has been added to include the 100 m radius from each municipal well. The Golder (2005) study delineated time-of-travel zones (TOT) for 50 days, 2 years, 10 years, and 25 years. WHPA-C, representing the 5 year TOT zone, was estimated under this study as per Technical Memorandum A2 – 5 year time-of-travel Estimation Methods (Appendix MO).

The WHPA reflect groundwater flow from northwest to southeast. This is reasonable based on available data describing regional groundwater flow patterns toward Lake Simcoe.

#### 11.5.1.2 Groundwater Vulnerability

The Harbourwood wells draw water from confined overburden aquifer layers (regional aquifers A3 and A4). The Groundwater Vulnerability for the municipal overburden aquifers was determined using the regional Aquifer Vulnerability Index (AVI) methods outlined in Technical Memorandum A1 – Groundwater Vulnerability Assessment Methods (Appendix MO). The regional Groundwater Vulnerability is illustrated in Technical Memorandum B1 – Regional Groundwater Vulnerability Mapping.

The Groundwater Vulnerability within the WHPA of the two municipal wells in the Harbourwood Water Supply is shown in Figure 11c-2. The Groundwater Vulnerability for the municipal water supply aquifers A3 and A4 within the WHPA is considered to be Low.

#### 11.5.1.3 Transport Pathway Increase

Technical Memorandum A3 (Appendix MO) 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 to increase the observed vulnerability.

Private wells, and particularly wells that either do not contain seals that will prevent water from moving down around the outside of the well pipe or wells that are no longer used and/or that have not been sealed, present the greatest potential for increasing the rated Vulnerability. The available data from the Provincial Water Well Information System (WWIS) database was screened to identify wells that penetrate to the water supply aquifers and have the potential to increase the Vulnerability of the natural stratigraphic profile. There is potential that other wells may exist that are not included in the database, particularly in areas now serviced by municipal water that formerly obtained water supply from private wells.

No wells were identified within the Harbourwood WHPA that are considered to have the potential to be a Transport Pathway. The Groundwater Vulnerability map (Figure 11c-2) is therefore proposed to be used to generate the Vulnerability Scores.

#### 11.5.1.4 WHPA-E

None of the wells in this study have been identified as Groundwater Under the Direct Influence (GUDI), therefore delineation of a WHPA-E was not required.

#### 11.5.1.5 Vulnerability Score

The WHPA zones for the Harbourwood Water Supply as shown in Figure 11c-1, and the Groundwater Vulnerability, as shown in Figure 11c-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 11c-3 illustrates the Vulnerability Scores for the Harbourwood WHPA. Figure 11c-3 will be used to assess Drinking Water Threats in Section 11.5.3.

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

The assessment of the uncertainty for the Vulnerability Assessment considers the type, quantity, and quality of available data, the methods used to determine the Groundwater Vulnerability, and the nature of the groundwater flow system.

The Uncertainty Rating assigned for the Vulnerability Assessment Component for the Harbourwood WHPA is High. The Vulnerability Rating for the Harbourwood Water Supply has been determined using decisions and assumptions that would err on the conservative side (higher Vulnerability Scores). In this case, the High Uncertainty Rating reflects that additional data to describe the continuity, thickness, and types of soils within the delineated WHPA could potentially be used to improve the understanding of local hydrostratigraphy and to increase the confidence in the Vulnerability Analysis. For further information, refer to Technical Memorandum A1.

### 11.5.2 Drinking Water Issues Evaluation

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals 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. 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 raw water quality and treated water quality for the Harbourwood Water Supply have 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 the Township of Oro-Medonte Groundwater are provided in Technical Memorandum L1 – Drinking Water Issues Evaluation – Oro-Medonte (Appendix OM).

***No Drinking Water Issues were identified for the Harbourwood Water Supply.***

Several parameters were observed on occasion or in low concentrations that are consistently less than the Ontario Drinking Water Quality Standard (ODWQS) values. Trends of increasing concentrations that would exceed the ODWQS value within 50 years were not observed.

The occasional presence of coliform bacteria in raw or treated water is not considered to represent a specific Drinking Water Issue as these parameters have only been rarely observed under circumstances that are not considered to be persistent. Iron concentrations occasionally exceed aesthetic objectives at the wells. Aesthetic/ operational parameters that exceed guidelines include organic nitrogen and turbidity, which are likely to be naturally-occurring.

### 11.5.3 Drinking Water Threats Evaluation

An assessment of Drinking Water Threats for the Harbourwood Water Supply was completed in accordance with the detailed methodology presented in Technical Memo – A5 (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 Harbourwood Water Supply builds on the information from the Vulnerability Analysis and Issues Evaluation and includes the 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.

#### 11.5.3.1 List of Drinking Water Threats – Activities

The list of Prescribed Drinking Water Threats considered in the assessment for the Harbourwood Drinking 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.***

#### 11.5.3.2 List of Drinking Water Threats – Conditions

Methods used to assess Conditions are described in Technical Memorandum A5 (Appendix MO). The following information sources were consulted to identify existing Conditions that could affect the Harbourwood 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 Township of Oro-Medonte staff to identify potential conditions within the identified WHPA for the drinking water supply.

***No confirmed Conditions have been identified for the Harbourwood Water Supply. No potential Conditions have been identified for consideration at this time.***

#### 11.5.3.3 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 table of drinking water threat circumstances can be used to correlate activities that are or would be Drinking Water Threats with the Vulnerability Scores. The tables can be found at: https://swpip.ca/

##### 11.5.3.3.1 Pathogen Parameters

The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11c-4 to identify the areas where Activities associated with pathogen Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Harbourwood 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.

#### 11.5.3.3.2 Chemical Parameters

The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11c-5 to identify the areas where Activities associated with chemical Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Harbourwood 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 8.

#### 11.5.3.3.3 DNAPL Chemical Parameters

Figure 11c-6 illustrates the area of the 5-year time-of-travel zone (WHPA-C) and areas with a Vulnerability Score of at least 6, where Activities associated with DNAPL parameters are considered to be a Significant Drinking Water Threat for the Harbourwood Water Supply. The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11c-6 to identify the circumstances in which these Activities associated with DNAPL threats would be Significant Drinking Water Threats.

### 11.5.3.4 Identifying Areas of Significant/Moderate/Low Threats – Conditions

Further to Section 11.5.3.2 no Conditions have been confirmed within the WHPA for the Harbourwood 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 11c-3 illustrates the Vulnerability Score map for Harbourwood well supply that can be used to determine where a Condition is or would be a Significant, Moderate, or Low Threat to Drinking Water.

#### 11.5.3.5 Enumerating Drinking Water Threats

The number of Significant Drinking Water Threats for the Harbourwood Water Supply has been determined using the methodology outlined in Technical Memorandum A5 (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 11-5 documents the enumeration of existing and potential activities that are considered to be Significant Drinking Water Threats within the WHPA for the Harbourwood Water Supply.

Sixteen (16) activities that are considered to be Significant Drinking Water Threats were identified in association with 16 land parcels in the WHPA for the Harbourwood Water Supply. Fifteen (15) parcels are identified as having significant threat activities relating to residential land use via the use of private individual sewage disposal systems. One (1) threat activity and parcel has been included to represent the potential for subsurface storage of fuel for home heating purposes within the area where the Vulnerability Score is 10. There are 17 residential parcels within this area.

**Table 11-5: Number of Significant Drinking Water Threats for the Harbourwood Drinking Water Supply.**

| Threat Number | Threat | Significant threat counts<br>Number of threats | Significant threat counts<br>Number of parcels |
|---|---|---|---|
| 1. | The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act. | 0 | 0 |
| 2. | The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage. | 15 | 15 |

| Threat Number | Threat | Significant threat counts Number of threats | Significant threat counts Number of parcels |
|---|---|---|---|
| 3. | The application of agricultural source material to land. | 0 | 0 |
| 4. | The storage of agricultural source material to land. | 0 | 0 |
| 5. | The management of agricultural source material. | 0 | 0 |
| 6. | The application of non-agricultural source material to land. | 0 | 0 |
| 7. | The handling and storage of non-agricultural source material. | 0 | 0 |
| 8. | The application of commercial fertilizer to land. | 0 | 0 |
| 9. | The handling and storage of commercial fertilizer to land. | 0 | 0 |
| 10. | The application of pesticide to land. | 0 | 0 |
| 11. | The handling and storage of pesticide. | 0 | 0 |
| 12. | The application of road salt. | 0 | 0 |
| 13. | The handling and storage of road salt. | 0 | 0 |
| 14. | The storage of snow. | 0 | 0 |
| 15. | The handling and storage of fuel. | 1 | 1 |

| Threat Number | Threat | Significant threat counts Number of threats | Significant threat counts Number of parcels |
|---|---|---|---|
| 16. | The handling and storage of dense non-aqueous phase liquid. | 0 | 0 |
| 17. | The handling and storage of an organic solvent. | 0 | 0 |
| 18. | The management of runoff that contains chemicals used in the de-icing of aircraft. | 0 | 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 | 0 |
| 20. | Any activity that reduces the recharge of an aquifer. | 0 | 0 |
| 21. | The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard. | 0 | 0 |
| 22. | The establishment and operation of a liquid hydrocarbon pipeline | 0 | 0 |
| - | Totals: | 16* | 16 |

*15 verified existing Threats and 1 Threat that requires further verification (2015)

#### 11.5.3.5.1 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 Part XII of the Technical Rules (December 2021).

Managed Lands were identified and the Managed Lands proportions were determined for the WHPA of the Harbourwood Water Supply as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.5.3.5). 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 11c-7 illustrates the location and proportion of Managed Lands within the delineated WHPA zones for the Harbourwood Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D.

#### 11.5.3.5.2 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 Part XII of the Technical Rules (December 2021).

The Livestock Density was determined for the delineated WHPA zones of the Harbourwood Water Supply as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.5.3.5). 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 11c-8 illustrates the distribution of Livestock Density within the delineated WHPA zones for the Harbourwood Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D. The Livestock Density was estimated for the identified Agricultural Managed Lands as determined in accordance with Technical Memorandum A5 (Appendix MO).

#### 11.5.3.5.3 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 Part XII of the Technical Rules (December 2021).

The proportion of Impervious Surfaces within the delineated WHPA zones for the Harbourwood Water Supply was determined in accordance with the methodology in Technical Memorandum A5 (Appendix MO).The results from this analysis were used in the enumeration of Significant

Drinking Water Threats (Section 11.5.3.5). The Impervious Surfaces are used in the identification of threat activities associated with the application of winter de-icing agents (salt).

Figure 11c-9 illustrates the distribution of Impervious Surfaces within the delineated WHPA zones for the Harbourwood Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D.

## 11.6 Maplewood Estates Well supply

The Maplewood Estates Water Supply is located in the southeastern part of the Township of Oro-Medonte, approximately 4 km south of the City of Orillia. The Maplewood Estates Water Supply consists of two water supply wells, Well 1 and well 2, that serves an estimated population of 125 (45 lots) in the Maplewood Estates subdivision based on 2001 data. Well 1 has been in operation since 1973 and Well 2 since 2009.

The Maplewood Estates wells (Wells 1 and 2) operate under the MECP's Amended Permit to Take Water (PTTW) permit number: 0825-89BLY7 which expires December 31, 2020. Under the Permit, Wells 1 and 2 can each operate at a maximum rate of 114 L/min (163,656 L/day). In most circumstances Wells 1 and 2 share the duty of providing water for the Maplewood Estates community. The Permit Holder may operate the two wells simultaneously provided the combined daily taking of water from both wells is limited to the maximum taking of 163,656 L/day.

Well 1 was drilled into a confined sand and gravel aquifer system. It was constructed with a nominal 178 mm diameter steel casing to a depth of 25.3 m and a nominal 127 mm diameter 1.8 m long 18-slot stainless steel screen. Well 2 was drilled into the same confined sand and gravel aquifer system. It was constructed with a nominal 394 mm diameter steel casing to a depth of 24.2 m and a nominal 381 mm diameter, 2.5 m, 14 to 16-slot stainless steel screen.

Both of the Maplewood Estates wells were constructed in the same confined sand and gravel aquifer system and terminate ~1 m into bedrock. The wells are drilled into an overburden aquifer consisting of approximately 3 m of sand and gravel overlain by approximately 24 m of confining materials (till, described as clay with a variable sand and gravel content and cemented sand and gravel). The aquifer is believed to represent the eastern limit of the regional A4 aquifer (also known as the Scarborough Formation) as it pinches out near Lake Simcoe. The recharge area for the municipal aquifer is believed to be located west of the wellfield, where the aquifer is thicker and closer to ground surface.

The screened interval for Wells 1 and 2 has been assigned to the A4 Aquifer in the draft regional hydrostratigraphic model prepared by Golder and Aquaresource (2009). The Groundwater Vulnerability rating will be determined for the A4 Aquifer.

Information presented for the Maplewood Estates section of this Chapter is based on the Genivar 2010a and LSRCA 2020 reports.

### 11.6.1 Groundwater Vulnerability Assessment

The Wellhead Protection Area (WHPA) is the primary Vulnerable Area delineated to ensure the protection of the municipal 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 Maplewood Estates Water Supply has been delineated following the process recommended in the Technical Rules (MOE, 2008a). The areas that were determined to contribute groundwater to the wells within 25 years were delineated as WHPA. The Groundwater Vulnerability within the WHPA was assessed and included consideration for the effects of man-made structures that may increase the vulnerability. The WHPA and the Vulnerability were considered together as per the Technical Rules to determine a Vulnerability Score for the Maplewood Estates WHPA. Details of the methods for the Vulnerability Analysis are provided in Technical Memorandum A1 – Groundwater Vulnerability Assessment Methods (Appendix MO).

#### 11.6.1.1 Wellhead Protection Area (WHPA) Delineation

The WHPA for the Maplewood Estates well was originally delineated in 2005 by Golder using a 2-dimensional analytical groundwater flow model. An updated survey of well locations was commissioned by LSRCA in 2009 to provide improved accuracy for delineation of the WHPA. A minor translation was required to adjust the Maplewood Estates well location and the WHPA. The Maplewood Estates WHPA Delineation was updated by LSRCA in 2020 to incorporate the changes to the size and shape of the WHPA due to the addition of Well 2. The well locations and the WHPA are shown in Figure 11d-1. WHPA delineation and adjustment details are documented in Genivar, 2010a and LASRCA (2020).

WHPA-A has been added to include the 100 m radius from each municipal well. The Golder (2005) study delineated time-of-travel zones (TOT) for Well 1 for 50 days, 2 years, 10 years, and 25 years. WHPA-C, representing the 5 year TOT zone, was estimated under this study as per Technical Memorandum A2 – 5 year time-of-travel Estimation Methods (Appendix MO).

LSRCA's methodology for delineating the new WHPA for Well 2 was simply to include the 100 m radius (WHPA-A) around municipal Well 2 and then use GIS to copy the size, shape, and orientation of the long axis of WHPA-B through D from Well 1 and apply it to Well 2. The same WHPA was determined to be acceptable for both wells in the Maplewood Estates supply system for several reasons. First, the maximum permitted water taking used to delineate the original WHPA has not changed and a condition of the current Permit to Take Water states the Permit Holder may operate the two wells simultaneously provided the combined daily taking of water from both wells is limited to the maximum taking of 163,656 L/day. Second, the 2 municipal wells are in close proximity (approximately 42m apart) and constructed in the same confined aquifer, suggesting they are likely to have similar if not identical WHPAs.

The WHPA reflect groundwater flow from west to east towards Lake Simcoe. This is reasonable based on available data describing regional groundwater flow patterns toward Lake Simcoe.

#### 11.6.1.2 Groundwater Vulnerability

The Maplewood Estates well draws water from a confined overburden aquifer layer (regional aquifer layer A4). The Groundwater Vulnerability for the aquifer in the area was determined using the regional Aquifer Vulnerability Index (AVI) methods outlined in Technical Memorandum A1 – Groundwater Vulnerability Assessment Methods (Appendix MO). The regional Groundwater Vulnerability is illustrated in Technical Memorandum B1 – Regional Groundwater Vulnerability Mapping. ,

The intrinsic Groundwater Vulnerability within the WHPA of the municipal well in the Maplewood Estates Water Supply is shown in Figure 11d-2. The Groundwater Vulnerability for the municipal water supply aquifers within the WHPA is considered to be Low throughout most of the WHPA, and Medium in parts of WHPA-A, WHPA-B, and WHPA-C.

#### 11.6.1.3 Transport Pathway Increase

Technical Memorandum A3 (Appendix MO) 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 to increase the observed vulnerability.

Private wells, and particularly wells that either do not contain seals that will prevent water from moving down around the outside of the well pipe or wells that are no longer used and/or that have not been sealed, present the greatest potential for increasing the rated Vulnerability. The available data from the Provincial Water Well Information System (WWIS) database was

screened to identify wells that penetrate to the water supply aquifers and have potential to increase the Vulnerability of the natural stratigraphic profile. There is the potential that other wells may exist that are not included in the database, particularly in areas now serviced by municipal water that formerly obtained water supply from private wells.

No wells were identified within the Maplewood Estates WHPA that are considered to have the potential to be a Transport Pathway. The Groundwater Vulnerability map (Figure 11d-2) is therefore proposed to be used to generate the Vulnerability Scores.

#### 11.6.1.4 WHPA-E

None of the wells in this study have been identified as Groundwater Under the Direct Influence (GUDI), therefore delineation of a WHPA-E was not required.

#### 11.6.1.5 Vulnerability Score

The WHPA zones for the Maplewood Estates Water Supply, as shown in Figure 11d-1, and the Groundwater Vulnerability, as shown in Figure 11d-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 11d-3 illustrates the Vulnerability Scores for the Maplewood Estates WHPA. Figure 11d-3 will be used to assess Drinking Water Threats in Section 11.6.3.

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

The assessment of the uncertainty for the Vulnerability Assessment considers the type, quantity, and quality of available data, the methods used to determine the Groundwater Vulnerability, and the nature of the groundwater flow system.

The Uncertainty Rating assigned for the Vulnerability Assessment Component of the Maplewood Estates WHPA is High. The Vulnerability Rating for the Maplewood Estates Water

Supply has been determined using decisions and assumptions that would err on the conservative side (higher Vulnerability Scores). In this case, the High Uncertainty Rating reflects that additional data to describe the continuity, thickness, and types of soils within the delineated WHPA could potentially be used to improve the understanding of local hydrostratigraphy and to increase the confidence in the Vulnerability Analysis. For further information, refer to Technical Memorandum A1 (Appendix MO).

The Uncertainty Rating for the Maplewood Estates WHPA was not changed as part of the 2020 update and was left as a High Uncertainty Rating. The quantity of available geologic and hydrogeologic data in the area of the WHPA has not changed significantly since the original uncertainty analysis was conducted by Dillon Consulting (2010) and therefore the Uncertainty Rating should not change.

### 11.6.2 Drinking Water Issues Evaluation

The intent of the Issues Evaluation is to identify parameters (e.g. chemicals 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. 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). 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 raw water quality and treated water quality for the Maplewood Estates Water Supply have 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 the Maplewood Estates Water Supply are provided in Technical Memorandum L1 – Drinking Water Issues Evaluation – Oro-Medonte (Appendix OM).

***No Drinking Water Issues were identified for the Maplewood Estates Water Supply.***

Several parameters were observed on occasion or in low concentrations that are consistently less than the Ontario Drinking Water Quality Standard (ODWQS) values. Trends of increasing concentrations that would exceed the ODWQS value within 50 years were not observed,

The occasional presence of coliform bacteria in raw or treated water is not considered to represent a specific Drinking Water Issue as these parameters have only been rarely observed under circumstances that are not considered to be persistent. Iron concentrations occasionally

exceed aesthetic objectives at the well. Aesthetic/operational parameters that exceed guidelines include organic nitrogen and turbidity, which are likely to be naturally-occurring.

### 11.6.3 Drinking Water Threats Evaluation

An assessment of Drinking Water Threats for the Maplewood Estates Water Supply was originally completed in accordance with the detailed methodology presented in Technical Memo – A5 (Appendix MO). In 2020, following the update to the WHPA mapping and vulnerability scoring the assessment of existing drinking water threats for the Maplewood Estates Well Supply was also updated. 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 Maplewood Estates Water Supply builds on the information from the Vulnerability Analysis and Issues Evaluation and includes the 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.

#### 11.6.3.1 List of Drinking Water Threats – Activities

The list of Prescribed Drinking Water Threats considered in the assessment for the Maplewood Estates Drinking 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.***

#### 11.6.3.2 List of Drinking Water Threats – Conditions

Methods used to assess Conditions are described in Technical Memorandum A5 (Appendix MO). The following information sources were consulted to identify existing Conditions that could affect the Maplewood Estates 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 Township of Oro-Medonte staff to identify potential conditions within the identified WHPA for the drinking water supply.

***No confirmed Conditions have been identified for the Maplewood Estates Water Supply. No potential Conditions have been identified for consideration at this time.***

#### 11.6.3.3 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 table of drinking water threat circumstances can be used to correlate activities that are or would be Drinking Water Threats with the Vulnerability Scores. The tables can be found at: https://swpip.ca/

##### 11.6.3.3.1 Pathogen Parameters

The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11d-4 to identify the areas where Activities associated with pathogen Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Maplewood Estates 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.

##### 11.6.3.3.2 Chemical Parameters

The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11d-5 to identify the areas where Activities associated with chemical Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Maplewood

Estates 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 8.

#### 11.6.3.3.3 DNAPL Chemical Parameters

Figure 11d-6 illustrates the area of the 5-year time-of-travel zone (WHPA-C) and areas with a Vulnerability Score of at least 6, where activities associated with DNAPL parameters are considered to be a Significant Drinking Water Threat for the Maplewood Estates Water Supply. The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11d-6 to identify the circumstances in which these Activities associated with DNAPL threats would be Significant or Moderate Drinking Water Threats.

### 11.6.3.4 Identifying Areas of Significant/Moderate/Low Threats – Conditions

Further to Section 11.6.3.2, no Conditions have been confirmed within the WHPA for the Maplewood Estates 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. Conditions can only be identified as a significant risk if they are located in Issue Contributing Areas and may contribute to the Issue associated with these areas.

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 11d-3 illustrates the Vulnerability Score map for Maplewood Estates well supply that can be used to determine where a Condition is or would be a Significant, Moderate, or Low Threat to Drinking Water.

### 11.6.3.5 Enumerating Drinking Water Threats

The number of Significant Drinking Water Threats for the Maplewood Estates Water Supply was originally determined using the methodology outlined in Technical Memorandum A5 (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. In 2020, following the update to the WHPA mapping and vulnerability scoring the assessment of existing drinking water threats for the Maplewood Estates Well Supply was also updated. As such, Table 11-6 documents the enumeration of existing and confirmed activities that are considered to be Significant Drinking Water Threats within the WHPA for the Maplewood Estates Water Supply. There are no Significant Threats associated with Conditions or Drinking Water Issues.

Following the update to the WHPA mapping in 2020 there are now a total of ten (10) activities that are considered to be Significant Drinking Water Threats identified in association with ten (10) land parcels within the WHPA for the Maplewood Estates Water Supply. Nine (9) parcels are identified as having significant threat activities relating to residential land use via the use of private individual sewage disposal systems. One (1) threat activity and parcel was included to represent the potential for subsurface storage of fuel for home heating purposes within the area where the Vulnerability Score is 10.

**Table 11-6: Number of Significant Drinking Water Threats for the Maplewood Estates Drinking Water Supply.**

| Threat Number | Threat | Significant threat counts<br>Number of threats | Significant threat counts<br>Number of parcels |
|---|---|---|---|
| 1. | The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act. | 0 | 0 |

| Threat Number | Threat | Significant threat counts Number of threats | Significant threat counts Number of parcels |
|---|---|---|---|
| 2. | The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage. | 4 | 4 |
| 3. | The application of agricultural source material to land. | 0 | 0 |
| 4. | The storage of agricultural source material to land. | 0 | 0 |
| 5. | The management of agricultural source material. | 0 | 0 |
| 6. | The application of non-agricultural source material to land. | 0 | 0 |
| 7. | The handling and storage of non-agricultural source material. | 0 | 0 |
| 8. | The application of commercial fertilizer to land. | 0 | 0 |
| 9. | The handling and storage of commercial fertilizer to land. | 0 | 0 |
| 10. | The application of pesticide to land. | 0 | 0 |
| 11. | The handling and storage of pesticide. | 0 | 0 |
| 12. | The application of road salt. | 0 | 0 |
| 13. | The handling and storage of road salt. | 0 | 0 |
| 14. | The storage of snow. | 0 | 0 |

| Threat Number | Threat | Significant threat counts Number of threats | Significant threat counts Number of parcels |
|---|---|---|---|
| 15. | The handling and storage of fuel. | 1 | 1 |
| 16. | The handling and storage of dense non-aqueous phase liquid. | 0 | 0 |
| 17. | The handling and storage of an organic solvent. | 0 | 0 |
| 18. | The management of runoff that contains chemicals used in the de-icing of aircraft. | 0 | 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 | 0 |
| 20. | Any activity that reduces the recharge of an aquifer. | 0 | 0 |
| 21. | The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard. | 0 | 0 |
| 22. | The establishment and operation of a liquid hydrocarbon pipeline | 0 | 0 |
| - | Totals: | *5 | 5 |

*4 verified Threats and 1 potential Threat that requires further verification (2015)

#### 11.6.3.5.1 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 Part XII of the Technical Rules (December 2021).

Managed Lands were identified and the managed lands proportions were determined for the WHPA of the Maplewood Estates Water Supply as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.6.3.5). 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 11d-7 illustrates the location and proportion of Managed Lands within the delineated WHPA zones for the Maplewood Estates Water Supply.

