



ST. CLAIR REGION ASSESSMENT REPORT

Section Summary - 1.0 Introduction and Background

Section Summaries

The Assessment Reports for the Thames-Sydenham and Region are large summary documents compiling information from many technical reports. These technical reports include Water Budgets, Watershed Characterization Reports and many Source Protection Technical Studies related to municipal drinking water systems. That information has been summarized and compiled into Assessment Reports of the Region. Each section of the Assessment Reports has been summarized in a series of Section Summaries.

1.0 Introduction and Background

An Assessment Report is being completed for each of the three Source Protection Areas (SPAs) of the Thames-Sydenham and Region. Figure 1 shows the Thames-Sydenham and Region Source Protection Region and the Lower Thames Valley, St. Clair Region and Upper Thames River SPAs within this region. The Clean Water Act (2006) requires that Assessment Reports be completed for areas within Source Protection Authorities. These reports will allow Source Protection Committees to develop Source Protection Plans to protect the sources of drinking water.

Assessment Reports are to contain detailed information that:

- identifies vulnerable areas associated with drinking water systems,
- assesses the level of vulnerability,
- evaluates issues related to the drinking water sources, and
- identifies activities within those vulnerable areas that pose threats to the systems.

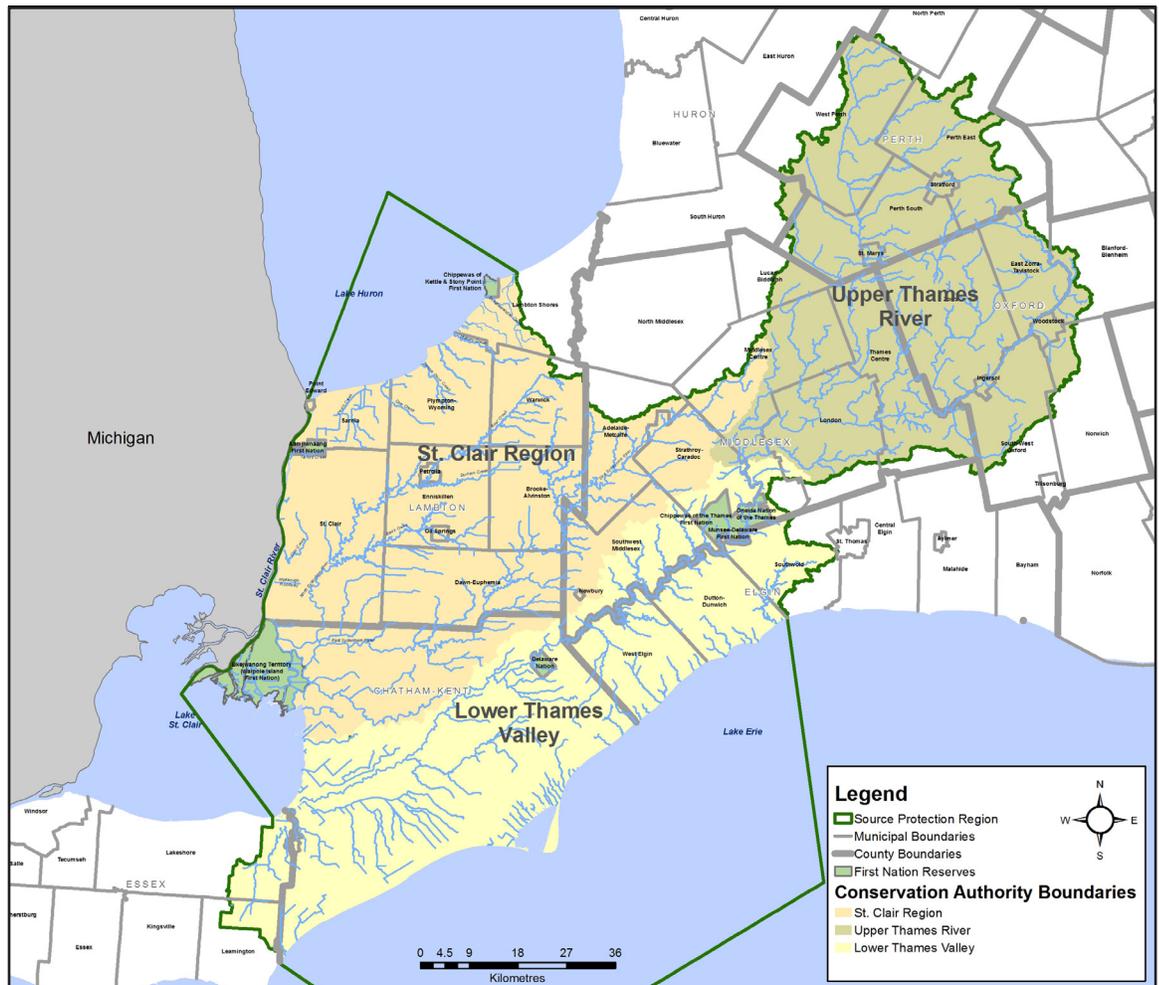


Figure 1. Thames-Sydenham and Region Source Protection Region

DRINKING WATER SOURCE PROTECTION
ACT FOR CLEAN WATER

ST. CLAIR CONSERVATION

UPPER THAMES RIVER CONSERVATION AUTHORITY

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Clean Water Act Rules and Regulations

The Clean Water Act (2006) established the requirements to develop a Source Protection Plan and set the framework to develop that plan. In order to define the work and enable aspects of the work, regulations and rules were required. Regulations were introduced to establish Source Protection Areas and Regions (O. Reg. 284/07), Source Protection Committees (O. Reg. 288/07), and a General Regulation (O. Reg. 287/07).

The General Regulation, among other things, establishes the activities that can be considered drinking water threats and determines much of the process behind developing Terms of References, Assessment Reports and Source Protection Plans.

The General Regulation, along with sections of the Clean Water Act, also identifies the requirements for Assessment Reports. In order to fully define the contents and methodologies used to develop an Assessment Report, the Ministry of the Environment (MOE) released Technical Rules: Assessment Reports (December 2008). The MOE Director of Source Protection Planning recently amended those rules in November 2009. Although the amendments were not completed at the time of drafting of the Lower Thames Valley Assessment Report, many of them have been incorporated into the report. Others will need to be incorporated into an amended Assessment Report that will fill the many of the data and analysis gaps in the current version of the report.

Along with the technical rules, the province released tables of drinking water threats that establish the circumstances under which threats can be considered significant, moderate or low. These circumstances, along with the vulnerability assessment of the vulnerable areas, determine the level of risk associated with an activity in a particular location.

A Source Protection Plan must then be developed by the Source Protection Committee to reduce or manage the risks to drinking water sources. The Clean Water Act requires that the plan address all significant threats. The plan can also consider moderate and low risks, with limitations on the types of policies that would be allowed for threats other than significant.

Although a regulation defining the scope and content of a Source Protection Plan has not yet been introduced, the province has consulted on a discussion paper that will form the basis for a Source Protection Plan regulation.

Source Protection Committee

Source Protection Areas were established through O. Reg. 284/07. This regulation established the Lower Thames Valley Source Protection Area, the St. Clair Region Source Protection Area and the Upper Thames River Source Protection Area. This regulation also combined the three Source Protection Areas into the Thames-Sydenham and Region Source Protection Region, building on a partnership that the three Conservation Authorities

in the region established while preparing for Source Protection Planning.

In the Thames-Sydenham and Region, the three Source Protection Areas have Conservation Authorities which, as specified in the Clean Water Act, will perform the powers and duties of a Source Protection Authority. As such the Conservation Authorities were required to form a Source Protection Committee for the region. They are also required to provide support to that committee.

The Clean Water Act identifies the general makeup of the Source Protection Committee (SPC) as having one third of its members representing municipalities, one third representing sectors and other third representing other stakeholders. The Conservation Authorities in the region further refined the make-up of each third and established a striking committee to form the SPC on behalf of the region's three Source Protection Authorities. The make-up and representation of the Thames-Sydenham and Region SPC is outlined in Table 1.

Table 1. Thames-Sydenham and Region Source Protection Committee

Chair		Robert Bedggood
Municipalities	Chatham-Kent, Lakeshore, Leamington	Sheldon Parsons
	Lambton	Darrell Randell
	London	Patrick Donnelly
	Middlesex	James Maudsley
	Elgin	Brent Clutterbuck
	Oxford	Pat Sobeski
	Perth, Stratford, St. Marys, Huron	Joe Salter
Sectors	Agriculture	John Van Dorp
		Patrick Feryn
		Don McCabe
	Industry/ Commercial	Dean Edwardson
		Earl Morwood
Aggregate/ Oil and Gas	Pits and Quarries	Paul Hymus
	Oil and Gas	Joe Van Overberghe
Other		Richard Philp
		Doug McGee
		Joseph Kerr
		Carl Kennes
		Valerie M'Garry
		Margaret Misk-Evans
		Charles Sharina
First Nations		Keenon Johnson
		Augustus Tobias
Liaisons	Medical Officers of Health	Jim Reffle
	Province	Teresa McLellan
	Source Protection Authority	Murray Blackie

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The Conservation Authorities provide resources to enable the SPC to complete its work. These resources include the provision of technical and administrative staff with expertise in hydrogeology, engineering, geographic information system, communications and graphics. This team is led by the Source Protection Project Manager, Chris Tasker, and technical leads at each of the Source Protection Authorities.

