

# DRINKING WATER SOURCE PROTECTION

ACT FOR CLEAN WATER

Thames-Sydenham and Region Source Protection Committee  
*Lower Thames Valley Source Protection Area*

## Assessment Report Appendices

Approved

September 16, 2015





# Lower Thames Valley Source Protection Area Assessment Report

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- Appendix 4 – Assessment Report Consultation
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This section is bound separately

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## ***Appendix 2 – Section Summaries***

This section is no longer part of the Assessment Report. Section Summaries will be revised to reflect the updates to the Assessment Report and will be available on the web site.

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## ***Appendix 3 – System Summaries***

This section is no longer part of the Assessment Report. System Summaries will be revised to reflect the updates to the Assessment Report and will be available on the web site.

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## ***Appendix 4 – Assessment Report Consultation***

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## **Assessment Report Consultation Plan**

# **Lower Thames Valley Source Protection Area Assessment Report**

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**Thames-Sydenham and Region  
Source Protection Region**

# **Assessment Report Consultation Plan**

**November 12, 2010**

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# 1 Background

The Clean Water Act requires the completion of Assessment Reports which will contain the science on which the Source Protection Plan will be based. These reports will identify vulnerable areas, assess the vulnerability of those areas, identify water quality issues related to the water sources and assess the risks to the water systems. General Regulation 287/07 under the Clean Water Act requires consultation on the Assessment Report.

Work on the components of the Assessment Report (AR) is being undertaken by various leads through partnerships involving system operating authority and CA staff. The following table summarizes the various projects and the systems included in those projects. It is generally anticipated that the work on the systems within a project will be completed together and this will determine when the work from a system can begin the peer review and consultation processes. Peer review involves the review of the work for technical completeness and whether it meets provincial rules and guidance. It is generally accepted that only the vulnerability assessment requires peer review due to the highly technical nature of this work. Upon completion of the peer review, stakeholder consultation on the delineation and vulnerability assessment of the vulnerable areas can be initiated. When the other components of the Assessment Report are complete consultation on those parts can be initiated. The regulations also require that the specific consultation be undertaken on the draft and proposed Assessment Reports.

**Table 1 - Assessment Report technical studies**

Ground-water		Surface Water	
Projects	Systems	Projects	Systems
Perth	Stratford St Marys West Perth -Mitchell Perth East -Shakespeare (& Milverton)* Perth South - St Pauls, Sebringville*	Essex Chatham Kent	Wallaceburg Wheatley South Chatham Kent/Chatham
London-Middlesex	City of London - Fanshawe, Hyde Park Thames Centre - Thorndale, Dorchester Kilworth Heights Subdivision, Melrose, Mount Brydges Birr	West Elgin	West Elgin
Oxford	Woodstock, Innerkip Ingersoll, Beachville-Loweville Mount Elgin* Embros, Lakeside* Thamesford Tavistock, Hickson-King*	Southern Lake Huron	LAWSS* Petrolia*
Chatham-Kent	Ridgetown Highgate		
GUDI Studies	St. Marys Oxford (Thamesford, Woodstock) City of London (Fanshawe) Thames Centre (Dorchester) Middlesex Centre (Kilworth Heights Subdivision) Chatham-Kent (Highgate)	IPZ-3 Studies	LAWSS, Petrolia Wallaceburg, Wheatley, Erie Beach West Elgin Lake St. Clair intakes (Essex Region SPA)

Municipalities identified with an asterisk (\*) include vulnerable areas from water systems in neighbouring municipalities  
Note: Milverton is outside of the TSR SP Region but included in the technical study

The Assessment Reports are to be submitted to the MOE one year from the approval of the Terms of Reference (April 20, 2010). MOE has accepted that it is unlikely that all work on the Assessment Report will be completed by the due date in the larger and more complex regions. They have therefore accepted that some components of the Assessment Report will be identified as data gaps at the time of submission of the first Assessment Report. There is an expectation that work would continue on those gaps in parallel with work on the Source Protection Plans. The remaining aspects would be expected to be submitted sufficiently in advance of the due date of the Source Protection Plan to allow for the approval of that work prior to the completion of the Source Protection Plan. Those aspects of the Assessment Report which we expect cannot be completed prior to the submission of the Assessment Report are identified in Phase 4 in the following table.

Due to the size and complexity of the AR it is not adequate to await its completion prior to initiation of consultation. Instead, a phased approach to consultation is proposed and described in the consultation plan. This Consultation Plan outlines the planned consultation on the Assessment Report in the Thames-Sydenham and Region.

## 2 Purpose

This consultation plan is intended to:

- Describe the consultation on the vulnerability assessment work including vulnerability zones (the lines on the map); Issues and Threats; Risk Assessment; and Tier 1 Water Budget.
- Meet the requirements of the Clean Water Act and related regulations and rules.
- Allow adequate opportunity for stakeholder input into the technical work comprising the Assessment Report.
- Increase the local community awareness of the Source Protection Planning process

## 3 Consultation Overview

In order to allow for adequate stakeholder engagement in the development of the Assessment Report a phased approach to consultation is planned. These phases allow multiple opportunities for stakeholders to be involved in the consultation process. The phases will allow multiple times and locations to be involved. The phases align with the availability of technical reports. The phases are also intended to target local information at the local communities. The 4 phases of consultation are described in the following table

**Table 2 - Consultation phases**

Phase	Description	Anticipated consultation
1. Vulnerability Assessment (Draft)	<ul style="list-style-type: none"> <li>• WHPA –A, B, C, D delineations</li> <li>• IPZ -1, 2 delineations</li> <li>• Vulnerability scores</li> <li>• List of activities which would be threats with a given vulnerability score</li> </ul>	<ul style="list-style-type: none"> <li>• Dependant on completion of work by consultants</li> <li>• Dependant on completion of peer review including possible revisions as a result of peer review comments</li> <li>• Local targets (systems or groups of nearby systems)</li> <li>• Municipal information packages</li> </ul>
2. Issues and Threats (Final Draft)	<ul style="list-style-type: none"> <li>• Vulnerable areas from previous consultation</li> <li>• HVA, SGRA</li> <li>• IPZ3 (preliminary)</li> </ul>	<ul style="list-style-type: none"> <li>• Local targets</li> <li>• Municipal consultation</li> </ul>

	<ul style="list-style-type: none"> <li>• Issues</li> <li>• Conditions</li> <li>• Significant Risks (preliminary)</li> </ul>	
3. Assessment Report	<ul style="list-style-type: none"> <li>• Proposed draft containing all aspects of the Assessment Report except for those identified in Phase 4 below.</li> </ul>	<ul style="list-style-type: none"> <li>• Regional open houses/public meeting</li> <li>• Internet posting and notices</li> <li>• Municipal and First Nations consultation required</li> </ul>
4. After submission of the first Assessment Report	<ul style="list-style-type: none"> <li>• Tier 3 Water Budget – SGRA Vulnerability Assessment</li> <li>• Significant Risks - Refinements based on site specific Risk Assessment</li> <li>• IPZ 3 vulnerability assessment</li> <li>• GUDI based WHPAs (WHPA E and F)</li> <li>• Prior to completion of SP Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation on the additional components</li> <li>• Consultation on the proposed AR – required regional open houses/ public meeting</li> <li>• Municipal and First Nations consultation required</li> </ul>

# Thames-Sydenham and Region Source Protection Assessment Report Consultation Plan

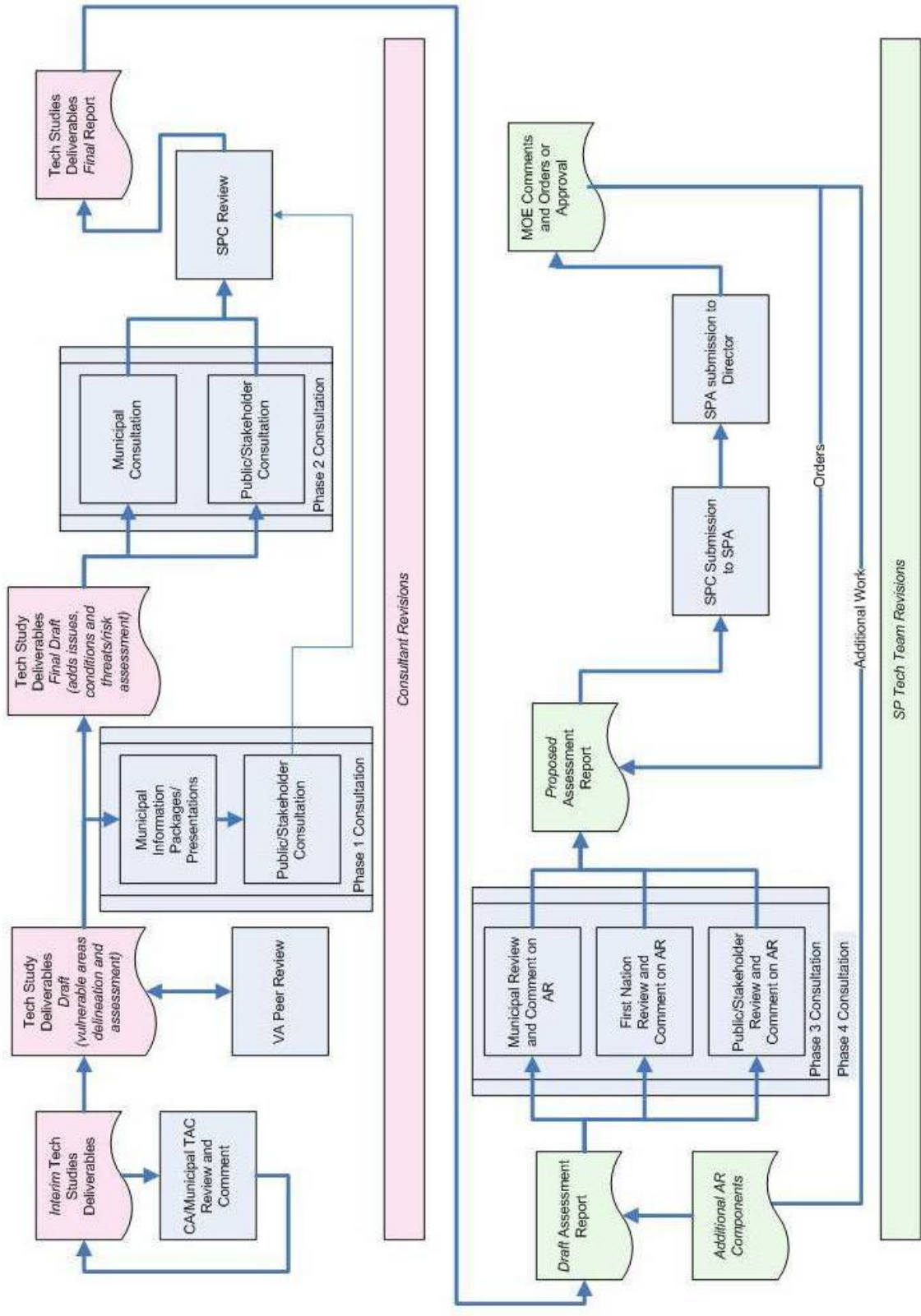


Figure 1 - Consultation plan overview

## **4 Target Audiences**

### ***4.1 Municipalities which do not include lands within vulnerable areas***

While these municipalities are not directly impacted by some aspects of the Source Protection planning process, it is important to maintain a flow of information to ensure they understand the process and the scope of the impacts in the region. Information will be made available to these municipalities on a regular basis. The focus on the municipalities outside of vulnerable areas will be on the process and to work ahead.

### ***4.2 Municipalities which include jurisdiction within vulnerable areas***

These municipalities need to be kept current and engaged with the Source Protection planning Process. Their participation will include all four phases of the consultation process. Significant effort will be focused on engaging those communities containing Wellhead Protection Areas (WHPA) and Intake Protection Zones which are likely to be the focus of many of the policies of the Source Protection Plans.

### ***4.3 Land owners within vulnerable areas***

These landowners may or may not be impacted by the Source Protection planning process. They will be included in all four phases of consultation. The early phases of the consultation are intended to allow these landowners to determine how closely they should remain involved in the Source Protection Planning process.

### ***4.4 Landowners that are or could be a significant risk***

At this point, these landowners have not been identified. They will be included in consultation in phase 1 as they are within the vulnerable areas. Specific efforts will be made to directly engage them in Phase 2 and 3 of the consultation. The regulation requires that landowners who are known to be involved in an activity which poses a significant risk to municipal drinking water source be contacted as part of the consultation on the Assessment Report.

### ***4.5 First Nations***

At this point, no First Nation Systems are part of the Source Protection Plan. Efforts will continue to involve First Nations in initiating technical studies. Once a system is identified, formal consultation on the vulnerability assessment will commence. Until this time, First Nation Communities will be kept informed of the Source Protection planning process.

### ***4.6 General Public***

The general public outside of vulnerable zones will be kept informed about the Source Protection planning process. It is important that all landowners have an opportunity to understand the process and to determine that, in fact, their properties lie outside of a vulnerable zone and therefore, are not directly impacted by this process.

## 5 Approaches to Consultation

### 5.1 Phase 1 – July – October, 2009

Phase I involves consultation on the identification of vulnerable areas and a general overview of threats and issues. The key messages to be communicated will include details regarding the planning process to date, local vulnerable areas and scores, the science behind the vulnerability mapping and the next steps.

#### 5.1.1 Municipalities which do not include lands within a vulnerable area

- distribution of updates and other printed material
- invitations to public meetings held throughout the region

#### 5.1.2 Municipalities which include jurisdiction within a vulnerable area

- letter and package of information to municipality which includes maps of vulnerable areas
- meeting with municipal staff/council as required

#### 5.1.3 Land owners within a vulnerable area

- A series of public meetings will be held as outlined in Appendix A. The meetings will each be held from 3:00 – 7:00 as an open house format. A 10 minute presentation will be available throughout the meeting as required.

#### 5.1.4 First Nations (not within a vulnerable area)

- general distribution of tabloid
- public meetings

#### 5.1.5 General Public

- invitation through newspapers for public meeting
- media articles
- general distribution of tabloid
- response to requests for information/presentations

## **5.2 Phase 2 – September –November, 2009**

Phase 2 Consultation involves the results of issues evaluation, threats assessment and the Tier 1 Water Budget. The key messages to be communicated will include details regarding the planning process to date, how threats are determined, the science behind the threats assessment and the next steps.

### **5.2.1 Municipalities which do not include a vulnerable area**

- distribution of updates and other printed material
- invitations to public meetings held throughout the region

### **5.2.2 Municipalities which include jurisdiction within a vulnerable area**

- letter and package of information to municipality which includes maps of vulnerable areas
- meeting with municipal staff/council as required

### **5.2.3 Land owners within a vulnerable area:**

- A series of public meetings will be held as outlined in Appendix A. The meetings will each be held from 3:00 – 7:00 as an open house format. A 10 minute presentation will be available throughout the meeting as required.

### **5.2.4 Landowners that are or could be a significant risk**

- direct mail followed with a kitchen table meetings with any landowner who is a significant risk, when information becomes available

### **5.2.5 First Nations not a vulnerable area**

- general distribution of tabloid
- public meetings

### **5.2.6 General Public**

- invitation through newspapers for public meeting
- media articles
- general distribution of tabloid
- response to requests for information/presentations

## **5.3 Phase 3 – December 2009 – March 2010**

Phase Three involves the formal consultation for the draft proposed Assessment Report includes public meetings held throughout the region, as shown in Appendix A. These sessions are timed to satisfy the requirements of the regulation. Dates are set based on the previous consultation phases and completion of technical studies. The key messages communicated include details regarding the process for establishing the

Assessment Report and the consultation that has taken place to date. Additional local consultation was undertaken as required.

#### **5.4 Phase 4**

Phase four involves consultation of parts of the Assessment Report which were not available when the proposed AR was consulted on. Location and dates of consultation will be based on a due date for the updates. It is anticipated that this will be in 2011.

Phase 4 will include local consultation on those aspects of the Assessment Report that have a local impact. There will also be a general Source Protection Area focus similar to that undertaken in phase three above.

#### **5.5 Use of Website**

The website [www.sourcewaterprotection.on.ca](http://www.sourcewaterprotection.on.ca) will be used extensively for the purpose of extending the consultation beyond the public meetings. A description of the process, vulnerability maps and scores, materials used in the consultation as well as the draft assessment report will be available on-line. The web site will describe options for submitting comments as well as the ability to provide comments on-line. Comments collected through the consultation will be posted on the web site as well as forming part of the submission to the MOE with the proposed Assessment Report.

#### **5.6 Distribution of Report and Other Materials**

The web site will include access to interactive mapping products through a geoportal. It will also include the availability of documents. The web site will be promoted as the primary method of accessing the documents and mapping products. CDs will also be made available to those who request them. Printed copies of the reports will be made available for review at CA offices and at the public meetings. Various summary products will be available for the public at the public meetings.



## **6 Appendices**

Appendix A – LTVSPA Assessment Report Consultation Schedule

Appendix B – SCRSPA Assessment Report Consultation Schedule

Appendix C – UTRSPA Assessment Report Consultation Schedule

Note: When included as part of the Assessment Report for a Source Protection Area only the appropriate schedule is included

## Appendix A – LTVSPA Assessment Report Consultation Schedule

**Table 1: Lower Thames Valley Source Protection Area Phase 1 and Phase 2 Consultation Schedule**

No.	PHASE 1 Meeting Date	PHASE 2 Meeting Date	Meeting Location	IPZ/WHPA	# of parcels in IPZ-1 or WHPA-A	# of parcels in IPZ-1 and 2 or WHPA-A, B, C, D	Methods of Notification
1	Aug. 4, 2009 3:00 – 7:00	Nov. 16, 2009 3:00 – 7:00	Royal Canadian Legion Branch 221 at 142 John Street, West Lorne	West Elgin (IPZ)	34	179 (phase 1), 193 (phase 2)	ad in paper direct mail website
2	Nov. 9 and Nov. 10, 2009 3:00 – 7:00	Nov. 9 and Nov. 10, 2009 3:00 – 7:00	Merlin Agricultural Hall, 150 Aberdeen Street, Merlin	Chatham/South Kent (IPZ)	71	332	ad in paper direct mail website
				Wheatley (IPZ)	119	360	ad in paper direct mail website
3	Oct. 27, 2009 3:00 – 7:00	Nov. 18, 2009 3:00 – 7:00	Willson Conference Room (Phase 1); Rudy Brown Building Room 110 (Phase 2); University of Guelph Campus at Ridgetown	Ridgetown (WHPA)	216	938	ad in paper direct mail website
				Highgate* (WHPA)	85	108	ad in paper direct mail website

\*GUDI systems

**Table 2: Lower Thames Valley Source Protection Area Phase 3 Consultation Schedule**

No.	PHASE 3 Meeting Date	Meeting Location	IPZ/WHPA	# of parcels in IPZ-1 or WHPA A	# of parcels in IPZ-1 and 2 or WHPA - A, B, C, D	Methods of Notification
1	February 17, 2010 3:00 – 7:00	Royal Canadian Legion Branch 221, 142 John Street, West Lorne	West Elgin (IPZ)	34	193	direct mail (for significant threats) ad in paper website
2	February 18, 2010 3:00 – 7:00	Merlin Agricultural Hall, 150 Aberdeen Street, Merlin	Chatham/South Kent (IPZ) and Wheatley (IPZ)	71 (Chatham/South Kent), 119 (Wheatley)	332 (Chatham/South Kent), 360 (Wheatley)	direct mail (for significant threats) ad in paper website
3	February 22, 2010 3:00 – 7:00	Willson Conference Room Ridgetown Campus, University of Guelph	Ridgetown (WHPA) and Highgate* (WHPA)	216 (Ridgetown), 85 (Highgate)	938 (Ridgetown), 108 (Highgate)	direct mail (for significant threats) ad in paper website

# **Lower Thames Valley Source Protection Area Assessment Report**

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## **Summary of Consultation and Comments**