#### 11.6.3.5.2 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 Part XII of the Technical Rules (December 2021).

The Livestock Density was determined for the delineated WHPA zones of the Maplewood Estates Water Supply as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.6.3.5). 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 11d-8 illustrates the distribution of Livestock Density within the delineated WHPA zones for the Maplewood Estates Water Supply where Vulnerability Scores. The Livestock Density was estimated for the identified Agricultural Managed Lands as determined in accordance with Technical Memorandum A5 (Appendix MO).

#### 11.6.3.5.3 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 Part XII of the Technical Rules (December 2021).

The proportion of Impervious Surfaces within the delineated WHPA zones for the Maplewood Estates Water Supply was determined in accordance with the methodology in Technical

Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.6.3.5). The Impervious Surfaces are used in the identification of threat activities associated with the application of winter de-icing agents (salt).

Figure 11d-9 illustrates the distribution of Impervious Surfaces within the delineated WHPA zones for the Maplewood Estates Well Supply.

## 11.7 Shanty Bay Well Supply

The Shanty Bay Well Supply is located in the southern part of the Township of Oro-Medonte off of Ridge Road between the 2nd and 3rd Lines South, approximately 4.5 km east of the City of Barrie. The Shanty Bay Water Supply consists of three water supply wells: Well 1, Well 2, and Well 3. The wells serve an estimated population of 210 (94 lots) in the Shanty Bay subdivision, based on 2001 data. Well 1 has been in operation since 1975, Well 2 has been in operation since 1979, and Well 3 has been in operation since 2005.

According to the Permit to Take Water (PTTW) #7520-6LJTGX issued on January 31 2006 and which expires on April 30 2015, the rated capacity for Wells 1 and 2 is 305 $m^3$/day, while Well 3 has a rated capacity of 610 $m^3$/day. The total treatment system capacity shall not exceed the maximum flow rate of 1220 $m^3$/day.

Well 2 was drilled into the upper part of a confined sand and gravel aquifer while Well 1 and Well 3 were drilled into the lower part. Well 1 was constructed with a nominal 152 mm diameter steel casing from surface to a depth of 55.5 m with a nominal 152 mm diameter 20 and 25-slot stainless steel screen set from 54 to 58.5 mbgl. Well 2 was constructed with a nominal 152 mm diameter steel casing from surface to a depth of 40.5 m with a nominal 152 mm diameter 18 and 20-slot stainless steel screen set from 40.8 to 45.4 mbgl. Well 3 was constructed with a nominal 203 mm diameter telescoping 16-slot stainless steel screen, 7.3 metres in length, and was set between 59.1 and 65.8 mbgl.

Well 2 is drilled into the upper part uppermost aquifer which consists of sand to sand and gravel and is locally present between approximately 200 to 215 masl (35 to 50 mbgl). This aquifer is overlain locally by aquitard materials described as clay and sand or clay and gravel (till). It is separated from the underlying aquifer by approximately 4 m of clay or clay till. Wells 1 and 3 are completed in the lower part of the uppermost aquifer and is reported to consist of sand at these locations, although also containing silt and a minor component of clay at Well 3. The recharge area for the aquifers is believed to be located north of the wellfield.

The screen interval for Well 1, Well 2, and Well 3 has been assigned to the A2, A3 and A2 Aquifers respectively, in the draft regional hydrostratigraphic model prepared by Golder and Aquaresource (2009). The Groundwater Vulnerability rating will be determined for the A2 and A3 Aquifers.

Information presented for the Bayshore Village section of this Chapter is based on Genivar 2010a report.

### 11.7.1 Groundwater Vulnerability Assessment

The Wellhead Protection Area (WHPA) is the primary Vulnerable Area delineated to ensure the protection of the municipal 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 Shanty Bay Water Supply has been delineated following the process recommended in the Technical Rules (MOE, 2008a). The areas that were determined to contribute groundwater to the wells within 25 years were delineated as WHPA. The Groundwater Vulnerability within the WHPA was assessed and included consideration for the effects of man-made structures that may increase the vulnerability. The WHPA and the Vulnerability were considered together as per the Technical Rules to determine a Vulnerability Score for the Shanty Bay WHPA. Details of the methods for the Vulnerability Analysis are provided in Technical Memorandum A1 – Groundwater Vulnerability Assessment Methods (Appendix MO).

#### 11.7.1.1 Wellhead Protection Area (WHPA) Delineation

The WHPA for the Shanty Bay wells was delineated in 2005 by Golder using a 2-dimensional analytical groundwater flow model. An updated survey of well locations was commissioned by LSRCA in 2009 to provide improved accuracy for delineation of the WHPA. A minor translation was required to adjust the Shanty Bay well locations and the WHPA. The updated well locations and the WHPA are shown in Figure 11e-1. WHPA delineation and adjustment details are documented in GENIVAR, 2010a.

WHPA-A has been added to include the 100 m radius from each municipal well. The Golder (2005) study delineated time-of-travel zones (TOT) for 50 days, 2 years, 10 years, and 25 years. WHPA-C, representing the 5 year TOT zone, was estimated under this study as per Technical Memorandum A2 – 5 year time-of-travel Estimation Methods (Appendix MO).

The WHPA reflects groundwater flow from north to south towards Lake Simcoe. This is reasonable based on available data describing regional groundwater flow patterns.

#### 11.7.1.2 Groundwater Vulnerability

The Shanty Bay wells draw water from a confined overburden aquifer layer (regional aquifer systems A2 and A3). The Groundwater Vulnerability for the aquifer in the area was determined using the regional Aquifer Vulnerability Index (AVI) methods outlined in Technical Memorandum A1 – Groundwater Vulnerability Assessment Methods (Appendix MO). The regional Groundwater Vulnerability is illustrated in Technical Memorandum B1 – Regional Groundwater Vulnerability Mapping.

The Groundwater Vulnerability within the WHPA of the two municipal wells in the Shanty Bay Water Supply is shown in Figure 11e-2. The Groundwater Vulnerability for the municipal water supply aquifers within the WHPA is considered to be Low.

#### 11.7.1.3 Transport Pathway Increase

Technical Memorandum A3 (Appendix MO) 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 to increase the observed vulnerability.

Private wells, and particularly wells that either do not contain seals that will prevent water from moving down around the outside of the well pipe or wells that are no longer used and/or that have not been sealed, present the greatest potential for increasing the rated Vulnerability. The available data from the Provincial Water Well Information System (WWIS) database was screened to identify wells that penetrate to the water supply aquifers and have the potential to increase the Vulnerability of the natural stratigraphic profile. There is potential that other wells may exist that are not included in the database, particularly in areas now serviced by municipal water that formerly obtained water supply from private wells.

No wells were identified within the Shanty Bay WHPA that are considered to have the potential to be a Transport Pathway. The Groundwater Vulnerability map (Figure 11e-2) is therefore proposed to be used to generate the Vulnerability Scores.

#### 11.7.1.4 WHPA-E

None of the wells in this study have been identified as Groundwater Under the Direct Influence (GUDI), therefore delineation of a WHPA-E was not required.

#### 11.7.1.5 Vulnerability Score

The WHPA zones for the Shanty Bay Water Supply, as shown in Figure 11e-1, and the Groundwater Vulnerability, as shown in Figure 11e-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 11e-3 illustrates the Vulnerability Scores for the Shanty Bay WHPA. Figure 11e-3 will be used to assess Drinking Water Threats in Section 11.7.3.

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

The assessment of the uncertainty for the Vulnerability Assessment considers the type, quantity, and quality of available data, the methods used to determine the Groundwater Vulnerability, and the nature of the groundwater flow system.

The Uncertainty Rating assigned for the Vulnerability Assessment Component for the Shanty Bay WHPA is High. The Vulnerability Rating for the Shanty Bay Water Supply has been determined using decisions and assumptions that would err on the conservative side (higher Vulnerability Scores). In this case, the High Uncertainty Rating reflects that additional data to describe the continuity, thickness, and types of soils within the delineated WHPA could potentially be used to improve the understanding of local hydrostratigraphy and to increase the confidence in the Vulnerability Analysis. For further information refer to Technical Memorandum A1 (Appendix MO).

### 11.7.2 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 raw water quality and treated water quality for the Shanty Bay Water Supply have 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 the Township of Oro-Medonte Groundwater are provided in Technical Memorandum L1 – Drinking Water Issues Evaluation – Oro-Medonte (Appendix OM).

***No Drinking Water Issues were identified for the Shanty Bay Water Supply.***

Several parameters were observed on occasion or in low concentrations that are consistently less than the Ontario Drinking Water Quality Standard (ODWQS) values. Trends of increasing concentrations that would exceed the ODWQS value within 50 years were not observed.

The occasional presence of coliform bacteria in raw or treated water is not considered to represent a specific Drinking Water Issue as these parameters have only been rarely observed under circumstances that are not considered to be persistent. Iron concentrations occasionally exceed aesthetic objectives at the wells. Aesthetic/operational parameters that exceed guidelines include organic nitrogen and turbidity, which are likely to be naturally-occurring.

### 11.7.3 Drinking Water Threats Evaluation

An assessment of Drinking Water Threats for the Shanty Bay Water Supply was completed in accordance with the detailed methodology presented in Technical Memo – A5 (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 Shanty Bay Water Supply builds on the information from the Vulnerability Analysis and Issues Evaluation and includes the 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.

#### 11.7.3.1 List of Drinking Water Threats – Activities

The list of Prescribed Drinking Water Threats considered in the assessment for the Shanty Bay Drinking 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.***

#### 11.7.3.2 List of Drinking Water Threats – Conditions

Methods used to assess Conditions are described in Technical Memorandum A5 (Appendix MO). The following information sources were consulted to identify existing Conditions that could affect the Shanty Bay 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 Township of Oro-Medonte staff to identify potential conditions within the identified WHPA for the drinking water supply.

***No confirmed Conditions have been identified for the Shanty Bay Water Supply. No potential Conditions have been identified for consideration at this time.***

#### 11.7.3.3 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 table of drinking water threat circumstances can be used to correlate activities that are

or would be Drinking Water Threats with the Vulnerability Scores. The tables can be found at: https://swpip.ca/.

#### 11.7.3.3.1 Pathogen Parameters

The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11e-4 to identify the areas where Activities associated with pathogen Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Shanty Bay 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.

#### 11.7.3.3.2 Chemical Parameters

The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11e-5 to identify the areas where Activities associated with chemical Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Shanty Bay 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 8.

#### 11.7.3.3.3 DNAPL Chemical Parameters

Figure 11e-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 Shanty Bay Water Supply. The MECP table of drinking water threats can be used in conjunction with the Vulnerability Scores on Figure 11e-6 to identify the circumstances in which these Activities associated with DNAPL threats would be Significant Drinking Water Threats.

### 11.7.3.4 Identifying Areas of Significant/Moderate/Low Threats – Conditions

Further to Section 11.7.3.2, no Conditions have been confirmed within the WHPA for the Shanty Bay 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 11e-3 illustrates the Vulnerability Score map for Shanty Bay Water Supply that can be used to determine where a Condition is or would be a Significant, Moderate, or Low Threat to Drinking Water.

#### 11.7.3.5 Enumerating Drinking Water Threats

The number of Significant Drinking Water Threats for the Shanty Bay Water Supply has been determined using the methodology outlined in Technical Memorandum A5 (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 11-7 documents the enumeration of existing and potential activities that are considered to be Significant Drinking Water Threats within the WHPA for the Shanty Bay Water Supply.

Sixteen (16) activities that are considered to be potential Significant Drinking Water Threats were identified in association with sixteen (16) land parcels in the WHPA for the Shanty Bay Water Supply. Fifteen (15) parcels are identified as having significant threat activities relating to residential land use via the use of private individual sewage disposal systems. One (1) threat activity and parcel has been included to represent the potential for subsurface storage of fuel for home heating purposes within the area where the Vulnerability Score is 10. There are 18 residential parcels within this area.

**Table 11-7: Number of Significant Drinking Water Threats for the Shanty Bay Drinking Water Supply.**

| Threat Number | Threat | Significant threat counts Number of threats | Significant threat counts Number of parcels |
|---|---|---|---|
| 1. | The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act. | 0 | 0 |
| 2. | The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage. | 15 | 15 |
| 3. | The application of agricultural source material to land. | 0 | 0 |
| 4. | The storage of agricultural source material to land. | 0 | 0 |
| 5. | The management of agricultural source material. | 0 | 0 |
| 6. | The application of non-agricultural source material to land. | 0 | 0 |
| 7. | The handling and storage of non-agricultural source material. | 0 | 0 |
| 8. | The application of commercial fertilizer to land. | 0 | 0 |
| 9. | The handling and storage of commercial fertilizer to land. | 0 | 0 |
| 10. | The application of pesticide to land. | 0 | 0 |

| Threat Number | Threat | Significant threat counts Number of threats | Significant threat counts Number of parcels |
|---|---|---|---|
| 11. | The handling and storage of pesticide. | 0 | 0 |
| 12. | The application of road salt. | 0 | 0 |
| 13. | The handling and storage of road salt. | 0 | 0 |
| 14. | The storage of snow. | 0 | 0 |
| 15. | The handling and storage of fuel. | 1 | 1 |
| 16. | The handling and storage of dense non-aqueous phase liquid. | 0 | 0 |
| 17. | The handling and storage of an organic solvent. | 0 | 0 |
| 18. | The management of runoff that contains chemicals used in the de-icing of aircraft. | 0 | 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 | 0 |
| 20. | Any activity that reduces the recharge of an aquifer. | 0 | 0 |
| 21. | The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard. | 0 | 0 |
| 22. | The establishment and operation of a liquid hydrocarbon pipeline | 0 | 0 |
| - | Totals: | 16 | 16 |

*14 verified Threats and 2 potential Threats that require further verification (2015)

#### 11.7.3.5.1 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 Part XII of the Technical Rules (December 2021).

Managed Lands were identified and the Managed Lands proportions were determined for the WHPA of the Shanty Bay Water Supply as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.7.3.5). 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 11e-7 illustrates the proportion of Managed Lands within the delineated WHPA zones for the Shanty Bay Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D.

#### 11.7.3.5.2 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 Part XII of the Technical Rules (December 2021).

The Livestock Density was determined for the delineated WHPA zones of the Shanty Bay Water Supply as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.7.3.5). 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 11e-8 illustrates the distribution of Livestock Density within the delineated WHPA zones for the Shanty Bay Water Supply where Vulnerability Scores were greater than 6 for WHPA-A to WHPA-D. The Livestock Density was estimated for the identified Agricultural Managed Lands as determined in accordance with Technical Memorandum A5 (Appendix MO).

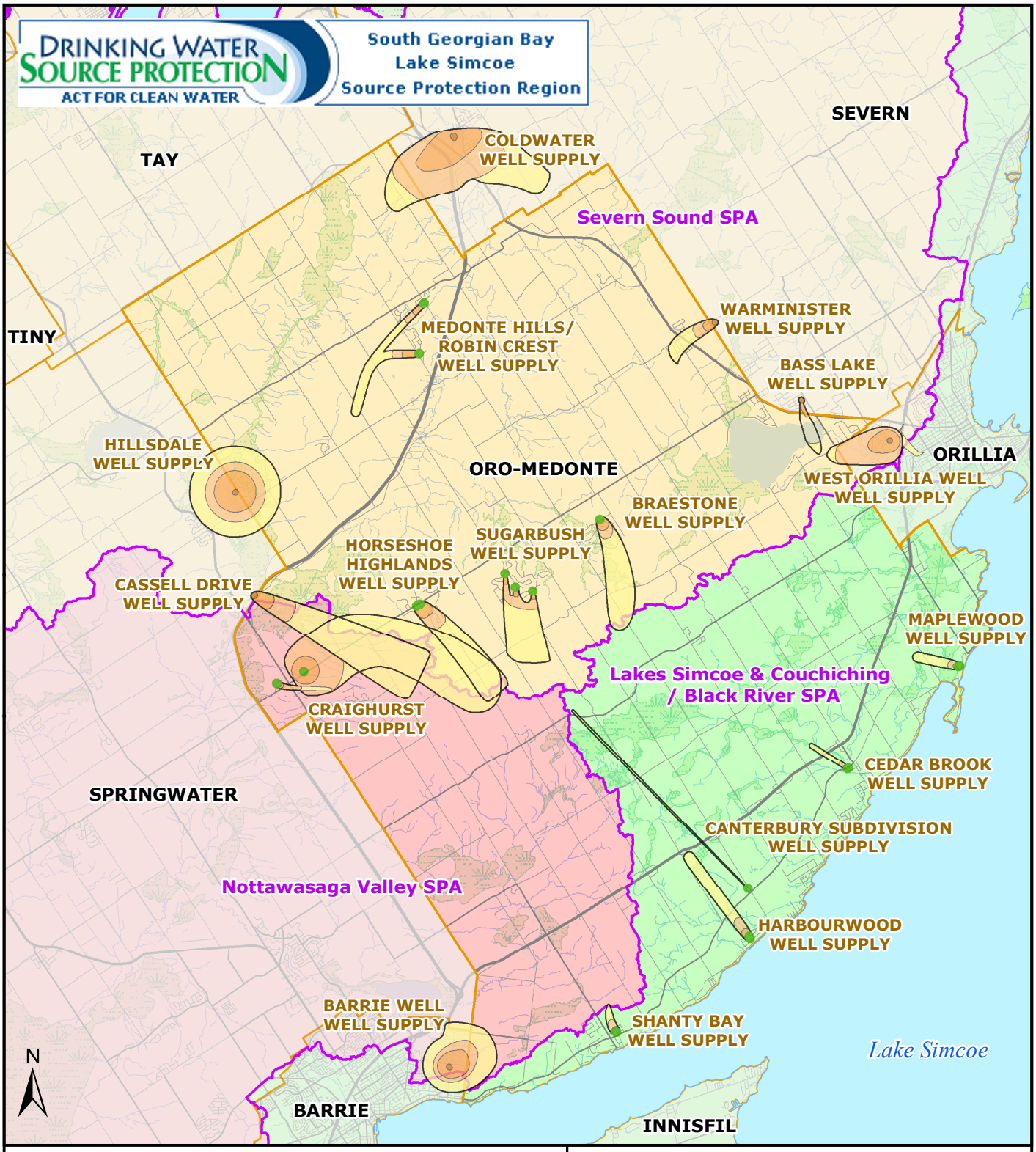
#### 11.7.3.5.3 Impervious Surfaces

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 Part XII of the Technical Rules (December 2021).

The proportion of Impervious Surfaces within the delineated WHPA zones for the Shanty Bay Water Supply was determined in accordance with the methodology in Technical Memorandum A5 (Appendix MO).The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 11.7.3.5). The Impervious Surfaces are used in the identification of threat activities associated with the application of winter de-icing agents (salt).

Figure 11e-9 illustrates the distribution of Impervious Surfaces within the delineated WHPA zones for the Shanty Bay Water Supply where vulnerability scores were greater than 6 for WHPA-A to WHPA-D.

**Figure 11-1: Drinking Water System Vulnerable Areas, Oro-Medonte**




- Municipal Supply Wells
- WHPA-A (100m)
- WHPA-B (2 years time of travel)
- WHPA-C (5 years time of travel)
- WHPA-D (25 years time of travel)
- Source Protection Area Boundary
- Municipality Boundary

**Drinking Water System Vulnerable Areas Township of Oro-Medonte**

Created by: LSRCA, 2024-01-25

Scale 1:200,000

0 3 6 9km

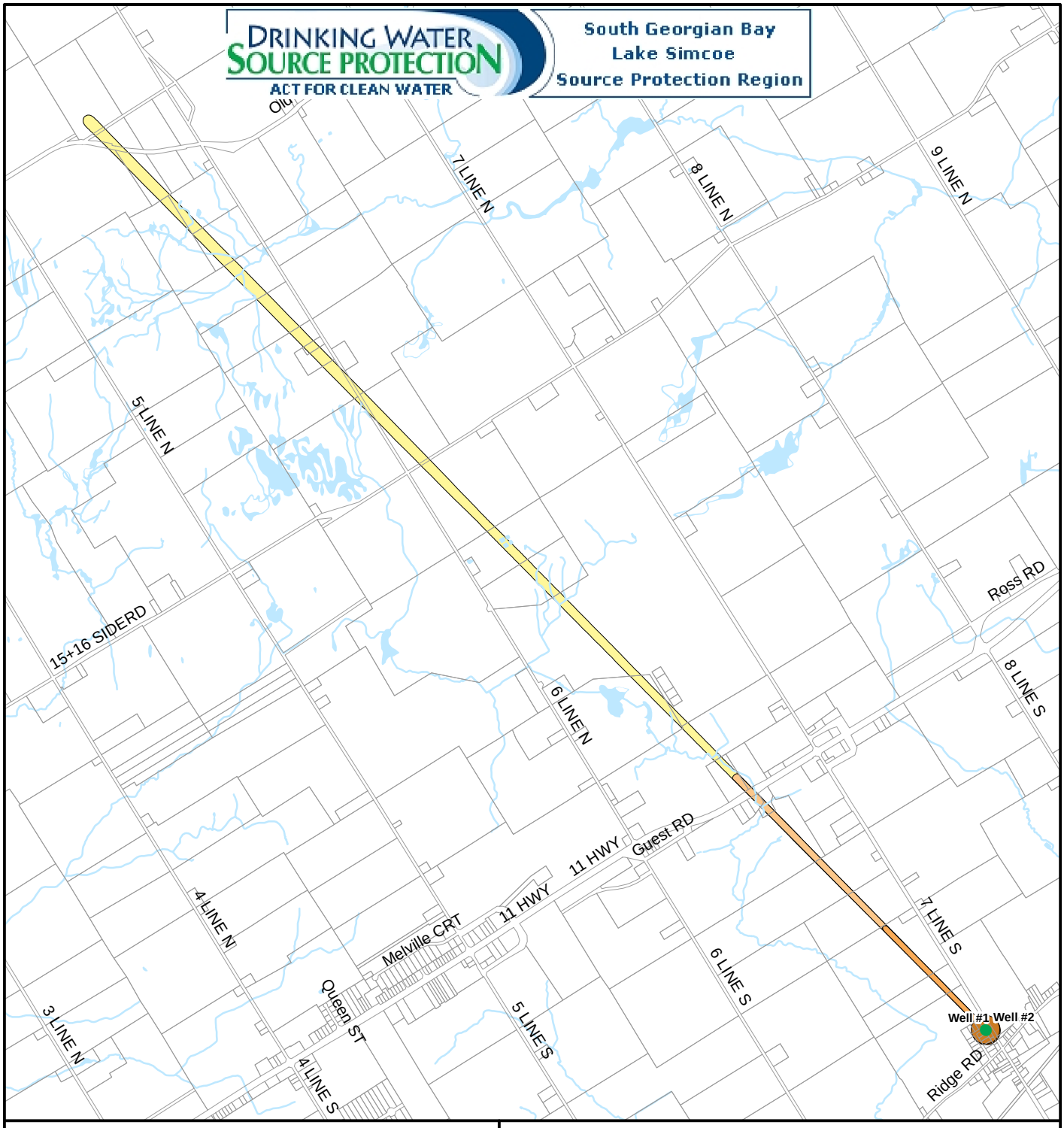
UTM Zone 17N, NAD83

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.