Once established, the SPC's first task was to develop rules of order and operating procedures. To guide them through the source protection planning process, the Committee developed a Mission Statement and Guiding Principles.

Mission Statement

Protect sources of drinking water by developing a plan based on science and local cooperation.

Guiding Principles

We value:

- Fair and reasonable solutions
- Consensus within our diverse area group
- Clarity of information
- Open communication
- Respecting diversity of opinion

Terms of Reference

The SPC's first major task was to develop a work plan to guide the source protection planning process for the next five years. The work plan - called the Terms of Reference - has been developed with input from municipalities and stakeholders. Figure 2 shows how the Terms of Reference fits in with the other components of the source protection planning process.

Two municipal working groups were established to help complete the Terms of Reference. The groups, one for surface water and one for groundwater related studies, were comprised of municipal staff and water treatment plant operators, and chaired by SPC members.

The Terms of Reference outlines who does what, when it will happen and how much it will cost. It guides the SPC through the completion of the Assessment Report and the Source Protection Plan. A Terms of Reference document was developed for each of the three Source Protection Areas.

Public open houses on the Terms of Reference were held in September of 2008 at Ridgeway, St. Marys and Wyoming. A follow-up public meeting was held in London. In addition, comments were received through the posting of the Terms of Reference on the region's website (www.sourcewaterprotection.on.ca). The SPC submitted the proposed Terms of Reference to the Source Protection Authorities, which received comments. The Terms of Reference for each of the three SPAs were submitted to the Ministry of Environment on December 18, 2008. The final Terms of Reference were approved by the Minister of the Environment on April 20, 2009.

Figure 2. Source Protection Timeline

	2005	2006	2007	2008	2009	2010	2011	2012
Watershed Studies	[Timeline bar spanning 2005 to 2011]							
Municipal Technical Studies	[Timeline bar spanning 2006 to 2010]							
Terms of Reference	[Timeline bar spanning 2008 to 2008]							
Assessment Report(s)	[Timeline bar spanning 2008 to 2011]							
Source Protection Plans	[Timeline bar spanning 2009 to 2012]							

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Section Summary - 1.0 Introduction and Background

Technical Studies

The Assessment Report is a summary and compilation of a number of technical reports completed in the following areas:

- Watershed Characterization
- Conceptual Water Budget
- Various levels of Water Budgets
- Municipal Technical Studies

The Municipal Technical Studies, such as vulnerability assessment and drinking water quality issues identification, were completed through partnerships between the municipalities and the Conservation Authorities (CAs). Leads for each study were established; in some cases the studies were led by the CAs or by a municipality. Most of these studies were organized based on the geographic extent of the upper tier municipalities (counties). Municipal involvement in the Municipal Technical Studies was through staff involvement in steering committees for these projects.

The Watershed Characterization and the Conceptual Water Budget studies were led by CAs and completed by CA staff.

Vulnerability Assessment and Water Budget studies were subjected to peer review. Many of these studies are still ongoing; however, the components from the studies have been compiled into these Assessment Reports.

Consultation

Provincial regulations require consultation on the Assessment Report. This consultation, much like that on the Terms of Reference, requires a public meeting and posting of the Assessment Report for comment. Two posting periods are required, one by the SPC for consultation on the draft proposed Assessment Report, and the second one by the Source Protection Authority, for comments on the proposed Assessment Report. Comments received in the final posting period are to be submitted to the MOE, along with the proposed Assessment Report.

The SPC identified the need to undertake a more detailed and locally focused consultation on the contents of the Assessment Report. A multi-phased consultation plan was developed and is available on the web site. The plan identifies two phases of local consultation focused on the vulnerable areas associated with the municipal water supplies. The first phase focuses on the vulnerability assessment of the areas while the second phase adds a summary of the threats and issues in the areas. The third

phase of consultation is the required public meeting and posting of the Assessment Report for comment. This phase has more of a regional focus involving open houses in each of the Source Protection Areas. Future phases will involve consultation on amendments and updates to the Assessment Reports.

Approvals and Next Steps

The Assessment Report consultation plan, shown in the Introduction and Background Section, illustrates a number of review and acceptance stages in the development of the Assessment Reports for the three Source Protection Areas. This work ultimately culminates in the approval of the Assessment Reports by the Director of Source Protection Planning for the Ministry of the Environment.

Local acceptance of the Assessment Reports is also included in the consultation process. Municipalities have been involved in many of the technical studies throughout the region, especially those that focus on the sources of drinking water for the municipal systems.

Prior to inclusion in the Assessment Report, the components have been reviewed and accepted by the SPC. During the first two phases of the consultation, municipal staff and councils were circulated invitations to the open houses and offers were made of presentations to municipal councils. Through the third phase of consultation, the draft proposed Assessment Report is to be distributed to the municipal clerks for comments. The draft Assessment Report is also to be circulated to First Nations for their input at this stage.

Comments received through these consultation periods are to be considered in finalizing the proposed Assessment Report prior to submitting it to the Source Protection Authority for its final posting. When submitting the Assessment Report to the Ministry of the Environment, the Source Protection Authority is to identify any outstanding municipal concerns over the Assessment Reports.

Assessment Reports can be amended at any time that the SPC becomes aware of the need to do so. As there are a number of data gaps in the Assessment Report submitted, amendments prior to the submission of the Source Protection Plan are anticipated. The Data Gaps section of this report identifies those gaps and discusses plans to fill them.

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Section Summary - 2.0 Watershed Characterization

Section Summaries

The Assessment Reports for the Thames-Sydenham and Region are large summary documents compiling information from many technical reports. These technical reports include Water Budgets, Watershed Characterization Reports and many Source Protection Technical Studies related to municipal drinking water systems. That information has been summarized and compiled into Assessment Reports of the Region. Each section of the Assessment Reports has been summarized in a series of Section Summaries.

2.0 Watershed Characterization

Justice O'Connor recommended that watershed based source protection plans be developed. The recommendations were part of the inquiry that investigated the May 2000 bacterial contamination of the Town of Walkerton's water supply. Compiling a summary of information pertinent to drinking water sources is one of the first steps in developing a Source Protection Plan.

Under the Clean Water Act (2006), an Assessment Report is to identify all watersheds in the source protection area and characterize the water quality and quantity in each identified watershed. The Regulations and Rules under the Clean Water Act require that the physical and human geography also be characterized. This information is contained in the Watershed Characterization Report for the St. Clair Region.

The Watershed Characterization Report was completed in 2008 based on information that was available at the time the analysis and writing was completed. Some information has been updated since and is included elsewhere in the Assessment Report. Some of the mapping products are also available in the Conceptual Water Budget, which is included as an appendix to the Assessment Report.

What is a Watershed Characterization Report?

The Watershed Characterization Report summarizes information on the physical, social and economic characteristics of the St. Clair Region. It also reviews surface water and groundwater quality and summarizes known issues and concerns pertaining to drinking water sources. A series of maps was prepared to help illustrate the information presented in the report. The components of the report are described below.

The summary of the Watershed Characterization Report for the St. Clair Region is included as an appendix in the St. Clair Source Protection Area Assessment Reports, complete with all maps. The entire Watershed Characterization Report is available on compact disc (CD).

Components of the Watershed Characterization Report

Watersheds and Subwatersheds

The source protection area (SPA) watershed boundary within the source protection region is identified and described. Figure 1 shows the watershed boundaries.