# Lower Thames Valley Source Protection Area Assessment Report

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General Description of Commenter	No.	Comment	Response
CA staff	1	Add list of issues studies conducted to Issues Section 5	List of studies will be added to Section 5
CA staff	2	Mark Watershed Characterization vulnerability map so that it references the Section 4 for more current information	Maps 35 and 38 of the Watershed Characterization summary will have a watermark put across them: 'Refer to Appendix 1 for Updated Map'
CA staff	3	Make available the Thames and St. Clair Region Watershed Characterization Reports on CD	Thames and St. Clair WCR will be copied onto CDs
CA staff	4	Watershed and subwatershed meanings need to be defined more consistently. It is noted in the January 2010 meeting of the Source Protection Committee, it was decided that Watershed should relate to the Source Protection Area scale while any smaller scale should be referred to as subwatersheds	Use of 'watershed' and 'subwatershed' were standardized in some sections, but this needs to be revisited to ensure that the terms are used consistently throughout AR
CA staff	5	If possible, Population density map in section 2 should better distinguish between ranges	New Map 2-1 will be created and added to Appendix 1 to show population density; figure in Section 2 will be deleted and pop. density text revised to refer to Map 2-1
CA staff	6	Map 3-1 should include a reference to table 3-2, Map 3-5 should include a reference to table 3-4, Map 3-6 should include a reference to table 3-5 and 3-6. The reference should be made in the legend of the map with the subwatershed and code labeled, but adding in brackets: refer to (relevant) table 3-X	References to tables will be included on maps
CA staff	7	Tables 3.4, 3.5, 3.6: table headings should be Subwatersheds with names (pp.3-15)	Change will be made in Section 3
CA staff	8	Correct the font sizes on Page 8-3 and 8-4	Corrections will be made in
CA staff	9	Page 1-14 add in brackets, after municipal technical studies: 'such as the vulnerability assessment, issues evaluation and threats assessment studies'.	Text will be added in Section 1 as was done in the section summary.
CA staff	10	Table 3-1 missing subwatershed 11T, add this to the table	Row will be added to table 3-1 - groundwater
CA staff	11	Table 3.2: 'SW' to be Code, 'Name' to be 'Subwatershed'	Corrections will be made in Section 1
CA staff	12	Indexed report on CD: correct 'quality' to 'quantity' for title of Section 3.0	Corrections will be made in CD index
CA staff	13	Add data gaps to summary section 3 and other summary sections missing data gaps	Data gaps will be added to section summaries

General Description of Commenter	No.	Comment	Response
CA staff	14	Issues Evaluation Methodology figure to be corrected for ' screening' box in section summary 5 and Section 5	Figure 5-1 will be corrected in Section 5 and summary 5
CA staff	15	Update SPC members table in section summary 1 to include First Nation members and to match the Section 1	Table of Source Protection Committee members will be updated in summary 1
CA staff	16	One thing which came up as we were putting together the SCR assessment report was that there was a misleading table in the LT one and Chris suggested that we address this correction as a comment. I am not sure if that should come in the form of a formal letter or if this message will suffice. In any case the issue is with Table 3-7, which suggests that the average recharge that the SGRA criteria were based upon was done for each of the 8 subwatersheds in the LTVSPA. In actual fact the average recharge was calculated on the 2 subwatersheds which were used in the Conceptual Water Budget. The attached table more accurately describes the way the SGRA calculation was done.	Table 3-7 in section 3 will be replaced with the table attached to Mark's email.
MOE	17	The document does not fully show the application of the TR to the data obtained from the technical work undertaken in this SPA. For example, the report is not clear on the existing circumstances or potential circumstances that would lead to the presence of threats related to agriculture as per the requirements in TR 119-122, 125, 128, 133 & 136. Significant, moderate and low threats were identified for each sub watershed related to pathogens, chemicals and DNAPLs, but not discussed thoroughly throughout the text.	In appendix 10 reference will be added to provincial tables of drinking water threats and new tables of circumstances to be posted on our web site until MOE posts on their web site.  Threats related to agricultural activities were identified as a data gap to be added to amended AR.
MOE	18	AR discussion good; related details not always clear. For example, Map 1-3 Drinking Water Systems shows two additional surface water intakes located outside of the SPA; it only became clear later in the review that LTV SPA has three large intakes from Lake Erie and two groundwater systems to match the ToR. Though it is understood that the committee consciously decided to include some references to the two other sw intakes as these systems serve a significant portion of the municipal water connections within the SPA boundary, these systems should not be shown on maps and the report would benefit from increased clarification as to any text pertaining to these 2 systems outside of SPA boundaries.	Separate Legend to indicate drinking water systems within the region and outside region

General Description of Commenter	No.	Comment	Response
MOE	19	On page 2-18 (discussion on drinking water systems), there is mention of three groundwater supplies that service three First Nations. It is not clear whether these systems are included in the total count of DWS in the area or separate. They are not included in the TOR and therefore it should be clearly stated that these three systems are separate. The report would benefit from updated wording to reflect that these FN systems exist within the watershed area, however have not been elevated to form part of the official system count.	Text in Section 2 will be revised to be more clear about the FN groundwater supplies not being included in the SPP unless requested by the FN.
MOE	20	It is unclear as to how the West Elgin and Wheatley treatment plants primary and emergency intakes are counted for (pg 2-19). Is there 1 or 2 intakes?	Text on page 2-18 and 2-19 to be revised to clearly indicate that there are two intakes each at West Elgin and Wheatley. A note with asterisk in Table 2-7 can be made to indicate that these systems also have emergency intakes
MOE	21	Section 3.2.5: LTV SPA may consider clarifying that water users taking more than 50,000 L/day are required to have a permit to take water (PTTW).	Information will be added to Section 3
MOE	22	Section 3.2.4: LTV SPA may consider "softening" the final few sentences to indicate any updates made to the recharge numbers may be included in a future update of the Tier 1 water budget.	A commitment to undertake this work as described in the AR has been made, therefore the text will remain.
MOE	23	4.3.5 Report should document the methodology for assessing both SWAT components	More info on the SWAT components methodology will be added to Section 4
MOE	24	Page 4-24, paragraph 2, line 2: MOE groundwater studies were not reviewed through a peer review process	Municipalities relied upon an MOE review of the reports and as a result peer review of that work was not included in our peer review process.
MOE	25	Future Significant Threats are identified. Maps are very well laid out but maps need to link vulnerable areas to circumstances (as per admin comments as well)	Add a reference to Appendix 10 for activities and circumstances which would result in significant, moderate or low threats

General Description of Commenter	No.	Comment	Response
MOE	26	Page 3-8, sec 3.2.6: the SW water budget calculations are based on annual average basis. This statement contradicts with what has been said in page 3-12, 2nd paragraph. For SW demand calculations, the monthly average of water quantities should be used.	Although stress calculations rely on monthly information, average annual water budget components were included as a summary to demonstrate the balance. This will be clarified in the text.
MOE	27	Page 3-14, table 3-4: it is suggested to add another column showing the S/G water demand in percent (%).	Through the WB Peer Review process it was determined that only the level of potential for stress should be indicated rather than specifying the percent water demand.
MOE	28	General comment on IPZ-2 delineations: For all intakes, from the maps, the text needs more clarifications on how the IPZ-2 was delineated accounting the storm sewer systems (SS) and transport pathways (TPW). There might be a mix-up of SS and TPW in the text. It is important to note that storm-sewer systems are not transport pathways. The technical rules require SPCs to include the storm-sewer systems in IPZ-2 within the time of travel chosen (in this case 2 hrs) if applicable, but it is up to SPC to extend the delineated IPZ-2 to include transport pathways (as per rule 72-75)	In Section 4, SS and TPW will be separated out in the text, for all IPZs.
MOE	29	Page 4-12: The vulnerability scores were estimated based on the factors mentioned in the text. However; more information on how those factors were considered to estimate the scores of IPZ-1 and IPZ-2 (brief description would be sufficient to reader).	More information on how the factors were considered will be added to Section 4
Member of Public	30	Compensation should be offered to cover any costs incurred	The Source Protection Committee is committed to developing policies which are fair and reasonable as indicated in Section 1 with reference to the Source Protection Committee's guiding principles.



<b>General Description of Commenter</b>	<b>No.</b>	<b>Comment</b>	<b>Response</b>
<b>Member of Public</b>	31	I own a lumberyard and was sent a significant threats letter; what does this mean to my business?	The landowner was given information on the types of activities that would be identified as significant threats, and the possible types of policies. Management of threats to help reduce the level of threats to moderate or low was discussed.
<b>Member of Public</b>	32	Need repair work on septic tank, what kind of grants are available?	Information on ODWSP was provided and the landowner encouraged to apply.
<b>Member of Public</b>	33	Need a well to be decommissioned; what kind of grants are available?	Information on ODWSP was provided and the landowner encouraged to apply.
<b>Member of Public</b>	34	Curious about the process and want to know more about the source protection program	Information on SWP, the Clean Water Act and work in the Lower Thames Valley SPA was provided.

### COMMENTS RECEIVED DURING THE COMMENT PERIOD ON THE PROPOSED LTV AR

Generic Description of Commenter	No.	Comment	Response	Status
Member of the public	1	This is a summary of her comment. Concerns are expressed about the threat posed to drinking water by proposed wind turbine projects in Lake Erie, and Lake St. Clair during and after construction.	The comment was received in the comment period on the proposed assessment report and was therefore forwarded to the MOE.	No action. It will be reviewed by the Source Protection Committee at a subsequent meeting for consideration in an amended assessment report.
Member of the public	2	Concerns are expressed about the contamination of raw water at the Erie Beach intake by suspected clandestine pesticide application at Rondeau Bay.	The comment was received in the comment period on the proposed assessment report and was therefore forwarded to the MOE.	No action. It will be reviewed by the Source Protection Committee at a subsequent meeting for consideration in an amended assessment report.
Water treatment plant operator	3	The new West Elgin water treatment plant capacity is 12,160 m <sup>3</sup> /day. This information should be updated in the assessment report as the old plant is now demolished.	The comment was received in the comment period on the proposed assessment report and was therefore forwarded to the MOE. MOE has directed, through its letter dated October 29, 2010, that this comment be addressed in an amended proposed assessment report.	Comment is addressed in the amended proposed assessment report.

### COMMENTS RECEIVED AFTER THE COMMENT PERIOD ON THE PROPOSED LTV AR

Generic Description of Commenter	No.	Comment	Response	Status
Ministry of Natural Resources	1	Wheatley Harbour was delisting as an AOC in April 2010	The comment was received after the comment period on the proposed assessment report and was forwarded to the MOE. Based on discussion with MOE after submission of the proposed AR, these comments are addressed in the amended proposed AR.	The status of Wheatley Harbour is updated in the amended proposed assessment report in Sections 6 and 8.
Ministry of Natural Resources	2	Species at risk (SAR) list in Appendix 5 Addendum is not up-to-date with Federal Status and Provincial Status of SARO is not present.	The comment was received after the comment period on the proposed assessment report and was forwarded to the MOE. Based on discussion with MOE after submission of the proposed AR, these comments are addressed in the amended proposed AR.	The Species at Risk list in Appendix 5 Addendum is now updated to May 2010.

**Changes made to the Lower Thames Valley amended Proposed Assessment Report based on discussions with the MOE prior to receiving the Director's directions**

No.	Item	Change made	Section	Status
1	West Elgin emergency intake IPZ-2 vulnerability assessment	Vulnerability assessment and uncertainty discussion added for emergency intake. Maps related to West Elgin vulnerability are updated. Removed from data gaps. System summary updated for score and map, section summary 4 updated for score, section summary 9 updated for data gaps.	Section 4 and 9, Map 4-4 in Appendix 1, System Summary, Section Summary 4 and 9	Done
2	West Elgin emergency intake IPZ-2 threats	Text in threats section updated to include emergency intake IPZ-2 threats. Maps related to West Elgin threats are updated. System summary updated for threats map.	Section 7, Map 7-7 in Appendix 1, System Summary, Section Summary 7	Done
3	West Elgin emergency intake IPZ-2 managed lands, livestock density and percent impervious mapping	Livestock density, managed lands and percent impervious calculations are completed for West Elgin emergency intake IPZ-2. Related maps are updated. (primary and emergency intake IPZ-1 calculations are as before)	Map 7-1, 7-2a and 7-3a are updated	Done
4	West Elgin primary intake IPZ-2 vulnerability assessment	Map related to West Elgin primary intake IPZ-2 vulnerability are updated for revised IPZ-2 delineation. Revision is based on improved datasets related to drainage, reach lengths. System summary updated for map.	Map 4-4 in Appendix 1, System Summary	Done
5	West Elgin primary intake IPZ-2 threats	Maps related to West Elgin primary intake IPZ-2 threats are updated. System summary updated for threats map.	Map 7-7 in Appendix 1, System Summary	Done
6	HVA and SGRA livestock density, managed lands and percent impervious mapping	HVA and SGRA livestock density, managed lands and percent impervious calculations are completed. Related mapping products are created.	Maps 7-1, 7-2c,d and 7-3c,d	Done
7	WHPA significant threats related to livestock density, managed lands	WHPA significant threats location counts related to livestock density and managed lands to be updated in threats tables. Removed from data gaps.	Section 7 and 9, system summaries (Ridgetown and Highgate), section summaries 7 and 9	Done
8	Significant threats related to the use of land for pasture and outdoor confinement area	Significant threats assessment related to pasture and outdoor confinement area is completed, and only found to occur in the Ridgetown WHPA, which is in agreement with the consultants previous assessment. This does not affect significant location count. Text in section 7 to be added to describe the assessment.	Section 7	Done
9	Purpose of current report	Current amended AR fills in some data gaps identified in the proposed AR	Section 1, section summary 1	Done
10	Correct the totals in Table 3-1 of the Water Budget section.	The AR be revised to correct the rounding errors in the grand totals presented for each of the sub watersheds in table 3-1, as per discussion with MOE and as per Direction 9 received on the St. Clair Region Proposed AR.	Section 3 Table 3-1	Done

Directions received from Ian Smith, Director, Source Protection Programs Branch, Ministry of Environment, as per letter dated October 29, 2010

No.	Direction	Response	Status	Section
1	The AR be revised to include the required technical work, mapping, and enumeration of significant drinking water threats associated with managed land, livestock density, and impervious surfaces that is consistent with the requirements of the technical rules.	See Items 3, 6, 7 and 8 of the attached table: Changes made to the Lower Thames Valley amended Proposed Assessment Report. Also references to the recent technical studies and technical memos are made in the sections and in the Appendix 12 (list of references)	Done	Maps 7-1, 7-2a, 7-2c,d, 7-3a and 7-3c,d, Section 7 and 9, system summaries (Ridgetown and Highgate), section summaries 7 and 9, Appendix 12
2	The AR be revised to include the technical work associated with the IPZ-2 delineation for the West Elgin emergency intake.	See Items 1 and 2 of the attached table: Changes made to the Lower Thames Valley amended Proposed Assessment Report. Since a more recent drainage layer was used for the delineation of the emergency intake IPZ-2, the primary intake IPZ-2 delineation was revised to also use a more recent drainage layer. See Items 4 and 5 of the attached table: Changes made to the Lower Thames Valley amended Proposed Assessment Report. Also references to the recent technical studies and technical memos are made in the sections and in the Appendix 12 (list of references). Appendix 9 (flagged parameters) notes that turbidity is flagged for the emergency intake but not identified as an issue (lack of data).	Done	Section 4, 7 and 9, Map 4-4 and Map 7-7 in Appendix 1, System Summary, Section Summary 4, 7 and 9, Appendix 12
3	The AR be revised to ensure that public is given the information needed to determine the areas where activities are or would be a significant, moderate and low drinking water threats and the circumstances that apply. (Additional context for this direction: the current report has a methodology section in an appendix but has maps and text in the report that is not clearly linked to the methodology. As a result, it is difficult to understand if and where an activity poses a risk).	Discussed with MOE. Add text to Maps 7-4 to 7-8 to point the reader to assessment report sections 7.2.3 to 7.2.8: "This map must be reviewed in conjunction with Section 7.2.X". Add text to Section 7.2.3 to 7.2.8 to describe what the threats maps 7-4 to 7-8 show, what the tables on the maps indicate, where to find the list of activities that are or would be significant, moderate or low threats for that specific vulnerable area and score, and where to find the circumstances for the threats.	Done	Appendix 1 Maps 7-4 to 7-8, and Section 7.2.3 to 7.2.8
4	The AR be revised to correct the reference to the provincial tables of circumstances, to reflect 76 tables, not 73.	Minor text revision made.	Done	Appendix 10 Threats and Circumstances Table
5	The discussion in the AR around issues and when activities become significant drinking water threats within a vulnerable area be revised to clearly describe that only activities documented through technical rule 115, pertaining to systems in the Terms of Reference, become significant drinking water threats within the delineated issue contributing area.	Text revised in Section 5.2 and 7.1.4 revised to indicate that issues identified through Rule 114 would be subject to Rule 115 (identification of issue contributing area and activities), for those systems listed in the Terms of Reference, and that activities identified in this manner would be significant threats within the delineated issues contributing area.	Done	Section 5.2 and 7.1.4, Section summary 5 and 7, all system summaries
6	The AR be revised to clarify that the SPC can only add local threats, other than the 21 prescribed drinking water threats, upon approval of the Director.	Minor text revision made.	Done	Section 7.1.2
7	The AR be revised to document issues that meet the tests in rule 114 in accordance with technical rule 115. (Additional context for this direction: Any issues that do not meet the test in rule 114 are documented as per technical rule 115.1. The rules do not allow that the AR include work plans to investigate issues. The only situation where a workplan is allowed in the technical rules related to issues is if an issue is documented as per rule 115, where the issue contributing area (technical rule 115(3)) and the identification of threats (technical rule 115 (4)) can not be completed, a work plan as per rule 116 is required).	Discussed with MOE. In Table 5-6 in Section 5.5, a note is added to state that all issues are identified as allowed under Rule 115.1. In Section 5.5 and 5.6, text is revised to state that some of the issues identified are naturally occurring, while the source of the rest of the issues is yet to be determined. Therefore all issues identified are as per Rule 115.1 and are currently not subject to Rules 115 and 116. If more information becomes available to the SPC to determine if an issue is wholly or partially due to anthropogenic sources, then work to satisfy Rule 115 or a work plan to satisfy rule 115 must be included in a subsequent AR. Table 5-7 is moved from Section 5.6 (Work Plan) to Section 5.7 (Data Gaps) to indicate that the source of some of the identified issues is a data gap and how to fill that data gap. Text in Section 5-7 is added to describe this data gap.	Done	Section 5.5, 5.6 and 5.7, Table 5-7, section summary 5, 9
8	The AR be revised to ensure correct references are made to rules that describe what are conditions throughout the report. (Additional context for this direction: The definition of condition should be amended in the report as per the technical rules as well as that there is more than one way that a condition could be identified as a significant drinking water threat including the event based approach where the condition has or could cause an issue at an intake).	Text throughout Section 6 is revised to ensure correct reference is made to the rules that describe what conditions are. Text in Section 6.1.3 below Table 6-2, and in Section 7.1.3 are revised to make reference to rule 68 (event based IPZ-3), 126 (identifying conditions), 140.1 and 141 (conditions that are significant threats). Further, in Section 6.2 and 8.2.1 the status of Wheatley Harbour is updated to indicate it is no longer an Area of Concern.	Done	Section 6 and Section 7.1.3, section summary 6 and 8, Section 8.2.1
9	The AR be revised to remove the work plan included to identify the WHPA E and F for the Highgate well. (Additional context for this direction: Since there are no issues identified for this well, there is no requirement in the technical rules to delineate WHPA F. In addition, since this system is being reclassified to no longer be GUDI the well does not meet the test in rule 49, which requires WHPA E to be delineated if the interaction of surface water and groundwater decreases the time of travel).	Discussed with MOE. The work plan to identify WHPA-E and F for Highgate system will be removed from the report. A statement will be added: The MOE directed that the workplans for WHPA-E and WHPA-F for the Highgate system not be included in the Assessment Report as information available at this time indicates that the system does not meet the test in Rule 49 (3) to revise any reference to the work plan in the report. The related data gap identified in Section 9 will be removed as well.	Done	Section 4.3.4, 4.3.5, 4.6 (Table 4-8), 7.1, 7.1.1, 7.4, 9.1 (Table 9-1), Section summary 4 and 7, System Summary
10	The AR should be revised to correctly reflect the issues or event based approaches of identifying threats. (Additional context for this direction: It is important for the AR to include an explanation that the vulnerability score is not the only method of identifying threats to Great Lakes systems).	Text will be revised to indicate that threats can be identified through the issues or event based approach.	Done	Sections 5.2, 6.1.3, 7.1.1, 7.1.3, 7.1.4, section summary 7
11	The AR be revised to include the correct design capacity of the West Elgin water treatment plant as per a public comment received during the 30-day consultation period.	The design capacity of the West Elgin water treatment plant will be corrected as per the plant operator's information (12,160 m3/day). See Appendix 4 of the LTVAR, item no. 34 (Summary of Comments and Responses).	Done	Section 4.2.2: Table 4-2 and West Elgin system summary