Ontario

**Figure 11-1**

**Figure 11a-1: Wellhead Protection Areas - Canterbury.**




**Legend**

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

N W E S

500 250 0 500 Metres

# WELLHEAD PROTECTION AREAS - CANTERBURY, ORO-MEDONTE

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:40000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.1-1 |

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 **11a-1**

**Figure 11a-2: Groundwater Vulnerability - Canterbury.**


# GROUNDWATER VULNERABILITY - CANTERBURY

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:40000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.1-2 |

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 11a-2

**Figure 11a-3: Vulnerability Scores - Canterbury.**


# VULNERABILITY SCORES - CANTERBURY

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

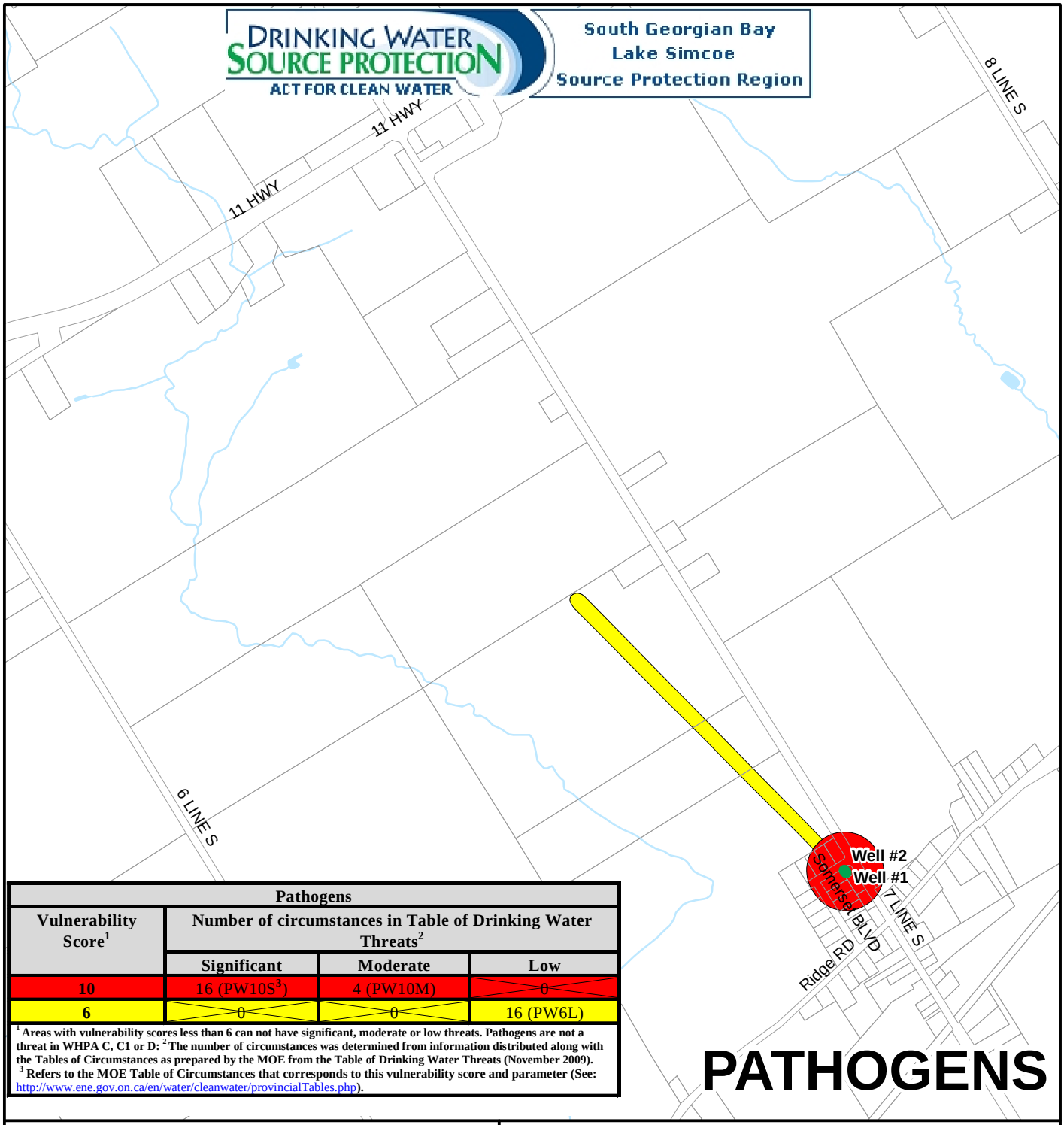
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:40000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.1-5 |

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.

GENIVAR Ontario

FIGURE 11a-3

**Figure 11a-4: Areas where Pathogens are or would be Significant, Moderate or Low Threats - Canterbury.**




| Pathogens | | | |
|---|---|---|---|
| Vulnerability Score[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| 10 | 16 (PW10S[3]) | 4 (PW10M) | ~~0~~ |
| 6 | ~~0~~ | ~~0~~ | 16 (PW6L) |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. Pathogens are not a threat in WHPA C, C1 or D: [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009).
[3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6

N W E S

200 100 0 200 Metres

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.

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.

**AREAS WHERE PATHOGENS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - CANTERBURY**

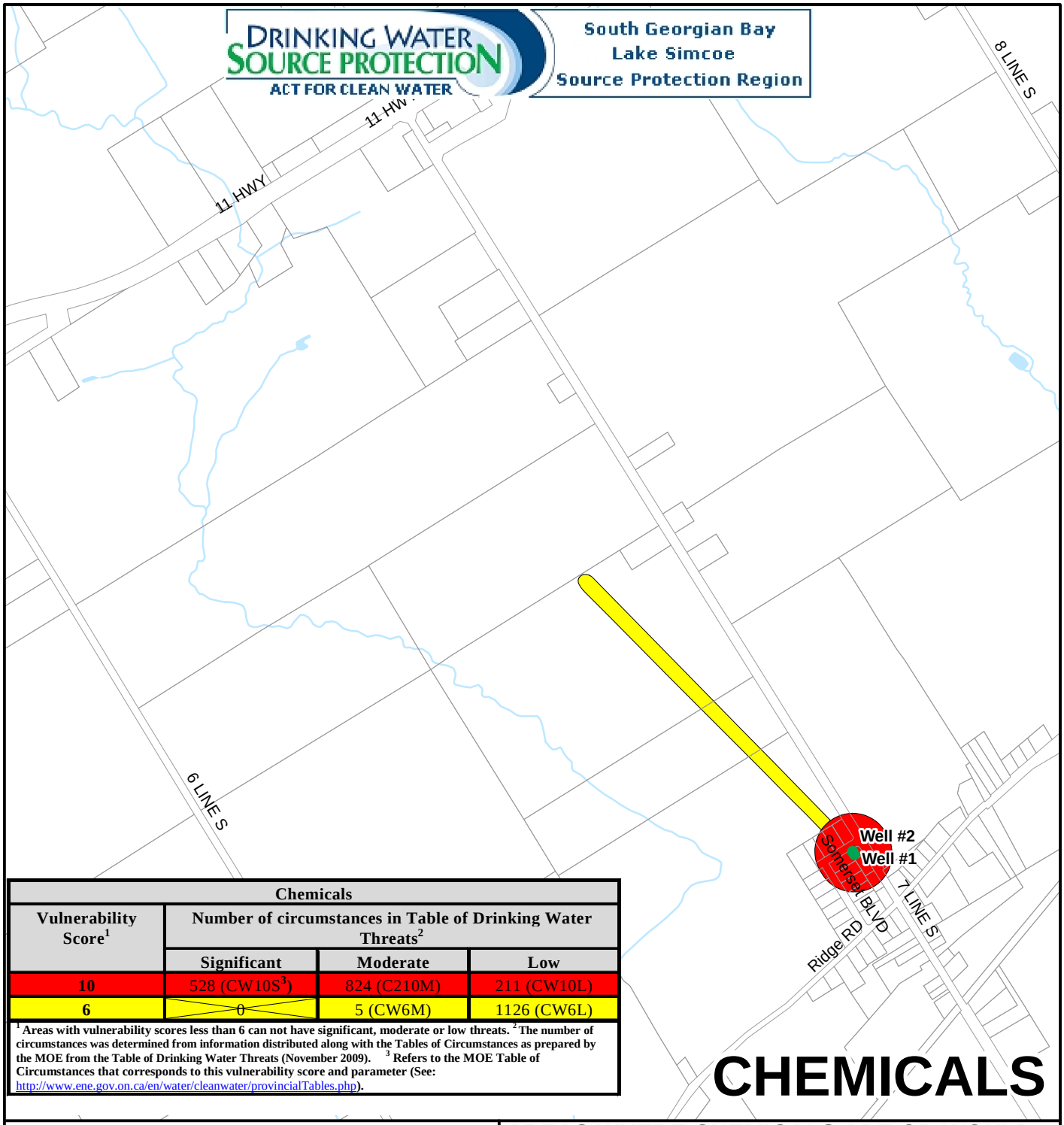
ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.1-6 |

GENIVAR Ontario

FIGURE **11a-4**

**Figure 11a-5: Areas where Chemicals are or would be Significant, Moderate or Low Threats - Canterbury.**




| Chemicals | | | |
|---|---|---|---|
| Vulnerability Score[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| 10 | 528 (CW10S[3]) | 824 (C210M) | 211 (CW10L) |
| 6 | ~~0~~ | 5 (CW6M) | 1126 (CW6L) |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009). [3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6

N W E S

200 100 0 200 Metres

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.

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.

**AREAS WHERE CHEMICALS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - CANTERBURY**

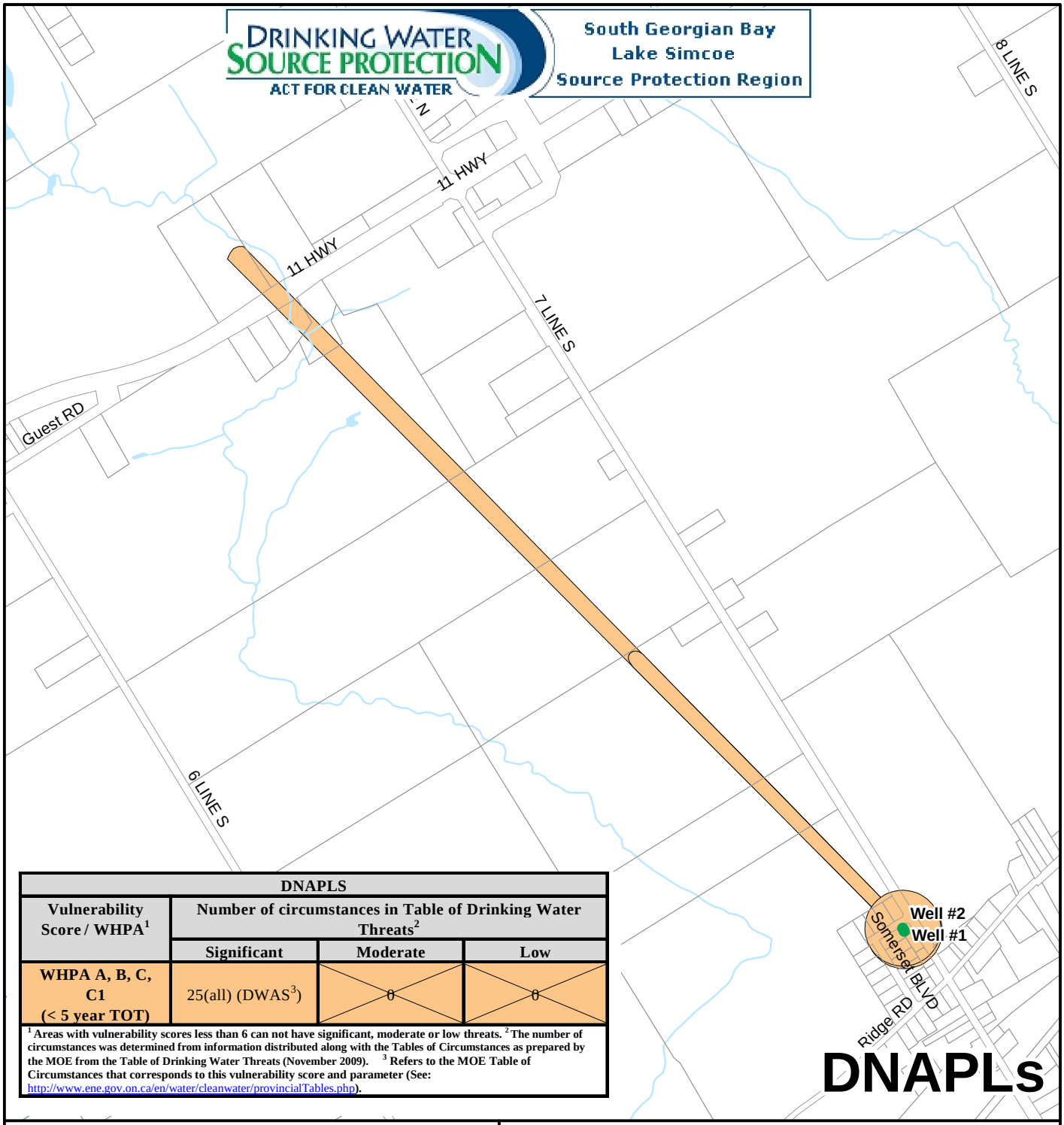
ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.1-7 |

GENIVAR Ontario

FIGURE **11a-5**

**Figure 11a-6: Areas where DNAPLs are or would be Significant, Moderate or Low Threats - Canterbury.**




| DNAPLS | | | |
|---|---|---|---|
| **Vulnerability Score / WHPA[1]** | **Number of circumstances in Table of Drinking Water Threats[2]** | | |
| | **Significant** | **Moderate** | **Low** |
| **WHPA A, B, C, C1 (< 5 year TOT)** | 25(all) (DWAS[3]) | 0 | 0 |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009). [3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

LEGEND

- MUNICIPAL WELL LOCATION
- WHPA-C: 5 YEAR TIME-OF-TRAVEL

N W E S

200 100 0 200 Metres

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.

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**AREAS WHERE DNAPLS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - CANTERBURY**

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.1-8 |

GENIVAR Ontario

FIGURE **11a-6**

**Figure 11a-7: Managed Lands - Canterbury.**


**Legend**

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

N W E S

150 75 0 150 Metres

# MANAGED LANDS - CANTERBURY

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.1-9 |

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 **11a-7**

**Figure 11a-8: Livestock Density - Canterbury.**


**Legend**

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

N W E S

200 100 0 200 Metres

# LIVESTOCK DENSITY - CANTERBURY

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.1-10 |

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 **11a-8**

**Figure 11a-9: Impervious Surfaces - Canterbury.**


**Legend**

MUNICIPAL WELL LOCATION

**IMPERVIOUS SURFACE**

<1%

>1% and <8%

>8% and <80%

N W E S

200 100 0 200 Metres

# IMPERVIOUS SURFACES - CANTERBURY

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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

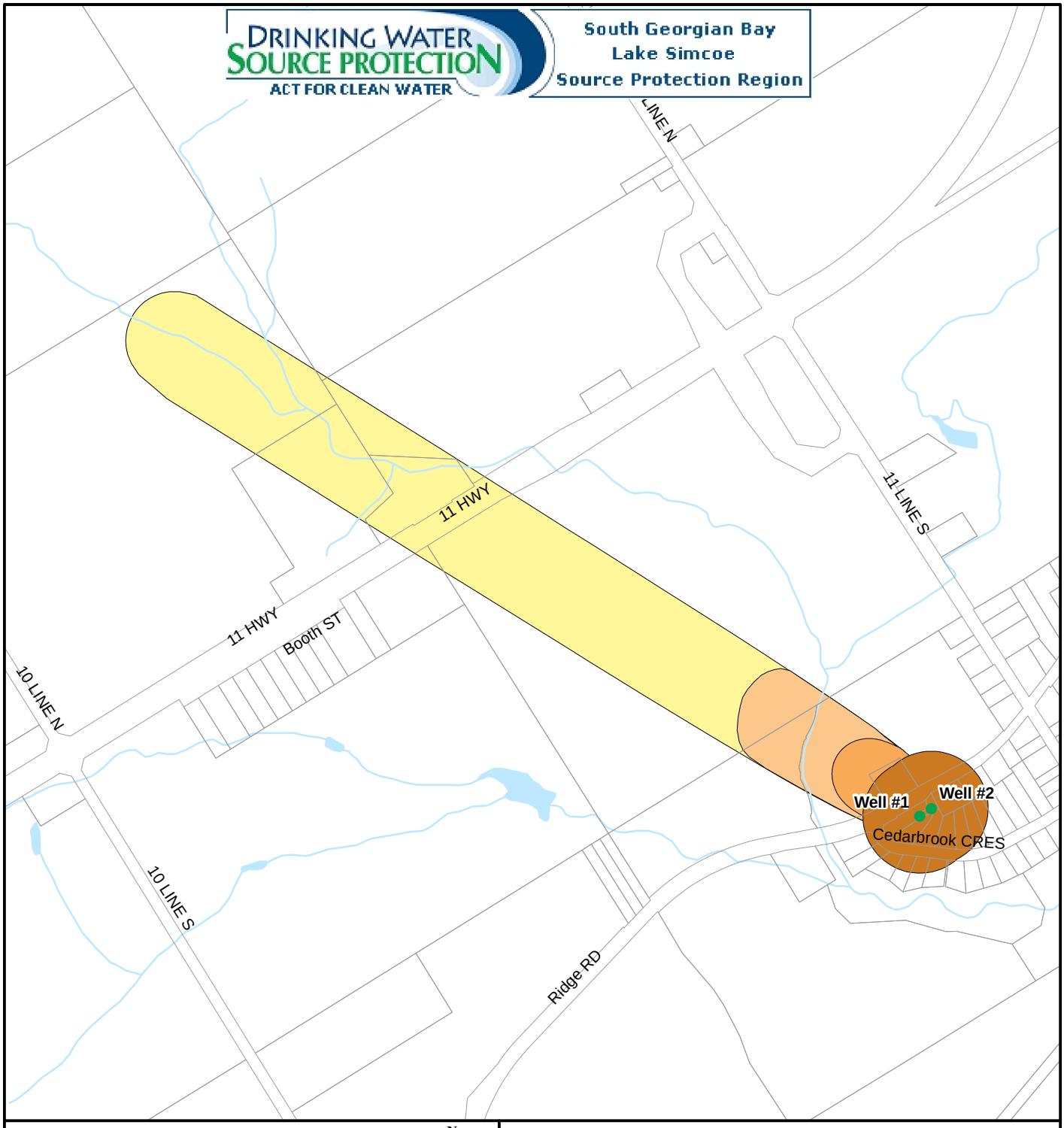
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.1-11 |

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 11a-9

**Figure 11b-1: Wellhead Protection Areas - Cedar Brook.**




**Legend**

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

N W E S

100 50 0 100 Metres

## WELLHEAD PROTECTION AREAS - CEDARBROOK, ORO-MEDONTE

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

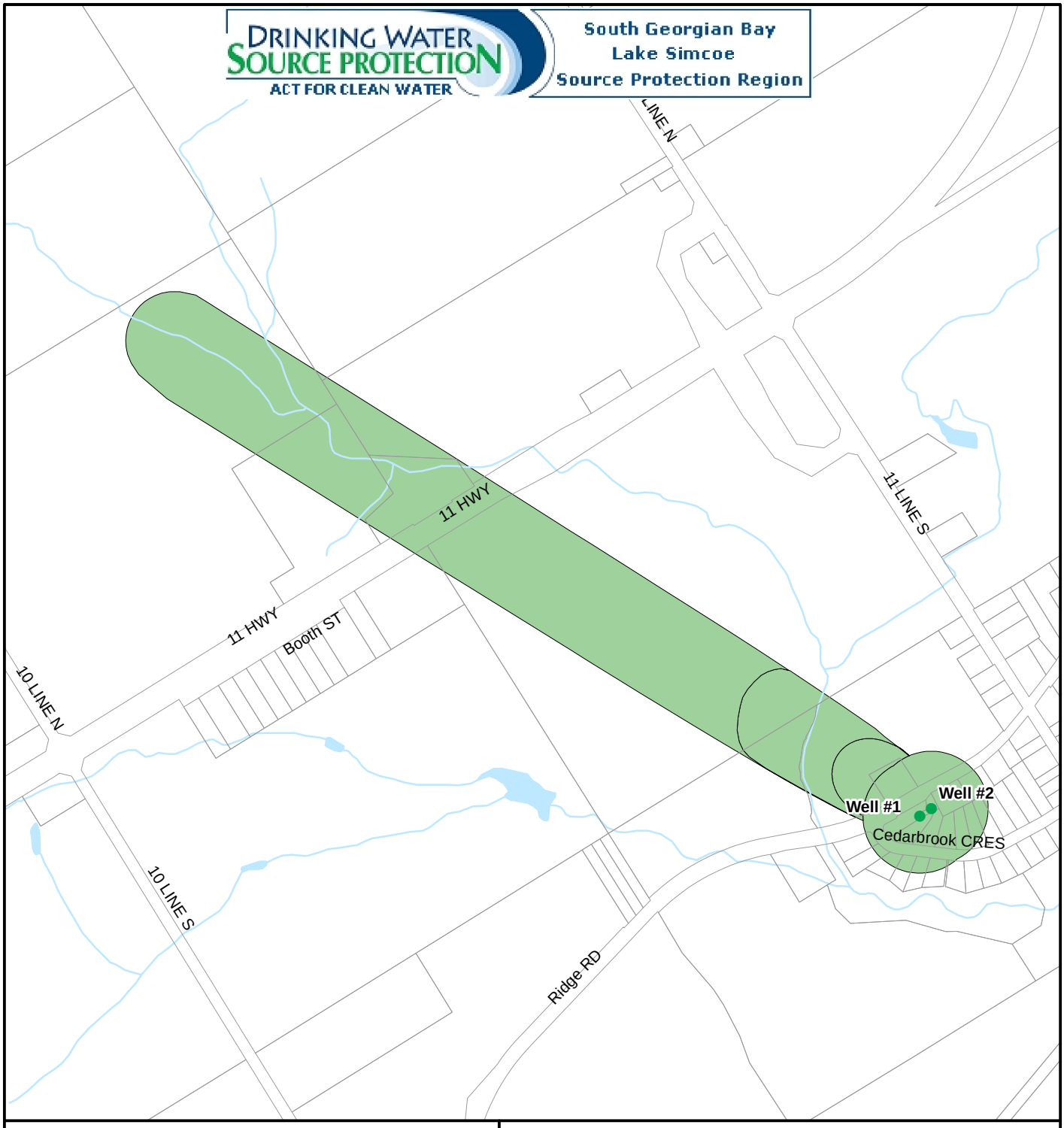
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.2-1 |

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 **11b-1**

**Figure 11b-2: Groundwater Vulnerability - Cedar Brook.**




LEGEND

- MUNICIPAL WELL LOCATION

AQUIFER VULNERABILITY INDEX

- HIGH
- MEDIUM
- LOW

N W E S

100 50 0 100 Metres

# GROUNDWATER VULNERABILITY - CEDARBROOK

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

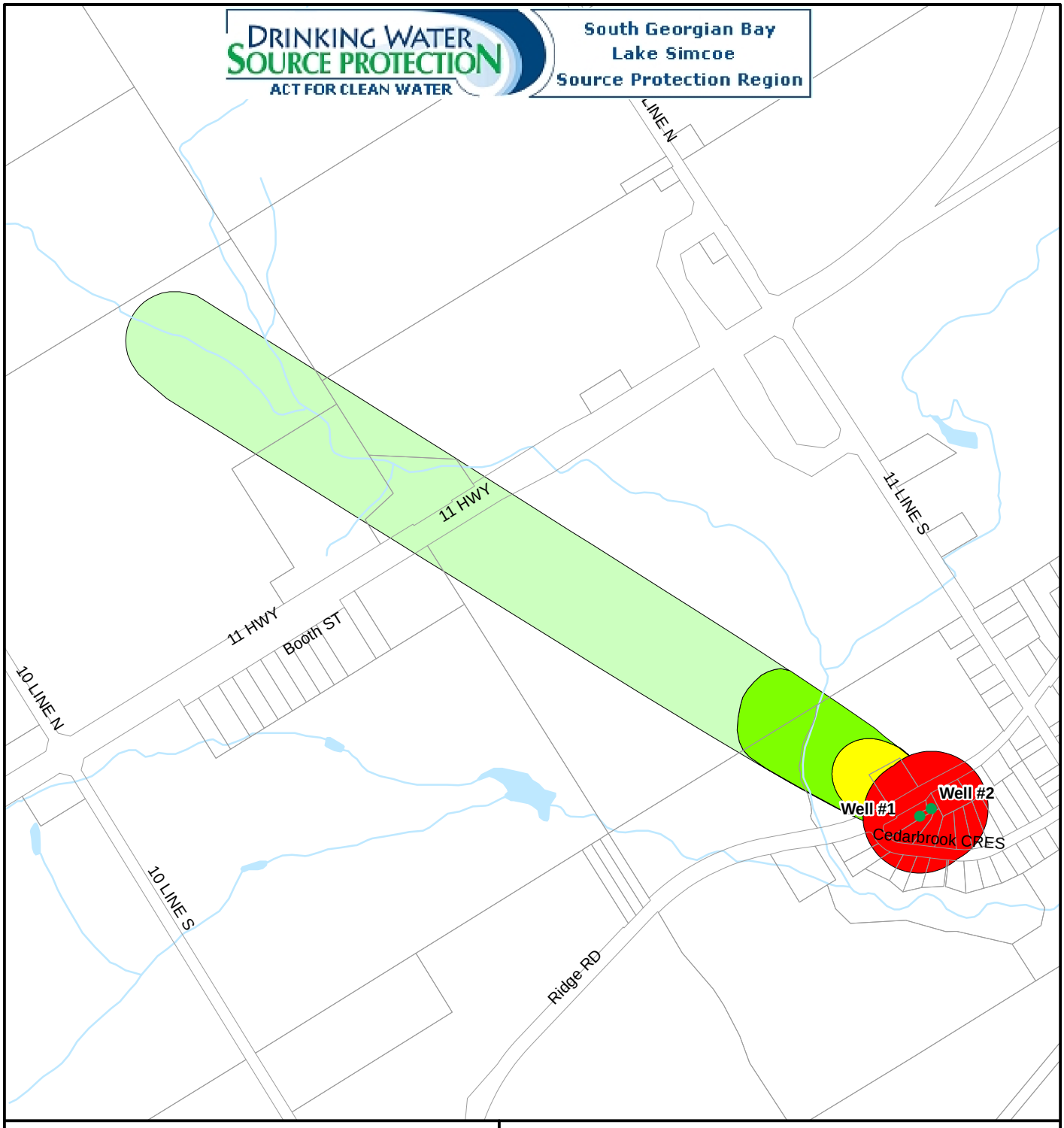
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.2-2 |