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Section Summary - 2.0 Watershed Characterization

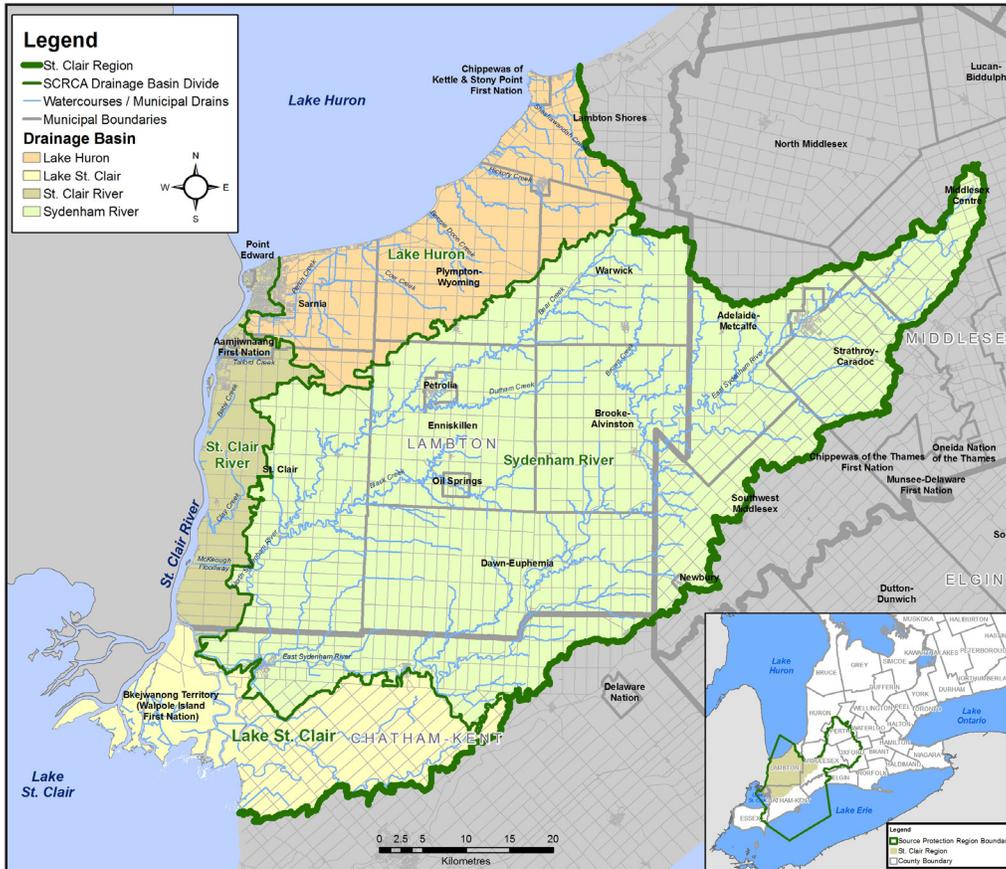


Figure 1: St. Clair Region Watershed and Subwatershed Boundaries

Physical Geography

This component describes the location and types of natural vegetative cover, location and types of aquatic habitats, and the locations within the SPA of habitat of species that are listed as Species at Risk in Ontario. It also describes the history, structure and composition of the land's surface and subsurface (geology), natural landscape features (physiography), soil types, surface shape and features (topography), water movement on the surface (surface hydrology) such as rainfall, water movement below the ground (groundwater hydrogeology) and climate, including air temperature and flooding. Figure 2 shows the St. Clair Region physiography.

Human Geography

The current population and estimated growth rate in each municipality are presented. First Nation reserves populations are also provided. The St. Clair Region Conservation Authority includes most of Lambton County, part of Middlesex County, and part of the Municipality of Chatham-Kent. The watershed area covers approximately 4,100 square kilometres with a total population of 167,000 in the year 2000. Three First Nations are located in the St. Clair SPA watershed, including Walpole First Nation, Chippewas of Kettle and Stony Point First

Nation and Aamjiwnaang First Nation.

Types of settlements (urban and rural centres) and land use (such as agricultural, residential and industrial) across the watershed are discussed. Figure 3 shows the generalized land cover in the St. Clair Region.

Water Quality

This component focuses on water quality across the SPA. The selection of indicator substances (parameters) such as nutrients, metals and bacterial indicators is discussed. The watershed inland surface water, the ambient groundwater, municipal well raw (untreated) water, and the municipal surface water intake raw water quality data is reviewed and assessed using treated water quality benchmarks and aquatic life/watershed health guidelines. Where possible, trend lines are shown and statistical analyses performed.

Water Quantity

In this component, the water use across the SPA is discussed. The approximate water taking (use) by sector (agricultural, commercial, industrial, municipal, water supply, dewatering, remediation, construction) is presented and described. The water taking for each subwatershed catchment area is also presented. These catchment areas are delineated through the Conceptual Water Budget study, which is described in a separate Section Summary.

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Section Summary - 2.0 Watershed Characterization

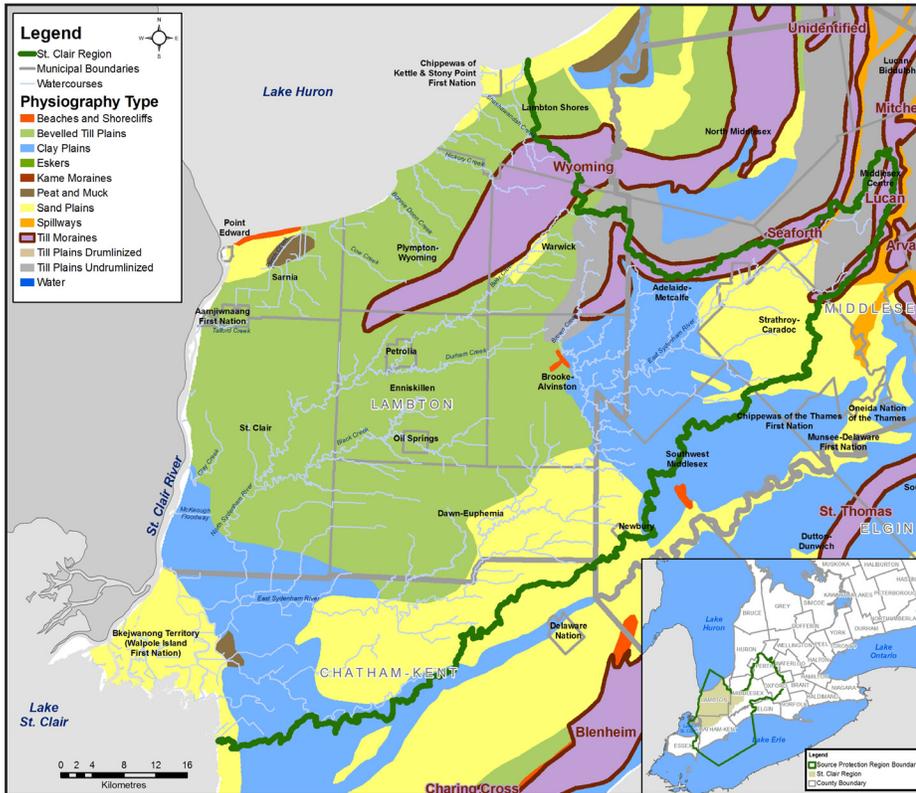


Figure 2: St. Clair Region Watershed Physiography

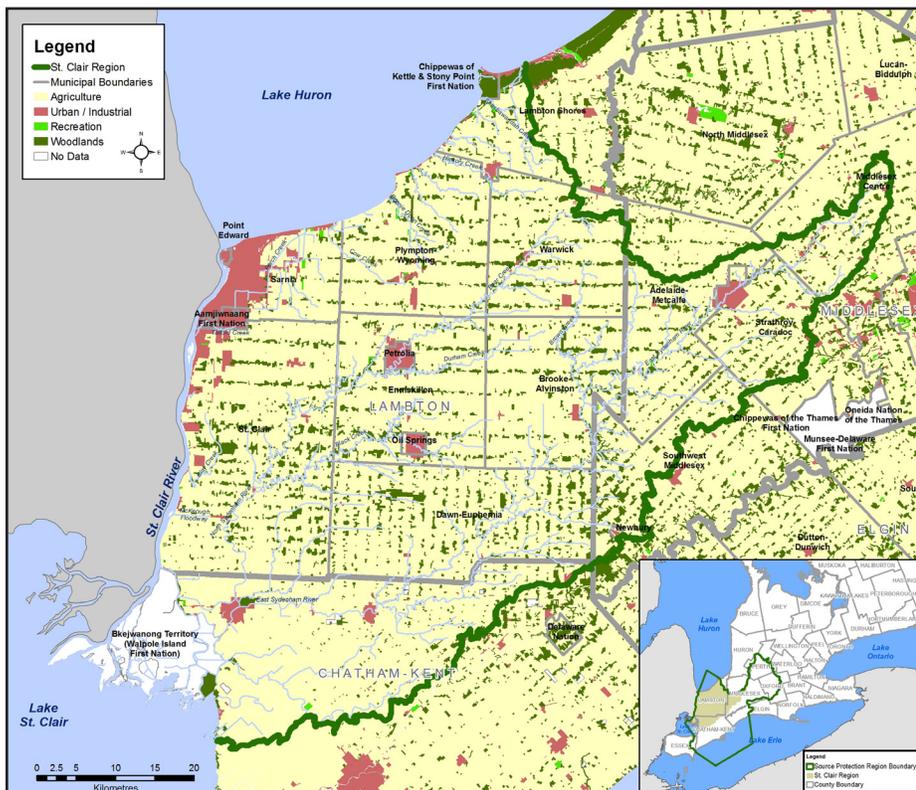


Figure 3: St. Clair Region Watershed Generalized Land Use

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Section Summary - 2.0 Watershed Characterization

Drinking Water Systems

Seven municipal drinking water systems service people living in the St. Clair Region SPA, including four systems that are located outside the SPA. Details are provided in Table 1. In addition, two surface water intakes supply two First Nations in the Area (Walpole Island and Kettle & Stony Point First Nations while Aamjiwnaang First Nation obtains their water from the Lambton Area Water Supply System. The drinking water supply systems servicing the St. Clair watershed are shown in Figure 4.