No.	Direction	Response	Status	Section
12	Once the AR is revised based on these directions, the Source Protection Authority shall consult with the Source Protection Committee and with those persons or bodies impacted by the changes in an appropriate manner before resubmitting the amended AR in accordance with the Act and provide proof thereof with the resubmitted AR.	Discussed with MOE. Notice will be posted on the website as well as in local newspapers, and sent to affected property owners and municipalities. The notice will indicate in a general sense the amendments made to the report. The report will be posted for a 30 day comment period on the website, and hard copies made available at the LTVCA, West elgin municipal office. There will be no public meeting. At the West Elgin IPZ, 10 new parcels are now included in the IPZ of which none have significant threats occurring. Individual contact will be made via letters to these property owners in the West Elgin IPZ. At the Highgate WHPA, 1 new parcel and at the Ridgetown WHPA, 5 new parcels are now identified as locations where significant threats are or could occur. Individual contact will be made via significant threat letters to these property owners. All contacted property owners will be invited to call or visit the LTVCA to discuss concerns or questions.		NA
13	The SPA shall include with the resubmitted AR a memo or document outlining the changes made to the AR, as per these directions, including chapter references in the AR where the changes were made.	This document outlining the changes made to the AR as per the MOE directions will be sent to the MOE with the amended proposed AR. Also see Item 9 of the attached table: Section 1 has been updated to reflect this amended proposed AR. Also included text in section 1 to indicate that the terms updated or amended AR used throughout the report refers to a future version following approval of this amended proposed AR.	Done	Cover letter, Appendix 4 along with MOE directions letter, Section 1, section summary 1.
14	The SPA shall submit the revised AR to the ministry in the form of both a hard copy and electronic version for the ministry's review.	Hard and electronic copies will be submitted to the MOE by January 15, 2011.		NA



# **Lower Thames Valley Source Protection Area Assessment Report**

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## **Assessment Report Consultation Addendum**

# **Lower Thames Valley Source Protection Area Assessment Report**

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# Assessment Report Consultation Plan Addendum

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## Updated Assessment Reports

A consultation Plan was developed to guide the consultation on the Assessment Reports through their various stages. All Assessment Reports in the Thames-Sydenham and Region were updated in November 14, 2014 along with amendments to the Source Protection Plan. This addendum is intended to describe the consultation on the updated Assessment Reports. The consultation on the Assessment Report followed the approaches to consultation during the previous phases of the Assessment Report development as described in the Assessment Report Consultation plan last updated in June 2011.

## Local consultation

The November 2014 updates to the Assessment Reports included updated or new technical work. Local consultation similar to that undertaken in Phase 1 and 2 was planned. This local consultation included:

- Open houses held within or near the areas of new or revised vulnerable areas. Table 1 identifies the local consultation open houses which were held across the region.
- Notices of the open houses placed in papers and on the web site.
- Municipalities notified of the open houses
- Updated vulnerable areas included in Source Protection Plan policy pre-consultation with municipalities.

**Table 1 - Local consultation open houses**

Date	Location	Primary Discussion Topics
Thursday, August 14 3 pm - 7 pm	Sarnia, Clearwater Arena, lower room	<ul style="list-style-type: none"> <li>• Event Modelled IPZ-Fuel updates</li> </ul>
Tuesday, August 19 3 pm - 7 pm	Wallaceburg Municipal Building	<ul style="list-style-type: none"> <li>• Event Modelled IPZ-Fuel updates</li> <li>• Event Modelled IPZ-Fertilizer (if interest)</li> <li>• Wallaceburg Nitrate Issue</li> </ul>
Thursday, August 21 3 pm - 7 pm	Camlachie Community Centre	<ul style="list-style-type: none"> <li>• Event Modelled IPZ-Fuel updates</li> <li>• Kettle &amp; Stony Point IPZ (if interest)</li> </ul>
Wednesday, September 3 3-7pm	Wheatley Legion	<ul style="list-style-type: none"> <li>• Event Modelled IPZ-Fuel</li> <li>• Wheatley Microcystin Concern</li> <li>• Updates to SGRA</li> </ul>
Wednesday, August 20 3 pm - 7 pm	Oxford County Offices, Woodstock	<ul style="list-style-type: none"> <li>• Nitrate ICA for Woodstock Tabor wellfield</li> <li>• Vulnerability reductions for Sweaburg</li> <li>• Water Quantity results (if interest)</li> </ul>

## Assessment Report Consultation

Consultation on the Updated Assessment Report will be undertaken together with the consultation on the Amended Proposed Source Protection Plan. This has the added advantage of providing people with both the areas where policy applies (in the Assessment Reports) and the policies (in the Source Protection Plan) which apply to those areas at the same time. In previous consultation, due to the staged or phased approach this was not possible. The Act and regulations have been interpreted to suggest that consultation on updated and amended Assessment Reports and Source Protection Plans must allow for consultation of those affected by the updates/amendments. In order to accomplish this, the consultation on the draft proposed plan and AR will be followed. The following are included in the consultation on the Amended Proposed Source Protection Plan and Updated Assessment Reports:

- posting the Assessment Reports with the Source Protection Plan on the web site
- placing notices in newspapers within the region
- posting the notice on the web site
- notifying municipalities of the posting
- notifying First Nations chiefs of the posting
- notifying people believed to be engaged in significant threat activities
- notifying agencies established under the great lakes water quality agreement, a remedial action plan or lakewide management plan
- providing a comment period of greater than 30 days
- hosting open houses within each Source Protection Area. Table 2 identifies the Assessment Report/Source Protection Plan open houses.

Table 2 - Assessment Report and Source Protection Plan Consultation

Source Protection Area	Date	Location
St Clair Region	Tuesday, January 13, 2015 3:00-7:00pm	St. Clair Region Conservation Authority, 205 Mill Pond Cr., Strathroy
Lower Thames Valley	Wednesday, January 14, 2015 3:00-7:00pm	Lower Thames Valley Conservation Authority Administration Building, 100 Thames Street, Chatham
Upper Thames River	Thursday, January 15, 2015 3:00-7:00pm	Watershed Conservation Centre, Fanshawe Conservation Area, 1424 Clarke Road, London

# **Lower Thames Valley Source Protection Area Assessment Report**

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## **Updated Assessment Report Comments**

Consultation comments on the updated Assessment Report may be found in the change logs with the related revisions to the document. Change logs, compiled from all Assessment Reports and the Source Protection Plan, are bound separate from this Assessment Report and included as a supplemental document in the Source Protection Plan.

# Lower Thames Valley Source Protection Area Assessment Report

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# **Lower Thames Valley Source Protection Area Assessment Report**

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## ***Appendix 5 – Watershed Characterization Summary***

This section is bound separately

# Lower Thames Valley Source Protection Area Assessment Report

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# Appendix 5 Addendum

# Lower Thames Valley Source Protection Area Assessment Report

**Table A5-1: Thames River Fish Species Summary including Species at Risk**

Species (Common Name)	Species (Scientific Name)	Thames Abundance	Sensitive	Coldwater	Native	Migrant	Target	COSEWIC Status
Alewife	<i>Alosa pseudoharengus</i>	Rare	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
American brook lamprey	<i>Lampetra appendix</i>	Uncommon	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>	Rare	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Special Concern
Black Buffalo	<i>Ictiobus niger</i>	Rare	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Special Concern
Black Bullhead	<i>Ameiurus melas</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Black Crappie	<i>Pomoxis nigromaculatus</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Black Redhorse	<i>Moxostoma duquesnei</i>	Uncommon	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Threatened
Blacknose Dace	<i>Rhinichthys atratulus</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Blacknose Shiner	<i>Notropis heterolepis</i>	Uncommon	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Blackside Darter	<i>Percina maculata</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Bluegill	<i>Lepomis macrochirus</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Bluntnose Minnow	<i>Pimephales notatus</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Brassy Minnow	<i>Hybognathus hankinsoni</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Brindled Madtom	<i>Noturus miurus</i>	Rare	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Brook Silverside	<i>Labidesthes sicculus</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Brook Stickleback	<i>Culaea inconstans</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Brook Trout	<i>Salvelinus fontinalis</i>	Uncommon	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Brown Bullhead	<i>Ameiurus nebulosus</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Brown Trout	<i>Salmo trutta</i>	Uncommon	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Central Mudminnow	<i>Umbra limi</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Central Stoneroller	<i>Campostoma anomalum</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Channel Catfish	<i>Ictalurus punctatus</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	Rare	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Coho Salmon	<i>Oncorhynchus kisutch</i>	Rare	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Common Carp	<i>Cyprinus carpio</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Common Shiner	<i>Luxilus cornutus</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Creek Chub	<i>Semotilus atromaculatus</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Eastern Sand Darter	<i>Ammocrypta pellucida</i>	Uncommon	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Threatened
Emerald Shiner	<i>Notropis atherinoides</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Fantail Darter	<i>Etheostoma flabellare</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fathead Minnow	<i>Pimephales promelas</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Freshwater Drum	<i>Aplodinotus grunniens</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Ghost Shiner	<i>Notropis buchanani</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Gizzard Shad	<i>Dorosoma cepedianum</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Golden Redhorse	<i>Moxostoma erythrurum</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Golden Shiner	<i>Notemigonus crysoleucas</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Goldfish	<i>Carassius auratus</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Gravel Chub	<i>Erimystax x-punctata</i>	Rare	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Extirpated
Greater Redhorse	<i>Moxostoma valenciennesi</i>	Common	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Green Sunfish	<i>Lepomis cyanellus</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Greenside Darter	<i>Etheostoma blennioides</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Special Concern
Hornyhead Chub	<i>Nocomis biguttatus</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Iowa Darter	<i>Etheostoma exile</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Johnny Darter	<i>Etheostoma nigrum</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Lake Chubsucker	<i>Erimyzon sucetta</i>	Rare	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Threatened
Largemouth Bass	<i>Micropterus salmoides</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Least Darter	<i>Etheostoma microperca</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Logperch	<i>Percina caprodes</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Longear Sunfish	<i>Lepomis megalotis</i>	Common	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Longnose Dace	<i>Rhinichthys cataractae</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Longnose Gar	<i>Lepisosteus osseus</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Mimic Shiner	<i>Notropis volucellus</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



# Lower Thames Valley Source Protection Area Assessment Report

**Table A5-1 Cont'd: Thames River Fish Species Summary including Species at Risk**

Species (Common Name)	Species (Scientific Name)	Thames Abundance	Sensitive	Coldwater	Native	Migrant	Target	COSEWIC Status
Mooneye	<i>Hiodon tergisus</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Mottled Sculpin	<i>Cottus bairdi</i>	Uncommon	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Muskellunge	<i>Esox masquinongy</i>	Rare	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Northern Brook Lamprey	<i>Ichthyomyzon fossor</i>	Rare	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Special Concern
Northern Hog Sucker	<i>Hypentelium nigricans</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Northern Madtom	<i>Noturus stigmosus</i>	Rare	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Endangered
Northern Pike	<i>Esox lucius</i>	Common	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Northern Redbelly Dace	<i>Phoxinus eos</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pearl Dace	<i>Margariscus margarita</i>	Uncommon	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Pugnose Minnow	<i>Opsopoeodus emiliae</i>	Rare	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Special Concern
Pumpkinseed	<i>Lepomis gibbosus</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Quillback	<i>Carpoides cyprinus</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Rainbow Darter	<i>Etheostoma caeruleum</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Rainbow Trout	<i>Oncorhynchus mykiss</i>	Common	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Redfin Shiner	<i>Lythrurus umbratilis</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
River Chub	<i>Nocomis micropogon</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
River Darter	<i>Percina shumardi</i>	Rare	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
River Redhorse	<i>Moxostoma carinatum</i>	Rare	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Special Concern
Rock Bass	<i>Ambloplites rupestris</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Rosyface Shiner	<i>Notropis rubellus</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Round Goby	<i>Neogobius melanostomus</i>	Rare	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sauger	<i>Sander canadensis</i>	Rare	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Sea Lamprey	<i>Petromyzon marinus</i>	Rare	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Silver Lamprey	<i>Ichthyomyzon unicuspis</i>	Rare	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Silver Redhorse	<i>Moxostoma anisurum</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Silver Shiner	<i>Notropis photogenis</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Special Concern
Smallmouth Bass	<i>Micropterus dolomieu</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Spotfin Shiner	<i>Cyprinella spiloptera</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spottail Shiner	<i>Notropis hudsonius</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Spotted Sucker	<i>Minytrema melanops</i>	Rare	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Special Concern
Stonecat	<i>Noturus flavus</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Striped Shiner	<i>Luxilus chrysocephalus</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Tadpole Madtom	<i>Noturus gyrinus</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Trout-perch	<i>Percopsis omiscomaycus</i>	Uncommon	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Walleye	<i>Sander vitreus</i>	Uncommon	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
White Bass	<i>Morone chrysops</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
White Crappie	<i>Pomoxis annularis</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
White Perch	<i>Morone americana</i>	Uncommon	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
White Sucker	<i>Catostomus commersoni</i>	Abundant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Yellow Bullhead	<i>Ameiurus natalis</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Yellow Perch	<i>Perca flavescens</i>	Common	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

With respect to the preceding table, the terms are described as:

**Abundance:** Refers to the relative abundance or common occurrence of the species found within the waters of the Thames River watershed based on sampling results. Consideration was given to accurately reflect the species presence within the watershed due to the sampling capture method, effort, and biases, difficulty in capturing certain species and

**Abundant:** Greater than 50 sample records in the database

**Common:** Between 15 and 50 sample records in the database

**Historical:** species that have been previously recorded in the Thames.

**Rare:** Less than 5 sample records in database

**Uncommon:** Between 5 and 15 sample records in database

# Lower Thames Valley Source Protection Area Assessment Report

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**Table A5-1 Cont'd: Thames River Fish Species Summary including Species at Risk**

**Sensitive:** In 2005, Coker and Portt identified sensitive species in the draft "Sensitive Species List for Agricultural Municipal Drain Clean Outs". Sensitive species have specific habitat requirements, and any alterations to their habitat could prove to be detrimental to the species.

**Coldwater:** Life history information was reviewed in "Morphological and Ecological Characteristics of Canadian Freshwater Fishes" to identify species habitat, including thermal 'preferences'. These species are found in coldwater habitats, defined as having water temperatures of less than 19°C.

**Native:** A species indigenous to a particular region or area.

**Migrant:** A species that moves to a riverine area from a lake in order to carry out one of its life history requirements such as spawning.

**Target:** Indicates if the species is a sportfish and considered a top level predator. Generally speaking, any species that is targeted for angling purposes would be a sportfish. Most sportfish feed on smaller fish, and baitfish can be used when angling for sportfish.

**COSEWIC Status:** Status assigned by the Committee on the Status of Endangered Wildlife in Canada for the Species at Risk Act (SARA).

**Extinct:** A species that no longer exists.

**Extirpated:** A species no longer existing in the wild in Canada, but occurring elsewhere in the wild.

**Endangered:** A species facing imminent extirpation or extinction.

**Threatened:** A species likely to become endangered if limiting factors are not reversed.

**Special Concern:** A species that may become threatened or endangered species because of a combination of biological characteristics and identified threats.

# Lower Thames Valley Source Protection Area Assessment Report

**Table A5-2: Lower Thames Valley SPA Lake Erie Tributaries Fish Species Summary including Species at Risk**

Species (Common Name)	Species (Scientific Name)	Sensitive	Coldwater	Native	Migrant	Target	COSEWIC Status
Alewife	<i>Alosa pseudoharengus</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Black Bullhead	<i>Ameiurus melas</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Black Crappie	<i>Pomoxis nigromaculatus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Blackchin Shiner	<i>Notropis heterodon</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Blacknose Dace	<i>Rhinichthys atratulus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Blacknose Shiner	<i>Notropis heterolepis</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Blackside Darter	<i>Percina maculata</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Bluegill	<i>Lepomis macrochirus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Bluntnose Minnow	<i>Pimephales notatus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Brassy Minnow	<i>Hybognathus hankinsoni</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Brook Silverside	<i>Labidesthes sicculus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Brook Stickleback	<i>Culaea inconstans</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Brown Bullhead	<i>Ameiurus nebulosus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Burbot	<i>Lota Lota</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Central Mudminnow	<i>Umbra limi</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Channel Catfish	<i>Ictalurus punctatus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Common Carp	<i>Cyprinus carpio</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Common Shiner	<i>Luxilus cornutus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Creek Chub	<i>Semotilus atromaculatus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Emerald Shiner	<i>Notropis atherinoides</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fantail Darter	<i>Etheostoma flabellare</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fathead Minnow	<i>Pimephales promelas</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Freshwater Drum	<i>Aplodinotus grunniens</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Gizzard Shad	<i>Dorosoma cepedianum</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Golden Redhorse	<i>Moxostoma erythrurum</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Golden Shiner	<i>Notemigonus crysoleucas</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Goldfish	<i>Carassius auratus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Green Sunfish	<i>Lepomis cyanellus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Johnny Darter	<i>Etheostoma nigrum</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Lake Chubsucker	<i>Erimyzon sucetta</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Threatened
Largemouth Bass	<i>Micropterus salmoides</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Logperch	<i>Percina caprodes</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Longnose Gar	<i>Lepisosteus osseus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Mimic Shiner	<i>Notropis volucellus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Mooneye	<i>Hiodon tergisus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Mottled Sculpin	<i>Cottus bairdi</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Northern Pike	<i>Esox lucius</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Pugnose Minnow	<i>Opsopoeodus emiliae</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Special Concern
Pumpkinseed	<i>Lepomis gibbosus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Quillback	<i>Carpiodes cyprinus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Rock Bass	<i>Ambloplites rupestris</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Sand Shiner	<i>Notropis stramineus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Sea Lamprey	<i>Petromyzon marinus</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Silver Lamprey	<i>Ichthyomyzon unicuspis</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Slimy Sculpin	<i>Cottus cognatus</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Smallmouth Bass	<i>Micropterus dolomieu</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Spotfin Shiner	<i>Cyprinella spiloptera</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spottail Shiner	<i>Notropis hudsonius</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Spotted Gar	<i>Lepisosteus oculatus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Threatened
Tadpole Madtom	<i>Noturus gyrinus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

# Lower Thames Valley Source Protection Area Assessment Report

**Table A5-2 Cont'd: Lower Thames Valley SPA Lake Erie Tributaries Fish Species Summary including Species at Risk**

Species (Common Name)	Species (Scientific Name)	Sensitive	Coldwater	Native	Migrant	Target	COSEWIC Status
Trout-perch	<i>Percopsis omiscomaycus</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
White Bass	<i>Morone chrysops</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
White Crappie	<i>Pomoxis annularis</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
White Perch	<i>Morone americana</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
White Sucker	<i>Catostomus commersoni</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Yellow Bullhead	<i>Ameiurus natalis</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Yellow Perch	<i>Perca flavescens</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

With respect to the preceding table, the terms are described as:

**Sensitive:** In 2005, Coker and Portt identified sensitive species in the draft "Sensitive Species List for Agricultural Municipal Drain Clean Outs". Sensitive species have specific habitat requirements, and any alterations to their habitat could prove to be detrimental to the species.

**Coldwater:** Life history information was reviewed in "Morphological and Ecological Characteristics of Canadian Freshwater Fishes" to identify species habitat, including thermal 'preferences'. These species are found in coldwater habitats, defined as having water temperatures of less than 19°C.

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**Migrant:** A species that moves to a riverine area from a lake in order to carry out one of its life history requirements such as spawning.

**Target:** Indicates if the species is a sportfish and considered a top level predator. Generally speaking, any species that is targeted for angling purposes would be a sportfish. Most sportfish feed on smaller fish, and baitfish can be used when angling for sportfish.