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 11b-2

**Figure 11b-3: Vulnerability Scores - Cedar Brook.**




LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6
- 4
- 2

N
W E
S

100 50 0 100 Metres

# VULNERABILITY SCORES - CEDARBROOK

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.2-3 |

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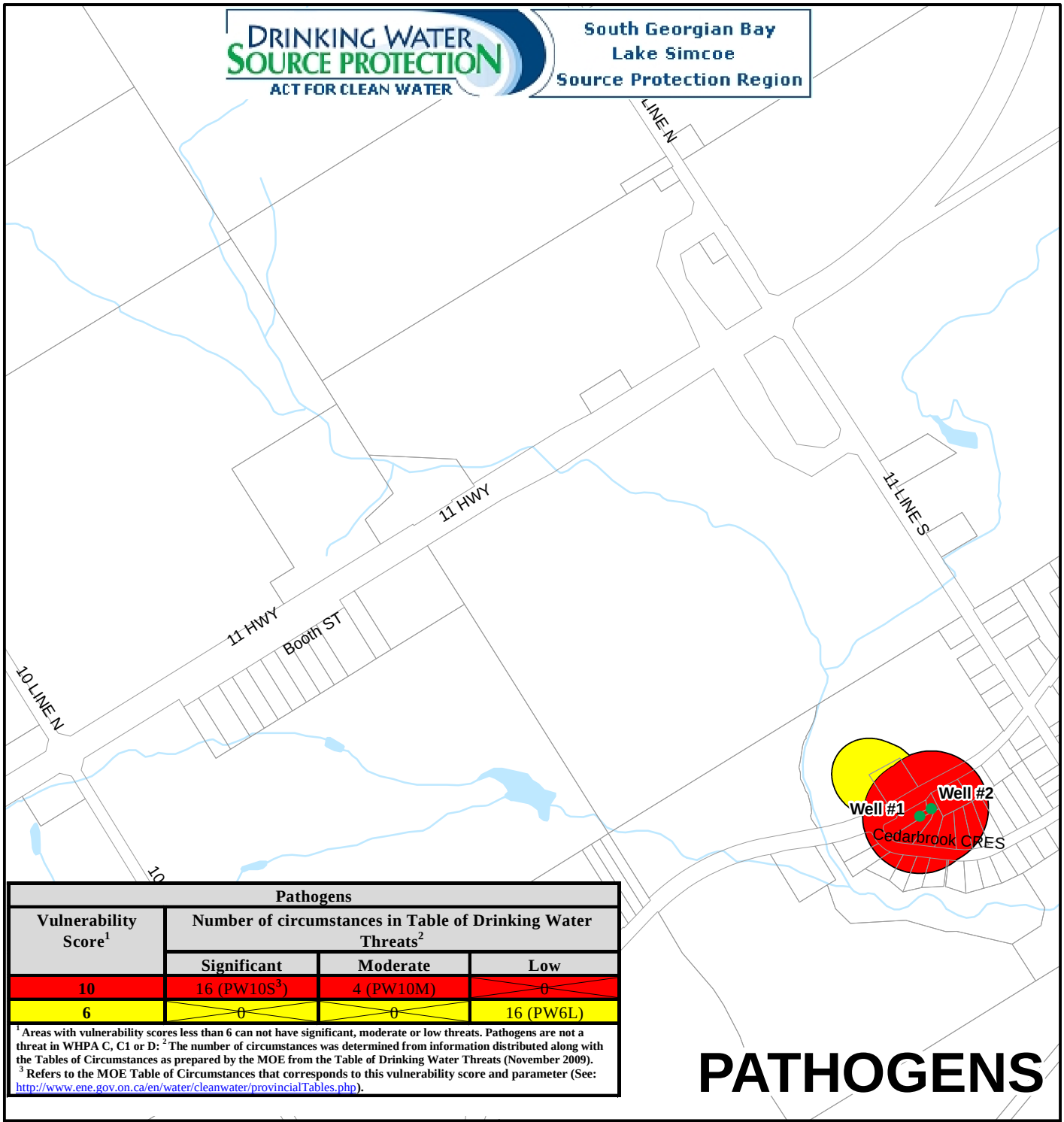
GENIVAR Ontario

FIGURE 11b-3

**Figure 11b-4: Areas where Pathogens are or would be Significant, Moderate or Low Threats - Cedar Brook.**




| Pathogens | | | |
|---|---|---|---|
| Vulnerability Score[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| 10 | 16 (PW10S[3]) | 4 (PW10M) | ~~0~~ |
| 6 | ~~0~~ | ~~0~~ | 16 (PW6L) |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. Pathogens are not a threat in WHPA C, C1 or D: [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009).
[3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

# PATHOGENS

LEGEND
- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING
- 10
- 8
- 6

N W E S

100 50 0 100 Metres

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.

## AREAS WHERE PATHOGENS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - CEDARBROOK

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.2-4 |

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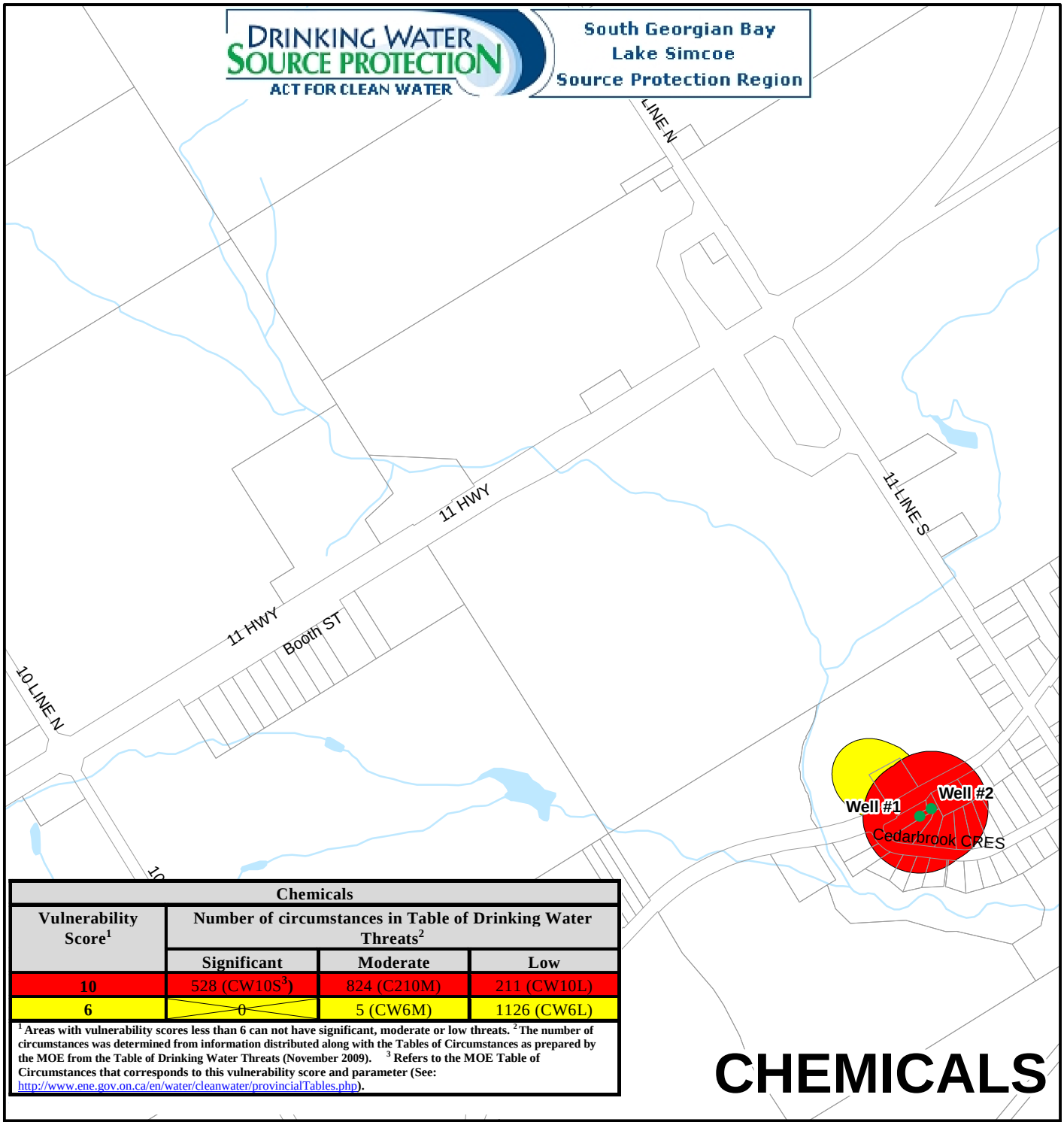
GENIVAR Ontario

FIGURE **11b-4**

**Figure 11b-5: Areas where Chemicals are or would be Significant, Moderate or Low Threats - Cedar Brook.**




| Chemicals | | | |
|---|---|---|---|
| Vulnerability Score[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| 10 | 528 (CW10S[3]) | 824 (C210M) | 211 (CW10L) |
| 6 | ~~0~~ | 5 (CW6M) | 1126 (CW6L) |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009). [3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

# CHEMICALS

LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6

N W E S

100 50 0 100 Metres

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.

## AREAS WHERE CHEMICALS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - CEDARBROOK

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

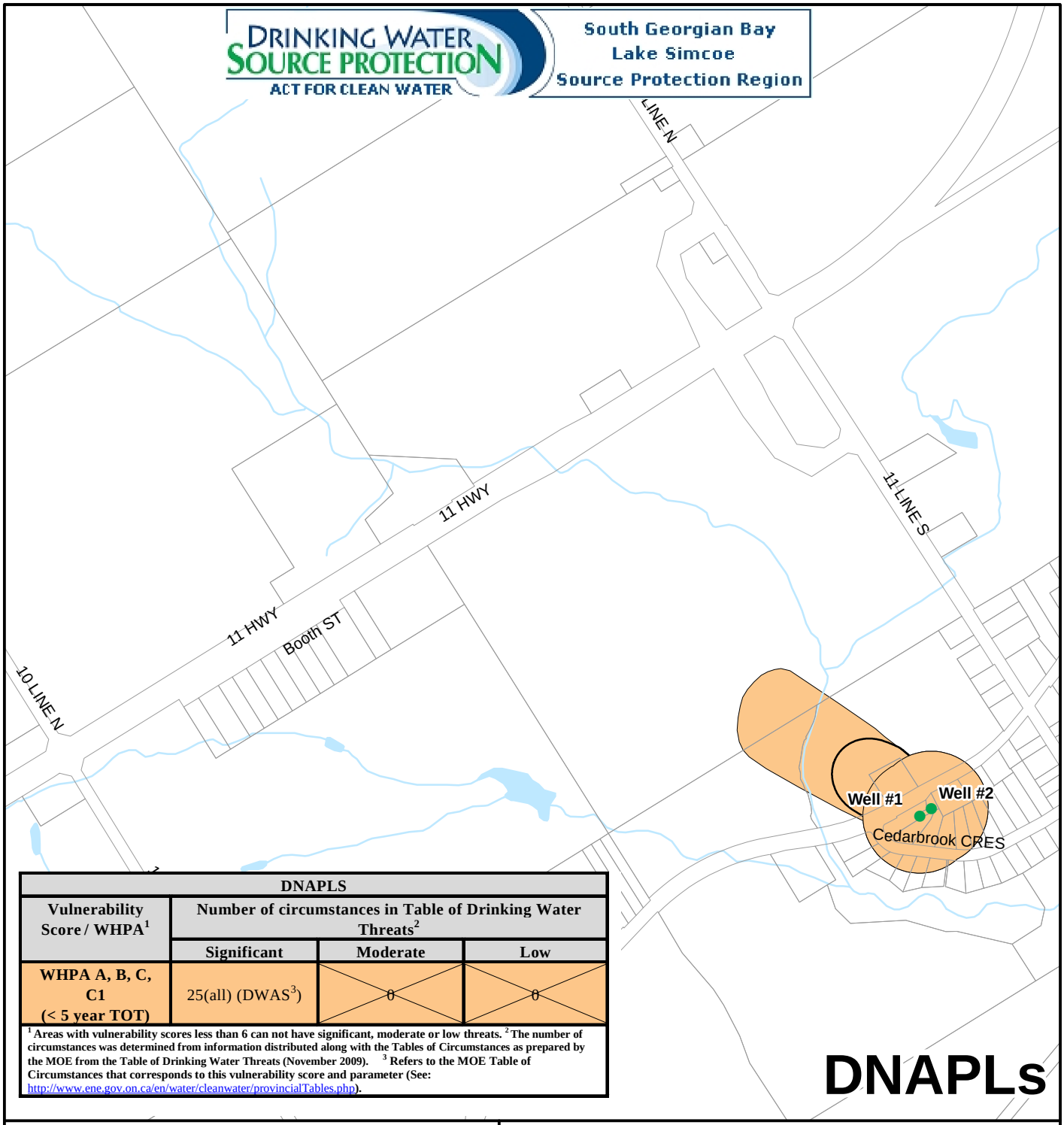
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.2-5 |

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.

GENIVAR Ontario

FIGURE **11b-5**

**Figure 11b-6: Areas where DNAPLs are or would be Significant, Moderate or Low Threats - Cedar Brook.**




| DNAPLS | | | |
|---|---|---|---|
| Vulnerability Score / WHPA[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| WHPA A, B, C, C1 (< 5 year TOT) | 25(all) (DWAS[3]) | 0 | 0 |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009). [3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

LEGEND

- MUNICIPAL WELL LOCATION
- WHPA-C: 5 YEAR TIME-OF-TRAVEL

N W E S

100 50 0 100 Metres

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.

**AREAS WHERE DNAPLS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - CEDARBROOK**

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| DATE: JUNE 2010 | SCALE: 1:10000 |
|---|---|
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.2-6 |

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.

GENIVAR Ontario

FIGURE **11b-6**

**Figure 11b-7: Managed Lands - Cedar Brook.**

**Figure 11b-8: Livestock Density - Cedar Brook.**

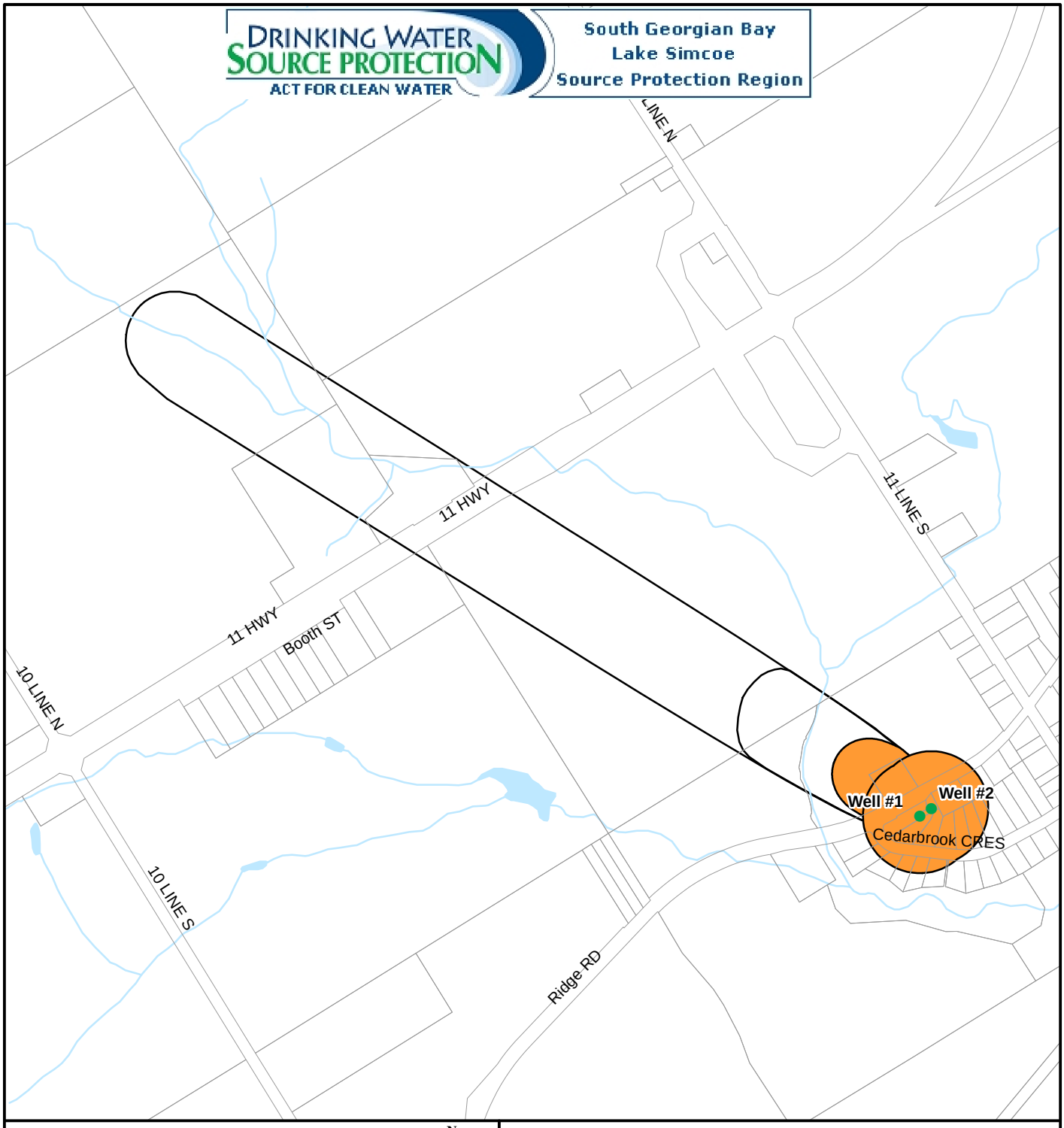
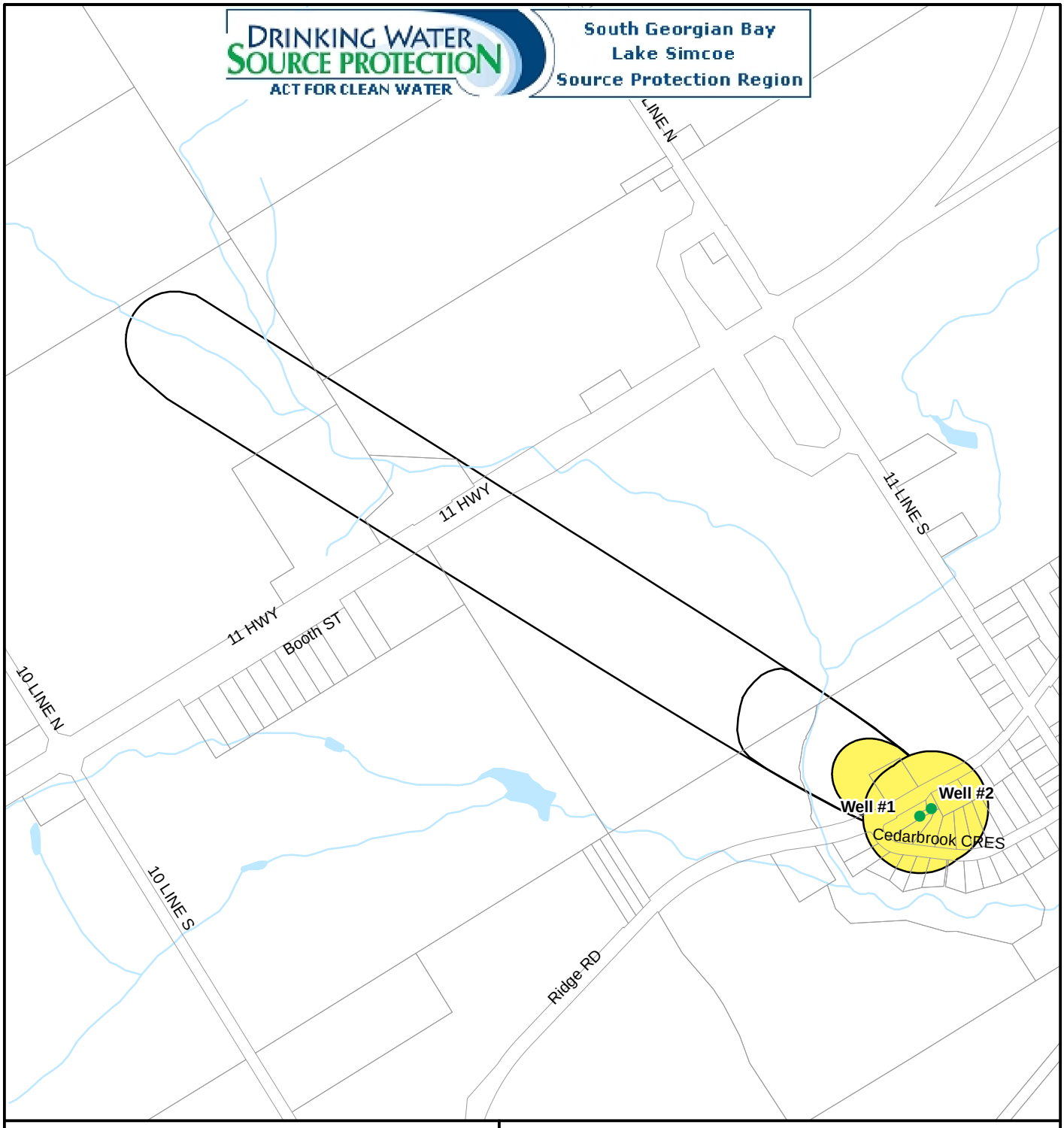


**Figure 11b-9: Impervious Surfaces - Cedar Brook.**




# IMPERVIOUS SURFACES - CEDARBROOK

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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

DATE: JUNE 2010 | SCALE: 1:10000

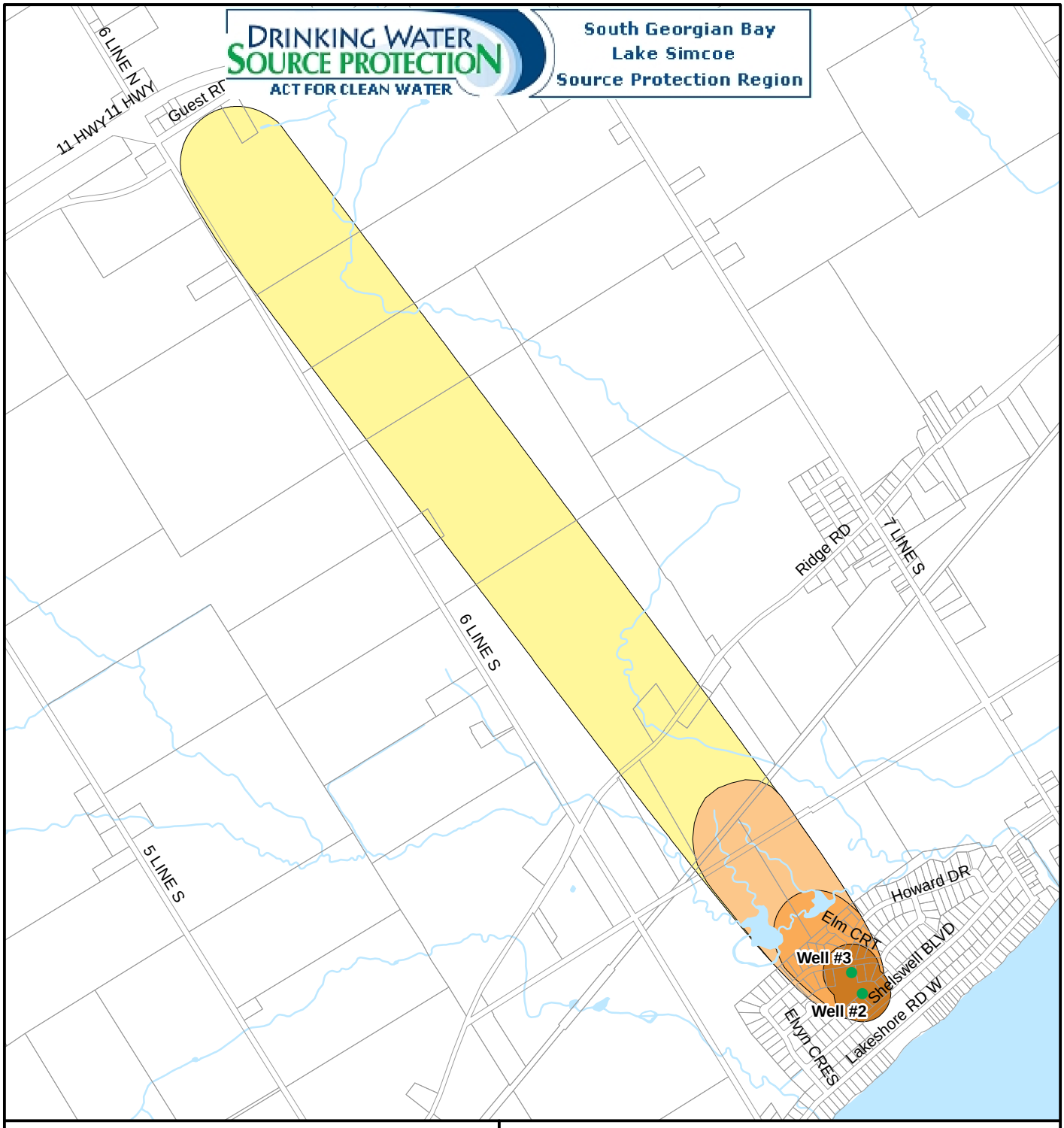
PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.2-9

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 11b-9

**Figure 11c-1: Wellhead Protection Areas – Harbourwood.**




# WELLHEAD PROTECTION AREAS - HARBOURWOOD, ORO-MEDONTE

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:20000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.4-1 |