Table 1. Municipal Drinking Water Systems Serving the St. Clair Region SPA

Drinking Water System	Water Source
Lambton Area Water Supply System	St. Clair River
Petrolia Water Treatment Plant	Lake St. Clair
Wallaceburg Water Distribution System	Chenal Ecarte
Lake Huron Primary Water Supply System *	Lake Huron
West Elgin Water Treatment Plant *	Lake Erie
Elgin Water Treatment Plant *	Lake Erie
Chatham Water Treatment Plant *	Lake Erie

* located outside the St. Clair Region SPA

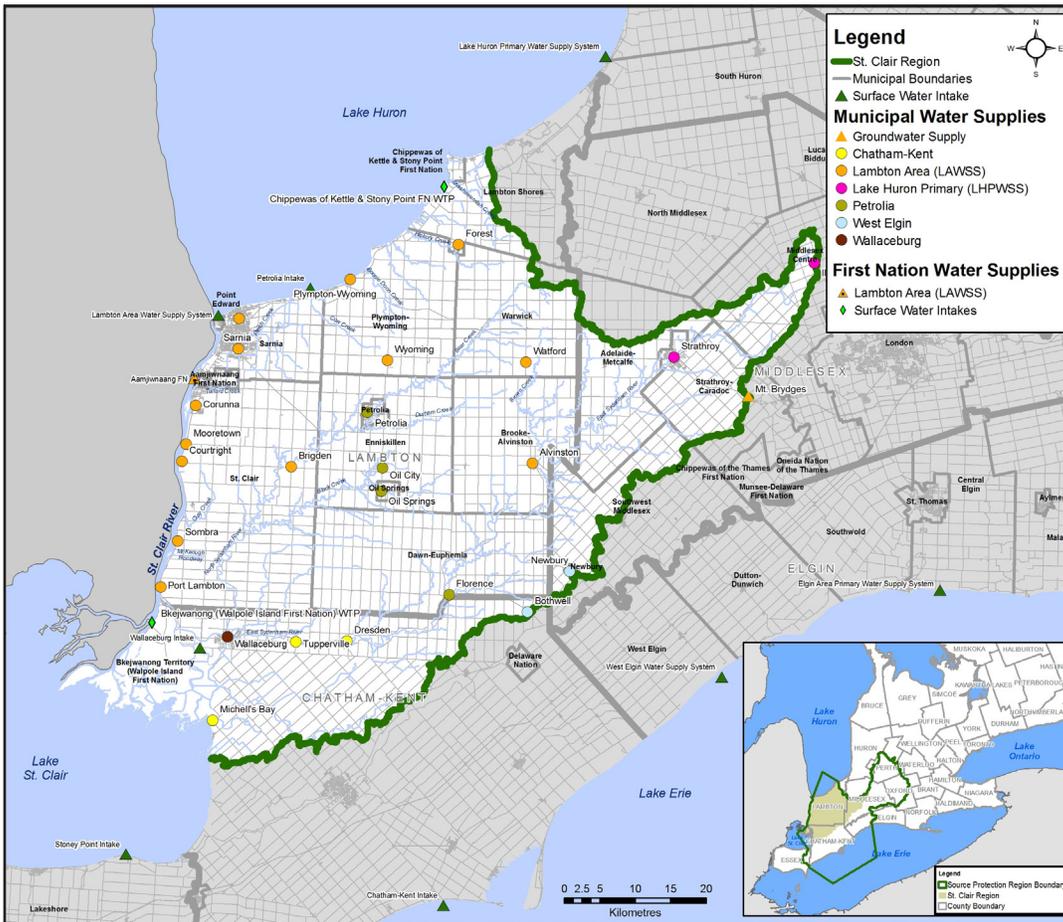


Figure 4: Municipal Water Supply Systems in the St. Clair Region SPA

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Section Summary - 4.0 Vulnerability Assessment

Section Summaries

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4.0 Vulnerability Assessment

In order to protect drinking water sources, it is necessary to identify areas where they can be affected by activities. The Clean Water Act refers to these areas as Vulnerable Areas, and requires that they be assessed to determine their relative level of vulnerability. Figure 1 shows the vulnerable areas identified in the St. Clair region.

The method of assessment of vulnerability depends on the type of vulnerable area. Four types of vulnerable areas must be identified:

- Intake Protection Zones (IPZ)
- Wellhead Protection Areas (WHPA)
- Highly Vulnerable Aquifers (HVA)
- Significant Groundwater Recharge Areas (SGRA)

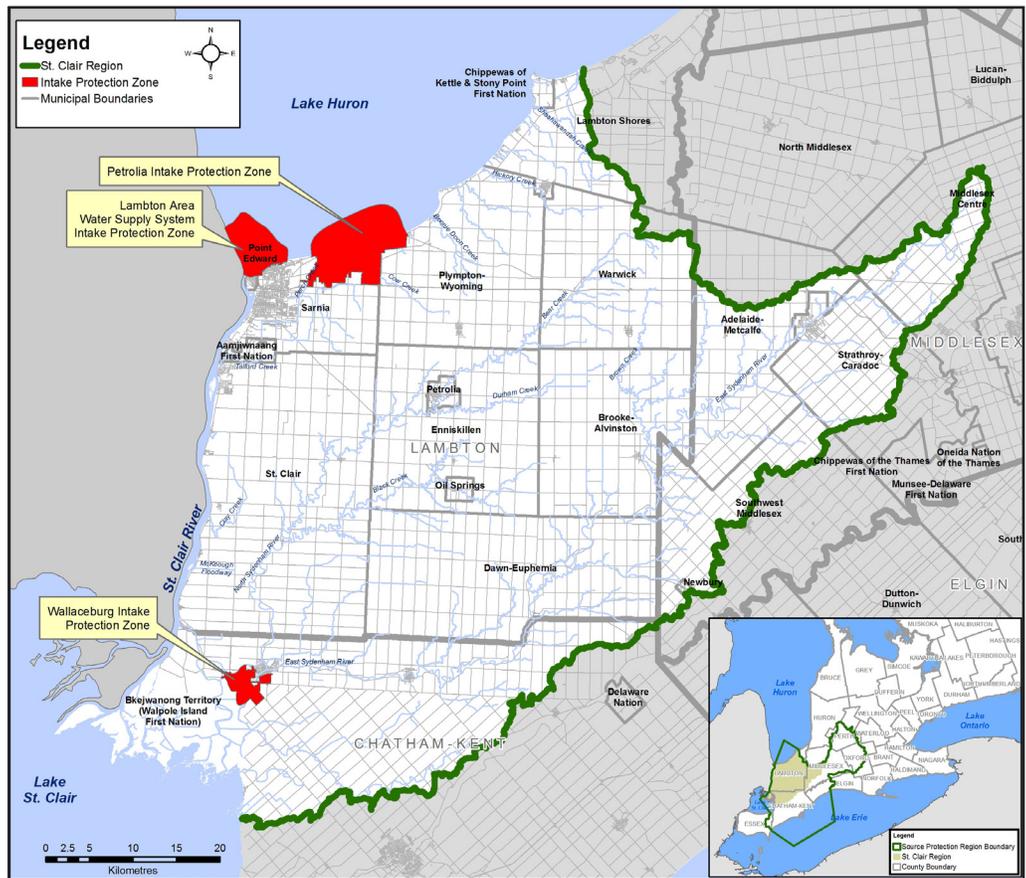


Figure 1. Intake Protection Zones in the St. Clair Region Source Protection Area

DRINKING WATER

SOURCE PROTECTION

ACT FOR CLEAN WATER

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Section Summary - 4.0 Vulnerability Assessment

Intake Protection Zones

Intakes are used to draw drinking water from lakes or rivers. An Intake Protection Zone, or IPZ, is an area of water and land delineated around a municipal water intake, where special care must be taken in the use and handling of potential contaminants. A spill or a leak in this area may threaten the municipal drinking water supply so quickly that there may not be enough time to warn the system's operator to shut down the water intake.