**COSEWIC Status:** Status assigned by the Committee on the Status of Endangered Wildlife in Canada for the Species at Risk Act (SARA).

**Extinct:** A species that no longer exists.

**Extirpated:** A species no longer existing in the wild in Canada, but occurring elsewhere in the wild.

**Endangered:** A species facing imminent extirpation or extinction.

**Threatened:** A species likely to become endangered if limiting factors are not reversed.

**Special Concern:** A species that may become threatened or endangered species because of a combination of biological characteristics and identified threats.

# Lower Thames Valley Source Protection Area Assessment Report

**Table A5-3: Lower Thames Valley SPA Lake St. Clair Tributaries Fish Species Summary including Species at Risk**

Species (Common Name)	Species (Scientific Name)	Sensitive	Coldwater	Native	Migrant	Target	COSEWIC Status
Alewife	<i>Alosa pseudoharengus</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Black Bullhead	<i>Ameiurus melas</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Black Crappie	<i>Pomoxis nigromaculatus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Bluegill	<i>Lepomis macrochirus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Bluntnose Minnow	<i>Pimephales notatus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Brindled Madtom	<i>Noturus miurus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Brook Silverside	<i>Labidesthes sicculus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Channel Catfish	<i>Ictalurus punctatus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Common Carp	<i>Cyprinus carpio</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Emerald Shiner	<i>Notropis atherinoides</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Freshwater Drum	<i>Aplodinotus grunniens</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Gizzard Shad	<i>Dorosoma cepedianum</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Golden Shiner	<i>Notemigonus crysoleucas</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Grass Pickerel	<i>Esox americanus vermiculatus</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Green Sunfish	<i>Lepomis cyanellus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Largemouth Bass	<i>Micropterus salmoides</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Logperch	<i>Percina caprodes</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Longnose Gar	<i>Lepisosteus osseus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Mimic Shiner	<i>Notropis volucellus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Northern Pike	<i>Esox lucius</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Pugnose Minnow	<i>Opsopoeodus emiliae</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Special Concern
Pumpkinseed	<i>Lepomis gibbosus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Quillback	<i>Carpiodes cyprinus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
River Darter	<i>Percina shumardi</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Rock Bass	<i>Ambloplites rupestris</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Smallmouth Bass	<i>Micropterus dolomieu</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Spotfin Shiner	<i>Cyprinella spiloptera</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Spottail Shiner	<i>Notropis hudsonius</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Spotted Gar	<i>Lepisosteus oculatus</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Threatened Special Concern
Spotted Sucker	<i>Minytrema melanops</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Walleye	<i>Sander vitreus</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
White Bass	<i>Morone chrysops</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
White Crappie	<i>Pomoxis annularis</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
White Perch	<i>Morone americana</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Yellow Bullhead	<i>Ameiurus natalis</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Yellow Perch	<i>Perca flavescens</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

With respect to the preceding table, the terms are described as:

**Sensitive:** In 2005, Coker and Portt identified sensitive species in the draft "Sensitive Species List for Agricultural Municipal Drain Clean Outs". Sensitive species have specific habitat requirements, and any alterations to their habitat could prove to be detrimental to the species.

**Coldwater:** Life history information was reviewed in "Morphological and Ecological Characteristics of Canadian Freshwater Fishes" to identify species habitat, including thermal 'preferences'. These species are found in coldwater habitats, defined as having water temperatures of less than 19°C.

**Native:** A species indigenous to a particular region or area.

**Migrant:** A species that moves to a riverine area from a lake in order to carry out one of its life history requirements such as spawning.

**Target:** Indicates if the species is a sportfish and considered a top level predator. Generally speaking, any species that is targeted for angling purposes would be a sportfish. Most sportfish feed on smaller fish, and baitfish can be used when angling for sportfish.

# Lower Thames Valley Source Protection Area Assessment Report

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**Table A5-3 Cont'd: Lower Thames Valley SPA Lake St. Clair Tributaries Fish Species  
Summary including Species at Risk**

<p><b>COSEWIC Status:</b> Status assigned by the Committee on the Status of Endangered Wildlife in Canada for the Species at Risk Act (SARA).</p> <p><b>Extinct:</b> A species that no longer exists.</p> <p><b>Extirpated:</b> A species no longer existing in the wild in Canada, but occurring elsewhere in the wild.</p> <p><b>Endangered:</b> A species facing imminent extirpation or extinction.</p> <p><b>Threatened:</b> A species likely to become endangered if limiting factors are not reversed.</p> <p><b>Special Concern:</b> A species that may become threatened or endangered species because of a combination of biological characteristics and identified threats.</p>	
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# Lower Thames Valley Source Protection Area Assessment Report

**Table A5-4: Thames River Mussel Species Summary including Species at Risk**

Common Name	Scientific Name	Thames	COSEWIC Status	Native
Black Sandshell	<i>Ligumia recta</i>	Live		<input checked="" type="checkbox"/>
Creek Heelsplitter	<i>Lasmigona compressa</i>	Live		<input checked="" type="checkbox"/>
Creepers	<i>Strophitus undulatus</i>	Live		<input checked="" type="checkbox"/>
Cylindrical Floater (papershell)	<i>Anodontooides ferussacianus</i>	Live		<input checked="" type="checkbox"/>
Deertoe	<i>Truncilla truncata</i>	Live		<input checked="" type="checkbox"/>
Elktoe	<i>Alasmidonta marginata</i>	Live		<input checked="" type="checkbox"/>
Fat Mucket	<i>Lampsilis siliquoidea</i>	Live		<input checked="" type="checkbox"/>
Fawnsfoot	<i>Truncilla donaciformis</i>	Live		<input checked="" type="checkbox"/>
Fluted Shell	<i>Lasmigona costata</i>	Live		<input checked="" type="checkbox"/>
Fragile Papershell	<i>Leptodea fragilis</i>	Live		<input checked="" type="checkbox"/>
Giant Floater	<i>Pyganodon grandis</i>	Live		<input checked="" type="checkbox"/>
Hickorynut	<i>Obovaria olivaria</i>	Live		<input checked="" type="checkbox"/>
Kidneyshell	<i>Ptychobranthus fasciolaris</i>	Live	Endangered	<input checked="" type="checkbox"/>
Lilliput Mussel	<i>Toxolasma parvum</i>	Live		<input checked="" type="checkbox"/>
Mapleleaf	<i>Quadrula quadrula</i>	Live	Threatened	<input checked="" type="checkbox"/>
Mucket	<i>Actinonaias ligamentina</i>	Live		<input checked="" type="checkbox"/>
Mudpuppy Mussel	<i>Simpsonaias ambigua</i>	Shells only	Endangered	<input checked="" type="checkbox"/>
Pimpleback	<i>Quadrula pustulosa</i>	Live		<input checked="" type="checkbox"/>
Pink Heelsplitter	<i>Potamilus alatus</i>	Live		<input checked="" type="checkbox"/>
Plain Pocketbook	<i>Lampsilis cardium</i>	Live		<input checked="" type="checkbox"/>
Purple Wartyback	<i>Cyclonaias tuberculata</i>	Live		<input checked="" type="checkbox"/>
Rainbow	<i>Villosa iris</i>	Live	Endangered	<input checked="" type="checkbox"/>
Rayed Bean	<i>Villosa fabalis</i>	Live	Endangered	<input checked="" type="checkbox"/>
Round Hickorynut	<i>Obovaria subrotunda</i>	Shells only	Endangered	<input checked="" type="checkbox"/>
Round Pigtoe	<i>Pleurobema sintoxia</i>	Live	Endangered	<input checked="" type="checkbox"/>
Slippershell Mussel	<i>Alasmidonta viridis</i>	Shells only		<input checked="" type="checkbox"/>
Snuffbox	<i>Epioblasma triquetra</i>	Shells only	Endangered	<input checked="" type="checkbox"/>
Spike	<i>Elliptio dilatata</i>	Live		<input checked="" type="checkbox"/>
Threehorned Wartyback	<i>Obliquaria reflexa</i>	Live		<input checked="" type="checkbox"/>
Threenidge	<i>Amblyema plicata</i>	Live		<input checked="" type="checkbox"/>
Wabash Pigtoe	<i>Fusconaia flava</i>	Live		<input checked="" type="checkbox"/>
Wavy-rayed Lampmussel	<i>Lampsilis fasciola</i>	Live	Endangered	<input checked="" type="checkbox"/>
White Heelsplitter	<i>Lasmigona complanata</i>	Live		<input checked="" type="checkbox"/>
Zebra Mussel	<i>Dreissena polymorpha</i>	Live		<input type="checkbox"/>

With respect to the above table, the terms are described as:

**Thames:** Indicates whether live specimens have been located or relict shells only located.

**COSEWIC Status:** Status assigned by the Committee on the Status of Endangered Wildlife in Canada for the Species at Risk Act (SARA).

**Extinct:** A species that no longer exists.

**Extirpated:** A species no longer existing in the wild in Canada, but occurring elsewhere in the wild.

**Endangered:** A species facing imminent extirpation or extinction.

**Threatened:** A species likely to become endangered if limiting factors are not reversed.

**Special Concern:** A species that may become threatened or endangered species because of a combination of biological characteristics and identified threats.

**Native:** A species indigenous to a particular region or area.

# Lower Thames Valley Source Protection Area Assessment Report

**Table A5-5: Benthic Species in the Thames River and Tributaries**

Phylum	Class	Order	Family	Common Name		
Annelida	Hirudinea	Arhynchobdellida	Eripodellidae	Leech		
		Rhynchobdellida	Glossiphoniidae	Leech		
	Oligochaeta	Class ID only	Class ID only	Aquatic Worm		
Arthropoda	Arachnida	Acan	Class ID only	Water Mite		
		Crustacea	Amphipoda	Gammaridae	Sideswimmer	
			Talitridae	Sideswimmer		
			Cladocera	Daphniidae	Water Flea	
			Cyclopoida	Order ID only	Fish Lice	
			Decapoda	Cambaridae	Crayfish	
			Isopoda	Asellidae	Sow Bug	
			Ostracoda	Order ID only	Seed Shrimp	
	Insecta		Coleoptera		Chrysomelidae	Leaf Beetle
					Dytiscidae	Predacious Diving Beetle
					Elmidae	Riffle Beetle
				Halipidae	Crawling Water Beetle	
				Hydrophilidae	Water Scavenger Beetle	
				Psephenidae	Water Penny Beetle	
		Diptera			Chaoboridae	Fantom Midge
					Ceratopogonidae	Biting Midge
					Chironomidae	Midge
					Empididae	Dance Fly
				Ephydriidae	Shore Fly	
				Muscidae	Musoid Fly	
				Psychodidae	Sand Fly	
		Ephemeroptera		Simuliidae	Black Fly	
				Stratiomyidae	Soldier Fly	
				Tabanidae	Horse Fly	
				Tipulidae	Crane Fly	
			Baetidae	Small Mayfly		
			Caenidae	Crawling Mayfly		
	Ephemerellidae		Mayfly			
	Heptageniidae		Stream Mayfly			
	Leptophlebiidae		Mayfly			
	Oligoneuridae		Torpedo Mayfly			
Hemiptera		Corixidae	Water Boatmen			
		Velidae	Ripple Bug			
Lepidoptera		Pyralidae	Pyralid Moth			
Megeleoptera		Sialidae	Alderfly			
Odonata		Calopterygidae	Broad-winged Damselfly			
		Coenagrionidae	Narrow-winged Damselfly			
Plecoptera		Capniidae	Stonefly			
		Leuctridae	Stonefly			
		Nemouridae	Stonefly			
		Perlodidae	Stonefly			
		Perlidae	Stonefly			
	Taeniopterygidae	Stonefly				



# Lower Thames Valley Source Protection Area Assessment Report

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**Table A5-5 Cont'd: Benthic Species in the Thames River and Tributaries**

Phylum	Class	Order	Family	Common Name
		Tricoptera	Brachycentridae	Brachycentrid Caddisfly
			Glossosomatidae	Caddisfly
			Helicopsychidae	Snail-case Caddisfly
			Hydroptilidae	Micro-caddisfly
			Hydropsychidae	Net-spinning Caddisfly
			Leptoceridae	Long-horned Caddisfly
			Limnephilidae	Northern Caddisfly
			Lepidostomatidae	Lepidostomid Caddisfly
			Phryganeidae	Large Caddisfly
			Philopotamidae	Finger-net Caddisfly
			Polycentropodidae	Caddisfly
Rhyacophilidae	Primitive Caddisfly			
Onidaria	Hydrozoa	Class ID only	Class ID only	Hydra
Mollusca	Gastropoda	Prosobranchia	Hydrobiidae	Snail
			Valvatidae	Round-mouthed Snail
		Pulmonata	Ancylidae	Limpet
			Lymnaeidae	Pond Snail
			Physidae	Pouch Snail
			Planorbidae	Orb Snail
			Bivalvia	Veneroida
Nematoda	Phylum only	Phylum only	Phylum only	Thread Worm
Platyhelminthes	Turbellaria	Class ID only	Class ID only	Flatworm

# Lower Thames Valley Source Protection Area Assessment Report

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**Table A5-6: Aquatic and Semi-Aquatic Species At Risk in the Thames River Watershed (May 2010)**

Common Name	Scientific Name	SARO 2010	COSEWIC 2010	SARA 2010
<b><u>Fish</u></b>				
Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>	Not at Risk	Not at Risk	No Status
Black Buffalo	<i>Ictiobus niger</i>	Data Deficient	Data Deficient	No Status
Black Redhorse	<i>Moxostoma duquesnei</i>	Threatened	Threatened	Threatened
Eastern Sand Darter	<i>Ammocrypta pellucida</i>	Endangered	Threatened	Threatened
Grass Pickerel	<i>Esox americanus vermiculatus</i>	Special Concern	Special Concern	Special Concern
Gravel Chub	<i>Erimystax x-punctata</i>	Extirpated	Extirpated	Extirpated
Greenside Darter	<i>Etheostoma blennioides</i>	Not at Risk	Not at Risk	No Status
Northern Brook Lamprey	<i>Ichthyomyzon fossor</i>	Special Concern	Special Concern	Special Concern
Northern Madtom	<i>Noturus stigmosus</i>	Endangered	Endangered	Endangered
Pugnose Minnow	<i>Opsopoeodus emiliae</i>	Special Concern	Special Concern	Special Concern
River Redhorse	<i>Moxostoma carinatum</i>	Special Concern	Special Concern	Special Concern
Silver Shiner	<i>Notropis photogenis</i>	Special Concern	Special Concern	Special Concern
Spotted Sucker	<i>Minytrema melanops</i>	Special Concern	Special Concern	Special Concern
Spotted Gar	<i>Lepisosteus oculatus</i>	Threatened	Threatened	Threatened
<b><u>Mussels</u></b>				
Fawnsfoot	<i>Truncilla donaciformis</i>	Endangered	Endangered	Endangered
Kidneyshell	<i>Ptychobranchnus fasciolaris</i>	Endangered	Endangered	Endangered
Mapleleaf	<i>Quadrula quadrula</i>	Threatened	Threatened	Threatened
Mudpuppy Mussel	<i>Simpsonaias ambigua</i>	Endangered	Endangered	Endangered
Rainbow	<i>Villosa iris</i>	Threatened	Endangered	Endangered
Rayed Bean	<i>Villosa fabalis</i>	Endangered	Endangered	Endangered
Round Hickorynut	<i>Obovaria subrotunda</i>	Endangered	Endangered	Endangered
Round Pigtoe	<i>Pleurobema sintoxia</i>	Endangered	Endangered	Endangered
Snuffbox	<i>Epioblasma triquetra</i>	Endangered	Endangered	Endangered
Wavy-rayed Lampmussel	<i>Lampsilis fasciola</i>	Endangered	Special Concern	Endangered
<b><u>Reptiles</u></b>				
E. Ribbonsnake	<i>Thamnophis sauritus</i>	Special Concern	Special Concern	Special Concern
Queensnake	<i>Regina septemvittata</i>	Threatened	Endangered	Threatened
Blanding's Turtle	<i>Emydoidea blandingii</i>	Threatened	Threatened	Threatened
N. Map Turtle	<i>Graptemys geographica</i>	Special Concern	Special Concern	Special Concern
Snapping Turtle	<i>Chelydra serpentina</i>	Special Concern	Special Concern	No Status
Spiny Softshell	<i>Apalone spinifera</i>	Threatened	Threatened	Threatened
Spotted Turtle	<i>Clemmys guttata</i>	Endangered	Endangered	Endangered

# Lower Thames Valley Source Protection Area Assessment Report

**Table A5-7: Aquatic Species At Risk in the Lower Thames Valley SPA Lake Erie Watershed**

Common Name	Scientific Name	COSEWIC Status	Provincial Rank	Global Rank	Status in Watershed
<b>Reptiles</b>					
Eastern Spiny Softshell	<i>Apalone spinifera</i>	Threatened			Reduced range, may be declining
Northern Map Turtle	<i>Graptemys geographica</i>	Special Concern			Locally common, under pressure
Blanding's Turtle	<i>Emydoidea blandingii</i>	Threatened			Unknown
Spotted Turtle	<i>Clemmys guttata</i>	Endangered			May be extirpated or very rare
Stinkpot Turtle	<i>Sternotherus odoratus</i>	Threatened			May be extirpated
Fowler's Toad	<i>Bufo fowleri</i>	Threatened			Sustainable population at Rondeau
Northern Cricket Frog	<i>Acris crepitans</i>	Endangered			Extirpated
Queen Snake	<i>Regina septemvittata</i>	Threatened			Reduced range, declining population
Tiger Salamander	<i>Ambystoma tigrinum</i>	Extirpated			Extirpated
Jefferson Salamander	<i>Ambystoma jeffersonianum</i>	Threatened			Rare
Eastern Foxsnake	<i>Elaphe gloydi</i>	Threatened			Discontinuous distribution along the Lake Erie - Lake Huron waterway shoreline, including tributaries and several islands
Massasauga	<i>Sistrurus catenatus</i>	Threatened			
Eastern Ribbonsnake	<i>Thamnophis sauritus</i>	Special Concern			Localized, may be extirpated
<b>Fish</b>					
Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>	Special Concern			Disjunct
Black Buffalo	<i>Ictiobus niger</i>	Special Concern			Rare
Black Redhorse	<i>Moxostoma duquesnei</i>	Threatened			Rare, localized
Eastern Sand Darter	<i>Ammocrypta pellucida</i>	Threatened			Uncommon, localized

# Lower Thames Valley Source Protection Area Assessment Report

**Table A5-7: Aquatic Species At Risk in the Lower Thames Valley SPA Lake Erie Watershed**

Common Name	Scientific Name	COSEWIC Status	Provincial Rank	Global Rank	Status in Watershed
Greenside Darter	<i>Etheostoma blennioides</i>	Special Concern			Common, Widespread
Lake Chubsucker	<i>Erimyzon sucetta</i>	Threatened			Rare, localized
Northern Brook Lamprey	<i>Ichthyomyzon fossor</i>	Special Concern			Rare, localized
Northern Madtom	<i>Noturus stigmosus</i>	Endangered			
Pugnose Minnow	<i>Opsopoeodus emiliae</i>	Special Concern			Rare, may be extirpated
River Redhorse	<i>Moxostoma carinatum</i>	Special Concern			Unknown
Pugnose Shiner	<i>Notropis anogenus</i>	Endangered			Restricted to the Great Lakes
Spotted Gar	<i>Lepisosteus oculatus</i>	Threatened			Rare, localized
Channel Darter	<i>Percina copelandi</i>	Threatened			Rare to unknown
Warmouth	<i>Lepomis gulosus</i>	Special Concern			Extant, localized
Orangespotted Sunfish	<i>Lepomis humilis</i>	Special Concern			Unknown
Silver Chub	<i>Macrhybopsis storeriana</i>	Special Concern			Localized
Grass Pickerel	<i>Esox americanus vermiculatus</i>	Special Concern			Unknown
Lake Sturgeon	<i>Acipenser fulvescens</i>	Special Concern			Unknown
Spotted Sucker	<i>Minytrema melanops</i>	Special Concern			Uncommon, localized, may be expanding
<b>Mussels</b>					
Northern Riffleshell	<i>Epioblasma torulosa rangiana</i>	Endangered			May be extirpated or very rare
Wavy-rayed Lampmussel	<i>Lampsilis fasciola</i>	Endangered			Extirpated
Rayed Bean	<i>Villosa fabalis</i>	Endangered			Presumed extirpated
Round Hickorynut	<i>Obovaria subrotunda</i>	Endangered			Presumed extirpated
Round Pigtoe	<i>Pleurobema sintoxia</i>	Endangered			Rare

# Lower Thames Valley Source Protection Area Assessment Report

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**Table A5-7: Aquatic Species At Risk in the Lower Thames Valley SPA Lake Erie Watershed**

Common Name	Scientific Name	COSEWIC Status	Provincial Rank	Global Rank	Status in Watershed
Snuffbox	<i>Epioblasma triquetra</i>	Endangered			Presumed extirpated



# **Lower Thames Valley Source Protection Area Assessment Report**

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## ***Appendix 6 – Conceptual Water Budget***

This section is bound separately

# **Lower Thames Valley Source Protection Area Assessment Report**

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### ***Appendix 7 - Assessment Report Checklist***

The Assessment Report Checklist has not been updated from the version in the approved Amended Proposed Assessment Report. Please refer to that version; however locations of the material referenced in the checklist may be off by a few pages

# Lower Thames Valley Source Protection Area Assessment Report

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# **Lower Thames Valley Source Protection Area Assessment Report**

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## ***Appendix 8 – Issues Evaluation Methodology***

# **Lower Thames Valley Source Protection Area Assessment Report**

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**Thames-Sydenham and Region  
Source Protection Region**

**ISSUES EVALUATION METHODOLOGY**

**Version 2.0  
May 14, 2009**

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# 1. INTRODUCTION

Under the Clean Water Act (2006) Technical Rules (December 2008), the assessment report must identify and describe drinking water quality issues. Identifying issues is a key step in the overall process of protecting drinking water quality. This is because an activity that may contribute to an identified issue is deemed a significant drinking water threat which must be mitigated, through source protection plans, to no longer be a significant threat.