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 **11c-1**

**Figure 11c-2: Groundwater Vulnerability - Harbourwood.**


LEGEND

- MUNICIPAL WELL LOCATION

AQUIFER VULNERABILITY INDEX

- HIGH
- MEDIUM
- LOW

N W E S

250 125 0 250 Metres

# GROUNDWATER VULNERABILITY - HARBOURWOOD

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

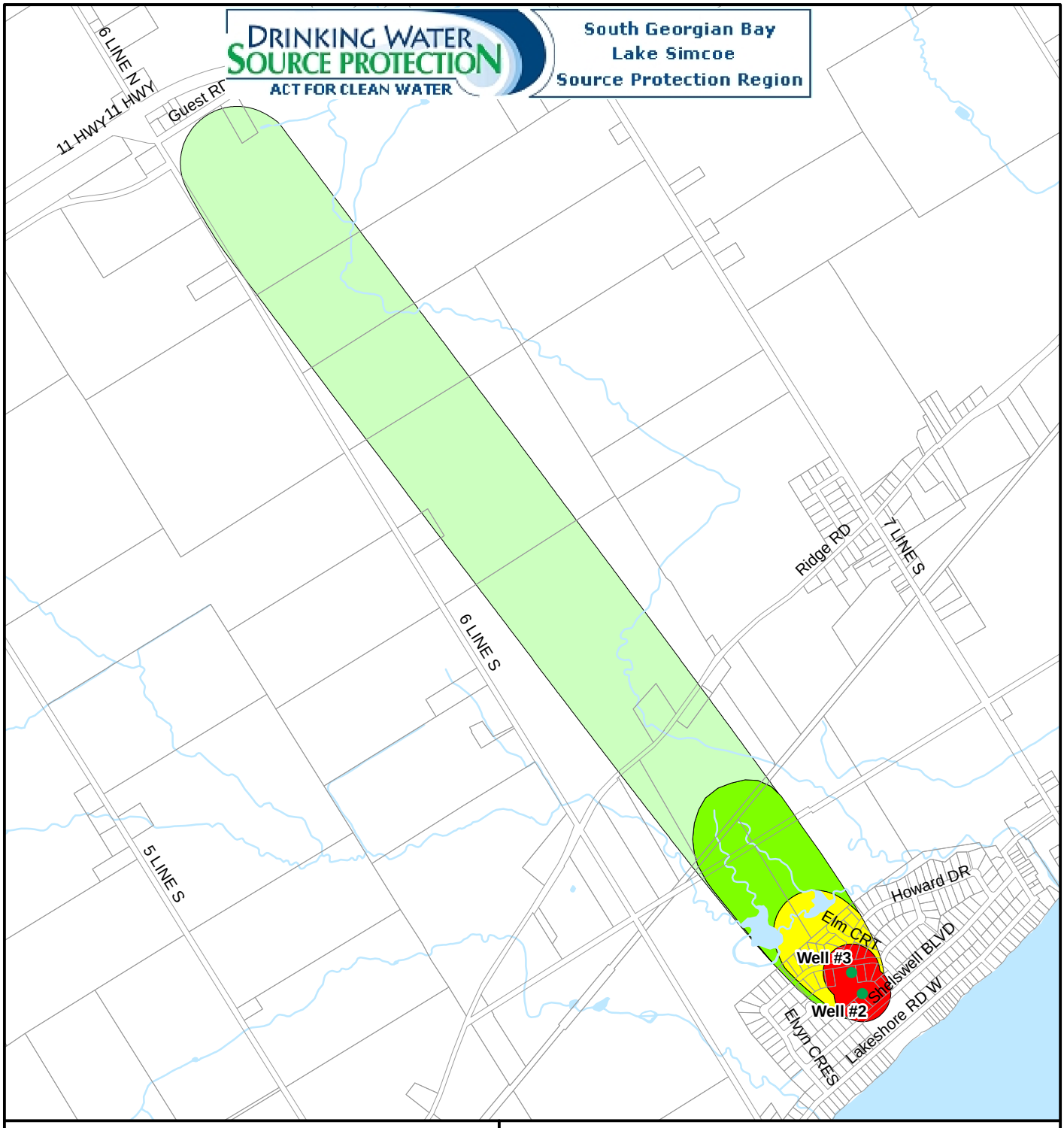
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:20000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.4-2 |

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 **11c-2**

**Figure 11c-3: Vulnerability Scores - Harbourwood.**




# VULNERABILITY SCORES - HARBOURWOOD

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

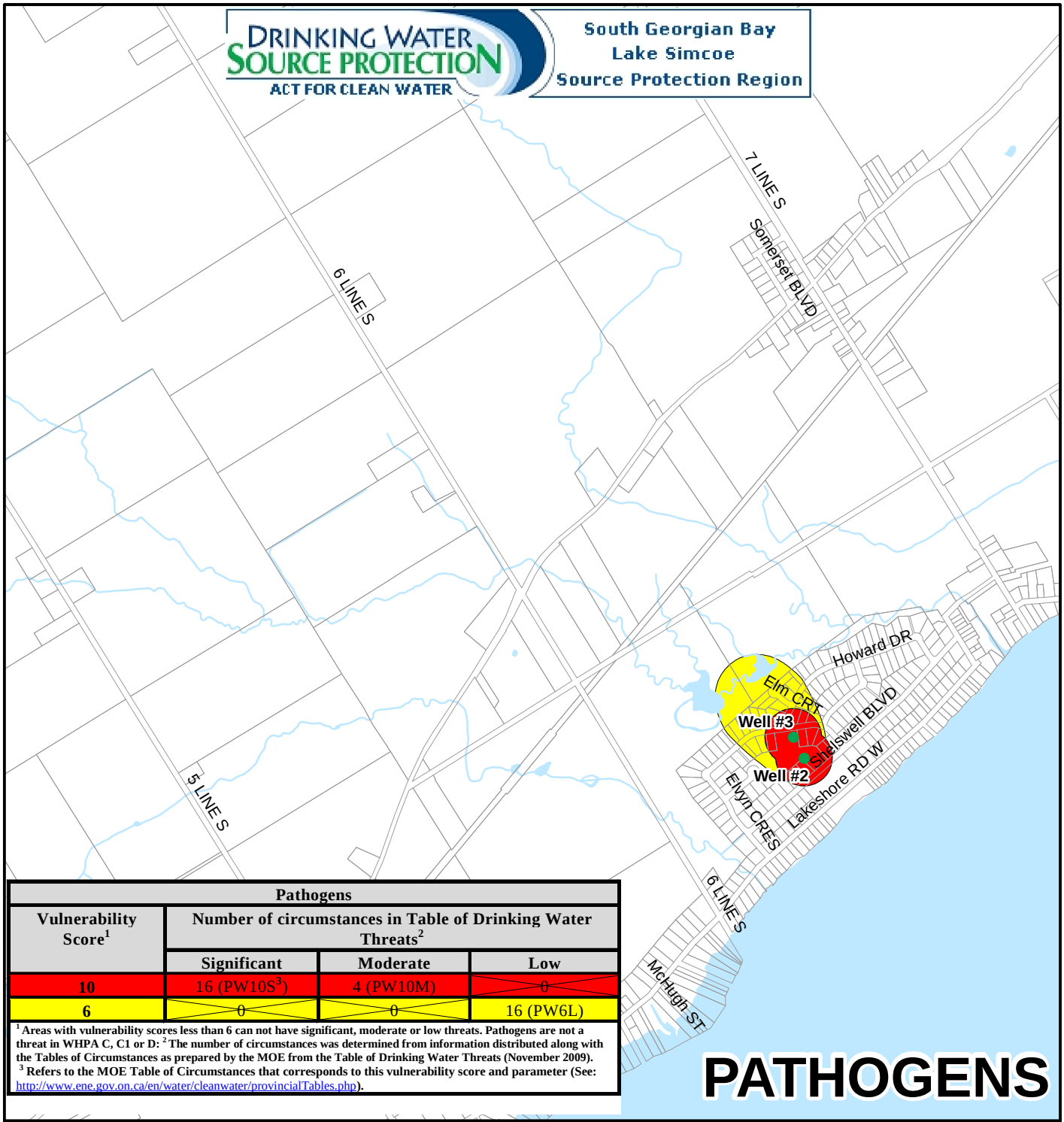
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:20000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.4-3 |

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 **11c-3**

**Figure 11c-4: Areas where Pathogens are or would be Significant, Moderate or Low Threats - Harbourwood.**




| Pathogens | | | |
|---|---|---|---|
| Vulnerability Score[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| 10 | 16 (PW10S[3]) | 4 (PW10M) | ~~0~~ |
| 6 | ~~0~~ | ~~0~~ | 16 (PW6L) |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. Pathogens are not a threat in WHPA C, C1 or D: [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009).
[3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

LEGEND
- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING
- 10
- 8
- 6

N W E S

250 125 0 250 Metres

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.

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.

**AREAS WHERE PATHOGENS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - HARBOURWOOD**

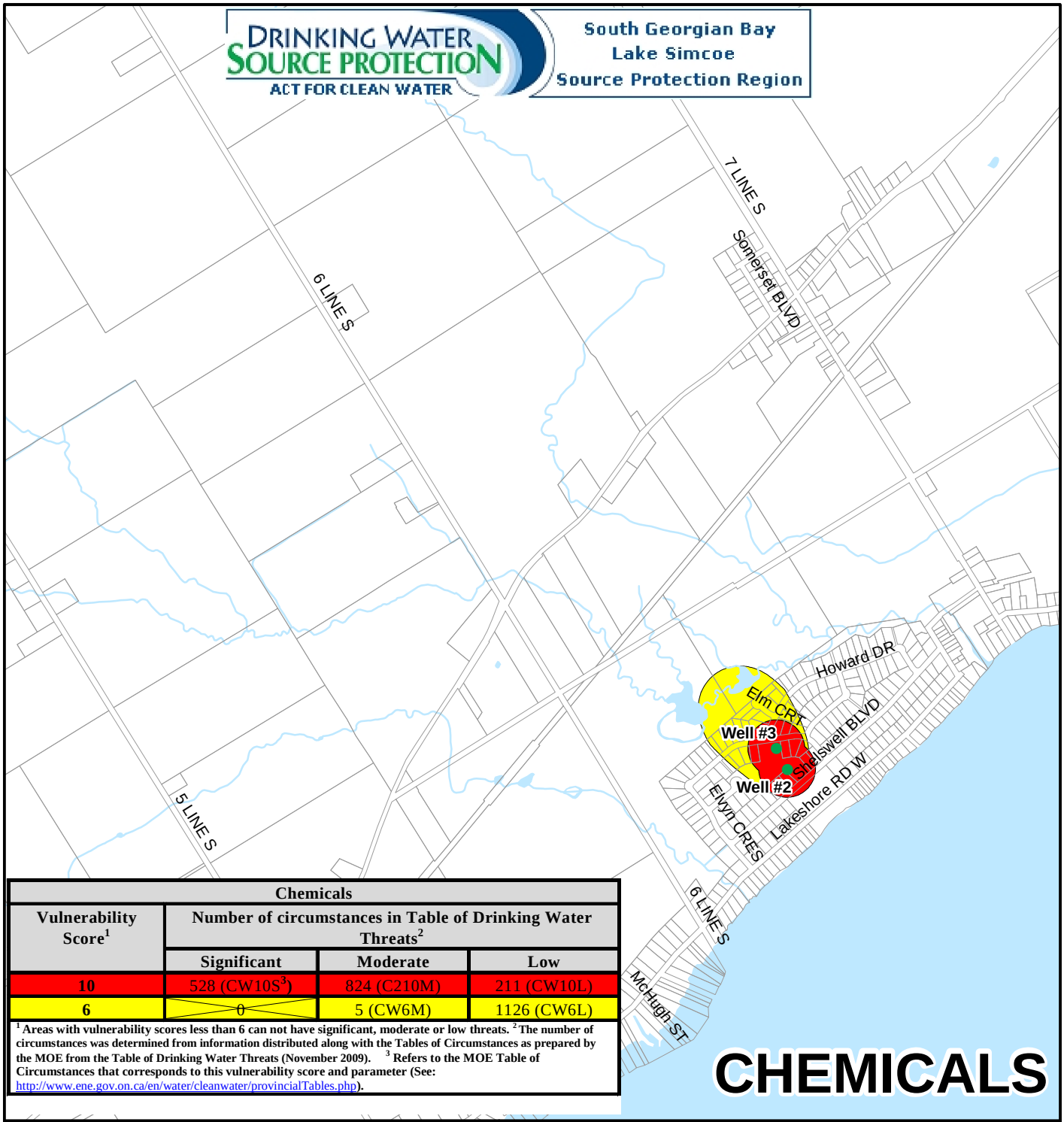
ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:20000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.4-4 |

GENIVAR Ontario

FIGURE **11c-4**

**Figure 11c-5: Areas where Chemicals are or would be Significant, Moderate or Low Threats - Harbourwood.**




| Chemicals | | | |
|---|---|---|---|
| Vulnerability Score[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| 10 | 528 (CW10S[3]) | 824 (C210M) | 211 (CW10L) |
| 6 | ~~0~~ | 5 (CW6M) | 1126 (CW6L) |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009). [3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6

N W E S

250 125 0 250 Metres

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.

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**AREAS WHERE CHEMICALS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - HARBOURWOOD**

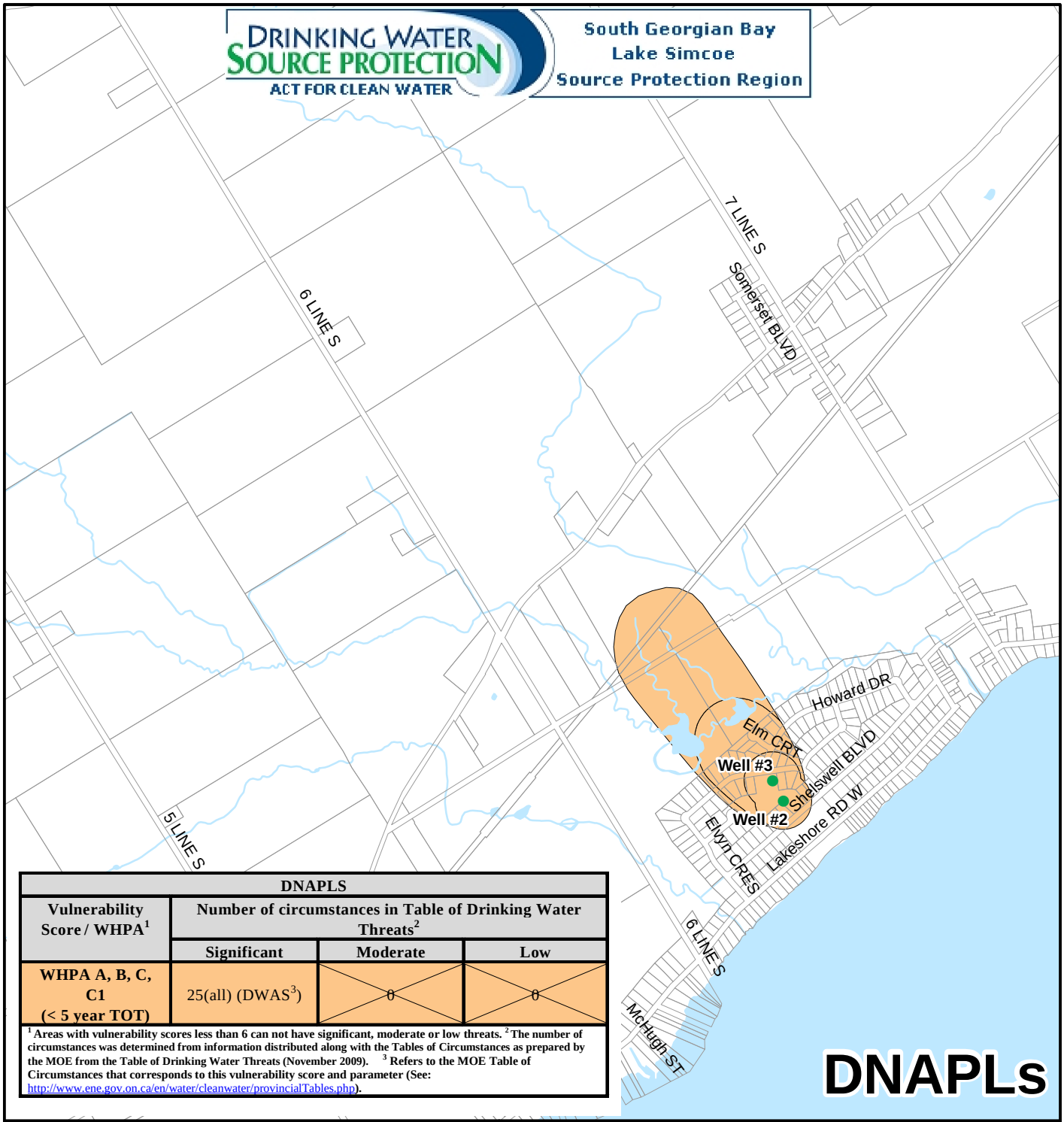
ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:20000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.4-5 |

GENIVAR Ontario

FIGURE **11c-5**

**Figure 11c-6: Areas where DNAPLs are or would be Significant, Moderate or Low Threats - Harbourwood.**




| DNAPLS | | | |
|---|---|---|---|
| Vulnerability Score / WHPA[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| WHPA A, B, C, C1 (< 5 year TOT) | 25(all) (DWAS[3]) | 0 | 0 |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009). [3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

**Legend**

- MUNICIPAL WELL LOCATION
- WHPA-C: 5-YEAR TIME-OF-TRAVEL

N W E S

250 125 0 250 Metres

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.

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.

**AREAS WHERE DNAPLS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - HARBOURWOOD**

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| DATE: JUNE 2010 | SCALE: 1:20000 |
|---|---|
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.4-6 |

GENIVAR Ontario

FIGURE **11c-6**

**Figure 11c-7: Managed Lands - Harbourwood.**


# MANAGED LANDS - HARBOURWOOD

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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

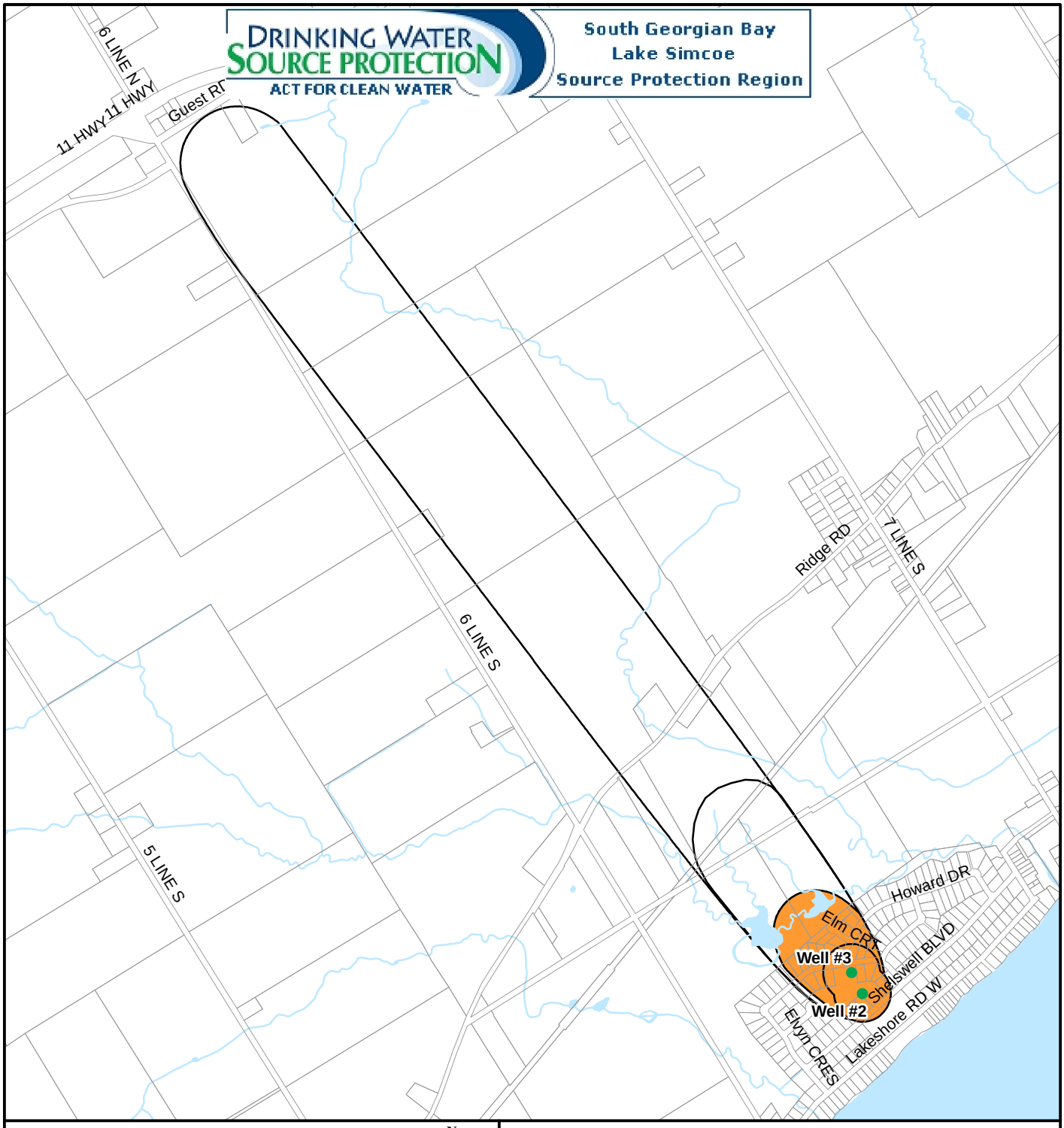
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:20000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.4-7 |

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.

GENIVAR Ontario

FIGURE 11c-7

**Figure 11c-8: Livestock Density - Harbourwood.**




# LIVESTOCK DENSITY - HARBOURWOOD

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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

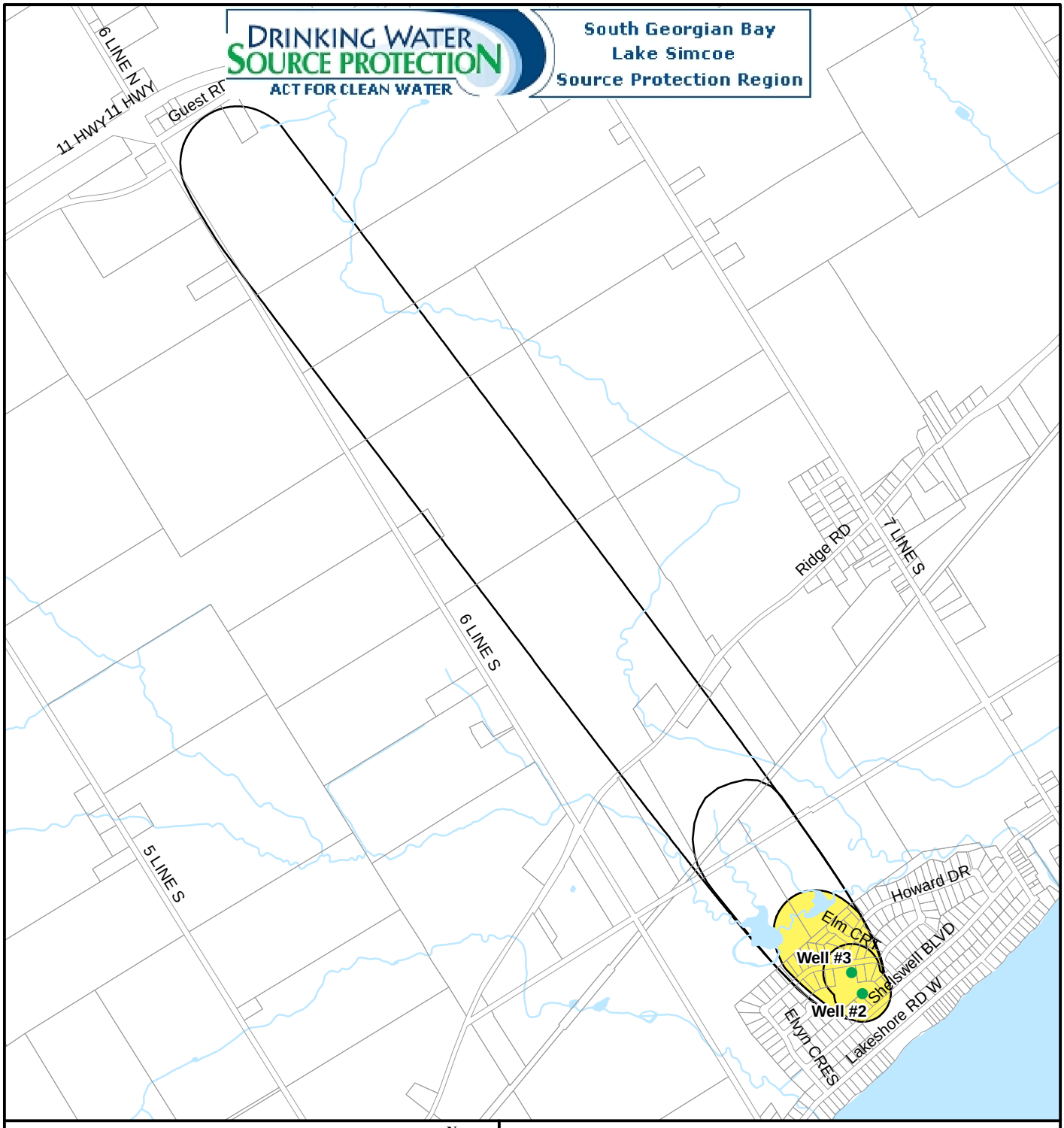
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:20000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.4-8 |

