Style Definition: Caption

Chapter 10: District Municipality of Muskoka

Table of Contents

List of Tables

List of Figures

Port Severn Water Treatment Plant

10 District Municipality of Muskoka

10.1 Introduction

This chapter contains information on one drinking water system for the District Municipality of Muskoka. 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~~Various consultants have completed the work presented, all of which was reviewed by South Georgian Bay-Lake Simcoe Source Water Protection staff and members of the Technical Work Group~~.

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 or Intake Protection Zone), and the assignment of a Vulnerability Score for the delineated area. An Uncertainty Rating is also provided for the Vulnerable Area delineation and the Vulnerability Assessment as per Technical Rules 13-15 [Part I.4 – Uncertainty Analysis – Water Quality (MOE, 2008a)] to express the level of confidence in the results based on the information that was available for the study.

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

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

10.2 Drinking Water Systems

Within the South Georgian Bay-Lake Simcoe (SGBLS) Source Protection Region (SPR), the District Municipality of Muskoka operates one (1) surface based water supply. As shown in Table 10-1 and Figure 10-1 the surface water supply is within the SGBLS SPR. Table 10-1 also

indicates the SPR and corresponding lead Source Protection Authority (SPA) for the municipal water supply.

Table 10-1: Municipal Surface Supply in the District Municipality of Muskoka.

Local Municipality	Community Water Supply	Source Protection Region / Lead Source Protection Authority (SPA)
District Municipality of Muskoka	Port Severn Water Treatment Plant	SGBLS SPR & Lakes Simcoe and Couchiching / Black River SPA

Formatted: Font: 11 pt
Formatted Table
Formatted: Font: 11 pt

In addition to the surface water plant within Muskoka, a number of vulnerable areas from surrounding municipalities extend into the District (Table 10-2). These include: a small section of the Severn Estates WHPA crosses the Township of Severn boundary into Muskoka, and the Robe Subdivision IPZ. Finally, the Port Severn IPZ has been found to extend out of the District and into the Township of Severn (Table 10-2).

Table 10-2: WHPA that cross into and out of the District Municipality of Muskoka in the SGBLS SPR.

Local Municipality that WHPA extends into	Municipality where wellhead is located	Name of Water Supply	Source Protection Region / Lead Source Protection Authority (SPA)	Location where entire Assessment can be obtained
District Municipality of Muskoka	Township of Severn	Severn Estates	SGBLS SPR & Lakes Simcoe and Couchiching / Black River SPA	This report (Chapter 9)
Township of Severn	District Municipality of Muskoka	Port Severn Water Treatment Plant	SGBLS SPR & Lakes Simcoe and Couchiching / Black River SPA	This Chapter
District Municipality of Muskoka	Township of Tay	Rope Subdivision Water Treatment Plant	SGBLS SPR & Lakes Simcoe and Couchiching / Black River SPA	Severn Sound Assessment Report (Chapter 12)

Formatted: Font: 12 pt

Formatted Table

Formatted: Font: 12 pt

Formatted: Font: 12 pt

Formatted: Font: 12 pt

10.3 Port Severn Water Treatment Plant

Formatted: Outline numbered + Level: 2 + Numbering Style: 1, 2, 3, … + Start at: 1 + Alignment: Left + Aligned at: 0 cm + Indent at: 1.02 cm

The Port Severn Water Treatment Plant (which is accessed from Lone Pine Drive) was constructed in 1998 and services a population of approximately 500 people in the Community of Port Severn. The Port Severn Water Treatment Plant draws its water from a point in Little Lake approximately 825 m upstream from the dam at Port Severn and has a rated water production capacity of 1900 m^3/day. Little Lake is the final water body in the Trent Severn Waterway before it empties into Severn Sound. It is separated from Severn Sound by the water level control structures at Port Severn and Lock 45. This lock, with a lift of 4.3 m (14 feet), allows passage from Severn Sound to the higher level of the Severn River / Little Lake. The separation between Severn Sound and Little Lake means that the currents in Little Lake are dictated by local meteorological conditions and the discharge from the Severn River. Hence, conditions in Little Lake at the Port Severn Water Treatment Plant intake are not influenced by the dynamics of Severn Sound.

The intake is located approximately 250 m from the western shore of Little Lake, in a water depth of approximately 4 m. Because the intake is located at a shallow depth, seasonal turbidity and temperature variations have been noted to potentially affect the water quality which requires operators to adapt the treatment in consequence. The raw water is pre-chlorinated for control of pathogens, such as cryptosporidium, and the effects of zebra mussels. The raw water is also UV treated in addition to chlorination.

Winter or break-up ice has not been identified as having been a problem at this intake. It is normal that Little Lake freezes over in late December, reaches a maximum ice thickness of 0.5 m, and clears of ice in early April and/or with high flows in the spring.

The IPZ-1 delineation for Port Severn was completed by the Severn Sound Environmental Association; the IPZ-2 delineation was completed by SNC-Lavalin, 2009; while the IPZ-3 delineation, Vulnerability Scoring, and Uncertainty Analysis were done by Baird (2010h). The Issues and Threats Assessment is based on the Genivar 2010a report.

10.3.1 Methods and Uncertainties

10.3.1.1 Surface Water Vulnerability

The Port Severn intake is classified as Type D surface water intake (Rule 55; MOE, 2008a). For Type D intakes, three zones are to be delineated: the IPZ-1 is based on a fixed radius around the intake crib; the IPZ-2 acts as a secondary protection zone around the IPZ-1; and the IPZ-3 is considered an additional protection zone.

10.3.1.2 Delineating IPZ-1 and IPZ-2

IPZ-1 was delineated by SSEA according to the Technical Rules and as outlined in Chapter 5. The IPZ-1 was based on the 1 km radius and a setback of not more than 120 m from the high water mark (HWM) and was prepared using GIS.

It must be noted however that the definition of HWM used in this assessment differs to that provided by the MOE[1]. MOE, 2009b, defines the HWM for water bodies where a long term water level record exists, as the 80th percentile for the month within which the highest water level occurs, or, where a long term record of water levels does not exist, the level at which flood plains are flooded and leave a mark where natural vegetation changes from predominantly aquatic vegetation to terrestrial vegetation. The HWM in this study was based on the MNR LIO water polygon data layer, as insufficient data exists to define HWM according to the proposed MOE method. Analysis of shoreline properties within the IPZ-1 showed that the approach used to delineate HWM (i.e. MOE recommended, or that used in this study), would have little or no effect on the properties identified as being partially or wholly within the IPZ-1. For this reason, the method applied is considered equal to or better than the MOE recommended approach. Detailed comparison of the two HWM approaches can be found in Baird (2010) which is located in Appendix M.

The IPZ-2 is defined based on the area that may contribute water to the intake where the time of travel to the intake is equal to or less than the time that is sufficient to allow the operator of the system to respond to an adverse condition in the quality of the surface water (Rule 65; MOE, 2008a). The two hour minimum response time was used for the Port Severn intakes, as this was the minimum time set by the MOE in the Guidance documents.

The IPZ-2 is comprised of four areas:

1. In-lake IPZ-2: the area within each surface water body and an extension up tributaries flowing into the IPZ-2;
2. Up-tributary: IPZ-2 is extended up tributary to the 2-hour time-of-travel limit;
3. Inland setback: 120m setback inland along the abutted land
4. Transport Pathways: an extension to include areas that contribute water to the IPZ-2 through a Transport Pathway.

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

10.3.1.2.1 In-lake IPZ-2 delineation

In-lake IPZ-2 delineation was completed SNC-Lavalin, 2009. Delineation of a source water protection zone requires a rigorous analysis which includes the withdrawal zone for the intake itself and the regional circulation patterns. Circulation in a region is a complex function of bathymetry, meteorological conditions, river discharges, intake operations and other similar factors. The process which was followed to study the combined effect of these aspects first involved the analysis of the currents at the intake point. Speeds and directions at that point were used to provide a preliminary estimate of the withdrawal zone and, hence, an estimate of the probable region of interest for more detailed modelling. This larger region was then simulated in the transient three-dimensional hydrodynamic model (GEMSS-SPM) to give a much more refined delineation of the source water protection zones.

Due to the typical extent of the region of interest at each intake and the high model grid resolutions, the Lagrangian method was adopted to increase computational efficiency. The time of travel for any contaminant to the intake was set at two-hours and the target dilution of 1000 was adopted for defining contact with the intake. A cluster of 1000 particles were released at each individual model cell lying within the region of interest and a target number of 1 or more particles reaching the intake in two hours was defined as a potential threat for contamination. The flow in Georgian Bay is mostly wind driven which leads to surface velocities being higher than the layers below it. Because of this, the modelled particles were only released at the surface. Releasing the particles at the surface with higher velocities will result in a larger withdrawal zone (source water protection zone) making the study conservative. Also, the target zone was defined at the intake location with an extent of 50 m in all directions (as well as extending from the water surface to the bottom).

The Little Lake region is separated from Severn Sound/Georgian Bay by the dam and lock at Port Severn. This separation from the Great Lakes, its regulation by river discharge in the spring months, and its behaviour as an inland lake for much of the year defines this water body as an inland lake (MOE, 2006).

Currents generally are wind-driven and currents near the shore are sheltered by the shoreline. As a result, there is a low probability of shoreline currents developing sufficient speed to carry contaminants to the intake in a two-hour period.

Direct Particle Modelling (DPM)

The hydrodynamic model was set up using this preliminary analysis of the IPZ-2 and a time of travel criterion of 2 hours. After this, two separate simulations were undertaken. The first covered the study period when river discharge ranged from a relatively normal spring high of

128 m^3/s to a normal September low of 11 m^3/s, and averaged approximately 43 m^3/s. The second considered continuous high flow at bank full stage (in this case the 1 in 5 year flow of 215 m^3/s) to assess this effect on the IPZ-2.

The IPZ-2 is oriented in a somewhat upstream direction which reflects the effect of upstream flows directing water to the intake. River and wind-driven velocities are relatively low and the IPZ-2 (0.1% probability) extends approximately 400 m upstream and 300 m downstream of the intake, and 200 m to the east and west.

The IPZ-2 extends further upstream (approximately 700 m) in response to currents moving faster to the intake from that direction. The downstream zone of the IPZ-2 is reduced to less than 100 m for the same reasons. Overall, the 1 km radius around the intake defining the IPZ-1 appears appropriate for the IPZ-2 as well, except that the downstream region need not extend much beyond the intake point.

The results of these two cases are combined to present the lake portion of the IPZ-2. It is defined by a broad range of conditions which could occur in any year. This ranges from bank full flood flows in the spring to very low flow, wind driven conditions in the summer. The IPZ-2 extends approximately 700 m upstream of the intake, 300 m downstream, and 250 m to the east and west.