In order to identify issues, the Thames-Sydenham and Region proposes an issues evaluation methodology with three main stages: screening, issue identification and issue description. The first two stages must be done to satisfy the **Rule 114**. The issues also have to be described according to **Rule 115**. The current document is intended to foster discussion on the proposed issues evaluation methodology. The methodology will be finalized upon consideration of comments from consultants and municipality staff working on technical studies in the Region, as well as conservation authority staff. The finalized methodology will serve as a guideline in the determination and description of drinking water quality issues in the Region for the Assessment Report.

The Rule 114 defines a parameter or pathogen being an issue if it is shown to deteriorate or trends towards a deterioration of raw water quality for the purposes of drinking. Hence assessing for the deterioration of the raw water meant for human consumption is an important step in defining issues, which can be accomplished by using a 'check' to determine whether a parameter is an issue or not. For treated drinking water, the 'check' is a drinking water standard. For the general health of a watershed and aquatic species in the water bodies, the 'check' is an aquatic life water quality objective. Raw water benchmarks for surface and groundwater drinking water sources are yet to be established. While background levels of water constituents may be reviewed, inadequate comprehensive long term (historical) data hinders the assessment of a background level of any contaminant in the raw water. It is important to consult with water treatment plant operating authorities, municipalities, consultants working on the technical studies, conservation authority staff and the Ministry of Environment (MOE) while setting up these 'checks' to identify issues in raw water sources.

**Rule 114.** *Without limiting the generality of subclause 15(2)(f) of the Act, the description of drinking water issues shall include the following drinking water issues in respect of the quality of water in a vulnerable area:*

**Subrule (1)** *the presence of a parameter in water at a surface water intake or in a well, including a monitoring well related to a drinking water system to which clause 15(2)(e) of the Act applies, if the parameter is listed in Schedule 1, 2 or 3 of the Ontario Drinking Water Quality Standards or Table 4 of the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines and*

*(a) the parameter is present at a concentration that may result in the deterioration of the quality of the water for use as a source of drinking water; or*

*(b) there is a trend of increasing concentrations of the parameter at the surface water intake, well or monitoring well and a continuation of that trend would result in the deterioration of the quality of the water for use as a source of drinking water;*

**Subrule (2)** *the presence of a pathogen in water at a surface water intake or in a well related to a drinking water system to which clause 15(2)(e) of the Act does apply, if a microbial risk assessment undertaken in respect of the pathogen indicates that*

*(a) the pathogen is present at a concentration that may result in the deterioration of the quality of the water for use as a source of drinking water, or*

(b) there is a trend of increasing concentrations of the pathogen at the surface water intake or well and a continuation of that trend would result in the deterioration of the quality of the water for use as a source of drinking water; and

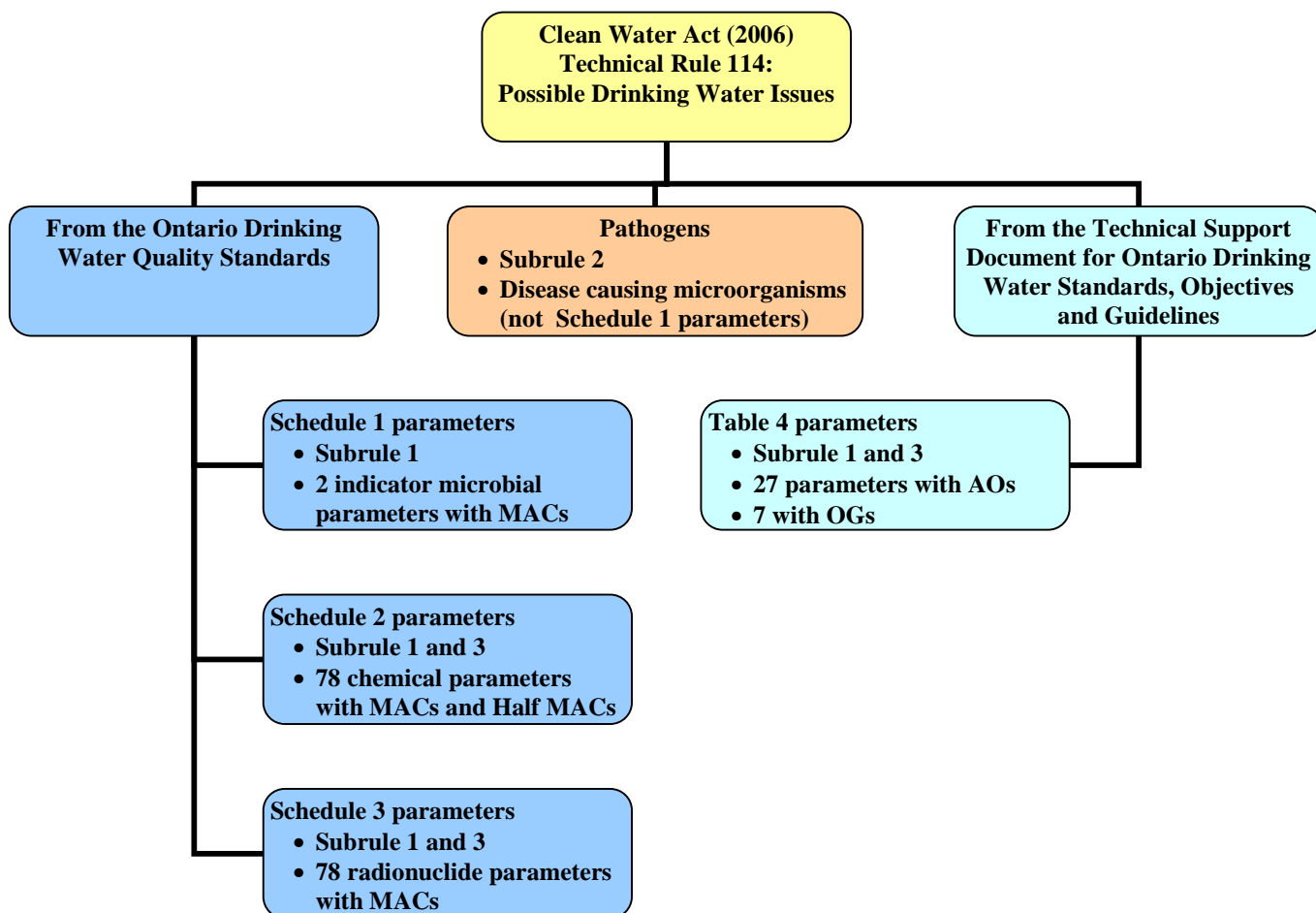
**Subrule (3)** the presence of a parameter in water at a surface water intake or in a well, including a monitoring well related to a drinking water system to which clause 15(2)(e) of the Act does not apply, if the parameter is listed in Schedule 2 or 3 of the Ontario Drinking Water Quality Standards or Table 4 of the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines and

(a) the parameter is present at a concentration that may result in the deterioration of the water for use as a source of drinking water, or

(b) there is a trend of increasing concentrations of the parameter at the intake, well or monitoring well and a continuation of that trend would result in the deterioration of the quality of the water for use as a source of drinking water.

Rule 115 requires that an identified water quality issue be ‘described’, by listing the parameter or pathogen concerned, the intake or well where it has occurred, areas within vulnerable areas where the drinking water threats due to ‘prescribed’ (see Rule 118) or ‘other’ (see Rule 119) activities contribute to the issue, and lastly, listing activities, conditions (from past activities) and naturally occurring conditions associated with the issue.

**Figure 1 shows** the parameters and pathogens to be considered in the identification of drinking water quality issues under the Clean Water Act. Note that it does not include parameters not in Schedule 1, 2, 3 or Table 4.



**Figure 1: Clean Water Act Technical Rule 114: Possible Drinking Water Quality Issues**



The Ontario Drinking Water Standards are human health based criteria established under the Regulation 169/03 under the Safe Drinking Water Act (2002) and are called Maximum Acceptable Concentrations. The Technical Support Document<sup>1</sup> provides criteria for Table 4 parameters to meet aesthetic objectives and plant operational guidelines. The criteria listed below are used to help flag and identify drinking water quality issues with the exception of the microbial parameters as explained in the relevant section.

**Maximum Acceptable Concentrations (MACs)** are the drinking water standards for chemical, radionuclide and microbial parameters beyond which human health may be adversely affected.

**Half MAC** is that level at which a Schedule 2 (chemical) parameter in the treated water is flagged for increased sampling and testing requirements under Regulation 170/03 - Section 13-5, Safe Drinking Water Act (2002).

**Aesthetic Objectives (AO)** are criteria for certain Table 4 parameters at which parameters such as taste and turbidity that may affect the taste, odour or colour of water or interfere with good water quality control practices.

**Operational Guidelines (OG)** are criteria for certain Table 4 parameters at which parameters such as alkalinity and hardness that may negatively effect the efficient and effective treatment, disinfection and distribution of the water.

## **2. DATA USED IN THE ISSUES EVALUATION PROCESS**

### ***2.1. Data used for Screening***

In the screening step, parameters or pathogens are ‘flagged’ based on certain concerns or previous water quality data review and reports which are described below.

#### **2.1.1. Operating Authority Concerns**

Conduct interviews with drinking water systems (DWS) operating authority to note specific concerns in the raw and treated water quality. The consultant/municipality should interview the operating authority (OA), document the outcomes of the interview and have the OA sign the document to confirm the document is an accurate representation of the OA’s opinions and concerns. Concerns may include parameters or pathogens that persist even after treatment, or which interfere in the treatment process, or parameters due to past activities that have resulted in increased monitoring at the well or intake.

#### **2.1.2. Thames and St. Clair Watershed Characterization Reports (December 2007)**

In the characterization reports, half MAC, MAC, AO and OG were the checks to flag Schedule 2, 3 and Table 4 parameters in raw water to most intakes and some well systems (data from 1990 to 2005, 1 to 12 samples per year). Additional well system data reviewed were annual drinking water system (DWS) reports (data from 2004 to 2006) in which Schedule 2, 3 and Table 4 treated water parameters are checked against the half MAC and parameters flagged. Where data

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<sup>1</sup> Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Ministry Of Environment, PIBS4449e01 (2003, Revised June 2006)

allowed it, upward trends in some Schedule 2 and 3 and Table 4 parameters are shown in the characterization reports. The weekly raw water microbial indicator data (2003 to 2006) is presented to show ranges of bacteria counts, spikes and seasonal variation and this information must be used as per the issues screening methodology for Schedule 1 parameters.

Where the data is not adequate for the purposes of screening to flag issues, other data where available may be utilised to flag parameters. For example, data available at the time of water quality review for the characterization reports for the West Elgin and Wheatley intakes were laboratory analysis sheets that were reviewed to provide raw water data for years 2001-2003 (West Elgin), and 2000-2002 (Wheatley) while annual DWS reports provided limited treated water data for 2005 (West Elgin), and 2003-2005 (Wheatley).

### **2.1.3. Annual Drinking Water System (DWS) Reports**

The annual DWS reports flag parameters that persist in treated drinking water and where required, additional sampling and testing of raw water for specific parameters is also reported. Schedule 2 (chemical) parameters in treated water that exceed the half MAC are flagged for increased monitoring, under the Regulation 170/03 - Section 13-5, Safe Drinking Water Act (2002). Exceedances of the MAC for Schedule 1, 2 and 3 and some Table 4 parameters are provided in these reports. Summary of additional testing and sampling carried out in accordance with the requirement of a certificate of approval, order or other legal instrument are also provided in the annual reports (these may also be raw water samples). A review of the reports must be done to flag parameters with exceedances of half MAC, MAC, and parameters that undergo extra testing by legal order.

### **2.1.4. Parameters not listed in Schedules 1, 2, 3 or Table 4**

In other source protection regions, there have been suggestions to consider parameters not included in Rule 114 for issues identification. Further clarification from the Ministry of Environment is requested and required before considering parameters not listed in the schedules and table. Any such parameters should be brought to the attention of the SPC immediately.

## **2.2. Data used for issues identification**

In the issues identification step, data to be used to determine if the screened (flagged) parameters are issues are:

### **2.2.1. Drinking Water Surveillance Program (DWSP)**

DWSP is a voluntary program and not all drinking water systems participate in this. This dataset provides raw water Schedule 2, 3 and Table 4 parameter data. Data on the flagged parameters should be reviewed as per the relevant methodology outlined in this document to confirm issues.

### **2.2.2. Drinking Water Information System (DWIS)**

This dataset provides Schedule 1 (indicator microbial) data and some chemical parameter data. Data on the flagged parameters should be reviewed as per the relevant methodology outlined in this document to confirm issues.

### **2.2.3. Other water treatment plant data for specific flagged parameters**

Where limited data is available on flagged parameters or pathogens, laboratory analysis sheets (usually available from the water treatment plant) may be used to help decide on whether they are issues or not. Any other such reliable raw or treated water data (like grab sample data from MOE inspection reports) may be used to further substantiate that a flagged parameter is an issue.

### 3. ISSUES EVALUATION METHODOLOGY

Figure 2 is a flow chart of the proposed issues evaluation methodology. The data sets are described in the previous section. There are separate screening and issues identification methodologies for pathogens, the different types of parameters grouped as in Rule 114, and parameters not included in Rule 114.

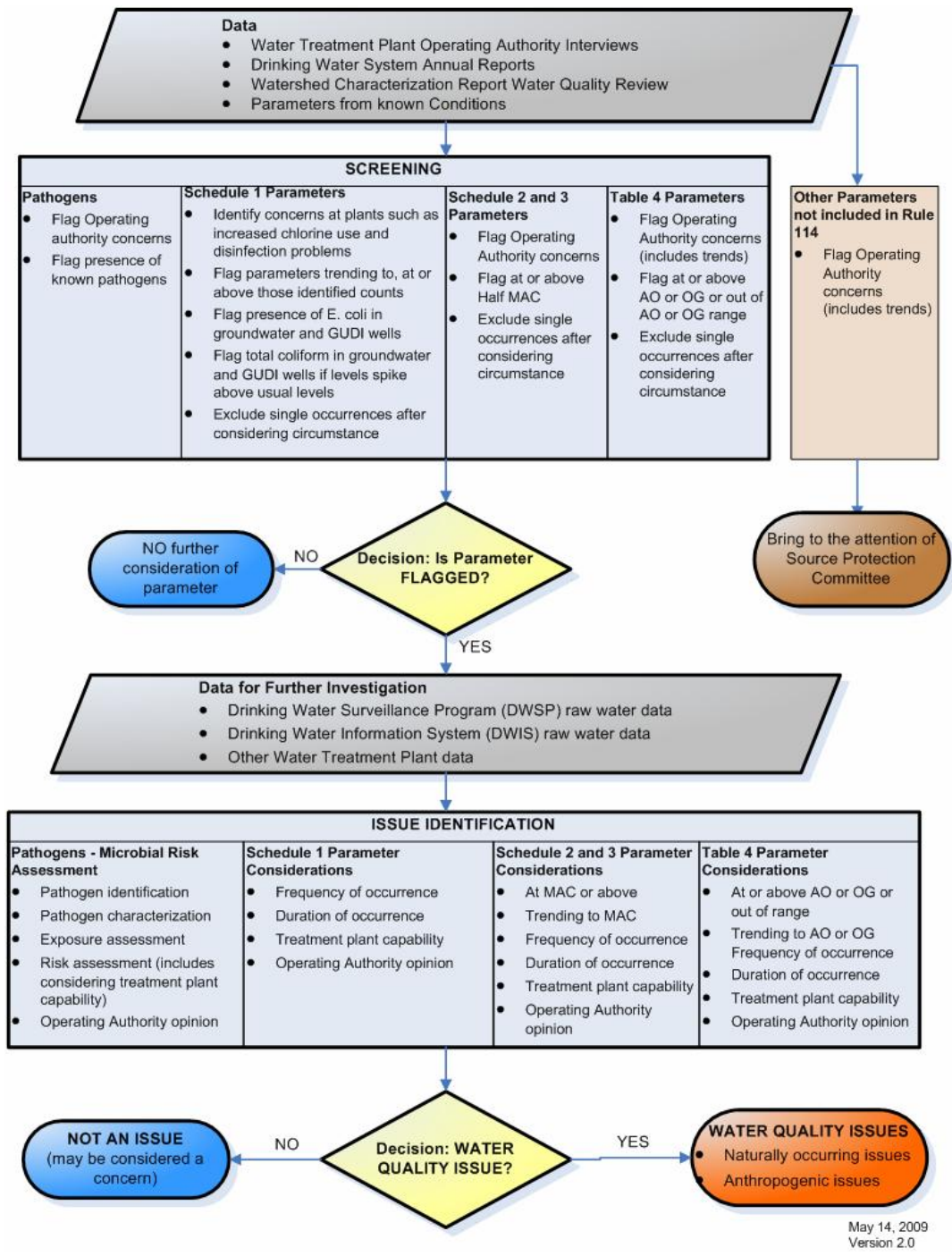


Figure 2: Proposed Issues Evaluation Methodology

## **3.1. Pathogens**

### **3.1.1. Background**

Pathogens are disease-causing bacteria, viruses or protozoa. They can cause severe or fatal waterborne illness in humans. Some are resistant to commonly used disinfectants at water treatment plants. Reliable laboratory detection methods for pathogenic protozoa are yet to be established. There are no established Canadian water quality guidelines for these microbiologic organisms.

It is understood that, under the Clean Water Act (2006), a microbial risk assessment must be done in order to confirm the identification of issues caused by pathogens. The main steps in such a risk assessment are pathogen identification and characterization, exposure assessment and risk characterization<sup>2</sup>.

**Any pathogens flagged through the pathogen screening process must be brought to the attention of the Thames-Sydenham and Region SPC. The Thames-Sydenham and Region is waiting for direction from the MOE on microbial risk assessment and until such direction is provided, it is suggested to complete the screening step only.**

### **3.1.2. Presence in Raw Water**

Pathogens may be found in raw surface water but not in groundwater, unless the groundwater is under the direct influence of surface water sources. Pathogens are not monitored routinely in raw water sources unless a known outbreak of waterborne illness caused by a pathogen or known fecal contamination has occurred. The indicators total coliform and *E. coli* are used to indicate the possible presence of some pathogens.