Each IPZ is comprised of three areas: Intake Protection Zone 1 (IPZ-1), IPZ-2, and IPZ-3. In the St. Clair Region Source Protection Area (SPA), the intakes of three drinking water systems draw water from Lake Huron, St. Clair River, and the Chenal Ecarte. Figure 1 shows the location of the intakes and the IPZs around them. The intake on Lake Huron at Bright's Grove serves the Town of Petrolia at Bright's Grove water treatment plant, and is classified as a Great Lakes (Type A) intake. The intake at the mouth of the St. Clair River where Lake Huron flows into that river serves the Lambton Area Water Supply System (LAWSS), and is classified as a Type B (connecting channel) intake. The third intake in the St. Clair Region SPA serves the Town of Wallaceburg and is located on the Chenal Ecarte, one of the St. Clair River tributaries that flows into the Sydenham River. This intake on Chenal Ecarte is classified as a Type B intake.

The vulnerability within an Intake Protection Zone is first assessed by delineating an IPZ-1. IPZ-1 is considered the most vulnerable to any contaminant of concern that may be released, because of its close proximity to the intake. Any contaminants released in this zone have the greatest likelihood of adversely affecting the raw (untreated) water at the intake.

On the Great Lakes (Type A intake), an IPZ-1 is a circle with a radius of 1 km, centred on where the intake draws its water from the lake. For a connecting channel (Type B intake), an IPZ-1 is comprised of a semicircle extending upstream of the intake centre, and a rectangle extending downstream of the intake centre. The semicircle has a radius of 1 km, and the rectangle has a length of 2 km and width of 100 m.

For both Type A and B intakes, where the circle touches shore, the IPZ-1 includes a setback on the land that is the greater of either 120 metres from the high water mark, or the regulatory flood limit, where water from that area drains into the water body part of the IPZ-1. The regulatory limit is defined by Conservation Authorities to be areas which are flooded under a severe regulatory event.

A second zone, the IPZ-2, is delineated based on time of travel to the intake being equal to or more than what is necessary for the water treatment plant operators to close the intake. Operators determined that they could close the intake within two hours of being notified of a situation that might cause a deterioration of the drinking water. Two hours is the minimum time allowed by the Clean Water Act.

Time of travel in regards to surface water is the length of time required for surface water to travel a specified distance within a surface water body, such as a lake, under moderate conditions.

IPZ-2 is comprised of an in-lake component and an in-land component. To determine the in-lake extent, computer models were used to simulate currents driven by wind and wave action within the Great Lakes and connecting channels. The models simulate particle movement in the water body and determine time of travel to the intakes. Various scenarios are run to determine areas that can contribute water or potential contaminants within the time required to close the intake. The models help to determine the time of travel between the shore where tributaries outlet to the lake, and the intake. The time remaining from the two hours is used to determine the distance that the IPZ-2 extends up tributaries.

The IPZ-2 also extends on-shore and on either side of the tributaries for a certain setback. That setback is the greater of either 120 metres from the high water mark, or the regulatory flood limit.

The IPZ-2 is also extended to include any storm sewersheds (i.e., areas drained by storm sewers and catch basins) and areas where transport pathways allow water to drain to the IPZ-2. A transport pathway is a natural or constructed (man-made) path that allows water to drain to the IPZ-2, such as drains, creeks, agricultural tile drains, or overland flow. The IPZ-2 has been extended to include transport pathways by including parcels adjacent to watercourse and water body setbacks. These adjacent parcels are likely to serve as transport pathways either through the extensive tile drainage in the area or through overland flow. Through the Tier 2 (site-specific) Risk Assessment, if these areas were found to be beyond the time of travel or to drain away from the IPZ-2, their inclusion would be reconsidered. These changes would be made through an amended Assessment Report.

The resulting IPZs-1 and 2 are illustrated in Figure 1. More detailed maps of these vulnerable areas are available in Appendix 1, and by each municipal surface water system, in Appendix 3 of the Assessment Report.

A third IPZ can also be developed, called the IPZ-3. This zone includes areas that can contribute contaminants under an extreme event (e.g., high winds or heavy rain), at a concentration that would result in a deterioration of the raw (untreated) source water for the purposes of drinking. IPZ-3 work is yet to be undertaken and will be part of an amended Assessment Report.

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Vulnerability Assessment

According to the 'Technical Rules,' the vulnerability of the IPZ is assessed based on a number of factors. These factors and the scores assigned to them are described below:

- Area Vulnerability Factor: IPZ-1 receives an area vulnerability score of 10. For Great Lakes and connecting channel intakes, the area vulnerability score of IPZ-2 is between 7 and 9, depending on the amount of land in the IPZ-2, land cover, soil type and permeability, as well as the presence of transport pathways.
- Source Vulnerability Factor: For a Great Lakes intake, the source vulnerability factor is between 0.5 and 0.7. For a connecting channel intake, the source vulnerability factor is between 0.7 and 0.9. The number is dependent on the intake depth and distance from shore, and the number of issues identified at the intake.

The IPZ's Vulnerability Score is then determined by multiplying the Source Vulnerability factor by the Area Vulnerability factor. A score of 10 indicates the highest vulnerability.

The vulnerability scores of the IPZs of the St. Clair Region SPA are summarized in Table 1 and a sample vulnerability map showing intake protection zones in Figure 2.

Table 1. Intake Protection Zone Vulnerability Scores in the St. Clair Region SPA

System Intake	Vulnerability Score	
	IPZ-1	IPZ-2
Lambton Area Water Supply System Intake	8.0	6.4
Petrolia Water Treatment Plant Intake	7.0	6.3
Wallaceburg Water Treatment Plant Intake	9.0	7.2

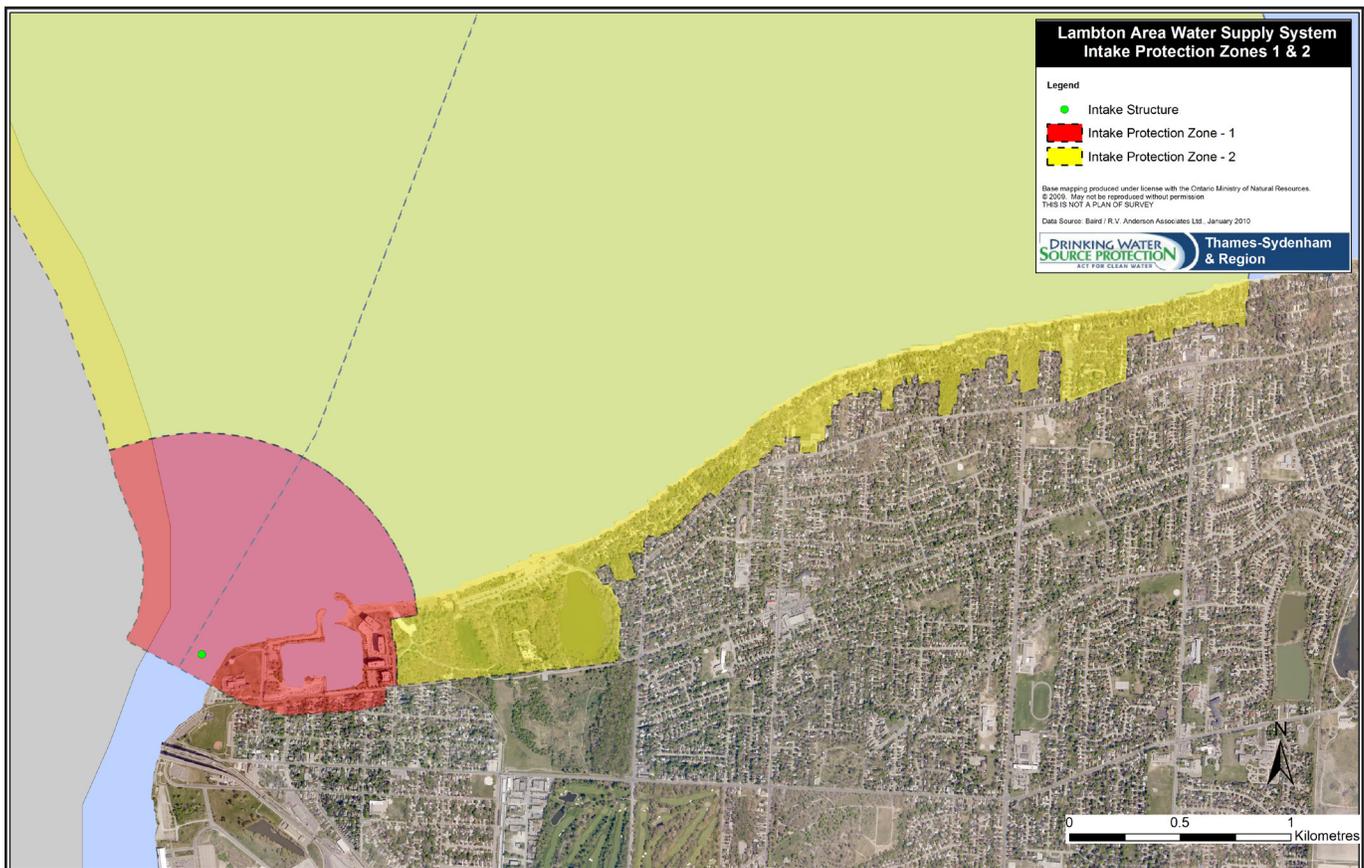


Figure 2: Vulnerability Mapping for the Lambton Area Water Supply System showing IPZ-1, IPZ-2 and vulnerability scores.