Reverse Particle Modelling (RPM)

The hydrodynamic model was then used to analyze the time of travel to the intake using the reverse particle tracking mode. The same hydrodynamic low flow and high flow and wind conditions which were employed above for the DPM approach were used in the RPM approach to identify the IPZ-2.

The final reverse tracking IPZ-2 is similar to the DPM results, primarily because the high flow hydraulics dominate the upstream extent of the IPZ-2. The final IPZ-2 for Little Lake extends over 500 m upstream and 250 m downstream to the southwest of the intake. The IPZ-2 includes a zone approximately 250 m to the west and 200 m to the east of the intake.

This RPM result does show the differences in the two approaches for defining the IPZ-2 (direct particle and reverse particle modelling). Basically, no two models give exactly the same results and, in this case, there are differences of approximately 100 m in the northern and east-west extent as compared to the direct particle modelling approaches.

In both modeling cases the IPZ-2 was found to be smaller than the IPZ-1 and does not connect to land. For this reason no inland setback, Transport Pathways, or up tributary components were identified.

10.3.1.3 Delineating IPZ-3

The IPZ-3 for Port Severn is shown in Figure 10a-1. The IPZ-3 for Type D intakes includes the area within each surface water body that may contribute water to the intake, plus a setback inland as described in Section 3.1 [Rule 70, MOE, 2009b]. As discussed above, the Port Severn intake is located in Little Lake, which is the final water body in the Trent Severn Waterway, before it empties into Severn Sound. It is separated from Severn Sound by the water level control structures at Port Severn and Lock 45. The IPZ-3 includes all water bodies that ultimately drain into Little Lake.

For vulnerability scoring, the IPZ-3 for Type D intakes may be subdivided into areas, reflecting the degree of vulnerability varying with the proximity of the area to the intake [Rules 90 and 92(4), MOE, 2009b]. Generally, the sub-area division was based on control structures associated with the Trent-Severn Waterway, that effectively regulate flow, and on watersheds.

Area 1 - these catchments drain directly into Little Lake with no control structures;

Area 2 - catchment drains directly to Little Lake via control structure (Lock # 44);

Area 3 - catchment drains to Little Lake via Area 2, with control structure (Lock #43);

Area 4 - catchment drains to Little Lake via Areas 3 and 2, with control structure (Lock #42);

Area 5 - Lake Simcoe watershed (including Upper Talbot subwatershed), drains to Little Lake via Areas 4,3,2 with no control structures; and

Area 6 - Peripheral catchments, drain to Little Lake via divisions 3 and 2. No control structures.

These sub-areas are illustrated in Figure 10a-1.

10.3.1.4 IPZ Vulnerability Scores

The Vulnerability Score ranks the relative Vulnerability of the intake to contaminants. Vulnerability Score is based on the Area Vulnerability Factor and the Source Vulnerability Factor using the formula below:

B x C

where,

B = the Area Vulnerability Factor of the area of the IPZ

C = the Source Vulnerability Factor of the surface water of the IPZ

The range of possible Vulnerability Scores can be found in Table 5-5, Section 5.3.2 of Chapter 5: Methods Overview.

10.3.1.4.1 Area Vulnerability Factor

Each of the Intake Protection Zones is assigned an Area Vulnerability Factor (B) with the IPZs closest to the intake having the highest factor.

For IPZ-1s, the Area Vulnerability Factor is assigned a value of 10 due to its close proximity to the intake (Rule 88; MOE, 2008a).

For the IPZ-2, a 'base' Area Vulnerability Factor of 8 (the median factor for an IPZ-2) was initially assigned, and then altered by four modifier scores based factors such as land cover, hydrology, slope and the characteristics of the subwatershed that the IPZ-2 is located in (the four potential modifiers can be found in Baird, 2010h).

The IPZ-2 base Area Vulnerability Factor, modifiers, and final Area Vulnerability Factor for the Port Severn WTP intake are listed in Table 10-3.

Table 10-3: Derivation of IPZ-2 Vulnerability Factor (B) for Port Severn WTP Intake.

MOE Criteria (Rule 92)	Descriptor	Modifier Descriptor	Sub Modifier Value	Combined Modifier Values[6]
Base Area Vulnerability Factor				8
92(1)	% area of IPZ-2 composed of land	Drainage Density Modifier[1]	0	0
92(1	% area of IPZ-2 composed of land	Land-Water Modifier[2]	0	0
92(2) and 92(3)	Land cover, soil type, permeability and slope and Hydrological and hydrogeological	SCS Curve Number Modifier[3]	0	-1
92(2) and 92(3)	Land cover, soil type, permeability and slope and Hydrological and hydrogeological	Land Use Modifier[4]	-1	-1
92(2) and 92(3)	Land cover, soil type, permeability and slope and Hydrological and hydrogeological	Relief-Length[5]	0	-1
Final Area Vulnerability Factor (B)				**7**

[1]Drainage density = (Total Length of Streams)/(Subwatershed Area).Modifier: Within +/-1 S.D. of mean = 0: >+1 S.D. of mean = +1: <-1 S.D. of mean = -1

[2]Land-water modifier = Ratio of Land to Open water and Wetlands in Sub-zone. Within +/-1 S.D. of mean = 0: >+1 S.D. of mean = +1: <-1 S.D. of mean = -1

[3]Adjusted SCS Curve Number. Modifier: Within +/-1 S.D. of mean = 0: >+1 S.D. of mean = +1: <-1 S.D. of mean = -1. Lake Couchiching CN is average of all other subwatersheds since no data was available.

[4]Land use: Natural/Forested = -1: Agricultural = 0: Urban/Developed = +1, coarsely interpreted from 1999 LandSat Imagery

[5]Relief-Length Ratio = (Relief)/(Subwatershed Length). Modifier: Within +/-1 S.D. of mean = 0: >+1 S.D. of mean = +1: <-1 S.D. of mean = -1

[6]Combined modifier in group 92(1) cannot exceed +/-1; combined modifier in group 92(2) and 92(3) cannot exceed +/-2.

Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted Table
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Font: 12 pt

For the IPZ-3 sub-areas, a distance modifier was also assigned, based on the proximity of the area of the IPZ-3 to the intake. The closest sub-area was assigned a modifier of 0, and this increased with distance from the intake. The IPZ-3 sub-area was assigned a base area vulnerability factor calculated as the IPZ-2 area vulnerability factor minus 1 [Rule 91; MOE, 2009b]. The area vulnerability factors for the IPZ-3 sub-areas are summarized in Table 10-4.

Table 10-4: Derivation of IPZ-2 and IPZ-3 Area Vulnerability Factors for Port Severn WTP Intake.

IPZ-2 Zone and IPZ-3 Sub-areas	Base Area Vulnerability Factor	Drainage Density Modifier[1]	Land-Water Modifier[2]	SCS Curve Number Modifier[3]	Land Use Modifier[4]	Relief Length Modifier[5]	Distance Modifier[6]	Final Area Vulnerability Factor (B)[6]
IPZ-2	8	0	0	0	-1	0	0	7
IPZ-3 Sub-area 1	6	0	0	0	-1	0	0	6
IPZ-3 Sub-area 2	6	1	0	0	-1	1	-1	6[8]
IPZ-3 Sub-area 3	6	0	0	0	-1	0	-2	3
IPZ-3 Sub-area 4	6	-1	*0	1	-1	0	-3	2
IPZ-3 Sub-area 5	6	-1	0	1	0	-1	-4	1
IPZ-3 Sub-area 6	6	0	0	0	-1	0	-4	1

[1]Drainage density = (Total Length of Streams)/(Subwatershed Area).Modifier: Within +/-1 S.D. of mean = 0: >+1 S.D. of mean = +1: <-1 S.D. of mean = -1

[2]Land-water modifier = Ratio of Land to Open water and Wetlands in Sub-zone. Within +/-1 S.D. of mean = 0: >+1 S.D. of mean = +1: <-1 S.D. of mean = -1

[3]Adjusted SCS Curve Number. Modifier: Within +/-1 S.D. of mean = 0: >+1 S.D. of mean = +1: <-1 S.D. of mean = -1.

[4]Land use: Natural/Forested = -1: Agricultural = 0: Urban/Developed = +1, coarsely interpreted from 1999 LandSat Imagery

[5]Relief-Length Ratio = (Relief)/(Subwatershed Length). Modifier: Within +/-1 S.D. of mean = 0: >+1 S.D. of mean = +1: <-1 S.D. of mean = -1

[6]See Baird, 2010h (Appendix M)for explanation.

[7]Combined Drainage Density and Land Water Modifier cannot exceed +/-1; Combined SCS CN, Land Use and Relief Length Modifiers cannot exceed +/-2.

[8]Sub-area 1 Final Area Vuln. F actor calculated as 5 but increased to 6, since it must be higher than Sub-area 2.

* Sub-area 4 Land-Water Modifier should be -1, but is set to 0 because net effects of DD modifier and LW modifier must be within range of ±1

Formatted: Font: (Default) +Body (Calibri), 11 pt
Formatted: Font: (Default) +Body (Calibri), 11 pt
Formatted: Font: (Default) +Body (Calibri)
Formatted Table
Formatted: Font: (Default) +Body (Calibri)
Formatted: Font: (Default) +Body (Calibri)
Formatted: Font: (Default) +Body (Calibri)
Formatted: Font: (Default) +Body (Calibri)
Formatted: Font: (Default) +Body (Calibri)
Formatted: Font: (Default) +Body (Calibri)

10.3.1.4.2 Source Vulnerability Factor

A Source Vulnerability Factor is assigned to each surface water intake (Rule 94; MOE, 2008a). Source Vulnerability for intakes within the SGBLS Source Protection Region was based on that developed by the Michigan Department of Environmental Quality (MDEQ). The first three rows in Table 10-5 were taken directly from MDEQ (2004), while the fourth row lists the corresponding Vulnerability Factor assigned for the Port Severn WTP.

Table 10-5: Intake Vulnerability Criteria based on Intake Distance from Shore and Depth (adapted from MDEQ, 2004).

Category[1]	Nearshore-Shallow Water	Nearshore-Deep Water	Offshore-Shallow Water	Offshore-Deep Water
Parameters[1]	<3500m offshore <6m depth	<3500m offshore >6m depth	>3500m offshore <6m depth	>3500m offshore >6m depth
Vulnerability [1]	High	High to Moderate	High to Moderate	Moderate
Recommended Factor (C) for Type D Intakes	1.0	0.9	0.9	0.8

[1]Category, parameters and vulnerability based on MDEQ (2004).

The Port Severn (Little Lake) intake is a Type D intake. The intake is located 250 m from the west shore of Little Lake (see Baird, 2010h), 4.0 m below the water surface. Based on Table 10-5, the intake therefore receives the highest Source Vulnerability Factor. The Issues Evaluation (Section 10.3.3) did not identify any Issues for this intake. A Source Vulnerability Factor (C) of 1.0 is therefore recommended.