The presence of the ‘current’ bacterial waterborne pathogens (e.g.: *Salmonella* and *Campylobacter*) may be associated with the presence of *E. coli*, a Schedule 1 parameter, but *E. coli* does not indicate the presence of the ‘emerging’ bacterial waterborne pathogens (e.g.: *Legionella* and *Helicobacter pylori*)<sup>3</sup>. Enteric viruses (such as noroviruses, hepatitis A and rotaviruses) and protozoa (such as *Giardia* and *Cryptosporidium*) cause human waterborne illnesses. The presence of *E. coli* is an indication that enteric viruses or protozoa could also be present; however, because enteric viruses and protozoa are more resistant to disinfection, the absence of *E. coli* does not necessarily mean that they are also absent<sup>4,5</sup>.

### **3.1.3. Screening**

- Operating Authority concerns must be flagged

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<sup>2</sup> Revised Framework for Microbial Risk Assessment. International Life Sciences Institute. 2000. ILSI Press, Washington, D. C., USA

<sup>3</sup> Health Canada (2006) Guidelines for Canadian Drinking Water Quality: Guideline Technical Document — Bacterial Waterborne Pathogens — Current and Emerging Organisms of Concern. Water Quality and Health Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.

<sup>4</sup> Health Canada (2004) Guidelines for Canadian Drinking Water Quality: Supporting Documentation — Enteric Viruses. Water Quality and Health Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.

<sup>5</sup> Health Canada (2004) Guidelines for Canadian Drinking Water Quality: Supporting Documentation — Protozoa: *Giardia* and *Cryptosporidium*. Water Quality and Health Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.

- Known presence of a pathogen at a raw water source must be flagged
- Known presence of a pathogen in treated drinking water (some pathogens resist disinfection) must be flagged
- Pathogen causing a past waterborne outbreak linked to the water supply must be flagged
- Single occurrences of pathogen in water samples due to faulty sampling or false laboratory results must be excluded from consideration

### 3.1.4. Issues Identification

- Microbial risk assessment must be done to confirm that the flagged pathogen is an issue
- The main steps in a microbiological hazard risk assessment are hazard (pathogen) identification, hazard characterization, exposure assessment and risk characterization<sup>6</sup>
- Elements include pathological characteristics, infection mechanisms, resistance to control or treatment, survival, persistence, seasonality, reliability of treatment processes, route of human exposure, exposed population characteristics, treatment, recontamination, infectivity, human dose response data, risk event and magnitude, evaluation of control measures<sup>2</sup>
- The microbial risk assessment takes into consideration the treatment plant disinfection capabilities, i.e. if a pathogen is adequately disinfected at the treatment plant, it may not be considered an issue

## 3.2. Schedule 1 Parameters

### 3.2.1. Background

Total coliform and *Escherichia coli* are the Schedule 1 parameters. They are microbial indicators. Total coliform bacteria are widespread in nature being present in the soil and in the intestines and feces of animals including humans, livestock, poultry and wildlife. For drinking water, total coliform are still the standard test because their presence indicates contamination of a water supply by an outside source. *Escherichia coli* (*E. coli*) is commonly used as an indicator of recent contamination of water by disease-causing bacteria, viruses or protozoa including those that are resistant to commonly used disinfectants. It is found exclusively in the faeces of humans and other animals. A specific strain of *E. coli*, O157:H7, is pathogenic and is not specifically identified while routinely testing water for Schedule 1 parameters. If however the particular strain is identified, it is examined under the pathogen issues identification methodology. The commonly used unit to enumerate coliform bacteria is counts (of coliform) per 100 mL (of water sample).

### 3.2.2. Presence in Raw Water

Total coliform is commonly found in raw surface and groundwater sources, at a few orders of magnitude lower in groundwater due to natural geologic protection. *E. coli* is widely found in surface water sources and rarely present in groundwater. From the municipal raw water quality data review conducted in the Thames-Sydenham and Region watershed characterization report:

- It was observed that the total coliform was present in most raw groundwater sources, ranging from zero to 100 counts/100 mL. Total coliform was also widely present in raw water at surface intakes, ranging from zero to as high as 90,000 counts/100 mL

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<sup>6</sup> Revised Framework for Microbial Risk Assessment. International Life Sciences Institute. 2000. ILSI Press, Washington, D. C., USA

- E. coli was found to be absent in nearly all raw groundwater well sources, with a highest count of only 3 per 100 mL in one well. E. coli ranged between zero and 2000 counts/100mL in raw surface water at the intakes

### **3.2.3. Screening**

In the Thames and St. Clair watershed characterization reports, the weekly raw water microbial indicator data (2003 to 2006) is presented to show ranges of bacteria counts and seasonal variation and this information as well as a review of data after 2006 must be used to flag potential issues as per the following criteria:

- Flag concerns and problems at plants due to high counts or trends of total coliform and E. coli in raw surface water and total coliform in groundwater that cause increased chlorine consumption or affect the disinfection capability. This is to be done in consultation with operating authority
- Flag the presence of E. coli (>0 counts/100mL) in raw groundwater and groundwater under the direct influence of surface water (GUDI) wells
- Flag total coliform in groundwater and GUDI wells that spike above usual levels
- Exclude single occurrences of total coliform or E. coli due to faulty sampling or false laboratory result

### **3.2.4. Issues Identification**

The following factors must be considered in determining whether the Schedule 1 parameter is an issue or not:

- Flagged Schedule 1 parameters must be examined for frequency and duration of occurrence, including continuous or repeated occurrence, trends, frequency of spikes that interfered in treatment processes (for example, a one time spike over 5 years data may not be an issue)
- Consider treatment plant capabilities recognising the multibarrier approach in source water protection (i.e. a parameter might be an issue even if the plant can typically remove or reduce it to acceptable levels, or a parameter might not be an issue if it is adequately treated and there is no evidence of worsening levels)
- Consult operating authority for their opinion on the identified issue

## **3.3. Schedule 2 And 3 Parameters**

### **3.3.1. Background**

Schedule 2 parameters include organic and inorganic chemicals from industrial and agricultural activities as well as municipal waste and natural decomposition of organic matter. Inorganic chemicals include metals and nitrates. Organic chemicals include pesticides (e.g.: atrazine and DDT), polynuclear aromatic hydrocarbons (e.g.: benzo-a-pyrene, chlordane), chlorophenols (e.g.: 2,4-dichlorophenol), volatile organics (e.g.: benzene, vinyl chloride), dioxins and furans (e.g.: 2,3,7,8 TCDD). Schedule 3 parameters, radionuclides, occur naturally or are released during activities like mining or nuclear energy production. Upon ingestion, they may cause cancer or hereditary genetic changes in children<sup>7</sup>. Examples are radium-224, uranium-235 (both natural) and tritium (artificial).

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<sup>7</sup> Technical Support Document for the Ontario Drinking Water Standards, Objectives and Guidelines, June 2003 (revised June 2006)

### 3.3.2. Presence in Raw Water

From the municipal raw water quality data review conducted in the Thames-Sydenham and Region watershed characterization report, certain Schedule 1 inorganic chemicals in the raw source water were found to be close to or above levels at which they could pose a risk to human health. Some of these inorganic chemicals are naturally occurring. In general, Schedule 2 organic chemicals as well as Schedule 3 radionuclides were either detected (and at levels not posing a risk to human health), or below detection levels.

### 3.3.3. Screening

- Flag operating authority concerns by conducting interviews with drinking water systems (DWS) operating authority to note specific parameters of concern to them in the raw and treated water, including qualitative concerns like nuisance plant growth (algae) at or near the intake (which may lead to flagging a nutrient parameter)
- A review of the annual drinking water system reports must be done to flag parameters with exceedances of half MAC as well as flag parameters that undergo extra testing by legal order
- Use the watershed characterization reports to flag schedule 2 and 3 parameters in raw and treated water at or above the Half MAC
- Make mention of those flagged that are naturally occurring or due to known past activities (conditions)
- A single instance of a parameter at or above Half MAC that is an isolated occurrence, faulty sampling or false laboratory result should be excluded from consideration as an issue

### 3.3.4. Issues Identification

- Identify, from flagged parameters, those trending to MAC levels and those at MAC levels
- Consider frequency of occurrence (a few times a year, seasonal, continuous presence, etc.) and further upward trending of identified parameters
- Consider treatment plant capabilities recognising the multibarrier approach in source water protection (i.e. a parameter might be an issue even if the plant can typically remove or reduce it to acceptable levels, or a parameter might not be an issue if it is adequately treated and there is no evidence of worsening levels)
- Identify parameters in spills that may have caused the water treatment plant to be shut down
- Obtain operating authority's opinion on identified issues

**Note:**

**Maximum Acceptable Concentrations (MACs):** Ontario drinking water standards for chemical, radionuclide and microbial parameters beyond which human health may be adversely affected

**Half MAC:** The level at which a Schedule 2 (chemical) parameter in the treated water is flagged for increased sampling and testing requirements (under Regulation 170/03 - Section 13-5, Safe Drinking Water Act, 2002)

## 3.4. Table 4 Parameters

### 3.4.1. Background

The Table 4 parameters are physical and chemical parameters such as taste and turbidity that may affect the taste, odour or colour of water or interfere with good water quality control practices. Also included are parameters such as alkalinity and aluminum may negatively effect the efficient and effective treatment, disinfection and distribution of the water.

### 3.4.2. Presence in Raw Water

From the municipal raw water quality data review conducted in the Thames-Sydenham and Region watershed characterization report, certain Table 4 parameters in the raw source water were found to be close to or above levels at which they could affect the aesthetic quality of water or the operation of the water treatment plant. Some of these are naturally occurring.

### 3.4.3. Screening

- Flag operating authority concerns by conducting interviews with drinking water systems (DWS) operating authority to note specific parameters of concern to them in the raw and treated water, trends of those parameters, and qualitative concerns like taste and odour
- Flag all Table 4 parameters in raw and treated water at or above the respective AO or OG
- A single instance of a parameter above AO or OG should be further checked for isolated occurrence, faulty sampling or false laboratory result
- Flag certain parameters differently
  - The AO of sodium is 200 mg/L, but the local Medical Officer of Health should be notified when sodium exceeds 20 mg/L to inform patients on sodium restricted diets. Flag sodium levels at or above 20 mg/L
  - The parameters 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2,4-dichlorophenol, 2,3,4,6-tetrachlorophenol, 2,4,6-trichlorophenol, 2,4,5-trichlorophenoxy acetic acid, monochlorobenzene and pentachlorophenol have both AOs and MACs; these would be considered under the issues identification process for Schedule 2 parameters using the half MAC (half Ontario treated drinking water standard) and not under the AO
  - Flag parameters pH, alkalinity and hardness at levels outside the OG range
- Flag qualitative and contributing parameters
  - Flag qualitative parameters like taste and odour based on operating authority interview information. Flag parameters that contribute to the Table 4 parameters even if they are not included in Rule 114; for example increased phosphorus levels may have caused algal growth which in turn may cause taste and odour problems at the intake, so flag the parameters of taste and odour and the contributing parameter phosphorus
  - Flag turbidity at or above AO levels for further investigation. Turbidity can significantly interfere with disinfection, be a source of disease-causing organisms and shield pathogenic organisms from the disinfection process; it is also an indicator of treatment efficiency (particularly filters)<sup>8</sup>.
  - If trihalomethanes (THMs) are flagged (under the methodology for Schedule 2 parameters), then flag contributing raw water parameters of dissolved organic carbon (DOC) and turbidity, which are Table 4 parameters. Raw water DOC and the organic content in turbidity combine with chlorine disinfectants at the treatment plant to form trihalomethanes (THMs), a by product that deteriorates the quality of drinking water

### 3.4.4. Issues Identification

- Further investigate flagged parameters for levels or trending to AO or OG levels and their interferences with proper treatment, for example, investigate flagged turbidity for interference with proper disinfection or filtration, or for contributing to flagged levels of THMs

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<sup>8</sup> Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. MOE PIBS 4449e01, June 2003, revised June 2006



- Consider parameters (including those not identified in Rule 114) contributing to flagged Table 4 parameters
- Consider frequency of occurrence (a few times a year, seasonal, continuous presence, etc.) and further upward trending of identified parameters
- Consider treatment plant capabilities recognising the multibarrier approach in source water protection (i.e. a parameter might be an issue even if the plant can typically remove or reduce it to acceptable levels, or a parameter might not be an issue if it is adequately treated and there is no evidence of worsening levels)
- Identify parameters in spills that may have caused the water treatment plant to be shut down
- Obtain operating authority opinion on list of issues

**Note:**

**Aesthetic Objectives (AO):** The level at which parameters such as taste and turbidity that may affect the taste, odour or colour of water or interfere with good water quality control practices.

**Operational Guidelines (OG):** The level at which parameters such as alkalinity and hardness that may negatively effect the efficient and effective treatment, disinfection and distribution of the water.

### **3.5. Other Parameters**

In other source protection regions, there have been suggestions to consider parameters not included in Rule 114 for issues identification. Further clarification from the Ministry of Environment on the consideration of issues arising due to parameters not listed in Rule 114 is requested and required before considering parameters not listed in the schedules and table. Any such ‘other’ parameters should be brought to the attention of the SPC immediately.

### **3.6. Deliverables**

The deliverables expected upon completion of the issues evaluation methodology are:

1. List of flagged parameters per intake or well or well system (if individual well data is unavailable, report flagged parameters for the well system), identifying those believed to be naturally occurring
2. List of issues with detailed justification for the identification of each issue, noting those believed to be naturally occurring
3. Supporting items, where it is possible, for issue identification such as tables (showing exceedances above the relevant criteria, ranges of flagged parameters), scatter plots (for schedule 1 parameters, can be obtained from watershed characterization report) and time series graphs (showing trends with or without linear regression depending on number of data points)
4. Completed **Appendix A: Issues Evaluation Database**

While the issues evaluation database summarizes the issues evaluation, it is still required to provide deliverables 1, 2 and 3 in a document separate from the completed Appendix A.

## Appendix A: Issues Evaluation Database

Field Name	Rule Reference	Description of contents	Field Type	Field Size	Choices
Issue_ID	114 & 115(1), (2)	<i>A unique identifier of the issue</i>	AutoNumber	Single (Integer)	N/A
DWS_no	114 & 115(1), (2)	<i>Drinking Water System number for the well, intake or system</i>	Text	10	N/A
Intake_Well_Name	114 & 115(1), (2)	<i>Identify the name or number of the well or intake</i>	Text	50	N/A
Intake_Well_Desc	114 & 115(1), (2)	<i>Include a brief description of the well or intake location and identify whether emergency intake or backup well</i>	Text	250	N/A
Pa_Name	114 & 115(1), (2)	<i>Name of parameter (e.g.: trichloroethylene) or pathogen (e.g.: Cryptosporidium)</i>	Text	50	N/A
Type	114 & 115(1), (2)	<i>Schedule 1, 2, 3 or Table 4 parameter OR pathogen OR 'Other' (not listed in rule 114)</i>	Text	10	Sched1 Sched2 Sched3 Table4 Pathogen Other
Natural	114 & 115(1), (2)	<i>Identify whether the parameter is believed to be naturally occurring</i>	Text	15	Natural Anthropogenic Both?
Description	114 & 115(1), (2)	<i>Describe briefly the nature of the issue and why it was identified as an issue - E.g.: exceeded drinking water standard several times in past 10 years</i>	Text	250	N/A
Issue_Status		<i>Identify whether the parameter was flagged only or has further been identified as an issue</i>	Text	10	Flagged Issue
Contrib_Area	115 (3)	<i>Provide a brief description of the area within vulnerable areas thought to be contributing to the issue</i>	Text	100	N/A
Threat_ID_Plan	116	<i>If information as per rule 115 (3) and (4) cannot be ascertained, a plan needs to be provided to obtain this information in a subsequent Assessment report. Provide a brief description of how you would propose to identify the area and threats which are contributing to this issue</i>	Text	250	N/A
SP_Area	117	<i>Identify the SP Area or areas (outside the SP Area where the issue occurs) in which contributing threats are believed to be located</i>	Text	20	LTV SCR UTR ER ABMV Other (specify)

# **Lower Thames Valley Source Protection Area Assessment Report**

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## ***Appendix 9 – Issues Evaluation Flagged Parameters***

# **Lower Thames Valley Source Protection Area Assessment Report**

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# Lower Thames Valley Source Protection Area Assessment Report

## Flagged Parameters

In the Lower Thames Valley Source Protection Authority, the parameters flagged for further investigation as an issue are summarized by drinking water system in the Table 1a and 1b below. The raw (untreated) water quality data is compared to a benchmark and parameters may be flagged if they meet the screening criteria. The benchmarks for chemical, physical and radioactive parameters 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. The table also indicates whether the flagged parameter was later identified as an issue or not. No pathogens are flagged or identified as issues in the raw (untreated) source water in the Lower Thames Valley SPA.

**Table A9-1a: Drinking Water Quality Parameters Flagged in the Lower Thames Valley Source Protection Area**

System	Flagged Parameter	Brief Description of Screening	Identified as an Issue?
Wheatley (Lake Erie intakes)	Turbidity	The Thames Watershed Characterization report identified turbidity levels in the Wheatley intake raw (untreated) water from 2000 – 2002, and 2004 – 2006. Highest turbidity levels were between 3.5 and 59.3 NTU and average levels were between 2 and 22.9 NTU. In the years 2000 and 2002, turbidity levels were below the AO benchmark of 5 NTU. A noticeable peak occurred in 2005, with the highest turbidity levels.	Yes
	Aluminum	The Thames Watershed Characterization report indicated that most of the raw water highest aluminum levels from 1990 - 2005 were above the OG benchmark of 0.1 mg/L. From 1999 - 2005, the average values were below the OG benchmark with the exception of 0.103 mg/L in 2002 and 0.37 mg/L in 2003.	Yes
Chatham/ South Kent (Lake Erie intake)	Organic nitrogen	All (100%) of the available Drinking Water Surveillance Program raw water data measured above the 100% OG of 0.15 mg/L. The highest recorded value of the dataset was 0.484 mg/L and the lowest recorded value of the dataset was 0.156 mg/L. The trend line implies that the organic nitrogen levels have been slightly increasing over time.	Yes
	Turbidity	The Thames Watershed Characterization report identified that in the raw water, average and most of the highest turbidity levels were more than the AO benchmark of 5 NTU from 1990 - 2005. The highest turbidity level recorded was 75.5 NTU. Average turbidity levels ranged between 2.2 and 60.4 NTU. It was also noted that a considerable peak in turbidity occurred in 2003, with a maximum and average level of 66.2 and 60.4 NTU respectively.	Yes
	Hardness	The Thames Watershed Characterization report identified that hardness levels at the Chatham/South-Kent Intake continuously exceed the OG benchmark range of 80 – 100 mg/L from 1990 – 2005, with average levels ranging from 108 to 127 mg/L.	Yes
	Color	Approximately 15% (9 of 59 samples) of the available Drinking Water Surveillance Program raw water data measures above the 100% AO benchmark of 5 TCU. The average value of all samples was 2.8 TCU which is below the AO benchmark.	No
	Iron	Approximately 31% (19 of 61) of the available sample Drinking Water Surveillance Program raw water data measured above the AO benchmark of 0.3 mg/L. The applied trend line for the data indicates a downward trend with about 20% of the sampled results from 1998-2006 measuring above the benchmark.	No

# Lower Thames Valley Source Protection Area Assessment Report

**Table A9-1a: Drinking Water Quality Parameters Flagged in the Lower Thames Valley Source Protection Area**

System	Flagged Parameter	Brief Description of Screening	Identified as an Issue?
West Elgin (Lake Erie intakes)	Turbidity	The Thames Watershed Characterization report identified that from 2001 to 2006 all average and highest recorded turbidity levels in the primary intake raw water are higher than the AO benchmark of 5 NTU. The highest turbidity levels ranged between 145.2 and 447 NTU while average levels range between 5.7 and 26.6 NTU. At the West Elgin emergency intake, turbidity is flagged as a plant operator's concern but due to lack of data, not evaluated as an issue.	Yes