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Section Summary - 4.0 Vulnerability Assessment

Wellhead Protection Areas

Wells are used to extract water from aquifers in the ground. A Wellhead Protection Area, or WHPA, is a vulnerable area delineated around a municipal wellhead, through which contaminants are reasonably likely to move toward or reach the well. Within a WHPA, certain activities and conditions (past activities) can pose a threat to the municipal drinking water supply.

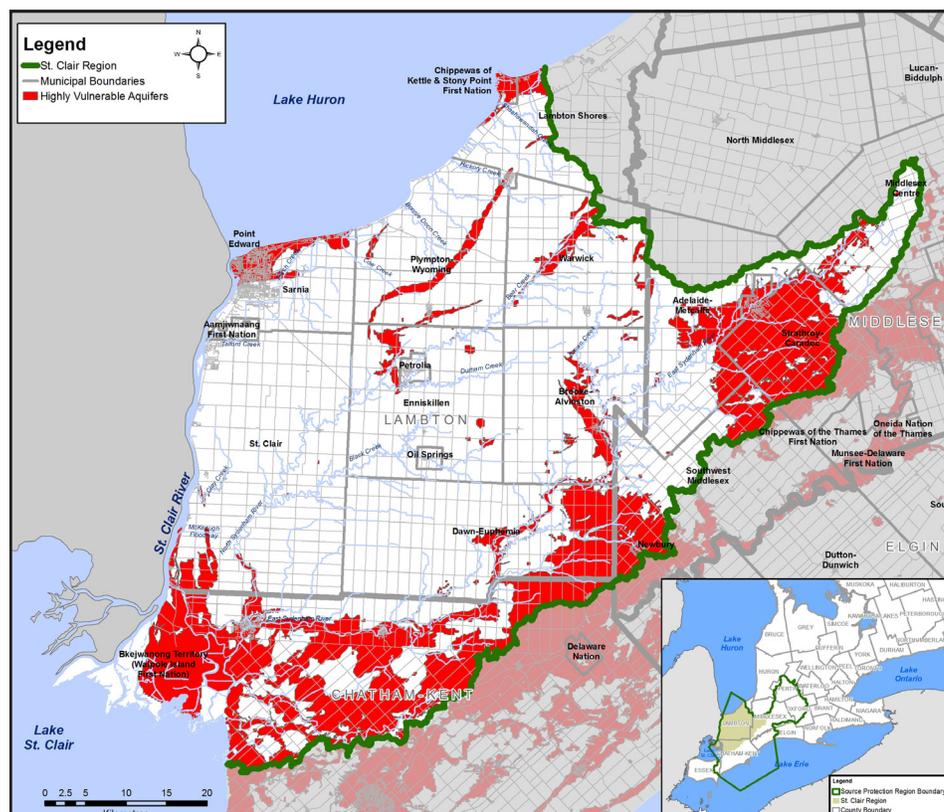
There are no municipal systems in the St. Clair Region SPA that are serviced by groundwater wells.

Highly Vulnerable Aquifers

In the Thames-Sydenham and Region, Highly Vulnerable Aquifers (HVA) were mapped using the Intrinsic Susceptibility Index (ISI). This method uses an index of depth and permeability of the materials which offer protection to the aquifers. The permeability of the material overlying the aquifer supplying the well is assessed at each location with a well record. The Ministry of the Environment's (MOE) Water Well Information System (WWIS) contains borehole information collected at the time of the well construction. The province undertook a project to characterize the materials identified in this database so that a 'k' value can be assigned to each material identified in the well log. The 'k' value is then multiplied by the thickness of the material in metres and summed over the depth to the aquifer of interest. It results in a score which is then categorized as high, medium or low as identified in Technical Rule 38 (1). A high vulnerability is assessed where the sum of the thickness times the k value

is less than 30. A medium vulnerability is assessed in areas where the sum of the products of thickness and k is less than 80 and greater than or equal to 30. Higher scores are considered low vulnerability.

ISI was available for the entire region from the county groundwater studies. This product was updated to provide seamless mapping between counties, which ensured that consistent computer algorithms were used to generate the vulnerability level contours across the region. The data was also reviewed to check that it agreed with other data sources such as sand and gravel mapping and surficial geology. Data was reviewed to be certain that small areas based on sporadic data points were not isolated if there were reason to believe that they were part of a more continuous vulnerable area. Similarly sporadic areas of high vulnerability were assessed to ensure that they were not resulting from erroneous or poorly interpreted data.



Similar analysis was undertaken on a more localized basis for the ISI product that was used for the vulnerability assessment of the WHPA. The ISI used in the WHPA was based on the depth to the aquifer being used by the municipal well supply system, whereas the ISI being used for HVA delineation is to the first (or shallowest) significant aquifer.

Areas where the ISI score is less than 30 (high vulnerability) are identified as HVA. Areas of moderate or low vulnerability are excluded from the HVA. According to the Technical Rules, all HVA have a vulnerability score of 6.

Figure 3 illustrates the HVA in the Source Protection Region. More detailed mapping is available in the Assessment Report in Appendix 1.

Figure 3. Highly Vulnerable Aquifers

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Section Summary - 4.0 Vulnerability Assessment

Significant Groundwater Recharge Areas

Significant Groundwater Recharge Areas (SGRA) are delineated through the Water Budget Process. In the St. Clair Region SPA, SGRA were delineated through the Tier 1 Water Budget. The initial delineation has been updated based on improved methodologies developed through the Tier 2 Water Budget undertaken in the Upper Thames River SPA.

SGRA are areas where the recharge is more than 1.15 times the average recharge in the area, or 55% or more of the volume determined by subtracting the annual evapotranspiration for the whole of the related groundwater recharge area from the annual precipitation for the whole of the related groundwater recharge area.

These areas are illustrated in Figure 3. More detailed mapping is available in the Assessment Report in Appendix 1.

Vulnerability within these SGRA was assessed using the ISI developed for delineation of the Highly Vulnerable Aquifers. Areas of high vulnerability are assessed a vulnerability score of 6, while moderate areas are scored 4 and low areas are scored 2. Mapping of the vulnerability in the SGRA is also shown in Figure 4.