10.3.1.5 Uncertainty Assessment

This section summarizes some of the uncertainty identified by Baird (2010h) for the work they completed (delineating IPZ-3 and assigning Vulnerability Scores). The entire discussion of uncertainties is presented in Baird 2010h, Appendix M. This assessment was used by Baird (2010h) to assign Uncertainty Ratings of either "High" or "Low" for the IPZ-3 and Vulnerability Scores.

10.3.1.5.1 Data Quality and Gaps:

Data gaps and data quality issues identified during the Vulnerability study (Baird, 2010h) included: intake locations and depths were provided by SGBLS SPR and are assumed to have

Formatted: Font: 12 pt
Formatted Table
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: English (Canada)

been confirmed through the review of all available data, and no Regulated Limit is available for the study area. Further details on the data quality and gaps listed for the Port Severn intake are in Appendix M, Baird 2010h.

10.3.1.5.2 Quality Assurance/Quality Control

In completing this project, Baird followed their established *Project Quality Control Program (QCP),* which includes: Preparation of the Project Control Plan (PCP); Identification of the Project Manager (PM), Project Team (PT), Quality Control Reviewers (QCRs) and Quality Assurance Manager (QAM); Schedule and Budget; Description of tasks, project phases and/or deliverables to be reviewed; Identification of checklists to be utilized during reviews; Discussion of Quality Assurance procedures to be used during the project life cycle.

10.3.1.5.3 Area and Source Vulnerability Factors

The factors considered in assigning the area Vulnerability values include: the percentage of the area of the IPZ-2 or IPZ-3, as the case may be, that is composed of land; the land cover, soil type, permeability of the land, and the slope of any setbacks; the hydrological and hydrogeological conditions in the area that contributes water to the area through Transport Pathways; and, in respect of an IPZ-3, the proximity of the area of the IPZ-3 to the intake. The only subwatershed characteristic that is relatively uncertain is the SCS Curve No., which was estimated from datasets provided by the SGBLS SPR. The uncertainty arises from the fact that the SCS Curve No. is a relativistic estimate of the capability of an area for surface runoff generation, based primarily on land cover and soil hydrologic characterization. There is less uncertainty with the other sub-watershed characteristics (area, length, sum of stream lengths, land use, and relief) as they were measured directly from GIS layers.

While there is a relatively low level of uncertainty associated with the datasets used to evaluate the Area Vulnerability Factor, there is a high degree of uncertainty in the methodology used to develop the Area Vulnerability Factor. The methodology developed by Baird is based on assigning a relative rating for each criterion in the rules. Other consultants have derived similar methodologies independently of Baird, but their exact choice of criteria, and the divisions between these, may vary.

The parameters considered in assigning the Source Vulnerability Factors were the distance of the intake from shore and the depth of water that it is located in. It is the consultants' (Baird) understanding that these values have been confirmed based on engineering drawings and the client has indicated a Low level of Uncertainty for these values. A Threats and Issues Analysis was undertaken by Genivar, 2010a and, based on the data reviewed, no Issues were identified. A Low level of Uncertainty has therefore been assigned to the Source Vulnerability Factors.

10.3.2 Results Port Severn Water Treatment Plant

10.3.2.1 Intake Protection Zones (IPZ)

The Intake Protection Zones for the Port Severn WTP are shown in Figure 10a-2. IPZ-1 consists of a 1 km radius centered on the crib of the intake. The IPZ-2 is entirely contained within the IPZ-1 and does not connect with shore.

The IPZ-3 for the Port Severn WTP has been defined as six geographical divisions (Figure 10a-1), that were generally based on control structures associated with the Trent-Severn Waterway that effectively regulate flow, and on watersheds.

10.3.2.2 Intake Protection Zone (IPZ) Vulnerability Scores

The Vulnerability Factors and Scores for the IPZ-1, IPZ-2, and IPZ-3 sub-areas are summarized below in Table 10-6 and Figure 10a-2.

Table 10-6: Summary of Vulnerability Factors and Scores for Port Severn WTP Intake.

IPZ	Area Vulnerability Factor (B)	Source Vulnerability Factor (C)	Vulnerability Score
IPZ-1	10	1.0	10.0
IPZ-2*	7	1.0	7.0
IPZ-3 Sub-area 1	6	1.0	6.0
IPZ-3 Sub-area 2	6	1.0	6.0
IPZ-3 Sub-area 3	3	1.0	3.0
IPZ-3 Sub-area 4	2	1.0	2.0
IPZ-3 Sub-area 5	1	1.0	1.0
IPZ-3 Sub-area 6	1	1.0	1.0

* Since the IPZ-2 is contained within the IPZ-1, the Vulnerability Score is only required for establishing IPZ-3 vulnerability.

Formatted: Font: 12 pt
Formatted Table
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Font: 12 pt

10.3.2.3 Uncertainty for IPZ Delineation and Vulnerability

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)).

Based on the factors discussed above, Baird (2010h) recommended an IPZ delineation Uncertainty Rating for the IPZ-1 as Low and IPZ-3 as High. The Uncertainty Rating for the IPZ-1 and -3 Vulnerability Scores are all High (Table 10-7). Uncertainty Ratings for the IPZ-2 delineation was classified by SNC-Lavalin (2009) as Low.

The IPZ-1 delineation was completed by others and reviewed by Baird. The SGBLS SPR has stated that there is a Low level of Uncertainty in the location of the intake. It is noted that the shoreline used in the delineation differs from the HWM defined in MOE (2009d). This is not expected to have a large impact on the IPZ-1 delineation. There is a Low level of Uncertainty in QA/QC. No modeling was required and the overall Uncertainty Rating for IPZ-1 delineation is therefore Low.

Table 10-7: Summary of uncertainty Ratings for District of Muskoka – Port Severn WTP Intake IPZs and Vulnerability Scores.

IPZ	Uncertainty for IPZ Delineation - Evaluation Factor	Uncertainty for IPZ Delineation - Rating	Uncertainty for Vulnerability Scores - Evaluation Factor	Uncertainty for Vulnerability Scores Rating
IPZ-1	Data	Low	Data	High
IPZ-1	QA/QC	Low	QA/QC	Low
IPZ-1	QA/QC	Low	Accuracy of Vuln. Factors	High
IPZ-1	**Overall:**	**Low**	**Overall:**	**High**
IPZ-2	Low	Low	Not applicable as IPZ-2 is contained entirely within IPZ-1	Not applicable as IPZ-2 is contained entirely within IPZ-1
IPZ-3	Data	High	Data	Low
IPZ-3	Modeling	High	-	-
IPZ-3	QA/QC	Low	QA/QC	Low
IPZ-3	Calibration/Validation	n/a	Accuracy of Vuln. Factors	High
	Overall:	**High**	**Overall:**	**High**

Formatted: Font: +Body (Calibri)
Formatted Table
Formatted: Font: +Body (Calibri)
Formatted: Font: +Body (Calibri)
Formatted: Font: +Body (Calibri)
Formatted: Font: +Body (Calibri)
Formatted: Font: +Body (Calibri)
Formatted: Font: +Body (Calibri)
Formatted: Font: +Body (Calibri)
Formatted: Font: +Body (Calibri)
Formatted: Font: +Body (Calibri)
Formatted: Font: +Body (Calibri)

There was a High level of Uncertainty in the data used to delineate the IPZ-3. Modeling was not used in the analysis. However, this category (modeling) has been used to describe the methodology used to delineate the IPZ-3 sub-zones. Methodologies are not well defined in MOE (2009b) and alternate approaches could have been used, providing different results. Contaminant specific modeling to determine if an Activity represents a Significant Drinking Water Threat [MOE, 2009b; Rule 130] has not been completed as part of this project but should be considered in the future to improve the level of certainty in the IPZ-3 delineation.

The Uncertainty Rating for the data used to define the Source Vulnerability Factor (offset from shore, depth, and history of water quality concerns) is High due to the limited data available to determine a history of water quality concerns. The Source Vulnerability Factor applies to both the IPZ-1 and the IPZ-3. The level of uncertainty for the Area Vulnerability Factor for the IPZ-1 is Low, as it is defined in MOE (2009b) as 10. The level of uncertainty for the Area Vulnerability Factors for the IPZ-3 subareas is High, as different interpretations of MOE (2009b) would result

in scoring variations. An overall rating of High was assigned to the uncertainty for the IPZ-3 Vulnerability Score.

10.3.3 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 and treated water quality for the Port Severn Water Treatment Plant has been reviewed to identify Drinking Water Issues that are considered likely to result in a deterioration of the quality of water for use as a source of drinking water. Details of the Drinking Water Issues Evaluation for the Port Severn Water Treatment Plant are provided in Technical Memorandum I1 – Drinking Water Issues Evaluation – Port Severn Water Treatment Plant (Appendix M).

No Drinking Water Issues were identified for the Port Severn Water Treatment Plant

The occasional presence of *E. coli* and coliform bacteria in the surface water are not considered to be a Drinking Water Issue as these parameters are being treated effectively and in accordance with Safe Drinking Water Act regulations.

Sodium concentrations are observed to be slightly increasing but are not projected to exceed the ODWQS of 200 mg/L within 50 years.

Trihalomethanes are present in treated water in trace concentrations as a byproduct of disinfection by chlorination. Trihalomethane concentrations are typically well below ODWQS values and are not observed to be increasing.

10.3.4 Drinking Water Threats Evaluation

An assessment of Drinking Water Threats for the Port Severn WTP 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 Port Severn 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.

10.3.4.1 List of Drinking Water Threats – Activities

The list of Prescribed Drinking Water Threats considered in the assessment for Port Severn 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.

10.3.4.2 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 Port Severn 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 IPZs.
- 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 with staff from the Severn Sound Environmental Association to identify potential conditions within the identified IPZs for the drinking water supply.

No confirmed Conditions have been identified for the Port Severn water supply*. *No potential Conditions have been identified for consideration at this time.

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

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

Field Code Changed

10.3.4.3.1 Pathogen Parameters

The Technical Rules can be used in conjunction with the Vulnerability Scores ~~The Key Table~~ on Figure 10a-3 ~~can be used in conjunction with the Vulnerability Scores~~ to identify the areas where Activities associated with pathogen Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Port Severn 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. Figure 10a-4 provides additional detail within the IPZ-1 area. The IPZ-3 sub regions with vulnerability scores of 3 and less are not shown of the map as it is not possible to have a Significant, Moderate, or Low Drinking Water Threats in these areas.