**Table A9-1b: Drinking Water Quality Parameters Flagged in the Lower Thames Valley Source Protection Area**

System	Flagged Parameter	Brief Description of Screening	Identified as an Issue?
Ridgetown (groundwater wells)	Fluoride	From the O. Reg. 170/03 Annual Report, fluoride concentrations measured as high as 2.05 mg/L. There are 21 instances since 2000 of fluoride concentrations being above the MAC benchmark of 1.5 mg/L in the well system. The Thames Watershed Characterization Report reveals that from 2003-2006, the fluoride concentrations obtained from well samples were above the MAC benchmark 4 times, with concentrations from 1.8 to 2.05 mg/L.	Yes
	Methane	Other reports (Dillon 2008) indicate that methane is regularly above the AO benchmark of 3L/m <sup>3</sup> . A cascading aeration system is in place to address high methane levels.	Yes
	Trihalo-methanes (THMs)	There are reported levels of THMs above 50% of the ODWS MAC of 100 µg/L in 2003 and 2006. No trends are evident in the reviewed data. THMs are flagged as a concern with a natural origin (natural origin because THMs are not introduced as a contaminant, but are produced as a result of a natural condition)	No
	Sodium	Sodium this parameter is identified in the annual reports as being consistently in excess of the 20mg/L Medical Officer of Health notification level, but less than the AO of 200 mg/L. The Watershed Characterization Report (UTRCA, 2007) also identifies sodium in the range of 75.3-76.4 mg/L. The O. Reg. 170/03 annual reports indicate a highest sodium concentration of 115 mg/L in 2002. The general trend in the data shows peak sodium levels decreasing in the raw water over time.	No
	Total coliform	Positive test results for total coliforms occur at least once in the years 2000-2001 and 2004-2007. The highest concentration recorded was 5000 cfu/100mL in 2004. Other results of samples containing total coliforms were reported as being equal to or less than 13 cfu/100mL. The total coliform levels are consistently reasonably low, with the exception of 2004. Since high levels of total coliforms haven't occurred since 2004, this parameter is not considered an issue, but is flagged as a parameter for continued close monitoring.	No

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<b>Highgate</b> (groundwater wells)	Fluoride	From the O.Reg 170/03 annual reports, fluoride concentrations as high as 2.0mg/L. There are 14 instances since 2003 of fluoride concentrations being above the MAC benchmark of 1.5 mg/L in the well system and a further 6 instances where concentrations were above 50% of the benchmark MAC. The average of the reported fluoride concentrations is 1.65 mg/L. The Thames Watershed Characterization Report reveals that from 2003-2006 the fluoride concentrations obtained from well samples were above the MAC benchmark on 10 occasions. The aquifer supplying water to the Highgate system appears to be naturally elevated with fluoride.	Yes
	Methane	The level of reported methane in both wells is very similar and tends to fluctuate in a similar trend between the wells. Reported methane levels range between 1.8 to 55 L/m <sup>3</sup> . The reported levels of methane are regularly above the AO benchmark of 3 L/m <sup>3</sup> .	Yes
	Organic nitrogen	The O. Reg 170/03 annual reports state that organic nitrogen ranges from non-detectable levels to 0.5 mg/L, which is above the 0.15 mg/L OG benchmark. The reported levels of organic nitrogen have been above the criterion every year since 2004.	Yes
	Trihalo-methanes (THMs)	There are reported levels of THMs above the MAC benchmark of 0.1 mg/L in 2006 and 2007, as well as levels exceeding 50% MAC benchmark in 2006-2008. No specific concentration trends over time are observed in the data, other than that concentration appear higher during the warmer months. THMs are flagged as a concern with a natural origin (natural origin because THMs are not introduced as a contaminant, but are produced as a result of a natural condition).	No
	Sodium	From the O.Reg 170/03 annual reports, sodium is detected at concentrations consistently in excess of the 20 mg/L Medical Officer of Health notification level, but less than the AO of 200 mg/L. The Thames Watershed Characterization Report also identifies sodium in the range of 75.3 to 76.4 mg/L. The annual reports identify a highest sodium concentration of 120 mg/L both in 2005 and 2006. The average reported sodium level is 109 mg/L.	No





# **Lower Thames Valley Source Protection Area Assessment Report**

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## ***Appendix 10 – Threats and Risk Assessment***

# **Lower Thames Valley Source Protection Area Assessment Report**

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# **Lower Thames Valley Source Protection Area Assessment Report**

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## **Threats and Risk Assessment Local Guidance**

# **Lower Thames Valley Source Protection Area Assessment Report**

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Thames-Sydenham and Region

# Threats and Risk Assessment Local Guidance

Version 1.2  
September 09, 2009

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## 2 Introduction

The Clean Water Act (2006) requires the completion of an Assessment Report and a Source Protection Plan. The Assessment Report is to contain the science behind the plan including:

- delineation of the vulnerable areas,
- assessment of the vulnerability of those areas,
- identification and assessment of drinking water quality issues,
- identification of conditions which may affect drinking water sources,
- identification of threats to drinking water sources,
- assessment of risks to the drinking water sources posed by activities within those vulnerable areas.

The Source Protection Plan is then developed by the Source Protection Committee to reduce the risks that those activities pose to the drinking water sources. The Clean Water Act requires that the Source Protection Committee develop a Terms of Reference which identifies the tasks to complete both the Assessment Report and the Source Protection Plan. This local guidance is intended, along with provincial rules, regulations and the Clean Water Act, to define the deliverables related to Threats and Risk Assessment tasks identified in the Terms of Reference.

This local guidance focuses on the threats and risk assessment portions of the assessment report. It is intended to give clarification and local interpretation of the sections in the Clean Water Act, its regulations and the associated technical rules pertaining to the threats and risk assessment. It must be read in conjunction with the Clean Water Act, its regulations and rules. References to some of those rules on which this local guidance is based are provided within the appendix to this local guidance.

This local guidance is intended to guide the current studies being undertaken by consultants, municipalities and conservation authorities. It will allow those undertaking the work to refine their work plans or develop supplemental work plans and to complete the tasks and deliverables identified in this local guidance. It is not intended to be a comprehensive outline of the work required to satisfy the requirements of the Act, regulations and rules, but must be read in conjunction with the provincial requirements.

This local guidance will allow the current work to proceed to a consistent conclusion so that material can be compiled into the first Assessment Report. In some cases additional work will be required through these studies. An example of this additional work would be site specific investigations to determine the circumstances associated with activities identified as threats.

### 3 Background

- Ministry Of Environment (MOE) funded municipalities and Conservation Authorities (CAs) to undertake technical studies
- These studies were initially based on agreements and later based on interim MOE source protection guidance.
- The work did not include detailed site specific inventories but instead relied upon desktop analysis of activities with the vulnerable areas and where necessary included drive-by inventories
- The inventories collected through this work included various levels of detail (in some studies the general activity was captured while not differentiating between specific activities such as various types of professional offices or farming)
- Most of the inventories were based on NAICS (North American Industry Classification System) codes as it was generally accepted that future risk assessment would be facilitated through provincial linking of the NAICS code to a hazard score
- The work which was initiated through these studies was intended to be a detailed inventory of activities which could be considered a threat within the entire WHPA or IPZ. At the point that the inventories were initiated there was no guidance available on the level of hazard which might constitute a threat nor was there a list of the activities which could be considered a threat.
- Subsequent to the initiation of these studies the CWA requirements, through regulations and rules, were developed. Specifically a list of prescribed threats was released as well as a table indicating the level of risk posed by an activity being undertaken under certain circumstances. This was different than the anticipated list of hazard ratings for a given NAICS code which was needed to assess the risks posed by the land uses identified in the inventories being developed.
- Although the inventories being developed through the initial studies will be useful in the risk assessment defined in this local guidance they were not developed with the needs now established through the regulations and rules.
- There are other challenges with adopting those inventories for use in this work such as the wide variation in the format and structure of the databases as well as the level of detail which was captured through the inventories.
- The rules now require lists of activities that are or would be threats. Inventories of existing activities are not required to develop these lists due to the requirement to identify what would be a threat if it were to be undertaken. Further, it is not necessary to distinguish whether an activity is currently undertaken from those that would be threats if they were to be undertaken, as a policy will need to be in place to manage the risk. Specifically, policies will be required to prevent activities from becoming a significant risk should such an activity be undertaken in the future. This is a significant departure from the methodology initiated based on interim guidance.
- The inventories will be useful in assisting the SPC to develop policies in that those policies may be significantly different if an activity is being undertaken than if it is not. For example it may be more likely to prohibit future activities than ones which are already in existence



- Assessment Reports also need to include a number of maps including significant drinking water threats
- Maps are needed which indicate where activities associated with chemicals, DNAPLs and pathogens pose significant. As the areas for each type of risk are different and overlap it may be necessary to map these areas on different maps.
- Similar maps are required for areas where activities associated with chemicals, DNAPLs and pathogens pose moderate risks as well as maps where those activities pose low risks. Ways of combining these maps with the maps of significant should be considered.
- These maps will all rely upon the vulnerability maps which have been created through previous work on these projects

## 4 Purpose and Objectives

This local guidance is intended to provide direction and guidance to consultants engaged in studies for the conservation authorities. It is recommended that municipalities working on similar projects utilize this local guidance in undertaking their projects, as ultimately their deliverables will be assembled into the Assessment Report with the other projects guided by this local guidance. This local guidance is intended to describe the minimum requirements to be included in the AR. There are also other aspects of the work related to threats and risk assessment which will be needed to inform and implement the Source Protection Plan (SPP).

The objectives of work described in this local guidance are:

1. to identify the number and types of significant risks,
2. to describe the lists and maps required by the Clean Water Act (and its regulations and rules)
3. to satisfy the requirements of the Clean Water Act, related rules and regulations as they pertain to water quality threats and risk assessment,
4. to provide information useful in developing policies to reduce risks to drinking water sources,
5. to provide information which will be beneficial when implementing the SPP

Although all of these objectives should be kept in mind, the focus of this local guidance is currently on satisfying the requirements of the first Assessment Report (numbers 1, 2 and 3 above) related to threats and risk assessment. The remaining objectives will be the focus of the second tier of this local guidance, described in Sections 5.3, 5.4 and 5.7, but currently beyond the scope of this local guidance.

## 5 Discussion

### 5.1 Studies

Threats and risk assessment work is being carried out through various technical studies. These studies are being lead by municipalities or CAs within the source protection region.

They were initiated through agreements with MOE. The work was defined within the agreement and later based on draft guidance modules provided as interim guidance. Those agreements still require the delivery of specific deliverables including threats inventories. These studies are currently being updated to meet the technical rules. This local guidance is focused on the minimum requirements related to threats and risk assessment required to meet those rules and focused on receiving those deliverables in time to meet legislated requirements rather than awaiting the completion of the other aspects of the studies (such as the threats inventories) which can be completed later. Much work has been undertaken on updating the other aspect of the technical work to meet those rules.

**Table 1 Current projects involving threats and risk assessment**

Ground-water Systems		Surface Water Systems	
Projects		Projects	
Perth	Stratford St Marys West Perth -Mitchell Perth East -Shakespeare (& Milverton)* Perth South - St Pauls, Sebringville*	Essex - Chatham Kent	Wallaceburg Wheatley South Chatham Kent/Chatham
London- Middlesex	City of London - Fanshawe, Hyde Park Thames Centre - Thorndale, Dorchester Kilworth Heights Subdivision, Melrose, Mount Brydges, Birr	West Elgin	West Elgin
Oxford	Woodstock, Innerkip, Ingersoll, Beachville-Loweville, Mount Elgin*, Embro, Lakeside*, Thamesford, Tavistock, Hickson-King*	Southern Lake Huron	LAWSS* Petrolia*
Chatham- Kent	Ridgetown Highgate		

Municipalities identified with an asterisk (\*) include vulnerable areas from water systems in neighbouring municipalities  
Note: Milverton is outside of the TSR SP Region but included in the technical study

## 5.2 Threats Inventories

County groundwater studies developed lists of potential threats within WHPA. They relied largely on professional judgment of the individuals undertaking the studies to identify land uses that could pose a risk to drinking water sources. This has resulted in significant variation in the detail and nature of the inventories. Source Protection technical studies improved those inventories where they existed before and initiated inventories where none existed before (surface water sources). These inventories were based on general land use categories or more specific categories as listed under the NAICS (North American Industry Classification System) classifications. Further information on the NAICS codes may be obtained at: <http://www.statcan.gc.ca/subjects-sujets/standard-norme/naics-scian/2002/naics-scian-02index-eng.htm>

Previous methodologies and guidance suggested that:

- a detailed parcel by parcel inventory was needed of all activities which might pose a threat to drinking water sources
- the activity would be described by a NAICS code

- each activity would need to be assessed to determine the hazard rating and multiplied by the vulnerability of the area where the activity was occurring
- the province would provide hazard scores related to the NAICS
- a database and look-up tables would be provided to facilitate this work

Since the studies were initiated the prescribed list of activities and the table of threats and circumstances under which they are considered threats have been released. The rules require a different approach where:

- a threat is an activity that occurs *or could occur* in an area
- the table of threats includes detailed descriptions of circumstances and identifies the level of risk (significant, moderate or low) depending on the type of vulnerable area and vulnerability score of a part of the vulnerable area in which the activity is being engaged
- the table includes the risk score of the activity based on the vulnerability zone and score in which the activity is being undertaken.
- the rules only require the number of significant threats to be counted in each vulnerable area.

This allows the inventory to be scoped and focus on:

- those areas where a significant risk could occur (with a vulnerability score of 8 or greater for chemical threats, WHPA-A and B, IPZ-1 and 2 for pathogens and WHPA-A, B and C for DNAPLs)
- the activities within those areas which could be significant

Threats inventories being developed and refined may be utilized if they are detailed enough and organized in such a fashion as to allow them to be compared or linked to the table of threats. The detailed circumstances are difficult to relate to the categories of NAICS codes. Although some links have been provided by the province along with the other look-up tables, this requires significant work to make links between the inventory and the table of activities and circumstances. In most cases additional information would be required to determine the appropriate circumstances under which the activity is being undertaken. Further, the list of NAICS codes and activities is not considered to be complete. These threats inventories will be important for the development of policies and in the implementation of the Source Protection Plan however they may not be the most efficient way to develop the required lists or count the number of locations where significant risks are occurring. Even if these lists are not used to determine the significant risks it will be important that they be completed and delivered to the conservation authorities as part of tier 2 of the work described in this local guidance. A more efficient methodology is described in this local guidance for completing the required deliverables in time for the submission of the Assessment Report.

In many cases the areas where a significant risk could occur is relatively small. Further, depending on the vulnerability score in those areas, the types of activities which need to be assessed to determine whether they are significant are limited. This list may include activities which were not captured in the originating inventories. Similarly, many activities

included in those inventories would not pose a significant risk in that location or perhaps even at locations with a lower vulnerability score.

Even if not utilized for this work it will be important that the inventories of threats be refined as they will be useful for other purposes. However, it may not be the most efficient way of satisfying the requirements of the rules and providing the required content for the Assessment Report. Scoped inventories with a focus on the deliverables identified below may be a more efficient way to collect and report on the information. This local guidance is intended to better describe the required outputs, rather than to define the methodology for creating those outputs.

### **5.3 WHPA-E and F for GUDI Systems (beyond the scope of this local guidance)**

Drinking water systems which have been determined to be Groundwater Under Direct Influence (GUDI) of surface water have additional vulnerable areas which must be defined. A WHPA-E must be defined if the surface influence has the potential for "short circuiting" the travel times established through the delineation of WHPA-B, C and D. A WHPA-F is also to be delineated where the system has issues which are not dealt with through WHPA-A, B, C, D and E.

Most of these areas have yet to be delineated and assessed for vulnerability. As a result the work associated with threats and risk assessment in those areas is beyond the scope of this local guidance. The methodologies described in this local guidance will be applied to those areas upon completion of the delineation and vulnerability scoring of those areas.

### **5.4 Threats contributing to Issues (beyond the scope of this local guidance)**

The rules require threats contributing to issues to be identified. The rules also allow for that work to be undertaken later if a work plan is included which identifies how and when that work will be completed. This is due to the significant effort and data which may be required to refine and substantiate the "issues contributing area".

In this region issues assessment on municipal water sources is currently underway. Until the issues assessment has been completed, identifying the threats contributing to the issues cannot be undertaken. It is expected that, in most cases, the issues assessment will identify a work plan for investigating the area and threats contributing to the issues, but will not actually be able to identify specific threats contributing to issues.

Threats contributing to issues are therefore not currently a part of this local guidance. In the future, however, it will be necessary to include, in the lists of threats, the threats which are tied to issues. This is important as threats associated with issues are significant and will therefore need to be added to the count of significant threats.

## **5.5 Conditions (beyond the scope of this local guidance)**

Conditions are the result of past activities. Technical Rule 126 describes the types of things which can be considered Conditions.

MOE has indicated that a condition cannot be the result of an activity which is still occurring. This is most likely a result of the fact that there are existing regulatory methods for dealing with these situations. However, if a material is found in a concentration and manner that would be considered a condition then it needs to be documented so that the SPC and MOE can consider the situation.

Although inventorying conditions is beyond the scope of this work and will be considered through separate local guidance, the following is provided in case a situation is identified through the work described in this local guidance.

- The situation needs to be considered to determine if it may be considered an imminent risk to the drinking water system. The operating authority, conservation authority and MOE need to be involved considering the situation.
- Where the potential condition is attributed to an existing activity, the activity should be assessed as a threat.
- Where the circumstances associated with the activity do not adequately describe the situation the unique circumstances surrounding this situation need to be considered and an appropriate hazard score is to be developed using the method described in the rules.
- The criteria for defining conditions may be used as a comparison.

As work associated with conditions is beyond the scope of this local guidance, therefore no allowance is required for this work. Should the situation above be identified a work plan will be developed with the consultant to deal with the situation.

## **5.6 Activities that are not included in the prescribed list**

Rule 119 (see Table 4 in Appendix A) allows the SPC to identify activities which are not on the prescribed list and which pose a risk to a drinking water source. The SPC is also able to identify circumstances not in the list with an activity. In order to identify an activity in this manner the committee (or actually the consultant on their behalf) must calculate the hazard related to the activity in the same manner as the hazards associated with the prescribed activities in the table of threats. The Director must agree with the calculations.

The consultant is to identify if there are any activities which the operating authority is concerned about. The consultant will investigate to determine if the activity is included in the prescribed lists. If it is not included in the prescribed lists or if the circumstances under which the activity is being undertaken are different than those described in the table of drinking water threats, such activities will be listed separate from the prescribed activities considered threats.

Further, through their review of activities occurring in the vulnerable areas, the consultant may identify activities being undertaken in the area which they think may pose a risk to the drinking water system, but which they cannot associate with the prescribed threats. The consultant shall consider activities which are similar in nature to those identified in the prescribed list, activities which involve similar chemicals to those listed, and circumstances which are not included in the prescribed list.

One such activity that the SPC has expressed a concern over is transportation corridors such as pipelines. Known major transportation corridors are to be identified and mapped within the vulnerable areas. The chemicals of concern identified in the threats tables are to be reviewed to determine the most hazardous material (highest hazard score) which may be transported along the corridor within the vulnerable area. This chemical is to be used to assess the risk score.

Activities which are identified in this manner will need to be evaluated to determine the hazard score for the activity. Where the methodologies described above are not able to allow the threat to be assessed the consultant is to provide suggestions as to similar activities or circumstances which could be relied upon in determining the hazard associated with the activity of concern. Doing a detailed analysis of the risk associated with these activities is beyond the scope of this local guidance and will need to be identified through a specific work plan should this situation arise.

The consultant shall also document activities which the operating authority is concerned about which are occurring beyond the vulnerable area. This may be useful in delineation of IPZ-3 and GUDI-F (for a GUDI system) where applicable. There is however no similar methodology for the extension of a vulnerable zone to include activities beyond WHPA-D for non-GUDI systems.

## **5.7 Future threats**

Activities which are or "would be" threats are to be included in the required lists. Generally this is addressed by including all activities listed in the prescribed lists even if they are not being engaged in an areas. Activities not currently being undertaken in the vulnerable areas "would be" threats if the activity was to be undertaken in the vulnerable area in the future. This greatly simplifies the process of identifying the activities which are or would be threats as the lists provide that information. Filtering and sorting of the lists will provide for a list which can be utilized for local consultation on the threats and risks. However, this is considerably more challenging when counting the number of locations at which significant risks are occurring.