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 **11c-8**

**Figure 11c-9: Impervious Surfaces - Harbourwood.**




# IMPERVIOUS SURFACES - HARBOURWOOD

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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

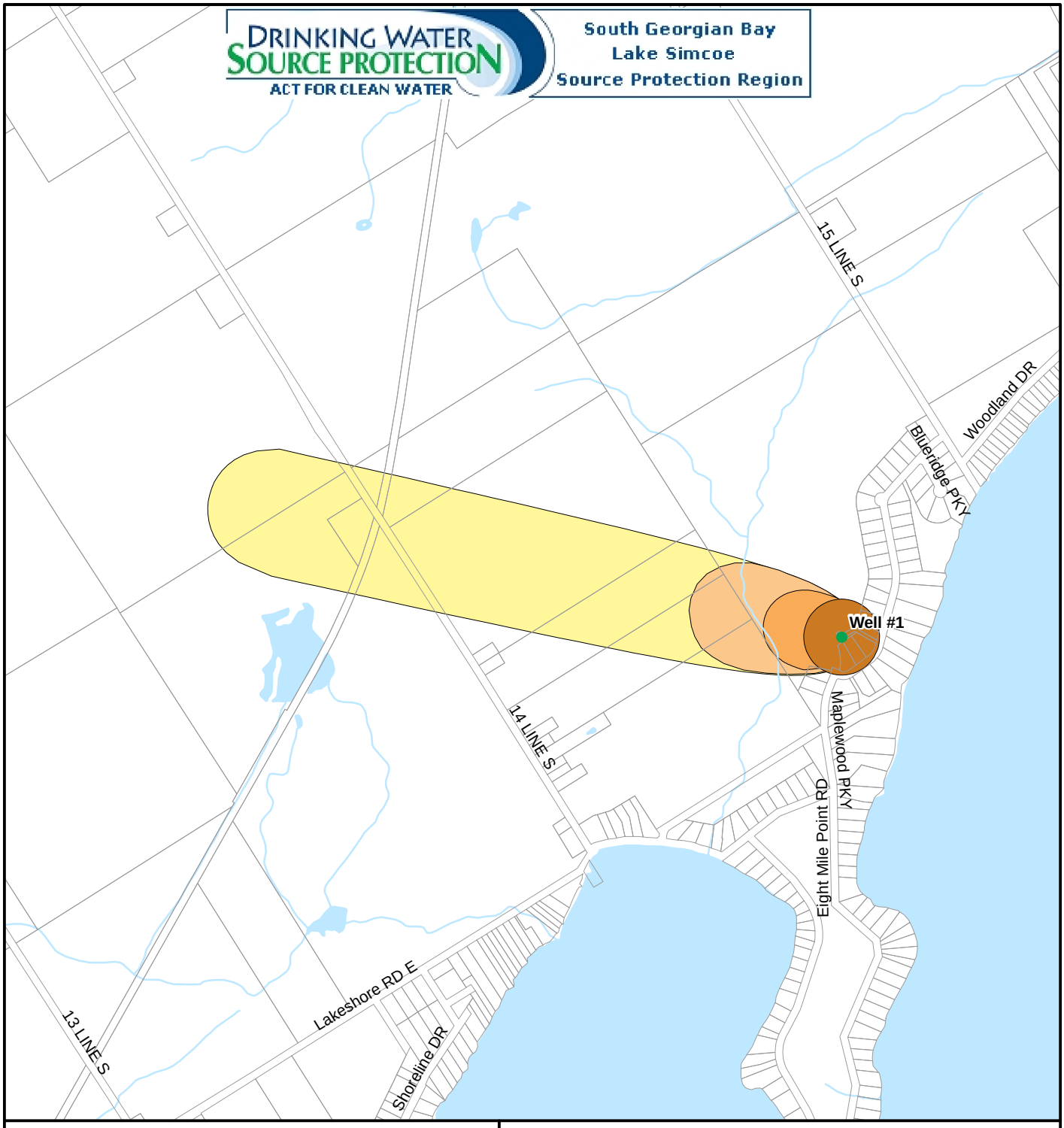
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:20000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.4-9 |

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 **11c-9**

**Figure 11d-1: Wellhead Protection Areas - Maplewood Estates.**




# WELLHEAD PROTECTION AREAS - MAPLEWOOD, ORO-MEDONTE

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

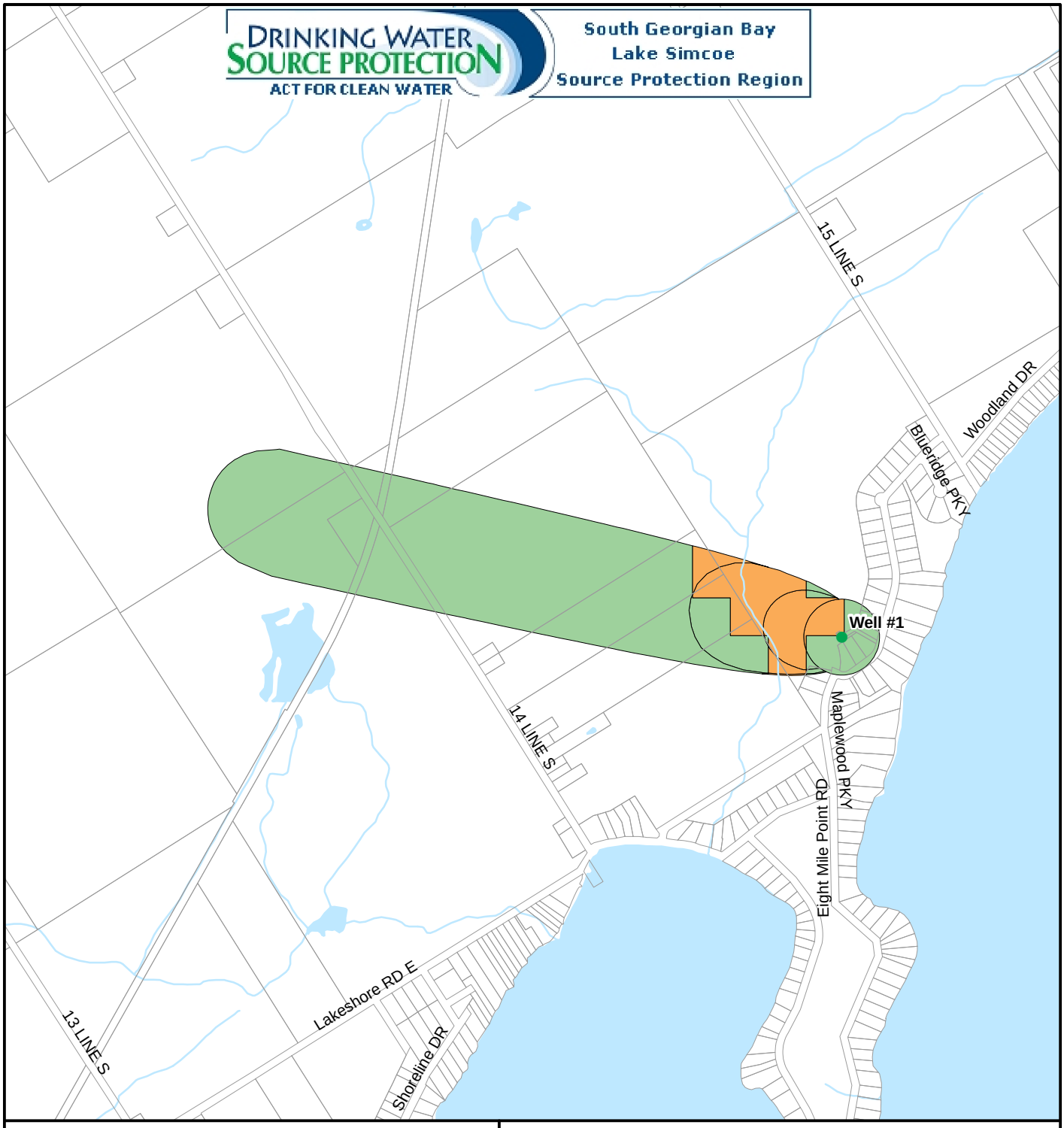
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.6-1 |

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 **11d-1**

**Figure 11d-2: Groundwater Vulnerability - Maplewood Estates.**




LEGEND

- MUNICIPAL WELL LOCATION

AQUIFER VULNERABILITY INDEX

- HIGH
- MEDIUM
- LOW

N W E S

150 75 0 150 Metres

# GROUNDWATER VULNERABILITY - MAPLEWOOD

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.6-2 |

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 **11d-2**

**Figure 11d-3: Vulnerability Scores - Maplewood Estates.**

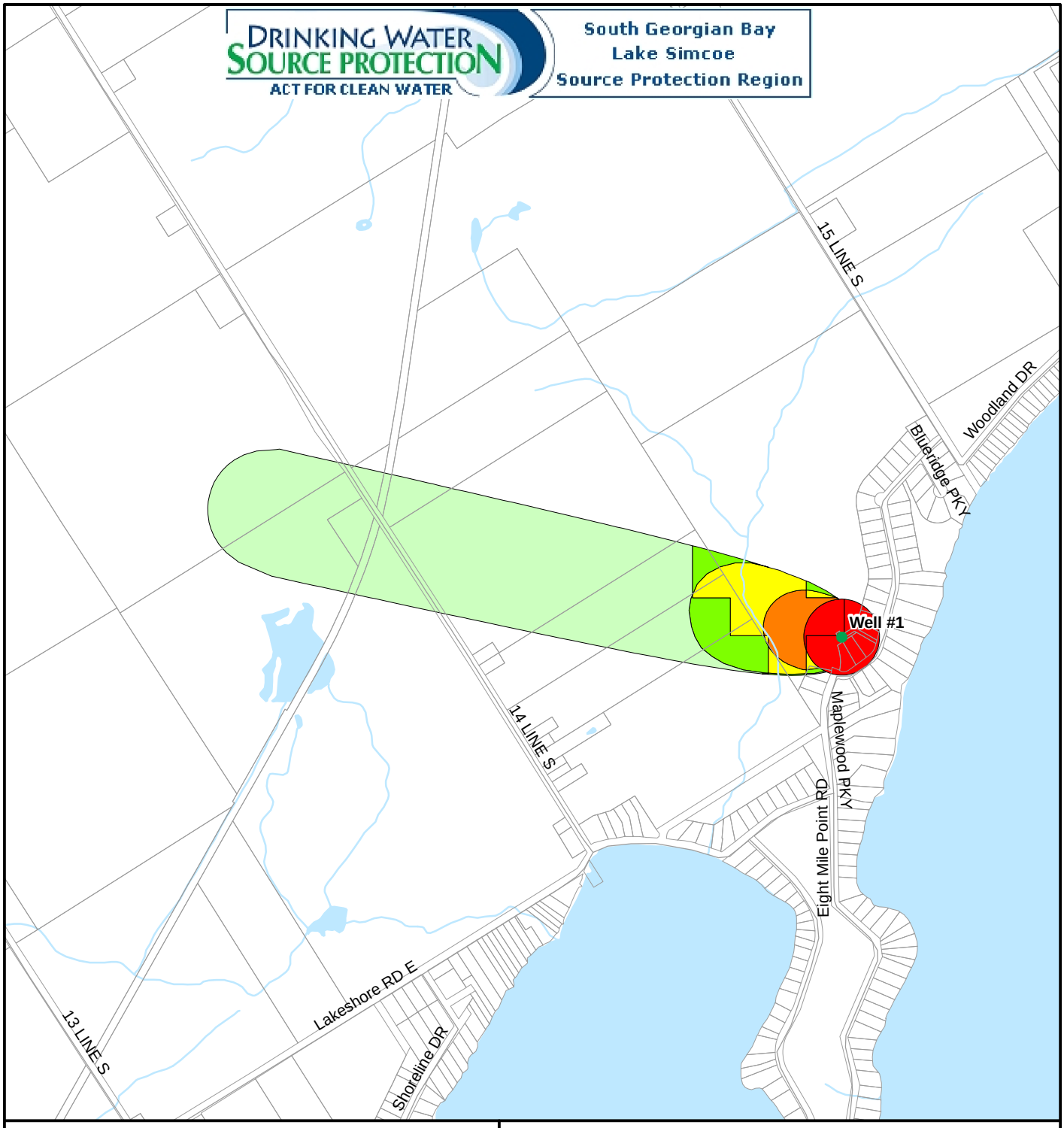
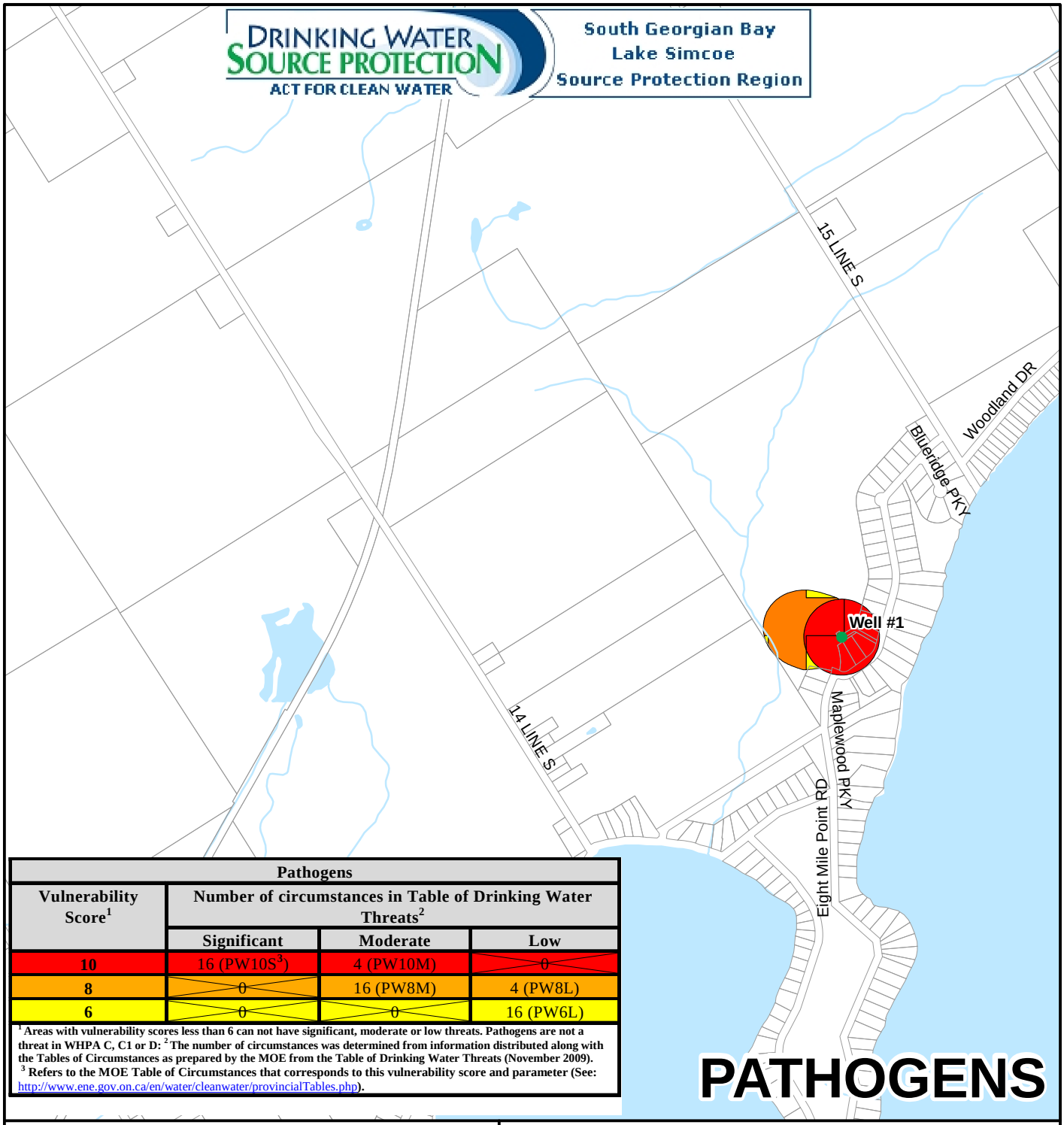


**Figure 11d-4: Areas where Pathogens are or would be Significant, Moderate or Low Threats - Maplewood Estates.**




| Pathogens | | | |
|---|---|---|---|
| Vulnerability Score[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| 10 | 16 (PW10S[3]) | 4 (PW10M) | ~~0~~ |
| 8 | ~~0~~ | 16 (PW8M) | 4 (PW8L) |
| 6 | ~~0~~ | ~~0~~ | 16 (PW6L) |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. Pathogens are not a threat in WHPA C, C1 or D: [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009).
[3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6

N W E S

150 75 0 150 Metres

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.

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## AREAS WHERE PATHOGENS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - MAPLEWOOD

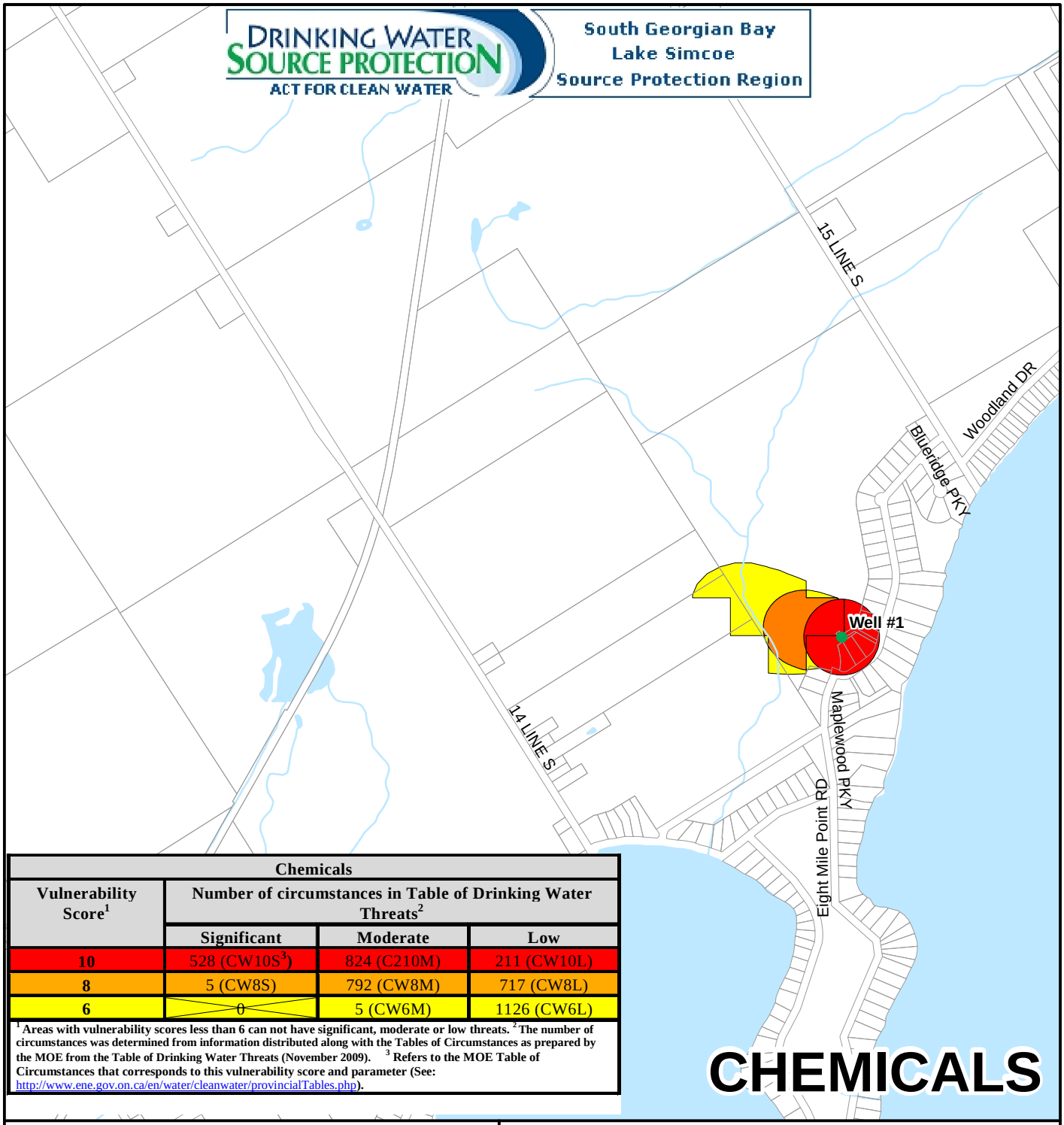
ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.6-4 |

GENIVAR Ontario

FIGURE **11d-4**

**Figure 11d-5: Areas where Chemicals are or would be Significant, Moderate or Low Threats - Maplewood Estates.**




| Chemicals | | | |
|---|---|---|---|
| Vulnerability Score[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| 10 | 528 (CW10S[3]) | 824 (C210M) | 211 (CW10L) |
| 8 | 5 (CW8S) | 792 (CW8M) | 717 (CW8L) |
| 6 | ~~0~~ | 5 (CW6M) | 1126 (CW6L) |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009). [3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6

N W E S

150 75 0 150 Metres

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.

**AREAS WHERE CHEMICALS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - MAPLEWOOD**

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

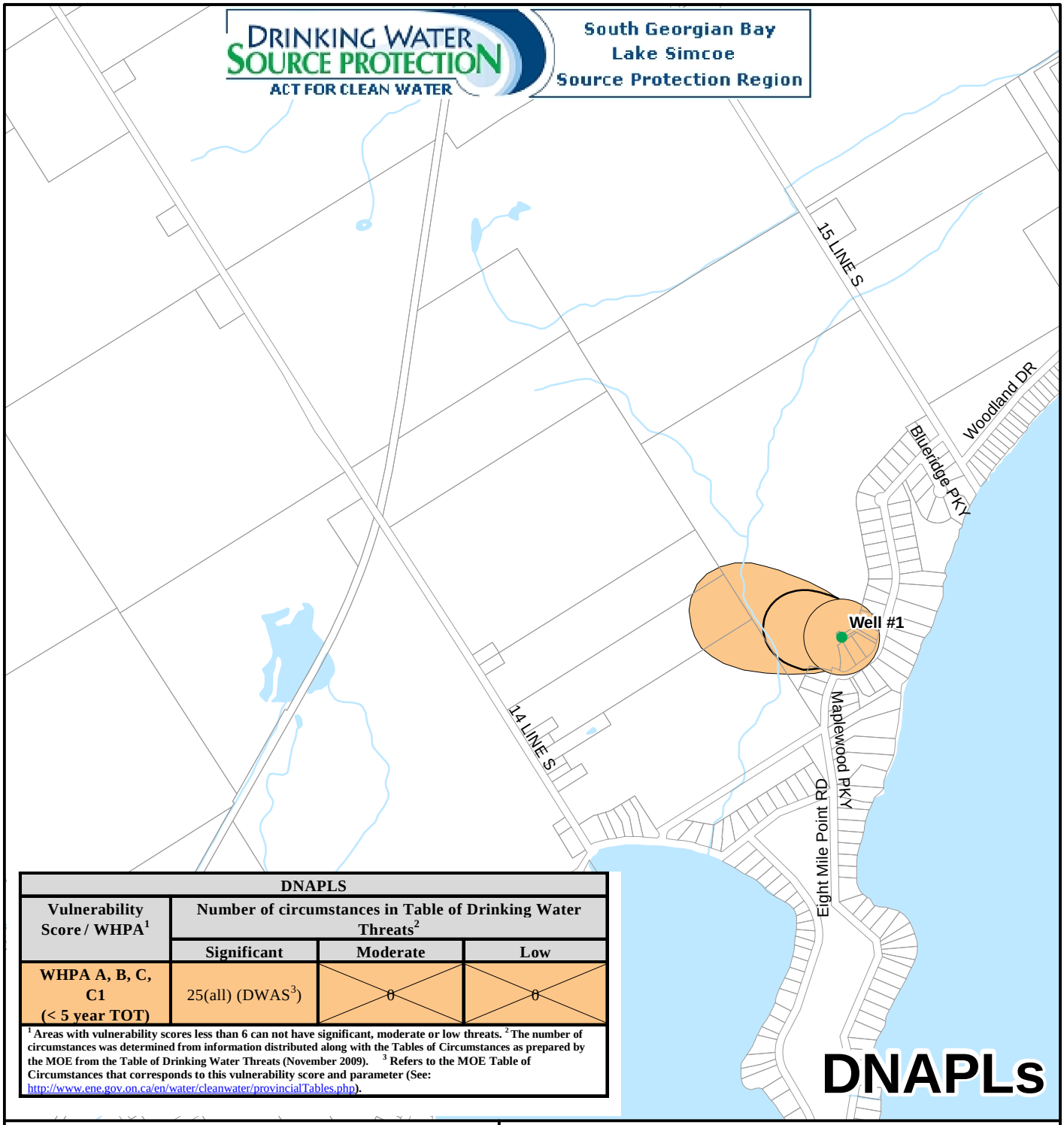
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.6-5 |

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.

GENIVAR Ontario

FIGURE **11d-5**

**Figure 11d-6: Areas where DNAPLs are or would be Significant, Moderate or Low Threats - Maplewood Estates.**




| DNAPLS | | | |
|---|---|---|---|
| Vulnerability Score / WHPA[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| WHPA A, B, C, C1 (< 5 year TOT) | 25(all) (DWAS[3]) | 0 | 0 |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009). [3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

**Legend**

- MUNICIPAL WELL LOCATION
- WHPA-C: 5-YEAR TIME-OF-TRAVEL

N W E S

150 75 0 150 Metres

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.