10.3.4.3.2 Chemical Parameters

The Technical Rules can be used in conjunction with the Vulnerability Scores ~~The Key Table~~ on Figure 10a-5 ~~can be used in conjunction with the Vulnerability Scores~~ to identify the areas where Activities associated with chemical Threats are or would be Significant, Moderate, or Low Drinking Water Threats for the Port Severn Water Supply. Activities that are or would be Significant Drinking Water Threats for chemicals can be observed within areas where the Vulnerability Score is 10. Figure 10a-6 provides additional detail within the IPZ-1 area. The IPZ-3 sub regions with vulnerability scores of 3 and less are not shown of the map as it is not possible to have a Significant, Moderate, or Low Drinking Water Threats in these areas.

10.3.4.4 Identifying areas of Significant/Moderate/Low Threats – Conditions

Further to Section 10.3.4.2, no Conditions have been confirmed within the WHPA for the Port Severn 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 that 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 10a-2 illustrates the Vulnerability Score map for Port Severn WTP that can be used to determine where a Condition is or would be a Significant, Moderate, or Low Threat to Drinking Water.

10.3.4.5 Enumerating Drinking Water Threats

~~10.3.4.5~~

Formatted: Font: Italic

Formatted: Normal

The number of Significant Drinking Water Threats for the Port Severn 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 10-8 documents the enumeration of existing activities that are considered to be potential Significant Drinking Water Threats within the IPZ for the Port Severn Water Treatment Plant. Potential Significant Drinking Water Threats were identified within areas where the Vulnerability Score is 10 in IPZ-1.

111 activities that are potentially Significant Drinking Water Threats were identified on 109 land parcels within the IPZ-1 for the Port Severn Water Supply.

The use of private sewage disposal systems was considered to be a potential Significant Drinking Water Threat on 105 parcels. Four (4) parcels were identified as having significant threats relating to the storage of more than 2500 L of fuel and two (2) of these were also identified for the potential for handling and storage of Dense Non-Aqueous Phase Liquids (DNAPLs).

Table 10-8: Number of Significant Drinking Water Threats for the Port Severn Surface Water Supply.

Threat Number	Threat	Significant threat counts Number of threats
1.	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V or the Environmental Protection Act.	1~~0~~
2.	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	105
3.	The application of agricultural source material to land.	0
4.	The storage of agricultural source material to land.	0
5.	The management of agricultural source material.	0
6.	The application of non-agricultural source material to land.	0
7.	The handling and storage of non-agricultural source material.	0
8.	The application of commercial fertilizer to land.	0
9.	The handling and storage of commercial fertilizer to land.	0
10.	The application of pesticide to land.	0
11.	The handling and storage of pesticide.	2~~0~~
12.	The application of road salt.	0
13.	The handling and storage of road salt.	0
14.	The storage of snow.	0

Formatted Table

Threat Number	Threat	Significant threat counts Number of threats
15.	The handling and storage of fuel.	4
16.	The handling and storage of dense non-aqueous phase liquid.	2
17.	The handling and storage of an organic solvent.	0
18.	The management of runoff that contains chemicals used in the de-icing of aircraft.	0
19.	An activity that takes water from an aquifer or a surface water body without returning the water taken to the safe aquifer or surface water body.	0
20.	Any activity that reduces the recharge of an aquifer.	0
21.	The use of land as livestock grazing or pasturing land, and outdoor confinement area, or a farm-animal yard.	0
22.	The establishment and operation of a liquid hydrocarbon pipeline	0
-	Totals:	1121* significant threats (on 110 properties)

Formatted Table

Commented [MTx361]: This was updated, it was 109 before

*50 verified existing Threats and 61 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

10.3.4.6 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 IPZ-1, -2 and -3. This mapping is not required where the Vulnerability Scores for the area are less than the Vulnerability Score necessary for the Activity to be considered a threat in the ~~Table of Drinking Water Threats~~Technical Rules.

Managed Lands were identified and the Managed Lands proportions were determined for IPZ-1 for the Port Severn Water Treatment Plant as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 10.3.4.5). 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 10a-7 illustrates the location and proportion of Managed Lands within the delineated IPZ-1 and IPZ-3 where the Vulnerability Scores are greater than 4 for the Port Severn Water Treatment Plant. Mapping for the Managed Lands Proportion will not be required if the Vulnerability Score in IPZ-3 is less than 4.

10.3.4.7 Livestock Density

Technical Rule 16(10) ~~(August 2009)~~ requires the Assessment Report to include maps showing the Livestock Density within IPZ-1, -2 and -3. This mapping is not required where the Vulnerability Scores for the area are less than the Vulnerability Score necessary for the Activity to be considered a Threat in the ~~Table of Drinking Water Threats~~Technical Rules.

The Livestock Density was determined for IPZ-1 of the Port Severn Water Treatment Plant as outlined in Technical Memorandum A5 (Appendix MO). The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 10.3.4.5). 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 10a-8 illustrates the distribution of Livestock Density within the delineated IPZ-1 and IPZ-3 where the Vulnerability Scores are greater than 4 for the Port Severn Water Treatment Plant. Mapping for the Livestock Density will not be required if the Vulnerability Score in IPZ-3 is less than 4.

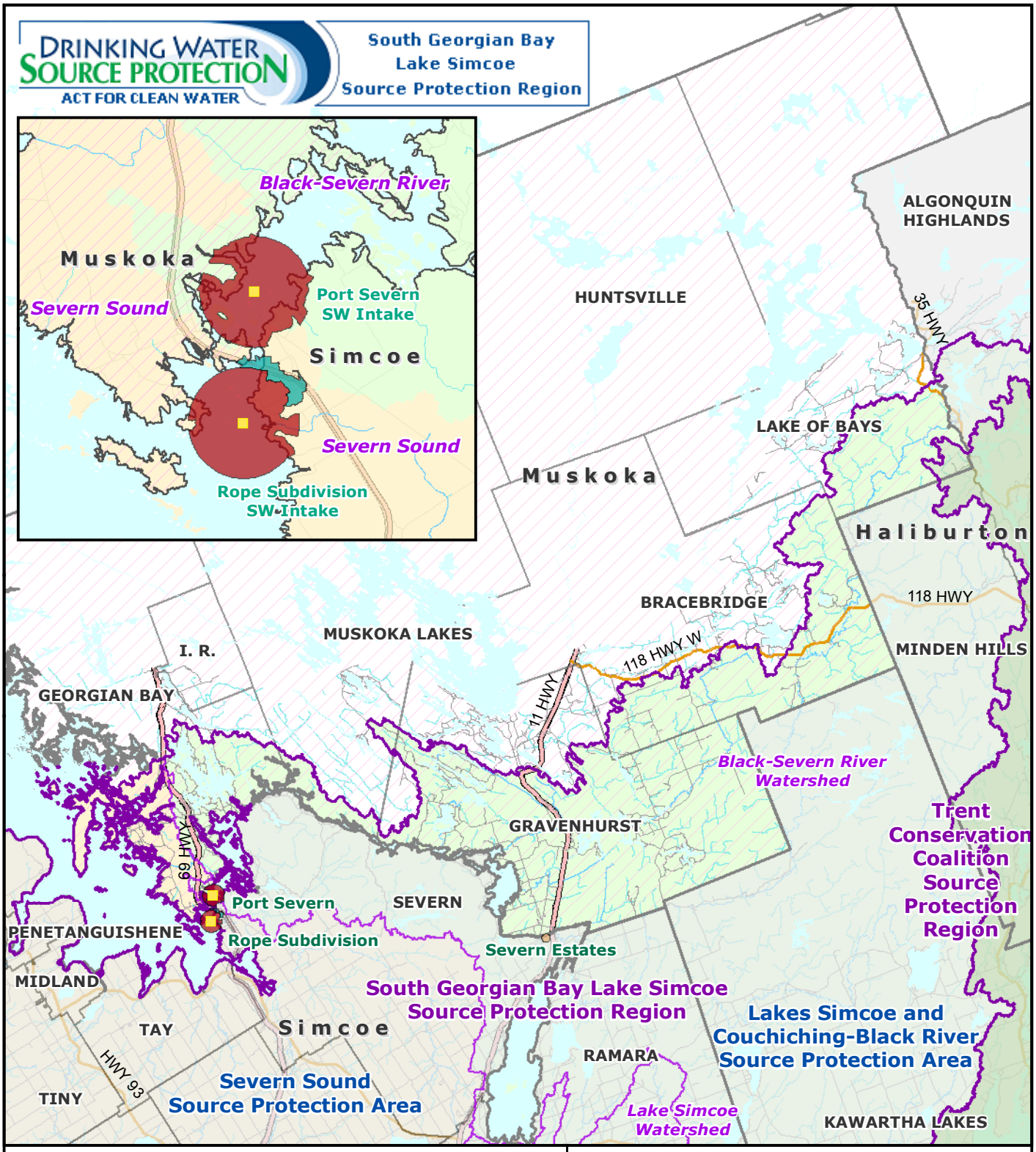
10.3.4.8 Impervious Surfaces

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 IPZ-1, -2 and -3. This mapping is not required where the Vulnerability Scores for the area are less than the Vulnerability Score necessary for the Activity to be considered a Threat in the ~~Table of Drinking Water Threats~~Technical Rules.

The proportion of Impervious Surfaces within the delineated IPZ-1 for the Port Severn Water Treatment Plant was determined in accordance with the methodology in Technical Memorandum A5 (Appendix MO). Methodology in Technical Memorandum A5.1 (Appendix MO) was used in 2023 to update the proportion of Impervious Surfaces within the delineated

Intake Protection Zone using the 2021 Technical Rules. The results from this analysis were used in the enumeration of Significant Drinking Water Threats (Section 10.3.4.5). The Impervious Surfaces are used in the identification of Threat activities associated with the application of winter de-icing agents (salt).

Figure 10a-9 illustrates the distribution of Impervious Surfaces within the delineated IPZ-1 and IPZ-3 where the Vulnerability Scores are greater than 4 for the Port Severn Water Treatment Plant. Mapping for the Impervious Surface proportion will not be required if the Vulnerability Score in IPZ-3 is less than 4.