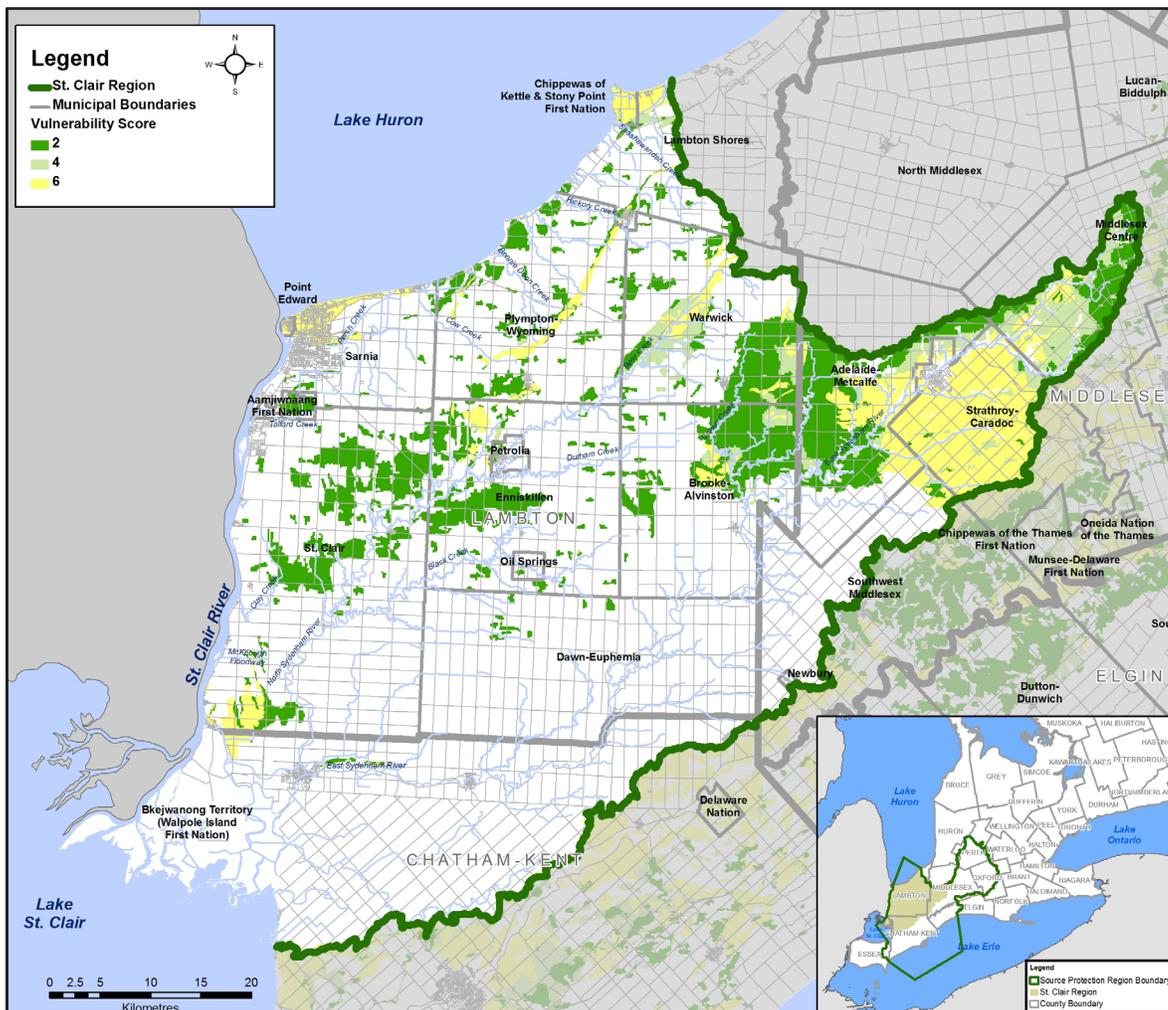


Figure 4. Significant Groundwater Recharge Areas Vulnerability

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ST. CLAIR REGION ASSESSMENT REPORT

Section Summary - 5.0 Issues Evaluation

Section Summaries

The Assessment Reports for the Thames-Sydenham and Region are large summary documents compiling information from many technical reports. These technical reports include Water Budgets, Watershed Characterization Reports and many Source Protection Technical Studies related to municipal drinking water systems. That information has been summarized and compiled into Assessment Reports of the Region. Each section of the Assessment Reports has been summarized in a series of Section Summaries.

5.0 Issues Evaluation

Under the Clean Water Act (2006), drinking water quality issues must be identified. A drinking water issue is a parameter (substance) or pathogen (disease-causing microorganism) that is present at a level that may cause the deterioration of the quality of water used as a source of drinking water. An issue may also be identified when levels of that substance or organism show an increasing trend that may result in deteriorated quality of water used as a source of drinking water.

What is an Issue?

The Technical Rules: Assessment Report indicates the following parameters can be considered in the identification of drinking water quality issues in raw (untreated) source water: Schedule 1, 2 and 3 parameters of the Ontario Drinking Water Quality Standards (Reg. 169/03 of the Safe Drinking Water Act, 2002), and Table 4 parameters of the Technical Support Document for the Ontario Drinking Water Standards, Objectives and Guidelines (MOE publication, June 2006). The parameters are physical (e.g., taste, turbidity), chemical (e.g., lead, nitrate), radioactive (e.g., uranium-235) or indicator microbial (total coliform, *E. coli*).

Safe levels of the parameters in treated drinking water are identified in the above referenced tables. Parameters are listed and further described in the Issues Evaluation Section of the Assessment Report.

Pathogens, which are disease-causing organisms such as cryptosporidium or certain strains of bacteria, can also be considered.

Impact of Identifying an Issue

Should an issue be identified, activities that contribute to the issue within a vulnerable area are deemed a significant risk to the source of drinking water. Significant risks must be mitigated through the source protection plan.

The area and the activities contributing to a drinking water quality issue must also be identified. Further, a third intake protection zone (IPZ-3) for surface water intakes may be delineated to include the activities and area known to contribute to the drinking water quality issue. These tasks are yet to be completed and will be part of an amended Assessment Report.

Issue Evaluation Methodology

Issues were identified in the St. Clair Region Source Protection Area by following the Thames-Sydenham and Region Issues Evaluation Methodology (May 14, 2009), depicted in Figure 1. The evaluation is a two step process.

Firstly, in the screening step, raw (untreated) water quality data is compared to a benchmark and parameters or pathogens may be flagged if they meet the screening criteria. For chemical, physical and radioactive parameters, the benchmarks are generally half the applicable human health based Ontario drinking water standards (Maximum Acceptable Concentrations, or MAC), and the full levels of the aesthetic objectives (AO) and operational guidelines (OG), and any plant operating authority concerns.

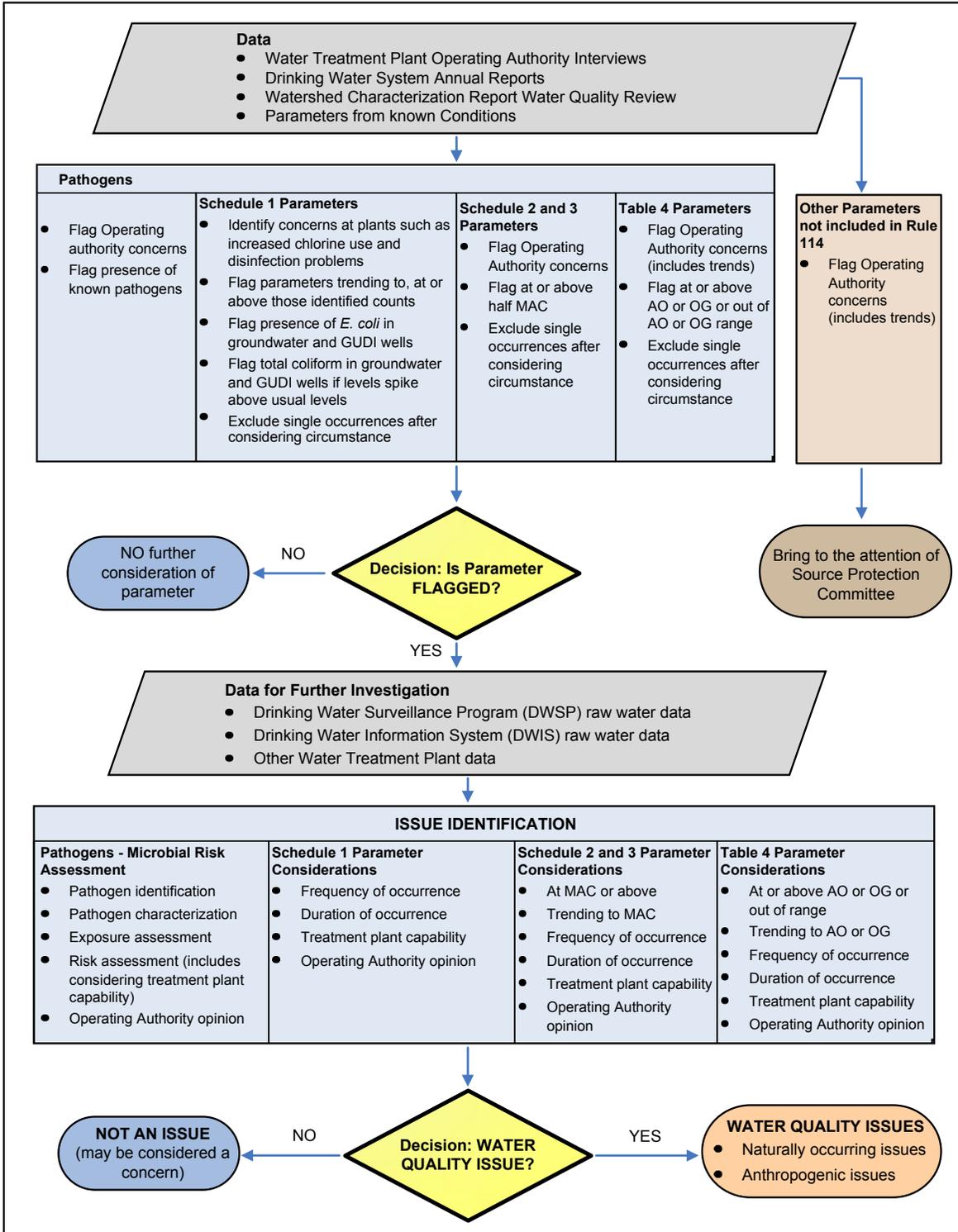
For parameters flagged through the screening, the second, identification step involves a review of trends and spikes, frequency and duration of occurrence, presence at or trending towards the applicable MAC, AO or OG benchmark, consideration of existing water treatment plant capabilities and discussions with the water treatment plant operating authority.