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**AREAS WHERE DNAPLS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - MAPLEWOOD**

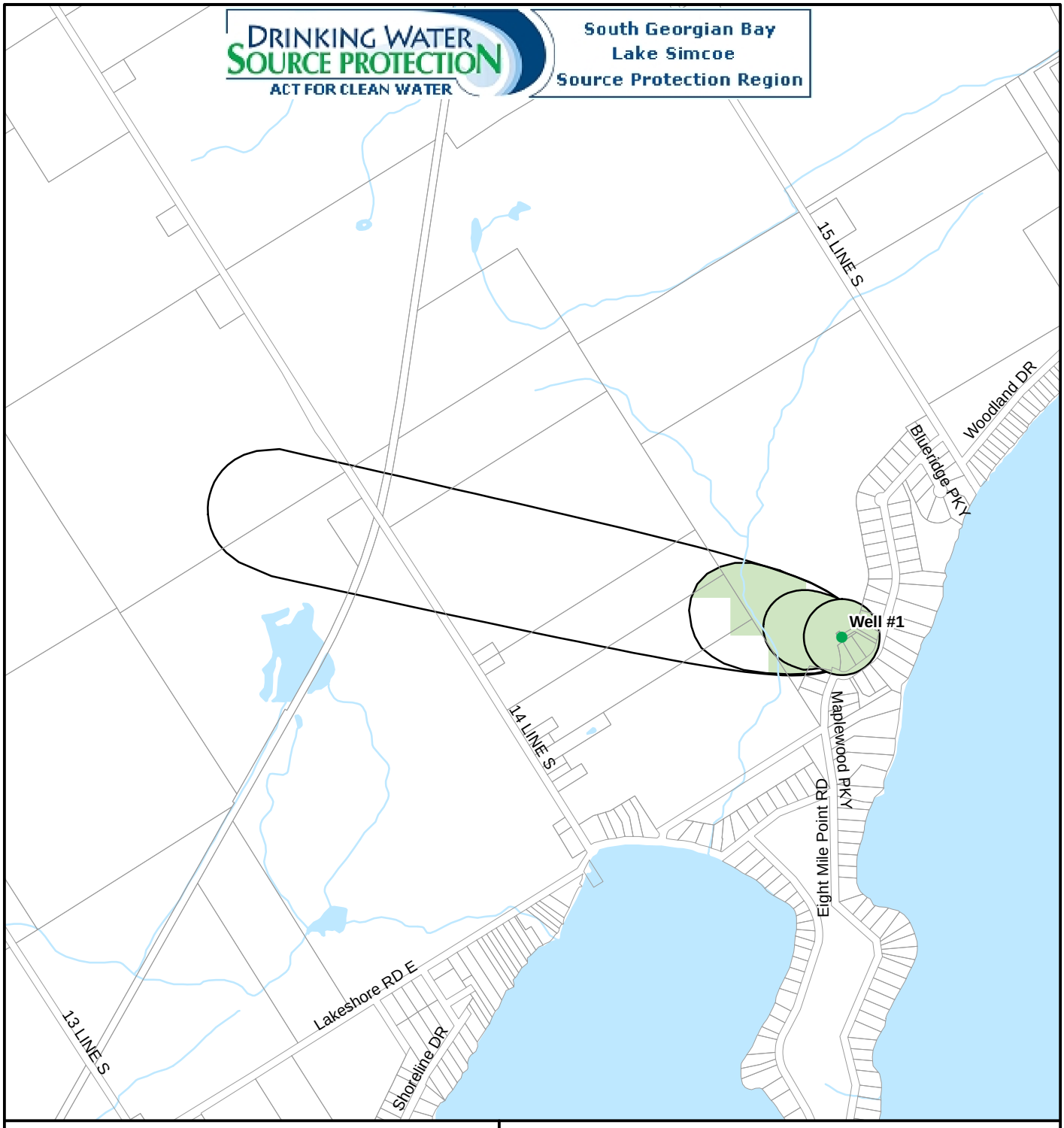
ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.6-6 |

GENIVAR Ontario

FIGURE **11d-6**

**Figure 11d-7: Managed Lands - Maplewood Estates.**




# MANAGED LANDS - MAPLEWOOD

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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

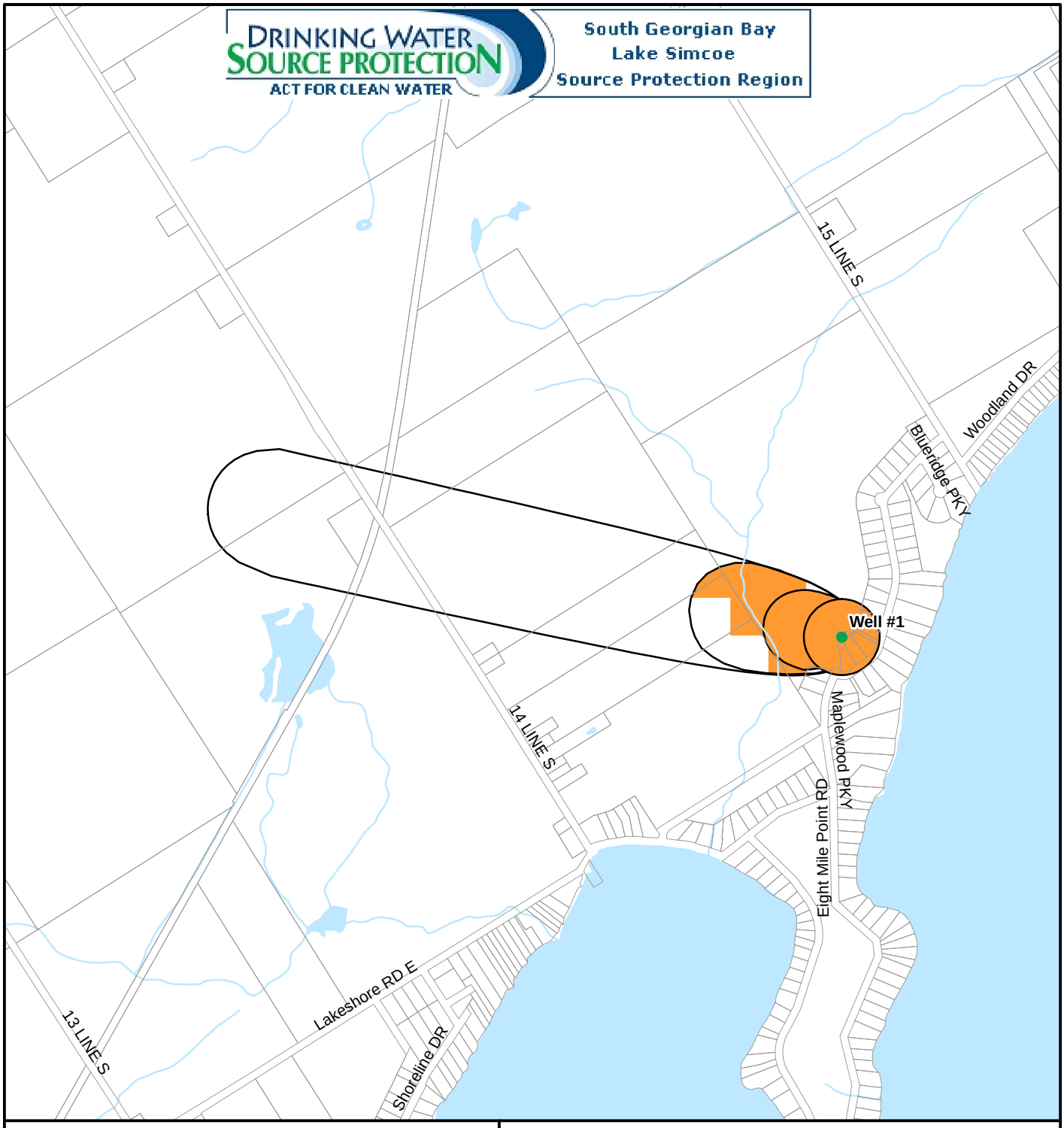
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.6-7 |

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.

GENIVAR Ontario

FIGURE **11d-7**

**Figure 11d-8: Livestock Density - Maplewood Estates.**




# LIVESTOCK DENSITY - MAPLEWOOD

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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

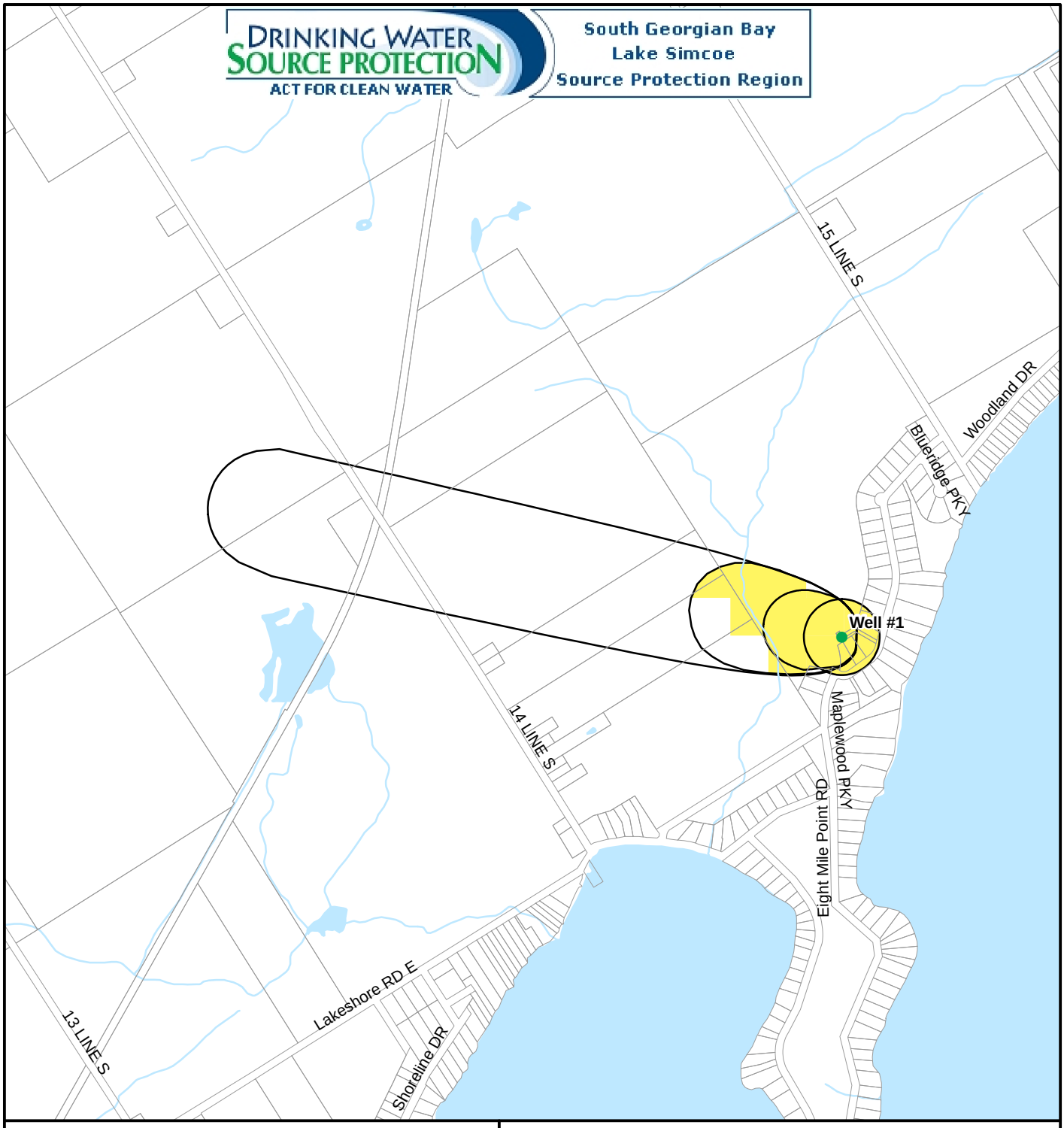
| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:15000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.6-8 |



GENIVAR Ontario

FIGURE **11d-8**

**Figure 11d-9: Impervious Surfaces - Maplewood Estates.**




# IMPERVIOUS SURFACES - MAPLEWOOD

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

The Impervious Surfaces proportion is illustrated for the parts of WHPA A-D where the vulnerability score is greater than 6, and for WHPA-E where the score is greater than 4.

DATE: JUNE 2010 | SCALE: 1:15000

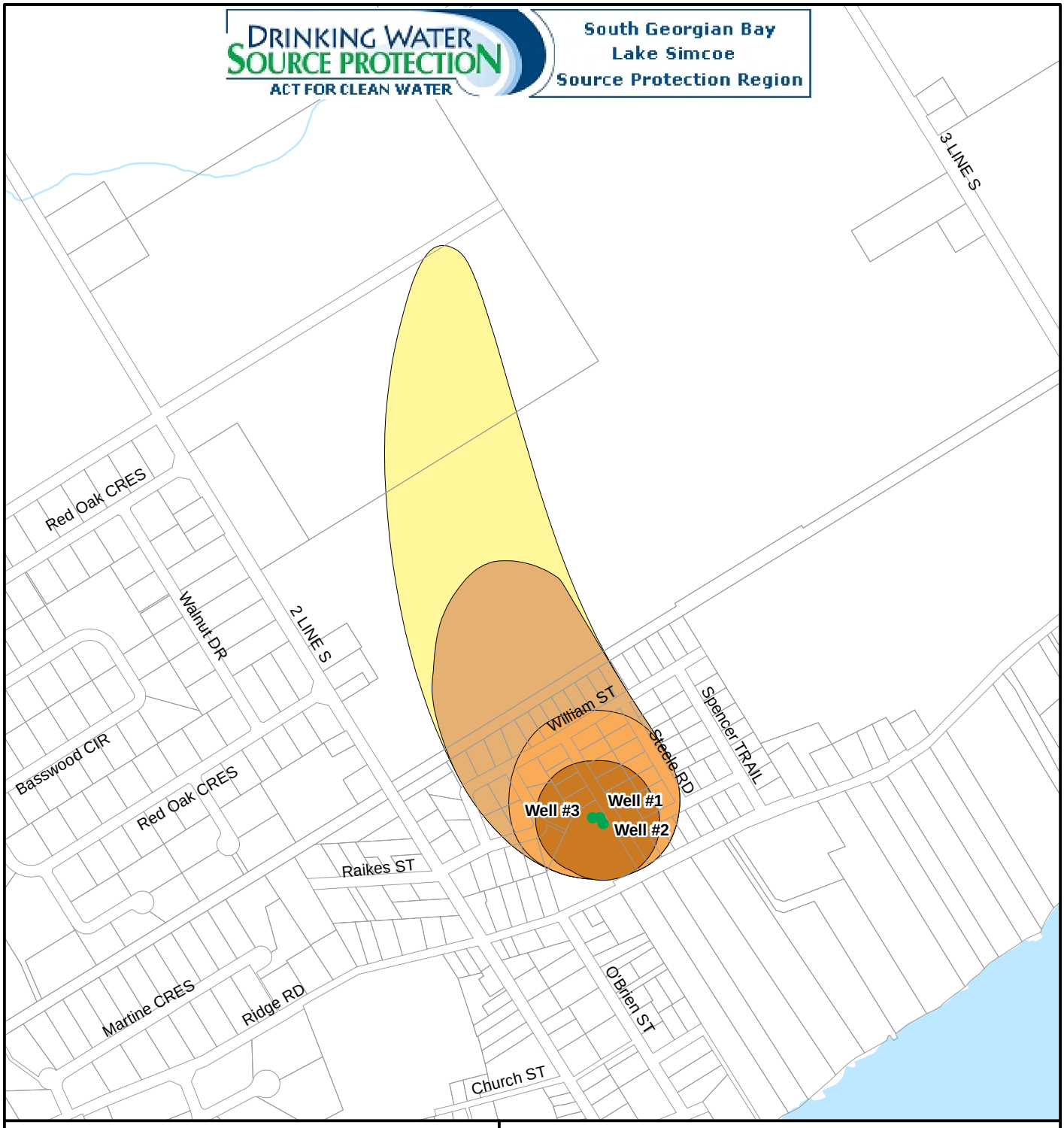
PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.6-9

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 11d-9

**Figure 11e-1: Wellhead Protection Areas - Shanty Bay.**




**Legend**

- MUNICIPAL WELL LOCATION
- WHPA-A: 100 m RADIUS
- WHPA-B: 2-YEAR TIME-OF-TRAVEL
- WHPA-C1: 10-YEAR TIME-OF-TRAVEL
- WHPA-D: 25-YEAR TIME-OF-TRAVEL

N W E S

100 50 0 100 Metres

# WELLHEAD PROTECTION AREAS - SHANTY BAY, ORO-MEDONTE

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.9-1 |

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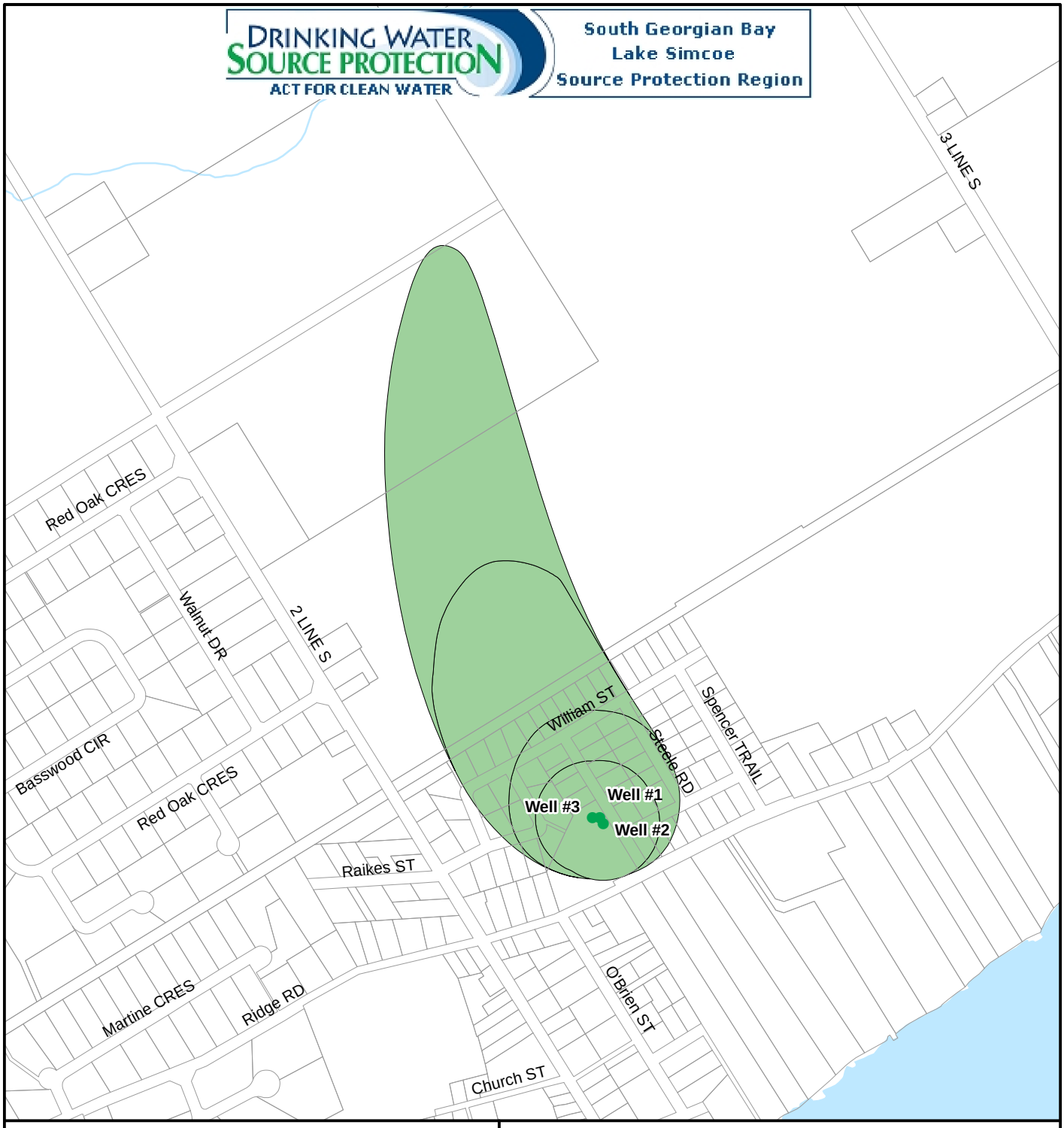
FIGURE **11e-1**

**Figure 11e-2: Groundwater Vulnerability - Shanty Bay.**




# GROUNDWATER VULNERABILITY - SHANTY BAY

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.9-2 |

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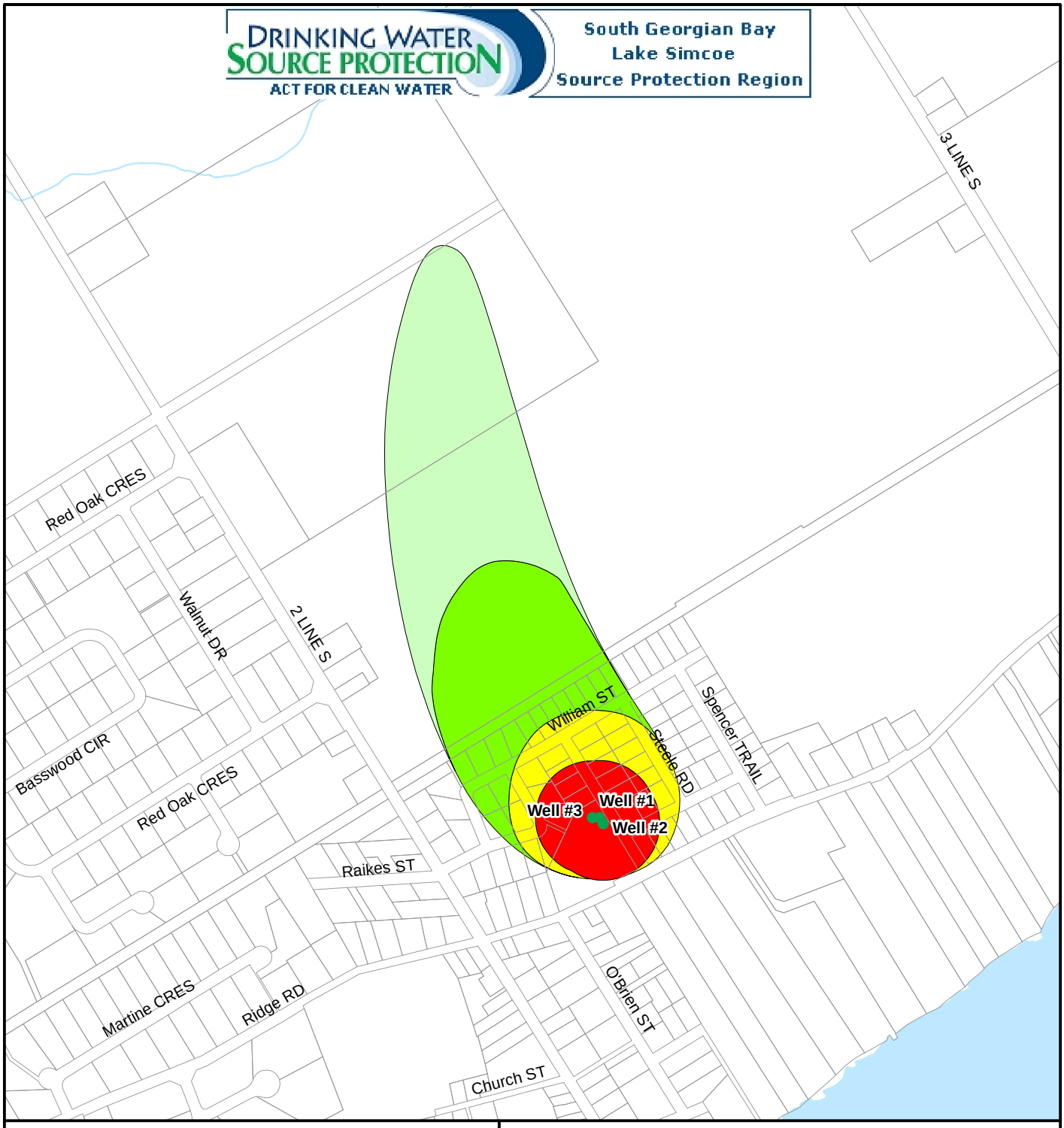
FIGURE 11e-2

**Figure 11e-3: Vulnerability Score - Shanty Bay.**




# VULNERABILITY SCORES - SHANTY BAY

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.9-3 |

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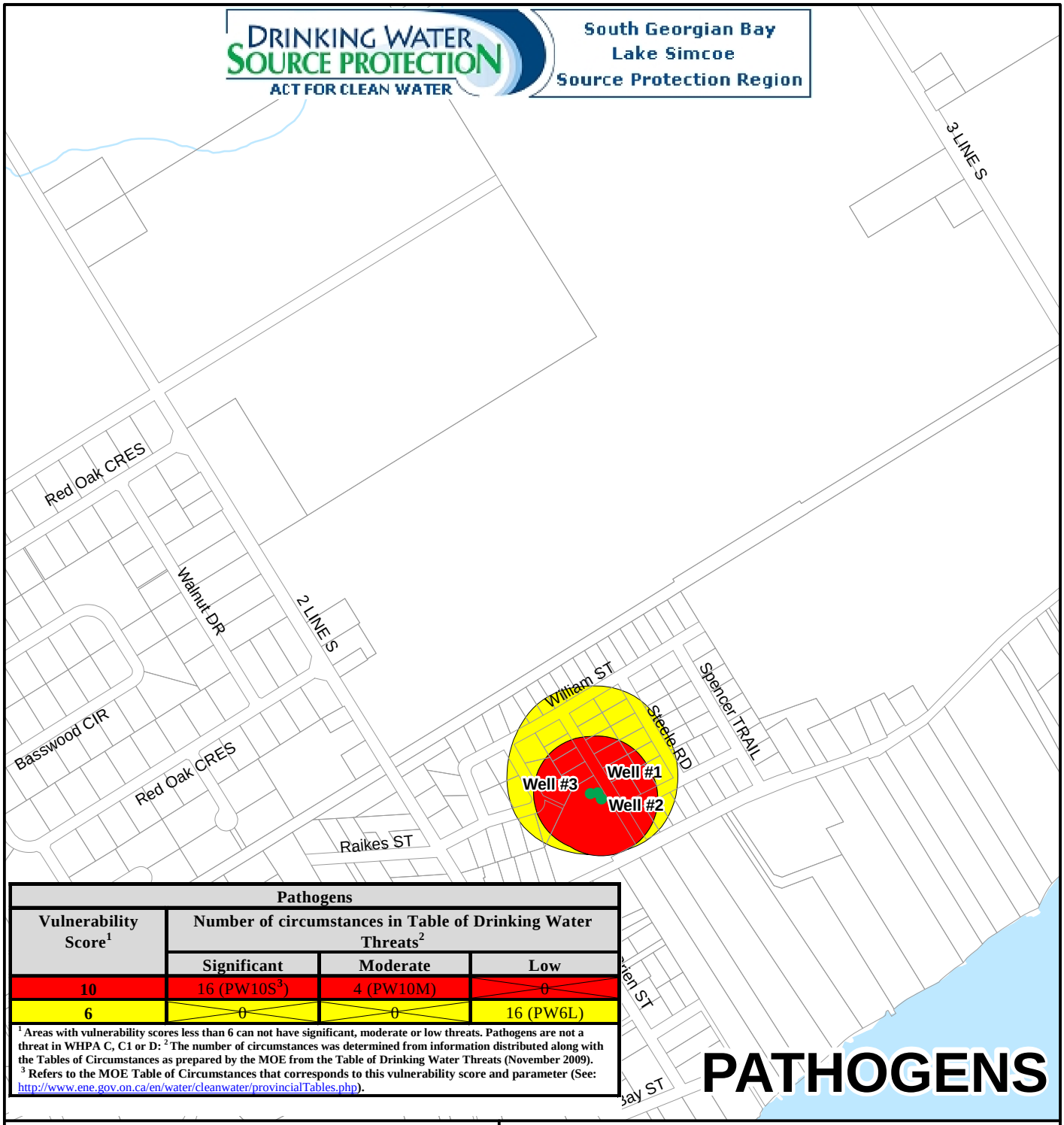
FIGURE 11e-3

**Figure 11e-4: Areas where Pathogens are or would be Significant, Moderate or Low Threats - Shanty Bay.**




| Pathogens | | | |
|---|---|---|---|
| Vulnerability Score[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| 10 | 16 (PW10S[3]) | 4 (PW10M) | ~~0~~ |
| 6 | ~~0~~ | ~~0~~ | 16 (PW6L) |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. Pathogens are not a threat in WHPA C, C1 or D: [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009).
[3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6

N W E S

100 50 0 100 Metres

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.