- Municipal Surface Water Intakes
- IPZ-1 (1000m on water or 120m inland)
- IPZ-2 (2 hr time of travel)
- Municipal Supply Well in District Municipality of Muskoka
- WHPA-A (100m)
- WHPA-B (2 years time of travel)
- WHPA-C (5 years time of travel)
- WHPA-C1 (10 years time of travel)
- WHPA-D (25 years time of travel)

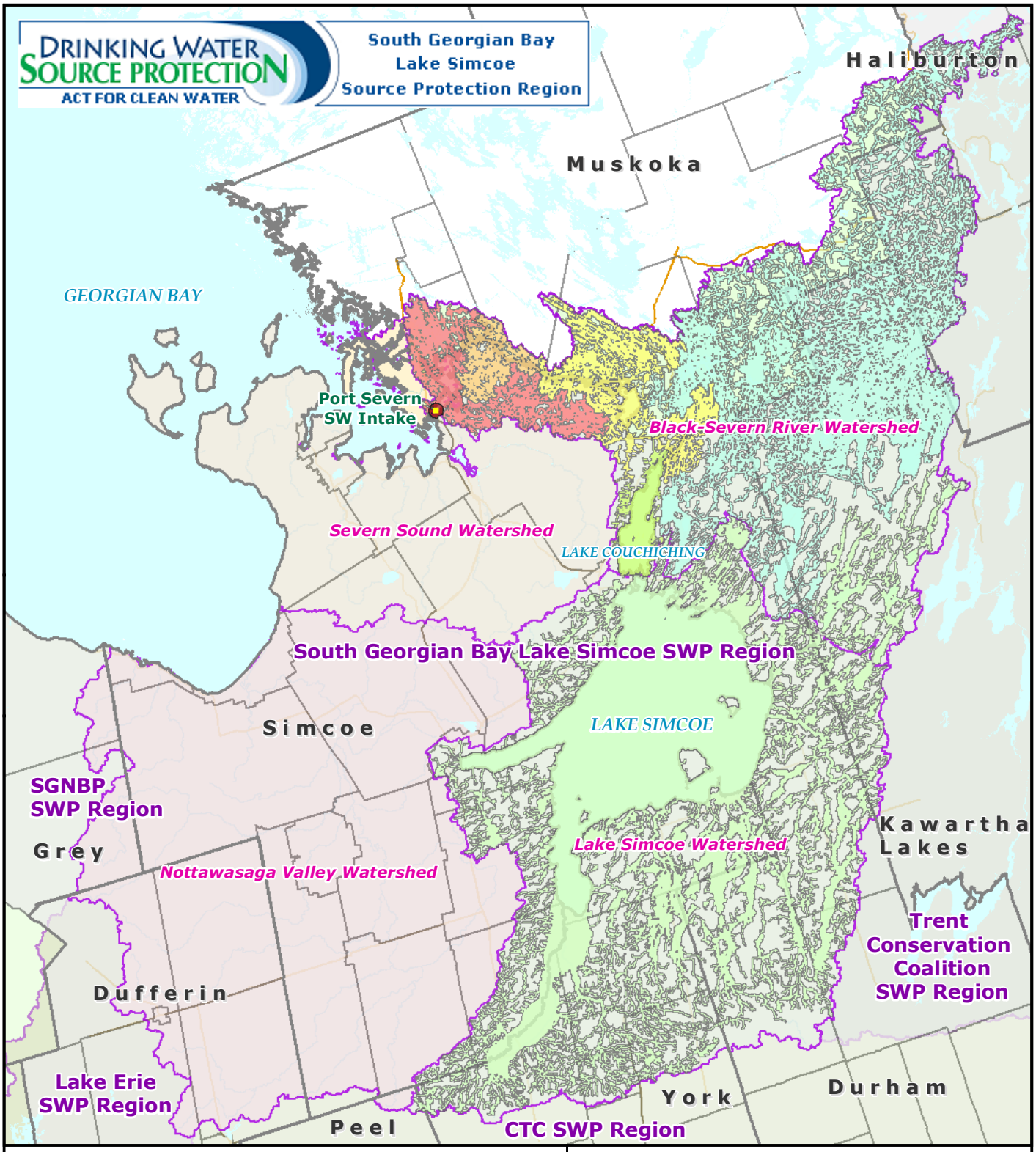
Drinking Water System Vulnerable Areas in in District Municipality of Muskoka

Created by: LSRCA
Date: 2010-07-16

Scale: 1:500,000
0 7 14km
UTM Zone 17N, NAD83

Ontario

Fig 10-1



Municipal Surface Water Intakes
IPZ-1 (1000m on water or 120m inland)
IPZ-2 (2 hr time of travel)
IPZ-3 with Sub Areas
Little Lake (Div1)
Little Lake (Div2)
Little Lake (Div3)
Little Lake (Div4)
Little Lake (Div5)
Little Lake (Div6)

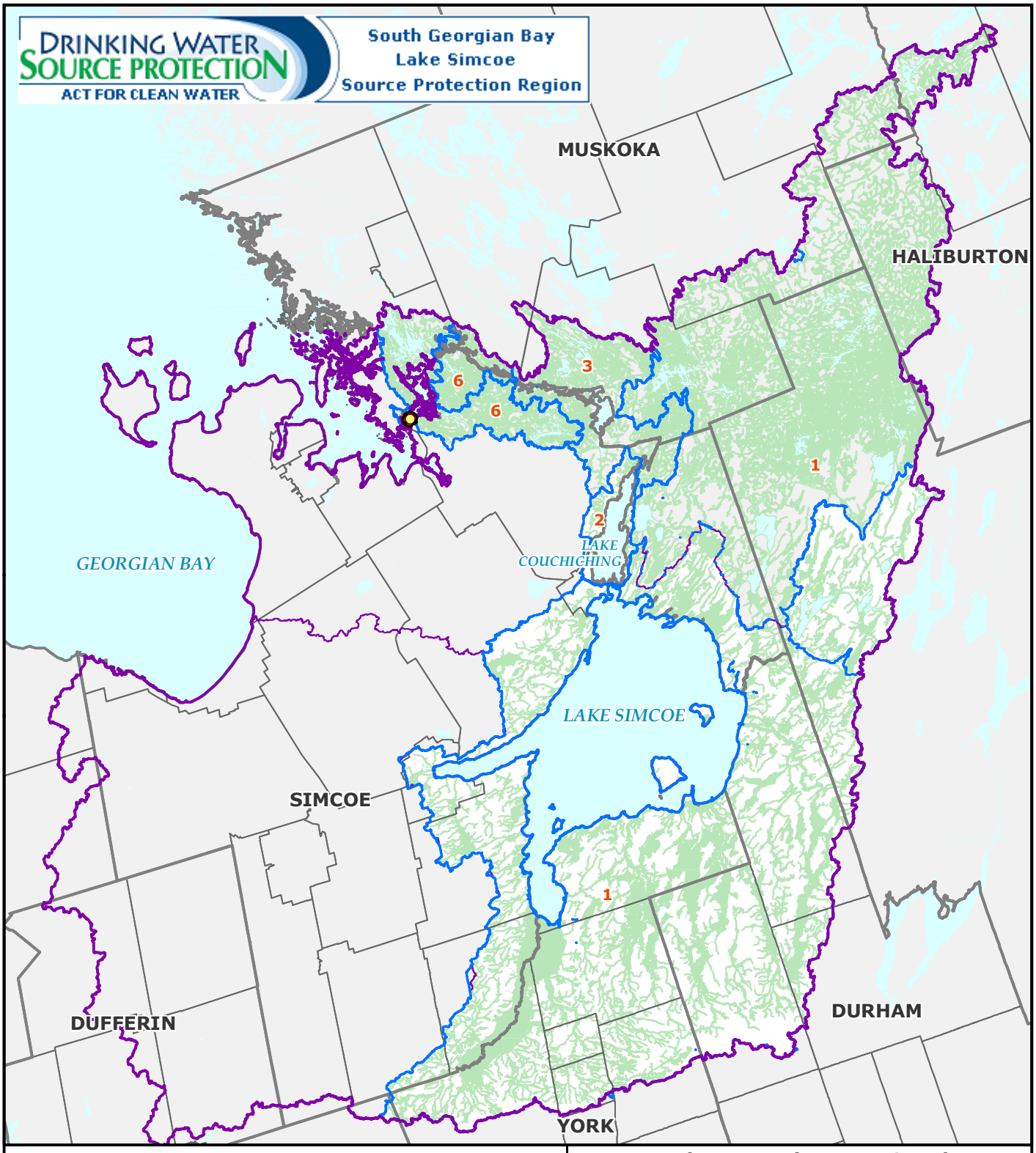
IPZ-3 Sub-Areas

Created by: LSRCA
Date: 2010-07-16

Scale: 1:750,000
0 10 20km
UTM Zone 17N, NAD83

Ontario

Fig 10a-1



Surface Water Intake
IPZ-1
IPZ-2
IPZ-3 and Vulnerability Score
SWP Watershed Region
SWP Watershed Area
Subwatershed Boundary

Intake Protection Zone 3 and Vulnerability Scores
Port Severn, Muskoka

Created by: LSRCA
Date: 2010-10-20

GENIVAR

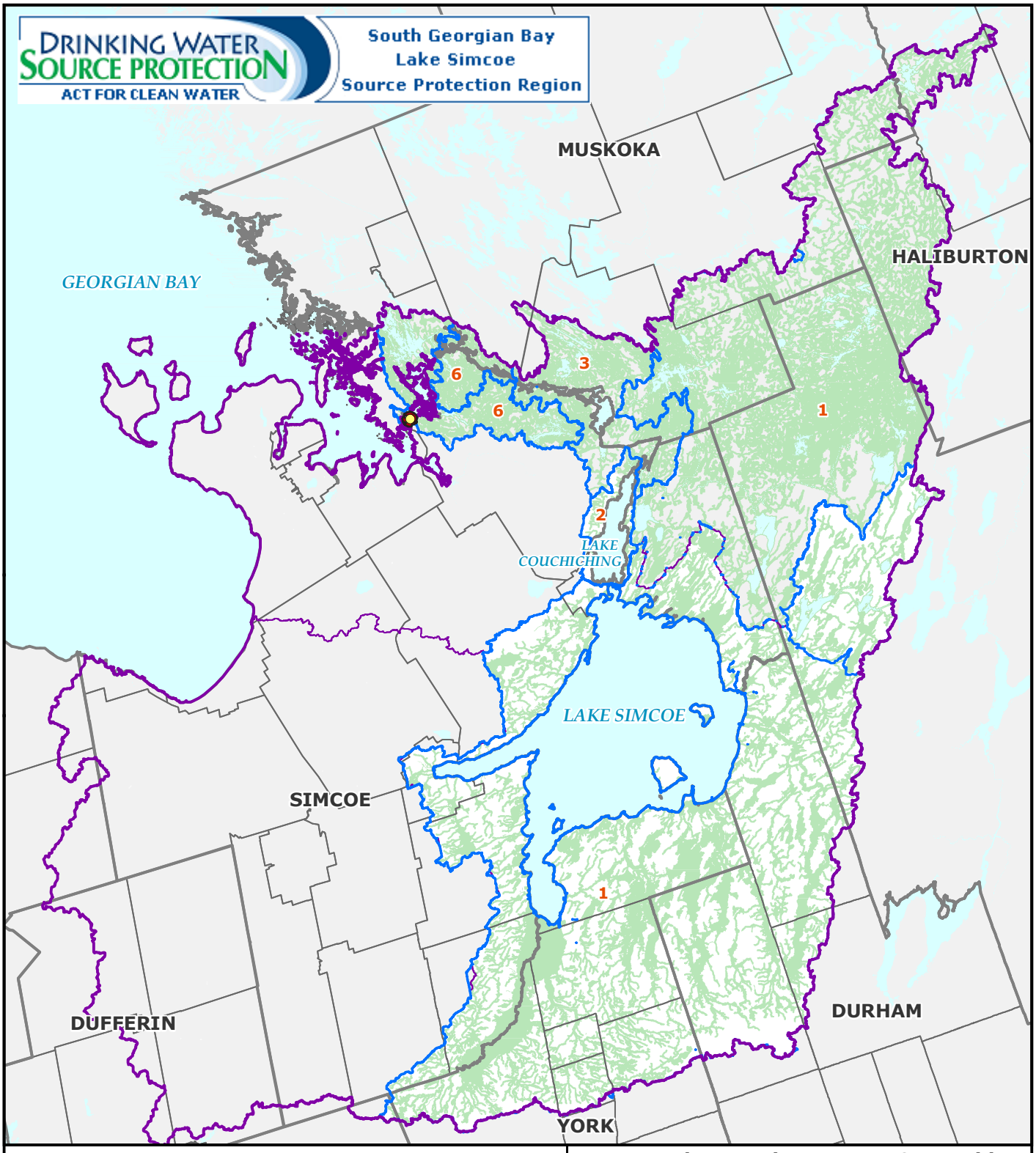
Scale: 1:750,000 0 5 10 15km

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 10a-2



- Surface Water Intake
- IPZ-1
- IPZ-2
- IPZ-3 and Vulnerability Score
- SWP Watershed Region
- SWP Watershed Area
- Subwatershed Boundary