ST. CLAIR REGION ASSESSMENT REPORT

Section Summary - 5.0 Issues Evaluation

Figure 1. Issues Evaluation Methodology



Pathogens are evaluated differently. A known pathogen of concern that is flagged through the screening process must be subject to a microbial risk assessment to identify it as an issue. This assessment involves pathogen characterization, exposure assessment and risk characterization.

Identified Issues

The drinking water quality issues identified in the raw (untreated) water to the surface water intakes and groundwater wells of the St. Clair Region SPA are provided in Table 1. Parameters may be due to anthropogenic (man-made) sources, i.e. activities on land, or may be naturally occurring, or both. No pathogens are identified as issues in the raw (untreated) source water in the St. Clair Region SPA. Information on flagged parameters is provided in Appendix 9 of the Assessment Report.

It is important to note that the drinking water quality issues identified in Table 1 are based on raw (untreated) water quality and do not represent the quality of water after treatment. The operation of a water treatment plant including treatment and distribution, are governed separately by the Safe Drinking Water Act (2002).

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Section Summary - 5.0 Issues Evaluation

Data Gaps

Schedule 2 and 3 (chemical and radiological) and Table 4 (chemical and physical parameters) data for the Town of Petrolia intake raw water (at Bright's Grove), other than 2003 to 2005 data, were not available. Additional data collection would facilitate future issues evaluation.

The area and activity contributing to an issue are yet to be identified. A work plan to accomplish this is provided in the Issues Evaluation Section of the Assessment Report. The work itself, upon completion, would be part of an amended Assessment Report.

Table 1. Drinking Water Quality Issues Identified in the St. Clair Region Source Protection Area

System	Issue	Brief Description of Evaluation	Natural or Anthropogenic Source
Town of Petrolia at Bright's Grove (Lake Huron intake)	None were identified		
LAWSS (St. Clair River intake)	None were identified		
Wallaceburg (Chenal Ecarte intake)	Nitrates	In the St. Clair Watershed Characterization report, there were two exceedances of the half MAC of 5 mg/L, identified for nitrates. The elevated levels were 5.9 mg/L in 1990 and 9.3 mg/L in 1992 (data from 1990 to 2005). Also, nitrates have been identified by the water treatment plant manager as being a significant concern, and hence are considered a drinking water quality issue. It is recommended that additional raw water quality data illustrating the elevated levels of nitrates be analyzed.	Possibly both natural and anthropogenic causes, further investigation required
	Organic nitrogen	Approximately 72% (52 of 72 samples) of the available DWSP data measured above the 100% OG benchmark of 0.15 mg/L. The trend line implies that the organic nitrogen levels have been decreasing over time; however, considering the consistent sampling measuring above the OG, organic nitrogen was identified as an issue.	Possibly both natural and anthropogenic causes, further investigation required
	Turbidity	Turbidity has been identified as a concern from the water treatment plant manager. The plotted turbidity samples of this raw water quality analysis indicate approximately 44% (38 of 77) of the sampling results between 1989 to 2006 measure above the 100% AO benchmark of 5 NTU.	Possibly both natural and anthropogenic causes, further investigation required
	Hardness	Hardness levels in approximately 53% (37 of 70) of the samples analyzed from 1989 to 2006 were above the 100% OG benchmark range of 80 to 100 mg/L. The maximum value recorded was 180 mg/L and the minimum recorded value was 93.5 mg/L. The average hardness level for the analyzed data set is 102.5 mg/L. The trend line implies that the hardness concentration slightly decreases over time; however, considering the consistent sampling measuring above the OG upper limit of the benchmark, hardness was identified as an issue.	Naturally occurring

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ST. CLAIR REGION ASSESSMENT REPORT

Section Summary - 6.0 Conditions

Section Summaries

The Assessment Reports for the Thames-Sydenham and Region are large summary documents compiling information from many technical reports. These technical reports include Water Budgets, Watershed Characterization Reports and many Source Protection Technical Studies related to municipal drinking water systems. That information has been summarized and compiled into Assessment Reports of the Region. Each section of the Assessment Reports has been summarized in a series of Section Summaries.

6.0 Conditions

The Source Protection Committee (SPC) is required to identify as a drinking water threat any "Condition" of which it is aware. A condition is the result of a past activity that has the potential to pose a risk to a drinking water source. The Technical Rules: Assessment Report identifies the type of situations that can be considered a condition.

The Soil, Ground Water and Sediment Standards refer to the MOE publication, 'Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act' (March 9, 2004). More information on the use of the standards may be obtained from the Conditions Assessment Section of the Assessment Report.

What is a Condition?

One of the following situations must be satisfied in order to be identified as a condition:

- the presence of a non-aqueous phase liquid in groundwater in a highly vulnerable aquifer, significant groundwater recharge area or wellhead protection area;
- the presence of a single mass of more than 100 litres of one or more dense non-aqueous phase liquids in surface water in a surface water intake protection zone;
- the presence of a contaminant in groundwater in a highly vulnerable aquifer, significant groundwater recharge area or a wellhead protection area, if the contaminant is listed in Table 2 of the Soil, Ground Water and Sediment Standards and is present at a concentration that exceeds the potable groundwater standard set out for the contaminant in that Table;
- the presence of a contaminant in surface soil in a surface water intake protection zone, if the contaminant is listed in Table 4 of the Soil, Ground Water and Sediment Standards and is present at a concentration that exceeds the surface soil standard for industrial/ commercial/ community property use set out for the contaminant in that Table; and
- the presence of a contaminant in sediment, if the contaminant is listed in Table 1 of the Soil, Ground Water and Sediment Standards and is present at a concentration that exceeds the sediment standard set out for the contaminant in that Table.

Impact of identifying a Condition

Should the SPC become aware of a condition, as described above, it is to be considered a drinking water threat. As for all drinking water threats, risk is quantified in the Technical Rules: Assessment Report, as the product of vulnerability and hazard.

$$\text{Risk} = \text{Vulnerability} \times \text{Hazard}$$

Although for activities the hazard score is determined through the table of drinking water threats, for a condition the hazard score is 6 or 10. It is 10 if: (a) there is evidence that the situation is causing off-site contamination, or (b) the condition occurs on a property on which a drinking water system intake, well, or monitoring well is located. The hazard score is 6 if neither (a) nor (b) apply. The threat level is dependent on the vulnerability score of the area within which the condition is located, and whether the hazard score is 6 or 10.

Table 1. Threat Levels for Conditions

Threat Level	Risk Score
Significant	80 or greater
Moderate	60 to less than 80
Low	Greater than 40 but less than 60
No threat	40 or less



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Section Summary - 6.0 Conditions

There are additional scenarios where, regardless of the risk score, a condition is a significant threat. These scenarios are when a condition is related to a drinking water quality issue or an intake protection zone-3 (IPZ-3). For more information, refer to Section 6.0 – Conditions Assessment of this Assessment Report.

The Clean Water Act requires that significant threats be managed to the point that they no longer become significant. The SPC may also develop policies for moderate and low drinking water threats; however, it is anticipated that the types of policies that can be applied to moderate and low threats will not be as broad as for the significant drinking water threats. Policies for conditions are, however, expected to be significantly different than those for prescribed activities, due to the fact that the activity is no longer being undertaken and the contaminant has already been released into the environment. The province has yet to release the regulation that will describe the type of policies which the Source Protection Plan can include.

Conditions Investigations

At the time of drafting this Assessment Report, the SPC has not completed an extensive investigation to determine if there are any conditions that need to be reported on. Their investigation at this point is limited to the following:

- Those undertaking municipal technical studies were requested to determine if there are conditions of which the water treatment plant operating authorities are aware.
- MOE provided information from their local offices to determine if their files contain any information that might lead to identifying a condition. This information was restricted to a fixed radius around intakes and wells. Although it has been provided to the consultants for their consideration, not all of the consultants have been able to review the information. In addition, the information does not include the entire vulnerable areas.
- It is anticipated that stakeholders, including the public, may identify situations that they believe may be a concern and that will require investigation to determine

if they are conditions. Some of these have been identified, but are yet to be reviewed to determine if they should be considered a condition.

More information on data reviewed while assessing vulnerable areas for conditions may be obtained from Section 6.0 - Conditions Assessment of this Assessment Report. While the efforts completed to date do not constitute an extensive investigation of potential conditions, they serve as a preliminary screening for known situations that the SPC should consider in developing a Source Protection Plan for the area.

Next Steps for Conditions

At this time, the SPC has not identified any conditions resulting from past activities. They will continue to investigate any situations or concerns of which they become aware. Additional information made available to the committee will be reviewed to determine if the criteria for a condition are met. Should the SPC identify any conditions, it will be necessary to revise the Assessment Report to include any conditions identified.

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