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## AREAS WHERE PATHOGENS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - SHANTY BAY

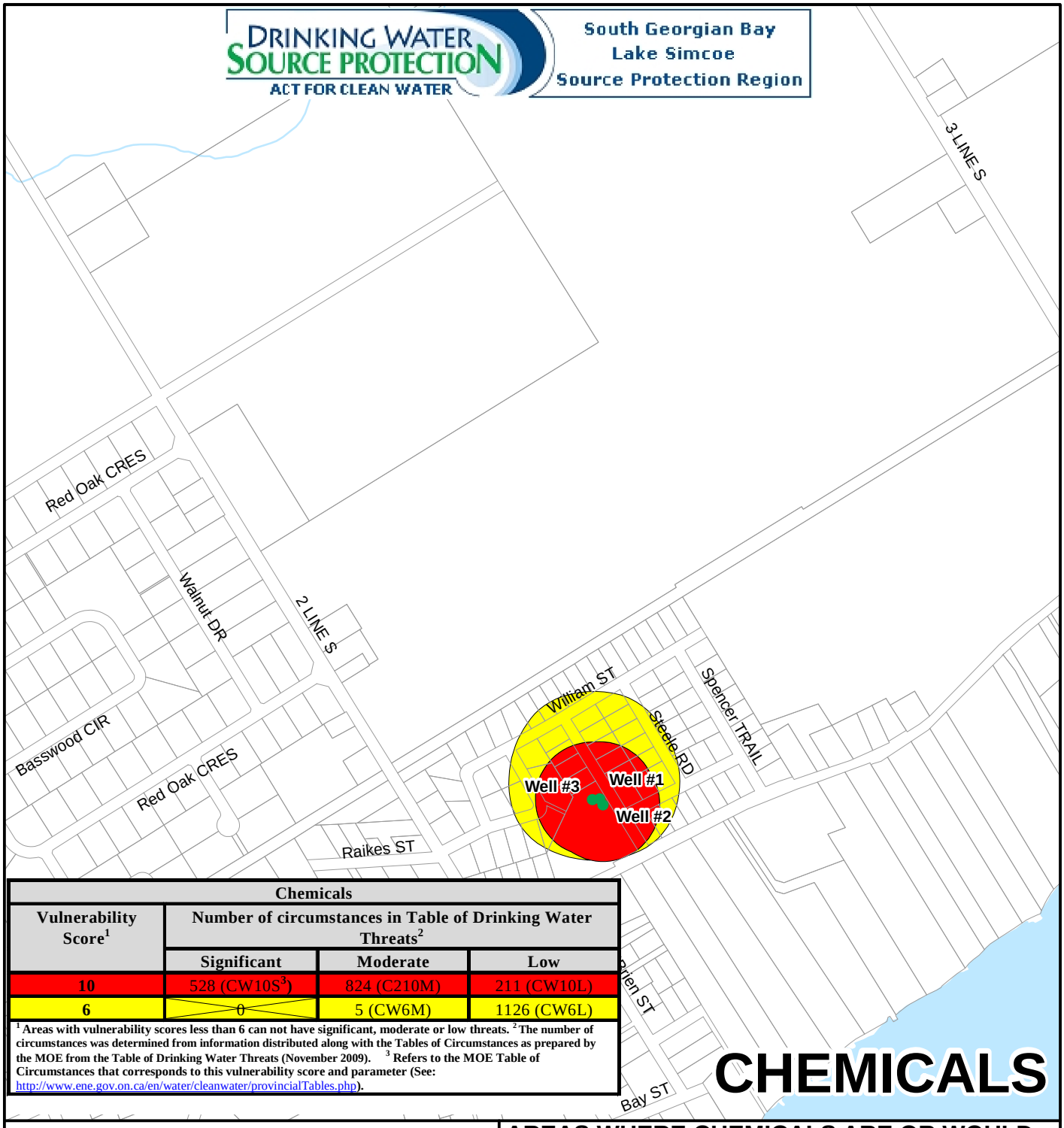
ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.9-4 |

GENIVAR Ontario

FIGURE **11e-4**

**Figure 11e-5: Areas where Chemicals are or would be Significant, Moderate or Low Threats - Shanty Bay.**




| Chemicals | | | |
|---|---|---|---|
| Vulnerability Score[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| 10 | 528 (CW10S[3]) | 824 (C210M) | 211 (CW10L) |
| 6 | ~~0~~ | 5 (CW6M) | 1126 (CW6L) |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009). [3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

LEGEND

- MUNICIPAL WELL LOCATION

VULNERABILITY SCORING

- 10
- 8
- 6

N W E S

100 50 0 100 Metres

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.

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**AREAS WHERE CHEMICALS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - SHANTY BAY**

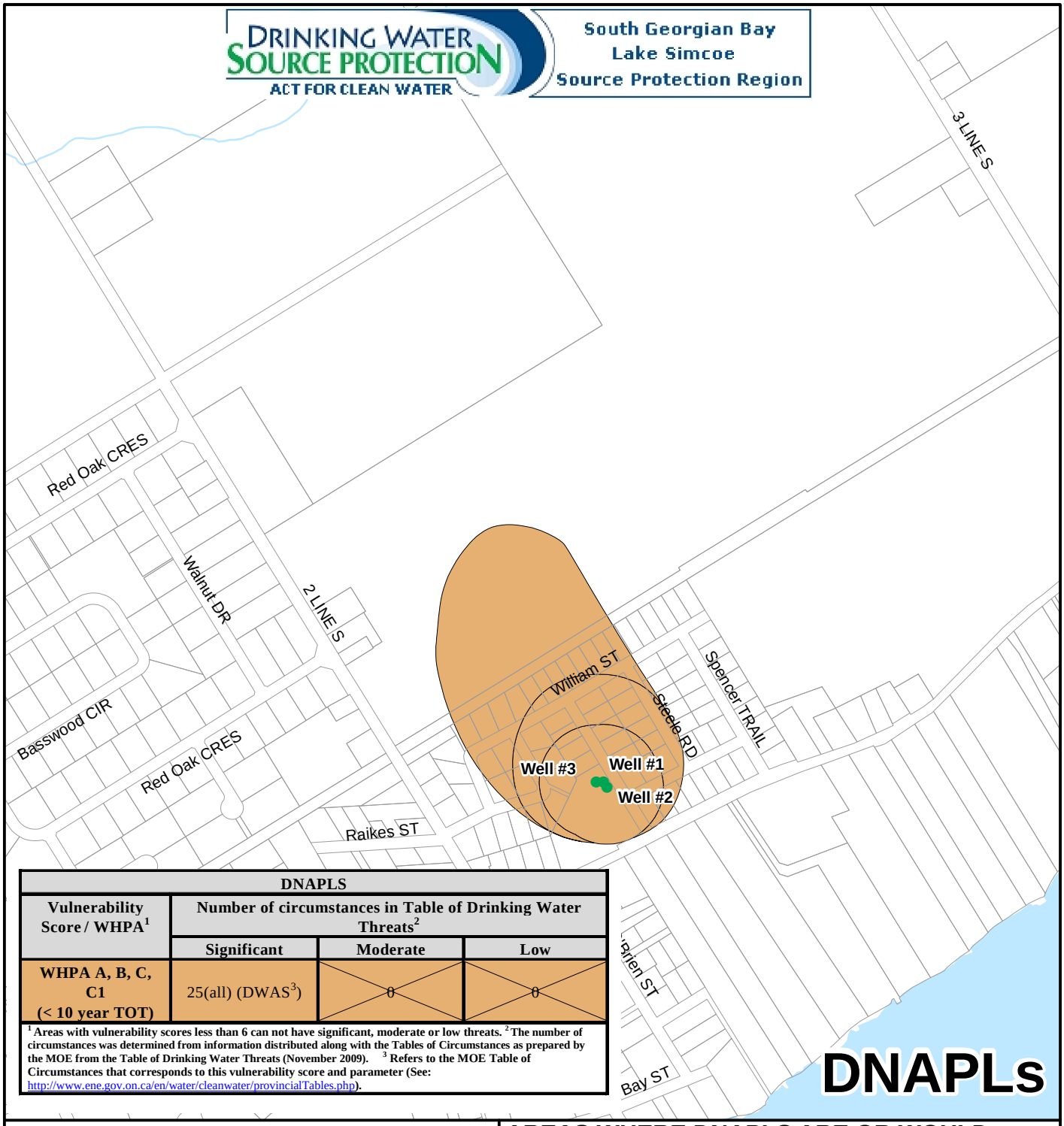
ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.9-5 |

GENIVAR Ontario

FIGURE **11e-5**

**Figure 11e-6: Areas where DNAPLs are or would be Significant, Moderate or Low Threats - Shanty Bay.**




| DNAPLS | | | |
|---|---|---|---|
| Vulnerability Score / WHPA[1] | Number of circumstances in Table of Drinking Water Threats[2] | | |
| | Significant | Moderate | Low |
| WHPA A, B, C, C1 (< 10 year TOT) | 25(all) (DWAS[3]) | 0 | 0 |

[1] Areas with vulnerability scores less than 6 can not have significant, moderate or low threats. [2] The number of circumstances was determined from information distributed along with the Tables of Circumstances as prepared by the MOE from the Table of Drinking Water Threats (November 2009). [3] Refers to the MOE Table of Circumstances that corresponds to this vulnerability score and parameter (See: http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php).

**Legend**

- MUNICIPAL WELL LOCATION
- WHPA-C1: 10-YEAR TIME-OF-TRAVEL

N W E S

100 50 0 100 Metres

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.

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**AREAS WHERE DNAPLS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - SHANTY BAY**

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.9-6 |

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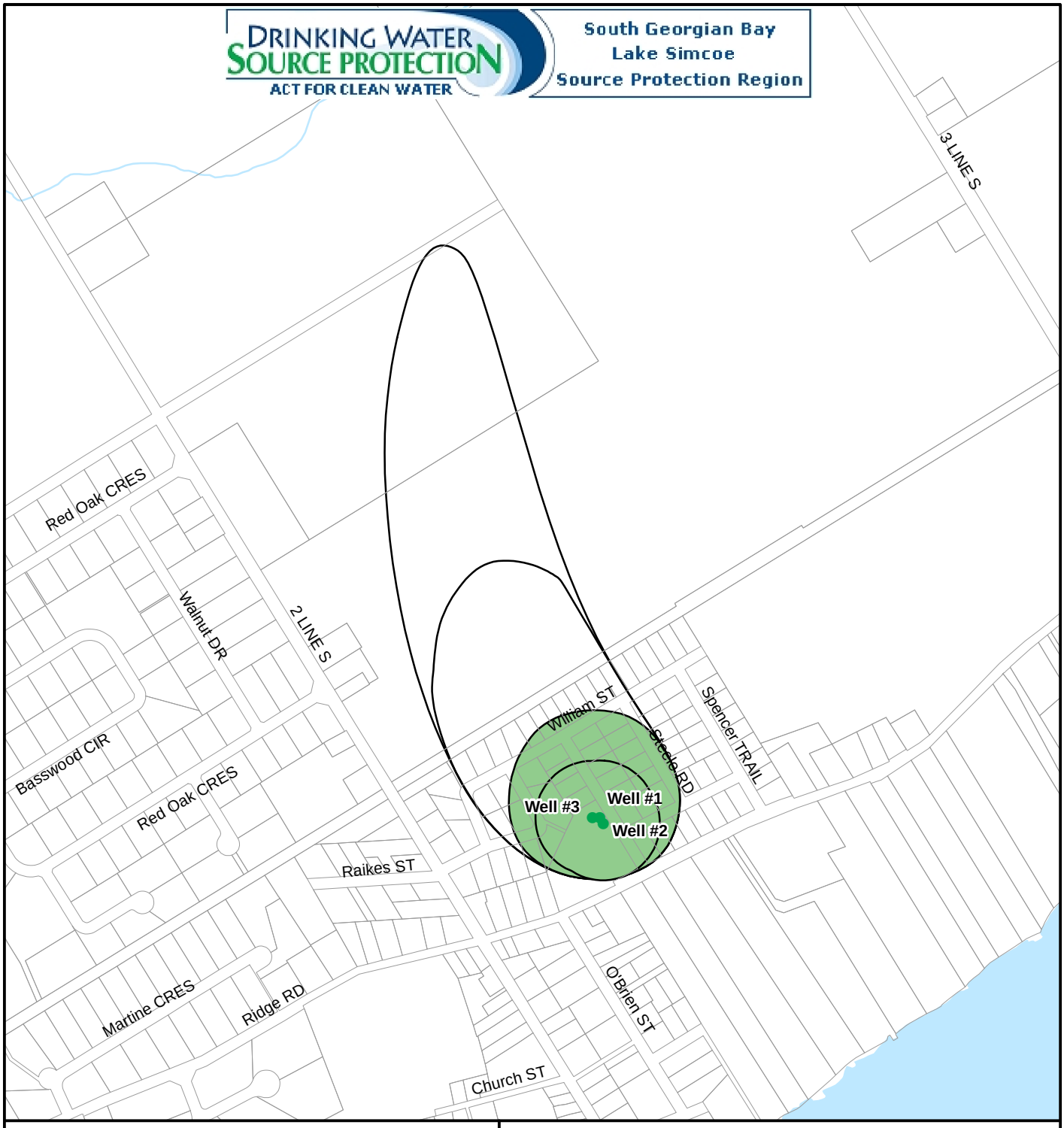
FIGURE **11e-6**

**Figure 11e-7: Managed Lands - Shanty Bay.**




**Legend**

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

N W E S

100 50 0 100 Metres

# MANAGED LANDS - SHANTY BAY

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.9-7 |

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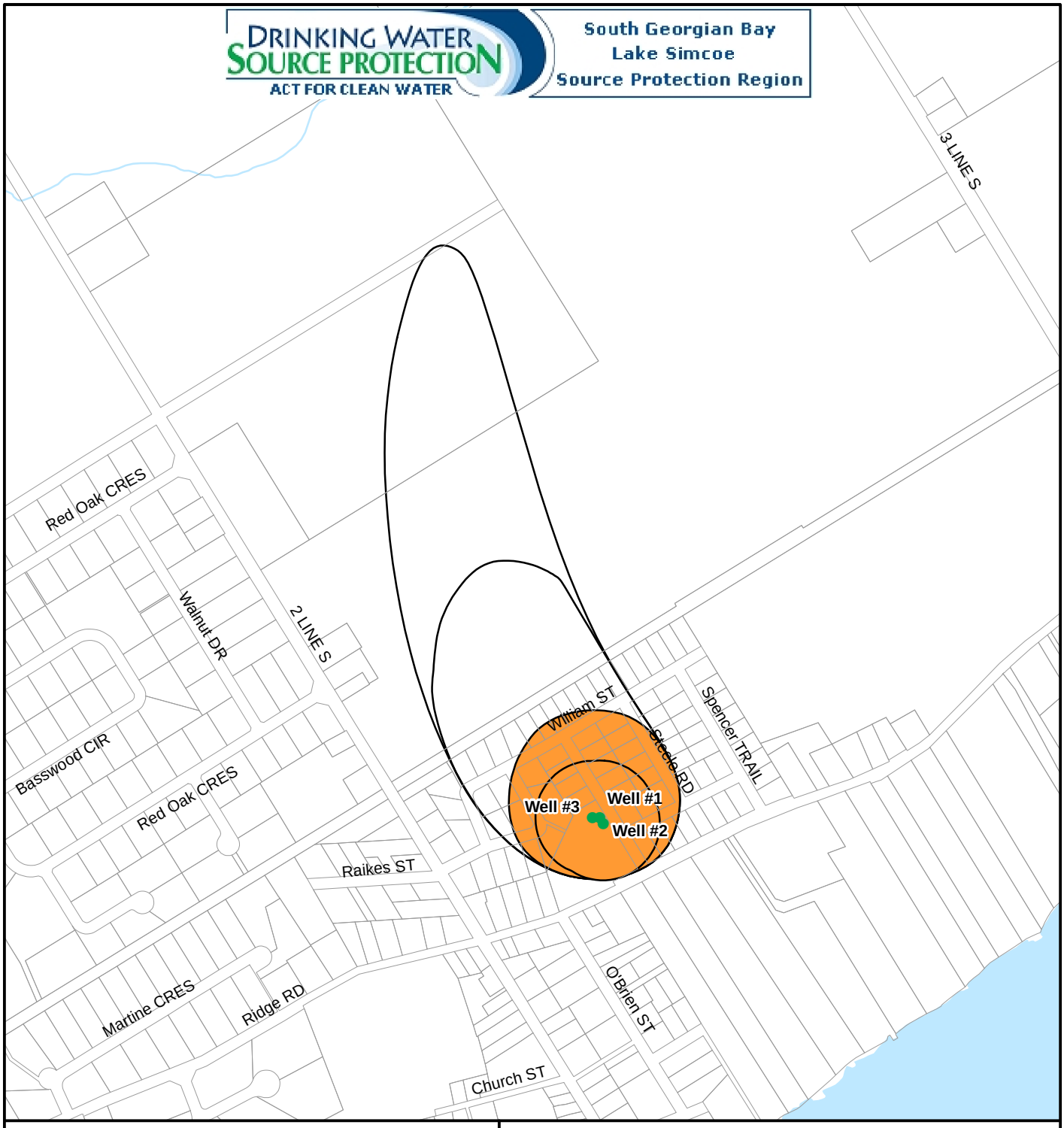
FIGURE **11e-7**

**Figure 11e-8: Livestock Density - Shanty Bay.**




**Legend**

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

N W E S

100 50 0 100 Metres

# LIVESTOCK DENSITY - SHANTY BAY

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.9-8 |

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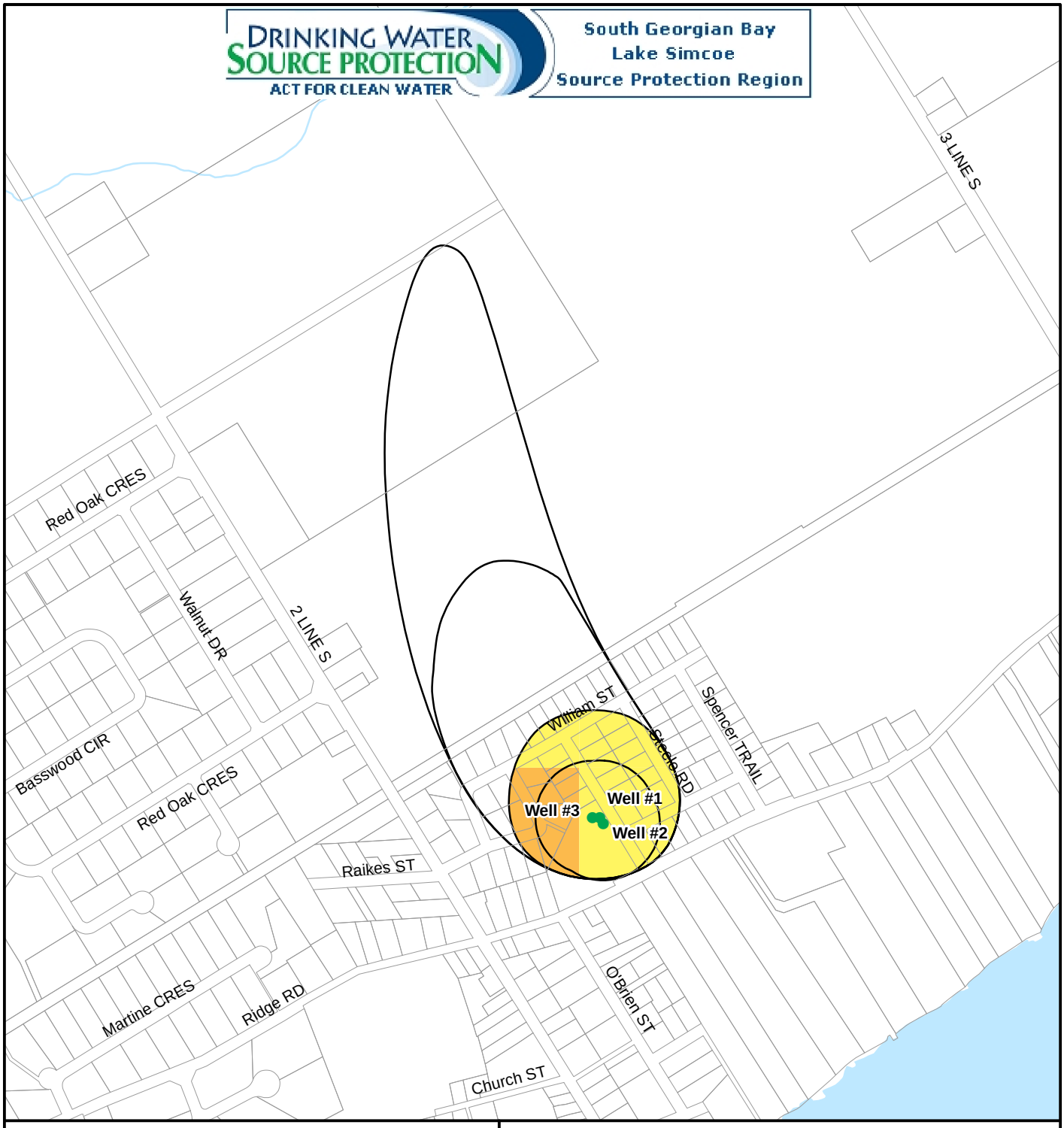
FIGURE **11e-8**

**Figure 11e-9: Impervious Surfaces - Shanty Bay.**




# IMPERVIOUS SURFACES - SHANTY BAY

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL GROUNDWATER SUPPLIES
South Georgian Bay Lake Simcoe
Source Protection Region

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

| | |
|---|---|
| DATE: JUNE 2010 | SCALE: 1:10000 |
| PROJECT: 0-071948.07 | FILE. NO.:0-07194807F13.9-9 |

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FIGURE 11e-9