Areas Where Pathogens Are Or Would Be Significant, Moderate, Or Low Threats
Port Severn, Muskoka

Created by: LSRCA
Date: 2010-10-20

GENIVAR

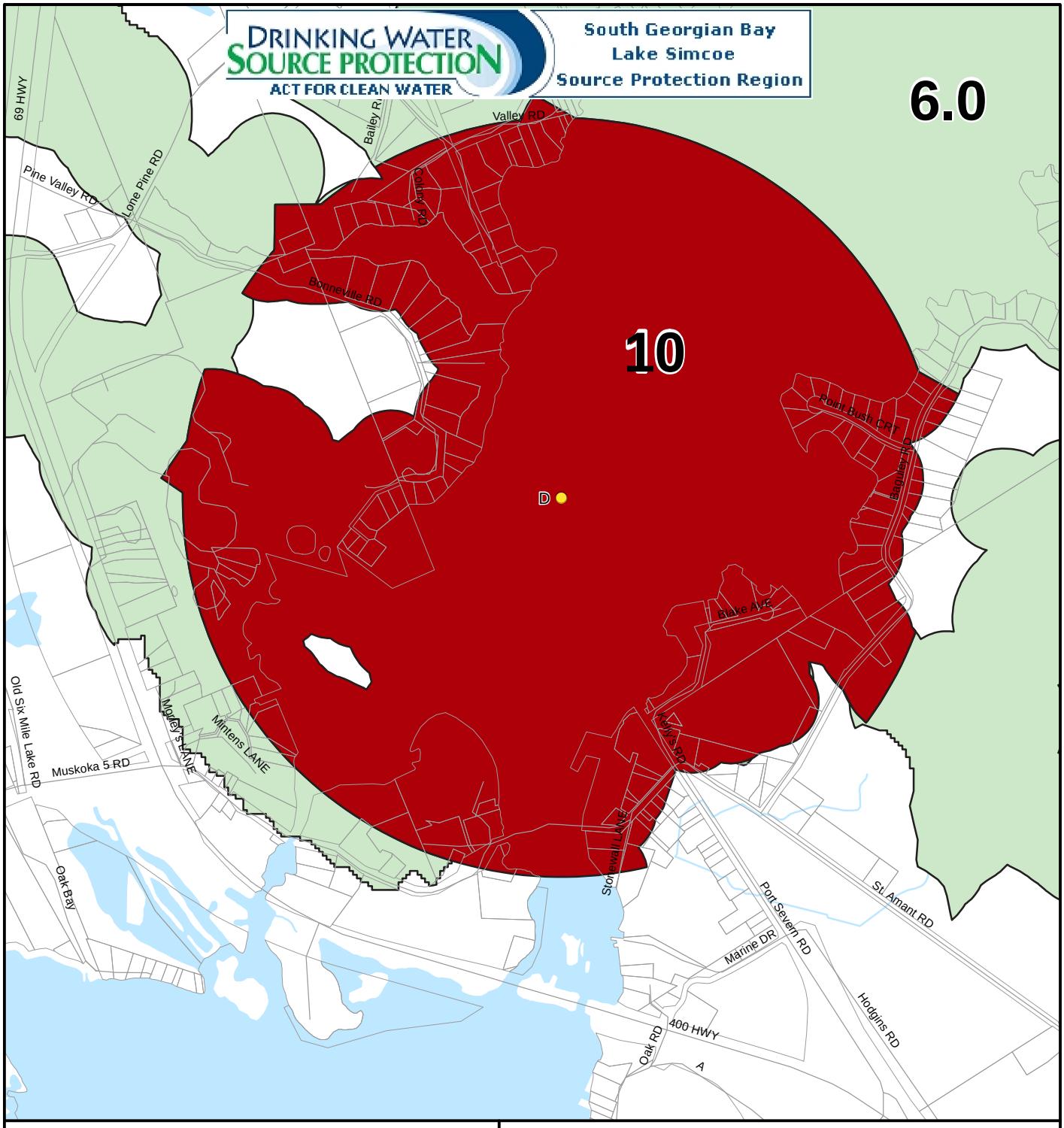
Scale: 1:750,000 0 5 10 15km

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 10a-3



Legend

- 10 — IPZ 1 AND VULNERABILITY SCORE
- 6.0 — IPZ 3 AND VULNERABILITY SCORE
- SURFACE WATER INTAKE (TYPE D)

N, W, E, S

150 75 0 150 Metres

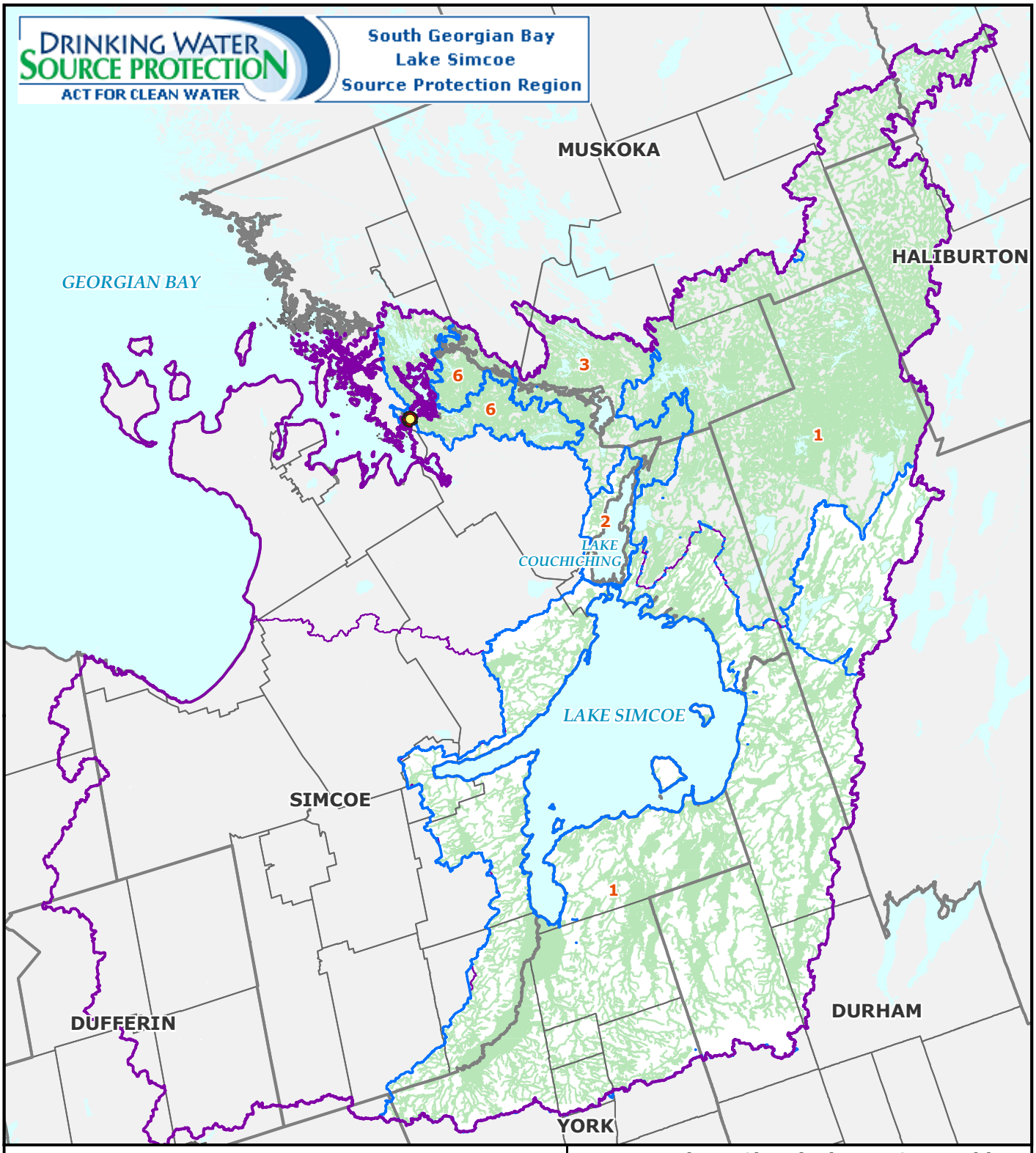
AREAS WHERE PATHOGENS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - PORT SEVERN

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

DATE: JUNE 2010	SCALE: 1:15000
PROJECT: 0-071948.04	FILE. NO.:0-07194804F10-4

GENIVAR Ontario

FIGURE **10a-4**



Surface Water Intake
IPZ-1
IPZ-2
IPZ-3 and Vulnerability Score
SWP Watershed Region
SWP Watershed Area
Subwatershed Boundary

Areas Where Chemicals Are Or Would Be Significant, Moderate, Or Low Threats
Port Severn, Muskoka

Created by: LSRCA
Date: 2010-10-20

GENIVAR

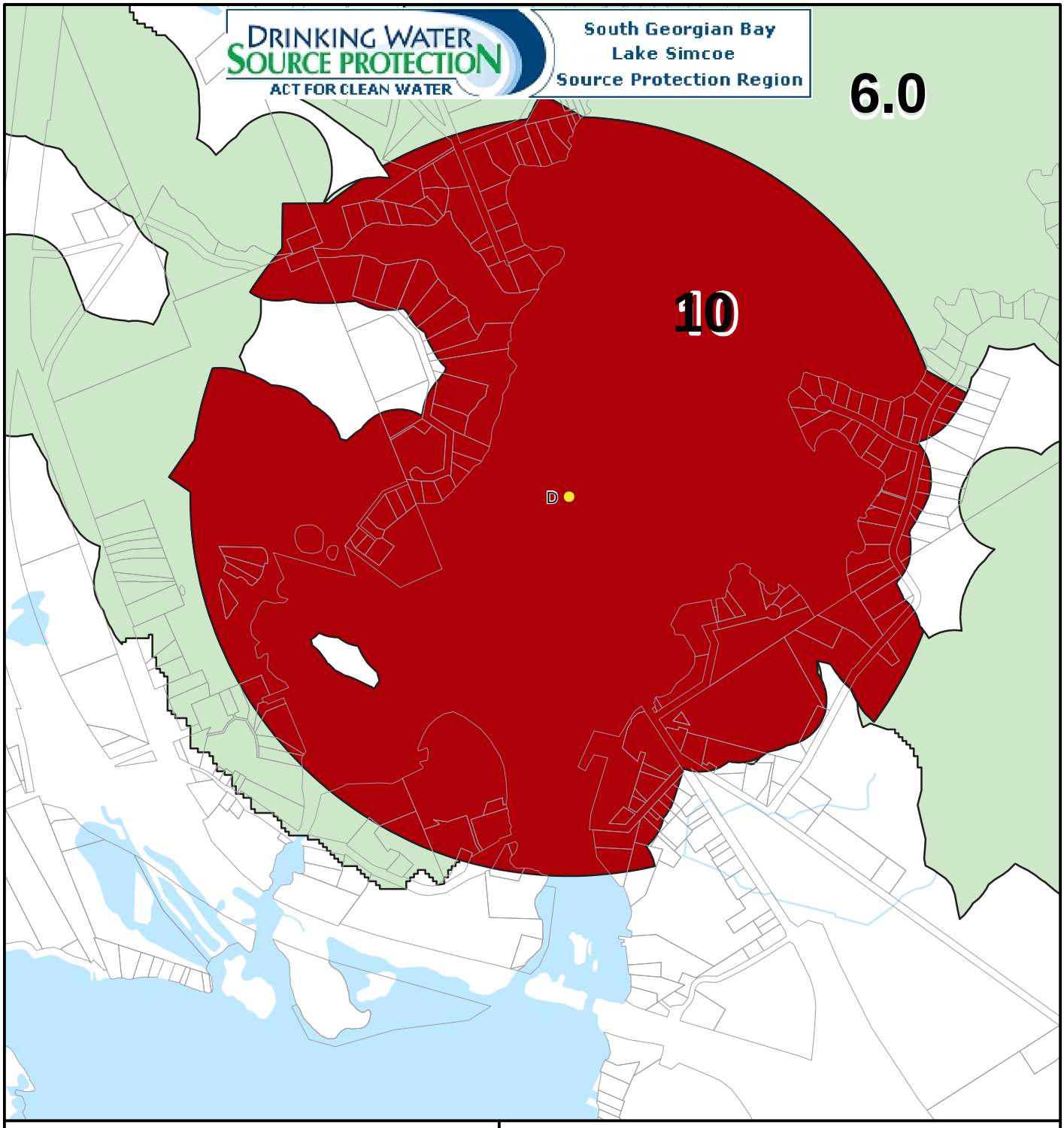
Scale: 1:750,000 0 5 10 15km

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 10a-5



Legend

- 10 — IPZ 1 AND VULNERABILITY SCORE
- 6.0 — IPZ 3 AND VULNERABILITY SCORE
- SURFACE WATER INTAKE (TYPE D)

N, W, E, S

150 75 0 150 Metres

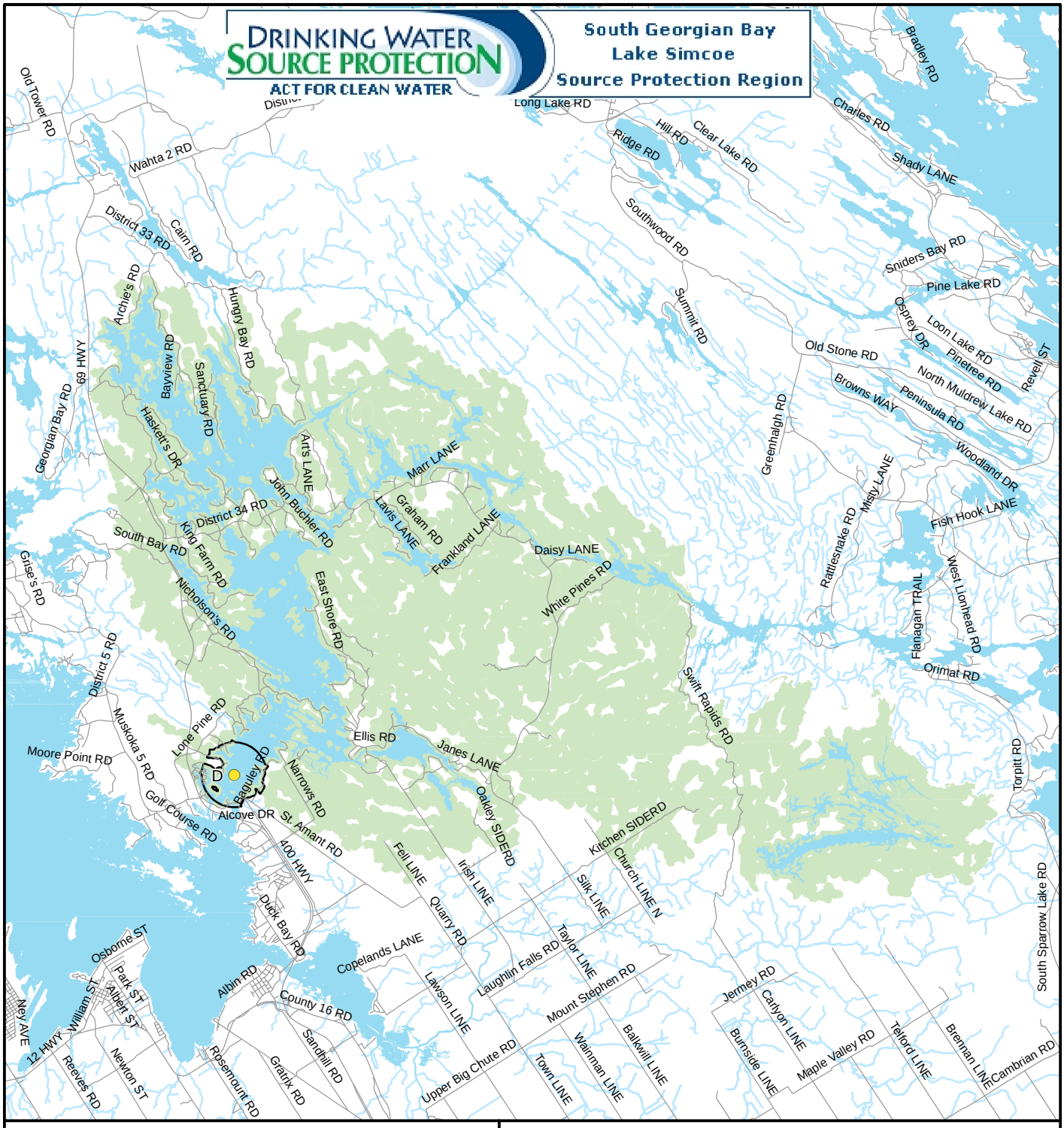
AREAS WHERE CHEMICALS ARE OR WOULD BE SIGNIFICANT, MODERATE, OR LOW THREATS - PORT SEVERN

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

DATE: JUNE 2010	SCALE: 1:15000
PROJECT: 0-071948.04	FILE. NO.:0-07194804F10-6

GENIVAR Ontario

FIGURE **10a-6**



MANAGED LANDS - PORT SEVERN

The Managed Land proportion proportion is illustrated for the parts of IPZ 1 and 3 where the vulnerability score is greater than 4.1.

DATE: JUNE 2010

SCALE: 1:175000

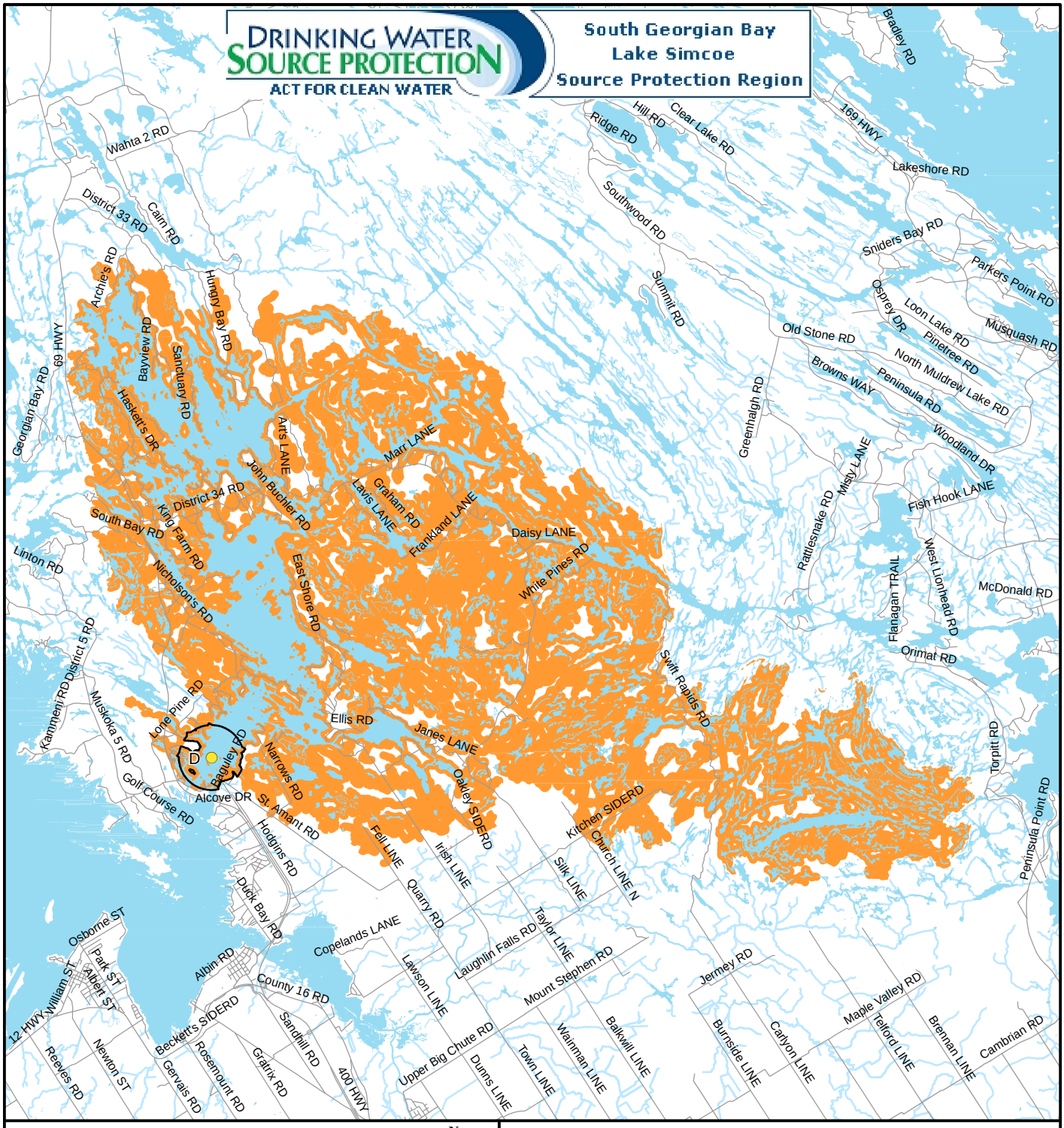
PROJECT: 0-071948.04

FILE. NO.:0-07194804F10-7

GENIVAR

Ontario

FIGURE 10a-7



Legend

- LIVESTOCK DENSITY (<0.5 NUTRIENT UNITS/ACRE)
- LIVESTOCK DENSITY (0.5-1.0 NUTRIENT UNITS/ACRE)
- LIVESTOCK DENSITY (>1.0 NUTRIENT UNITS/ACRE)
- SURFACE WATER INTAKE (TYPE D)

N W E S

1,500 750 0 1,500 Metres

LIVESTOCK DENSITY - PORT SEVERN

The Livestock Density proportion is illustrated for the parts of IPZ 1 and 3 where the vulnerability score is greater than 4.1.

DATE: JUNE 2010

SCALE: 1:175000

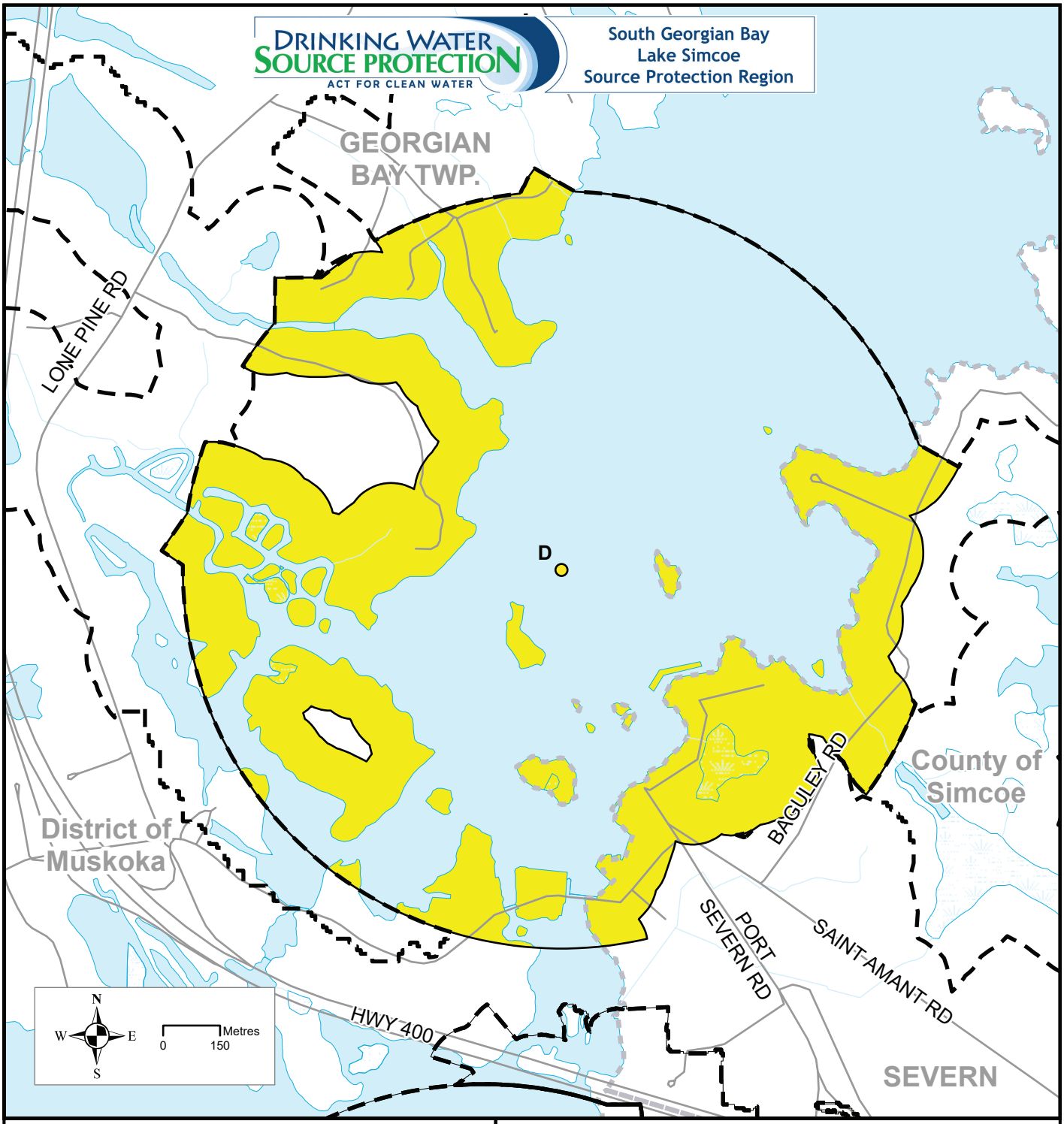
PROJECT: 0-071948.04

FILE. NO.:0-07194804F10-8

GENIVAR

Ontario

FIGURE 10a-8



Legend

- Surface Water Intake (Type D)

IMPERVIOUS SURFACE

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

- IPZ Boundary
- Road
- Watercourse
- Water Area, Permanent
- Wetland, Permanent
- Municipal Boundary
- Adjacent IPZ

IMPERVIOUS SURFACES - PORT SEVERN, GEORGIAN BAY TWP.

ASSESSMENT OF DRINKING WATER THREATS
SELECTED MUNICIPAL SURFACE WATER SUPPLIES

South Georgian Bay Lake Simcoe
Source Protection Region

DATE: AUGUST 2025

SCALE: 1:15,000

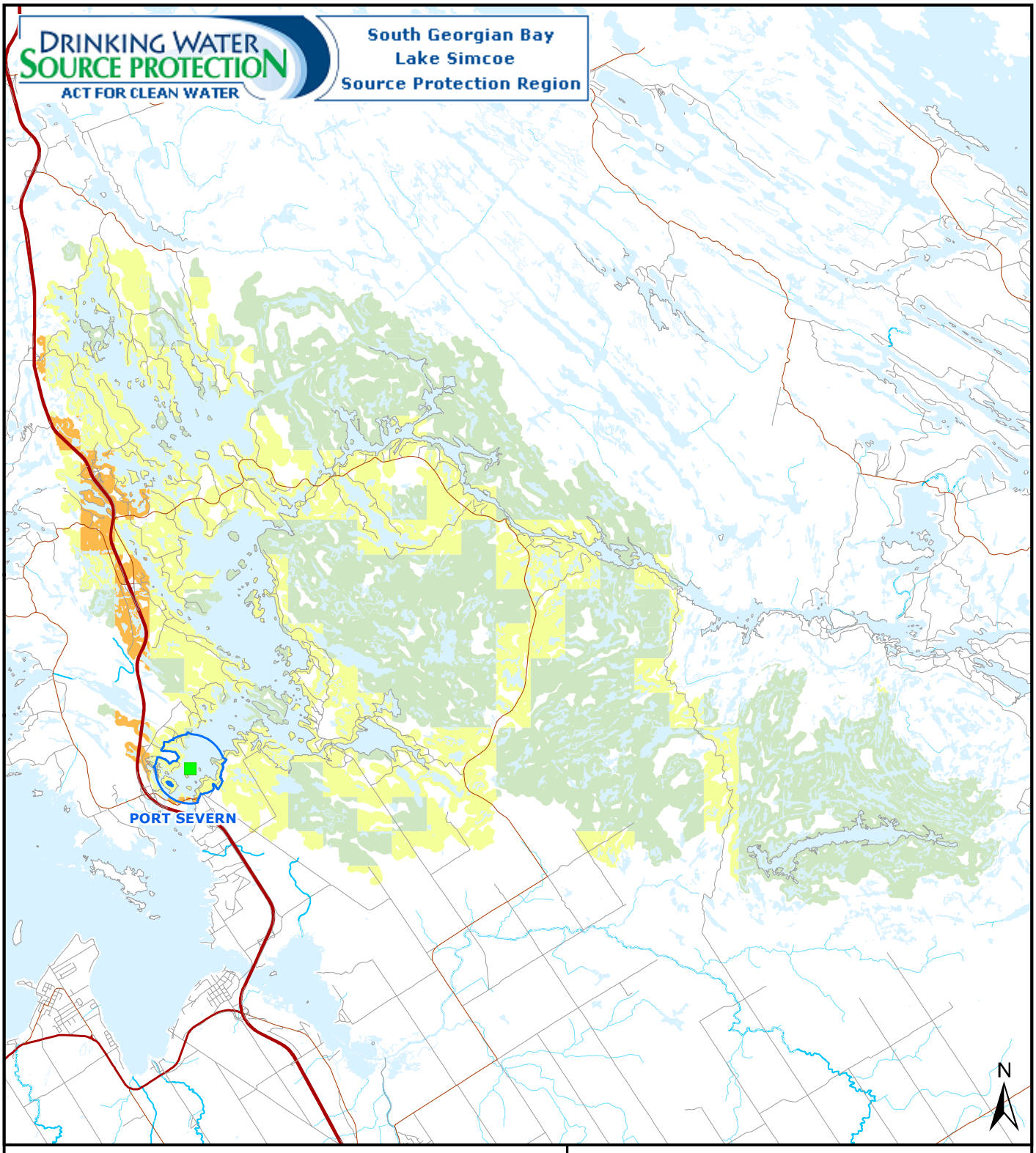
The Impervious Surfaces are illustrated for IPZ 1 and 2 where the vulnerability score is > 4.5.

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.

Severn Sound Environmental Association

Ontario

FIGURE 10a-9



Surface Water Intake

Impervious Surfaces in IPZ 3

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

Impervious Surfaces - Port Severn Intake Protection Zone 3

Created by: LSRCA, 2024-10-10

Scale 1:160,000

0 2 4 6km

UTM Zone 17N, NAD83

Ontario

Figure 10a-10