O. Reg. 287/07 s13(1)6i requires that we identify the number of locations at which a person is engaging in an activity which is a significant threat. It also includes counting locations where the activity "would be" a *significant* drinking water threat. It is very difficult and in many cases impossible to identify the circumstances associated with a future activity, especially based only on land use identified in Official Plans and bylaws. The circumstances are critical in identifying whether an activity would be significant or not. It is therefore apparent that this was not the intent of the rules. Therefore a different

interpretation of "would be" is required in identifying if future activity should be included in the count of significant threats. MOE has indicated that in this case **"would be" should be interpreted as having the infrastructure in place to undertake the activity** which would be a significant drinking water threat.

As an example, if the structure is in place to house or store the quantity which would make the activity a significant risk, but it is not in use or houses a lower quantity, then this location is to be included as "would be" even although at that location the circumstances are not in place (ie there is not sufficient quantity) to make this a significant risk at this time. An empty fuel tank or chemical storage would be an example of this. The level of risk would be established based on the quantity which could be stored rather than based on the amount which is there at the current time. This is obvious for certain activities as the risk should not be calculated based on the half empty storage tanks at the time of assessment, when they will likely be filled at the time of the next delivery. A barn which is currently empty or houses far fewer livestock than it could house would be another example. Similarly it does not make sense to assess the risk based on an empty chicken barn when the barn could be filled up days or weeks later. This does present significant challenges when the intended activity is less obvious. Empty warehouses or other commercial buildings will require considerable judgment to be exercised in assessing the future risks associated with this activity. Reasonable assumptions will be needed. These assumptions must be documented. These assumptions should be conservative but reasonable. These types of situations will need to be dealt with on a case by case basis and will likely need to be considered through the tier 2 threats and risk assessment described below.

It is likely that in the first tier of threats and risk assessment those areas with the infrastructure in place to undertake an activity which would be a drinking water threat will be assumed to be engaged in that activity. It would only be through direct contact with the person engaged in the activity that we would be able to determine whether or not the activity is currently being engaged in. Through the subsequent tiers, an assessment of whether the activity should be classified as a future threat will need to be made, but at this stage it should be counted as a location where the activity is or would be a significant risk.

### **5.8 Event Based Significant Threats (beyond the scope of this local guidance)**

Rule 130 of the Technical Rules: Assessment Report (Dec 2008) identifies a activity threat as significant if modeling demonstrates that a release of a chemical parameter or pathogen from the activity would be transported to the intake and result in the deterioration of the water for use as a source of drinking water. Currently rule 130 restricts this methodology for identifying a significant risk to IPZ-3, however we understand that MOE is considering amending the rules to allow that same event based modeling to identify significant threats in the other intake protection zones. The work to undertake this event and activity specific modeling is beyond the scope of this local guidance.

## 6 Deliverables

The Clean Water Act, General Regulation (O. Reg. 287/07) and Technical Rules all make reference to deliverables required in the Assessment Report. Appendix A includes a table of those references. The previous guidance referred to a tier 1 and tier 2 risk assessment where tier 2 involved site investigation and discussions with landowners. Threats and Risk Assessment in most studies in the Thames-Sydenham and Region will require a similar 2 tiered approach where the first tier is based on existing inventories, desktop investigations or windshield surveys. Tier 1 of the Threats and Risk Assessment must be completed in time for Assessment Report Consultation - Phase 2 (October 2009). Where time permits more detailed investigation can be undertaken in tier 1, however in most cases the detailed, site specific investigation will not be able to be completed within tier 1.

### 6.1 Tier 1 Deliverables

The deliverables required are described in the following table. It is important to note that most of the deliverables do not rely upon a threats inventory in any way. The only exception to this is the enumeration of significant threats. Even this enumeration requires a scoped inventory only.

The scoped inventory is focused on the areas where a threat can pose a significant risk- where the vulnerability score is 8 or higher. Significant Risks can also be from threats which contributes to an issue or are identified through event specific modeling, both of which are beyond the scope of this project (although any threats contributing to an issue, that have been identified through other work, can be brought forward to this work and included in the lists).

While the Act, Regulations and rules identify the deliverables, the following table is intended to provide a local interpretation of how those deliverables may be satisfied. These deliverables are to be based on best available information through desktop exercises relying on existing threats inventories and where necessary or more efficient, windshield surveys. Where there is uncertainty, reasonable, but conservative assumptions are to be made. These assumptions may include what activity is being undertaken or specifics on the circumstances associated with the activity. These assumptions and the level of uncertainty also need to be documented.

The following table considers water quality threats only. Water Quantity threats and the vulnerable areas associated with water quantity are being considered through the Water Budget process and are therefore beyond the scope of this local guidance.

The focus of this local guidance is on the WHPAs and IPZs and the projects associated with these areas being undertaken by consultants and municipalities. Similar methodologies will be applied to the water quality threats associated with HVAs and SGRAs, but not as part of the work currently being undertaken through these technical studies.



**Table 2 Local Description of Deliverables related to threats**

#	Deliverable	Reference	Description
1.	List of Significant Threats	TR 9 (1)(d), OReg 287/07 s13(1)(3)	<ul style="list-style-type: none"> <li>List by prescribed activity for each vulnerability score within the vulnerable areas (WHPA, IPZ) in the study</li> <li>Include the circumstances under which the prescribed activity is considered a significant threat</li> <li>Include any local circumstances (which were not identified in the above point) under which the prescribed activity is considered a significant threat</li> <li>Table, text</li> </ul>
2.	Map of areas where pathogen activities can be significant	CWA s15 (2) (h)	<ul style="list-style-type: none"> <li>In the Assessment Report maps do not need to be separated out for each of significant, moderate, low and pathogen, DNAPL and chemical, but for the purposes of clarity and consultants submission each combination is to be mapped separately. Suggestions as to ways to map these collectively would be appreciated. The SPC will consider more efficient mapping methodologies in the Assessment Report</li> <li>Clean Water Act Mapping Symbology (April 2009) and data standards to be met</li> <li>Maps, text (explain in text the interpretation of the map of vulnerability scores and table of circumstances together that give the areas where activities are significant, moderate or low)</li> </ul>
3.	Map of areas where DNAPL activities can be significant	CWA s15 (2) (h)	
4.	Map of areas where chemical activities can be significant	CWA s15 (2) (h)	
5.	List of Moderate Threats	OReg 287/07 s13(1)(4)	<ul style="list-style-type: none"> <li>List by prescribed activity for each vulnerability score within the vulnerable areas (WHPA, IPZ) in the study</li> <li>Include the circumstances under which the prescribed activity is considered a moderate threat</li> <li>Include any local circumstances (which were not identified in the above point) under which the prescribed activity is considered a moderate threat</li> <li>Table, text</li> </ul>
6.	Map of areas where pathogen activities can be moderate	OReg287 s13(1)2(i)	<ul style="list-style-type: none"> <li>As per deliverables 2-4 above</li> </ul>
7.	Map of areas where DNAPL activities can be moderate	OReg287 s13(1)2(i)	

#	Deliverable	Reference	Description
8.	Map of areas where chemical activities can be moderate	OReg287 s13(1)2(i)	
9.	List of Low Threats	OReg 287/07 s13(1)(5)	<ul style="list-style-type: none"> <li>List by prescribed activity for each vulnerability score within the vulnerable areas (WHPA, IPZ) in the study</li> <li>Include the circumstances under which the prescribed activity is considered a low threat</li> <li>Include any local circumstances (which were not identified in the above point) under which the prescribed activity is considered a low threat</li> <li>Table, text</li> </ul>
10.	Map of areas where pathogen activities can be low	OReg287 s13(1)2(ii)	<ul style="list-style-type: none"> <li>As per deliverables 2-4 above</li> </ul>
11.	Map of areas where DNAPL activities can be low	OReg287 s13(1)2(ii)	
12.	Map of areas where chemical activities can be low	OReg287 s13(1)2(ii)	
13.	Local threats (other Activities) that are or would be drinking water threats	CWA s15(2)(g)(i), TR 7(3), 119-125, OReg 287/07 s13(1)(3), 13(1)(4), 13(1)(5)	<ul style="list-style-type: none"> <li>To be brought to the attention of the SPC for consideration as a drinking water threat</li> <li>Consider any concern of the treatment plant operating authority</li> <li>Consider any threat identified by the public through consultation on Assessment Report (information to be provided by CA following Phase 1 and 2 consultation sessions)</li> <li>Include a recommendation as to how to determine hazard rating (consider similar activities or activities with similar chemical, pathogen or DNAPL circumstances)</li> <li>Hazard rating approved by Director must be listed for each local threat</li> <li>Must be listed separately from the prescribed activities (No. 1,5,9)</li> <li>List local circumstances for activities that are significant, moderate or low drinking water threats</li> <li>Table, text</li> </ul>

#	Deliverable	Reference	Description
14.	Activities considered linked to issues	TR 115(4)	<ul style="list-style-type: none"> <li>This is a cross reference to the work undertaken through Issues Evaluation, the work is to be undertaken through that project, any issues based threats identified through that process can be brought forward to this project to complete the list of threats if they are available</li> </ul>
15.	Number of Locations where Significant Threats occur	OReg 287 Sec 13 (1) 6(i) TR 9(1)(e)	<ul style="list-style-type: none"> <li>This is to be the total number of locations at which an activity which is a significant threat is being engaged in within the WHPA or IPZ.</li> <li>For the purposes of this count a location will be defined as a property parcel.</li> <li>Where multiple occurrences of an activity are identified on the same parcel it is generally only to be counted once (except as noted in the following point). Where this the case the cumulative effect of the occurrences are to be considered (ie the volumes are to be summed) in evaluating the risk associated with that activity at that location</li> <li>Where multiple tenants are know to occupy the same property parcel and are involved with the same activity they shall each be included in the count.</li> <li>Roads and other corridors are to be counted as a single location</li> <li>Summarized as per the 19 prescribed activities under OReg 287/07 s 1.1(1) which are prescribed drinking water threats related to water quality</li> <li>The details associated with the activities counted are to be recorded as per deliverable 16 below.</li> <li>Table, text</li> </ul>
16.	Details on locations of significant threats	Information for SPC and project team	<ul style="list-style-type: none"> <li>Details on the locations where significant threats exist are to be submitted in a database and not to be included in the technical memo (deliverable 18)</li> <li>Data to be included with this deliverable will be defined in Appendix B.</li> <li>This information will allow the total to be recalculated when updated information is available as well as providing the staff and the SCP with a better understanding of the total</li> </ul>

#	Deliverable	Reference	Description
17.	List of prescribed Activities that are or would be drinking water threats for each vulnerable area	CWA s15(2)(g)(i) TR 7(3), 118, OReg 287/07 s1.1	<ul style="list-style-type: none"> <li>As per Technical Rule 118 these may be collectively listed in the assessment report as "<i>the activities prescribed to be drinking water threats in paragraphs 1 through 18 and paragraph 21 of subsection 1.1(1) of O. Reg. 287/07 (General)</i>"</li> <li>The above statement when combined with the lists of activities which are significant, moderate and low should satisfy this requirement, thus no separate deliverable is required as part of the technical studies.</li> </ul>
18.	Technical memorandum	Information to SPC	<ul style="list-style-type: none"> <li>to inform Assessment Report compilation</li> <li>description of the method of calculations and the general nature of assumptions shall be included in the technical memorandum</li> <li>to include specific description of work but may refer to this local guidance for general description</li> </ul>

## **6.2 Tier 2 Deliverables (beyond the scope of this local guidance)**

Deliverables completed in tier 1 will likely need to be refined through site specific investigation. Where an activity was identified as a significant risk, contact with the person engaged in the activity will occur through the Assessment Report Consultation (phase 3). This personal contact may result in refinement of assumptions made through the tier 1 Threats and Risk Assessment and may well eliminate activities from being identified as significant or in some cases from being identified as threats. As a result deliverables 15 and 16 above will be refined in tier 2. Although beyond the scope of this local guidance the following will be required in the tier 2 Threats and Risk Assessment:

- Threats inventories initiated through previous tiers of this work will be finalized and delivered to the municipality and SPA.
- These threats inventories are to satisfy the data standards developed by the MOE and/or the SPA
- It is proposed that the survey or census that was developed by the Regional Municipality of Waterloo and is being applied in the Lake Erie Source Protection Region would be used to ascertain the circumstances around the activities which are being undertaken in the vulnerable areas where a significant risk is possible.
- The work associated with this tier of the project is currently beyond the scope of this local guidance. This will be refined when final guidance and database are received from the MOE.

## 7 Consultation

The Thames-Sydenham and Region Source Protection Committee has adopted a staged consultation plan for the Assessment Report which goes beyond the regulatory requirements.

- Phase 1 focuses local consultation on the vulnerable areas.
- Phase 2 is again a locally focused consultation adding issues and an overview of threats and risk assessment.
- Phase 3 is a regionally focused consultation on the draft proposed Assessment Report.

Output from the technical studies is required for phase 2 consultation. It is, however, expected that in areas where there may be higher numbers of risks or a great deal of uncertainty related to the circumstances associated with the activities, that more work will be undertaken beyond phase 2 consultation and perhaps beyond the submission of the first assessment report in April 2010.

The consultants' participation in consultation is not required. Results from the consultation may however be brought to the attention of the consultants for consideration in finalizing their submissions.

For more details on the consultation phases please refer to the Assessment Report Consultation Plan.

## 8 Schedule

The Assessment Reports in the Thames-Sydenham and Region are required to be submitted by April 20, 2010. It is generally accepted that the Assessment Reports will not be complete at that time, however, they will be submitted with data gaps identified. Work will continue on filling those gaps while work on the Source Protection Plan is initiated. An addendum will be submitted which addresses those data gaps, where possible. The schedule for the submission of the addendum has not yet been determined. The addendum needs to be submitted in sufficient time to allow for its approval prior to and allow sufficient time for the submission of a complete Source Protection Plan by its legislated due date of August 20, 2012 (5 years from the appointment of the chair of the Thames-Sydenham and Region Source Protection Committee).

The addendum may include, among other things, an update of Threats and Risk Assessment based on a more detailed inventory of existing threats and circumstances (referred to in past provincial guidance and in this local guidance as Tier 2 Risk Assessment). The Assessment Report submitted in April 2010 must include the deliverables identified in section 6.1 above (Table 2). Prior to submission of the Assessment Report the stakeholders in the region must be consulted. This consultation will be undertaken by the Conservation Authorities as part of the consultation identified in the Source Protection Committee's Assessment Report Consultation Plan. As such the consultant will not be required to participate in the consultation as part of the work

described in this local guidance. Where the specific expertise of the consultant is required their involvement will be arranged for separately, outside of the work described in this local guidance.

The phased approach to consultation, as described in Section 7 above, has been adopted by the Source Protection Committee. The deliverables identified in Table 2 must be completed to allow for consultation in Phase 2 of the Assessment Report Consultation as this is the last local consultation of the components of the Assessment Report.

It is therefore necessary to have completed the work contained in this local guidance by October 23, 2009. The following table outlines the schedule for the completion of this work.

**Table 3 Schedule**

<b>Task/Milestone</b>	<b>Description</b>	<b>Date Due</b>
1. Comments on ToR	<ul style="list-style-type: none"> <li>This ToR is to be distributed to that consultants engaged in these projects and technical steering committees</li> <li>Consultant and municipal comment will be considered along with comments received from the SPC</li> </ul>	Aug 14, 2009
2. Final local guidance	<ul style="list-style-type: none"> <li>Local guidance will be finalized and redistributed to consultants for proposals</li> </ul>	Sept 8, 2009
3. Proposals Due	<ul style="list-style-type: none"> <li>Proposals to be brief letter form proposal requesting extension of existing work plan to include this work</li> <li>Proposals to include a cost of undertaking the work and a confirmation of schedule</li> </ul>	Sept 16 2009
4. Draft Tier 1 Report	<ul style="list-style-type: none"> <li>Technical memorandum including required lists and maps as per deliverables identified in table 2</li> </ul>	Oct 5, 2009
5. Final Tier 1 Report	<ul style="list-style-type: none"> <li>Final report considering comments of technical steering committee</li> </ul>	Oct 23, 2009
6. Tier 2 (beyond the scope of this ToR)	<ul style="list-style-type: none"> <li>To follow consultation on preliminary Assessment Report</li> <li>Timing to align with addendum to Assessment Report</li> </ul>	To be determined (summer/fall 2010)

## 9 Appendix A - Clean Water Act References to threats

This appendix includes excerpts from the Act, Regulations and Rules which are intended to provide a quick reference for the reader. It is important, however, that the current official version of the regulatory material should be referred to when interpreting the requirements related to the deliverables identified in this local guidance. The excerpts included below are based on:

Clean Water Act, 2006

Clean Water Act Ontario Regulation 287/07

Clean Water Act Technical Rules, December 12, 2008

MOE Guidance Modules, October 2006

Thames-Sydenham and Region Assessment Report Consultation Plan, July 29 2009

**Table 4 Technical Rules (dated Dec. 12, 2008) references to threats**

<b>Rule/Section</b>	<b>Sub Title</b>	<b>Content</b>	<b>References within this Rule/Section</b>
Part I. Rule 9. Sub rule 1. Sub sections (d), (e).  On Page 9	<b>Minimum information</b> in the Assessment Report	<b>Rule 9.</b> An assessment report shall include the following: (1) One or more maps, graphics or tables detailing, .....  <b>(d) activities that are or would be and conditions resulting from past activities that are drinking water threats</b> and their respective hazard rating if one is required to be determined in accordance with rule 120, 121 or 139;  <b>(e) the number of locations at which an activity that is a significant drinking water threat is being engaged in;</b> and	<b>Rule 120.</b> The chemical hazard rating of an activity that is not prescribed to be a drinking water threat under O. Reg. 287/07 (General) shall be a rating that in the opinion of the Director reflects the hazard..... <b>Rule 121.</b> The pathogen hazard rating of an activity that is not prescribed to be a drinking water threat under O. Reg. 287/07 (General) shall be a rating that in the opinion of the Director reflects the hazard..... <b>Rule 139.</b> For the purpose of rule 138, the hazard rating of a condition that results from a past activity is 10. <b>Rule 138.</b> The risk score of an area in respect of a condition that results from a past activity shall be calculated.....
Part XI. Rule 118. On Page 52	Activities <b>prescribed</b> to be drinking water threats	<b>Rule 118.</b> The activities prescribed to be drinking water threats for a vulnerable area in paragraphs 1 through 18 and paragraph 21 of subsection 1.1(1) of O. Reg. 287/07 (General) <b>may be collectively listed in the assessment report as “the activities prescribed to be drinking water threats in paragraphs 1 through 18 and paragraph 21 of subsection 1.1(1) of O. Reg. 287/07 (General)”.</b>	<b>O. Reg. 287/07 (General),</b> Subsection 1.1(1), Paragraphs 1 through 18 and paragraph 21-list of threats excluding quantity threats. <a href="#">(see next table)</a>
Part XI.	<b>Other Activities</b>	<b>Rule 119.</b> In addition to activities prescribed to be drinking	<b>O. Reg. 287/07 (General),</b> Subsection 1.1(1),

<p>Rule 119. On page 52</p>		<p>water threats in paragraphs 1 through 18 and paragraph 21 of subsection 1.1(1) of O. Reg. 287/07 (General), <b>an activity shall be listed as a drinking water threat for a vulnerable area if,</b></p> <p><b>(1) the activity has been identified by the source protection committee as an activity that may be a drinking water threat;</b></p> <p>(2) in the opinion of the Director, (a) the chemical hazard rating of the activity is greater than 4, or (b) the pathogen hazard rating of the activity is greater than 4; and</p> <p>(3) the risk score for an area within the vulnerable area in respect of the activity calculated in accordance with rule 122 is greater than 40.</p>	<p>Paragraphs 1 through 18 and paragraph 21 (see next table)</p> <p><b>Rule 122.</b> The risk score of an area within a vulnerable area in respect of an activity that is not listed in the Tables of Drinking Water Threats shall be calculated in accordance with the following formula:</p> <p>A x B</p> <p>where,</p> <p>A = the chemical hazard rating or pathogen hazard rating of the activity determined in accordance with 120 or 121 as the case may be; and</p> <p>B = the vulnerability of the score of the area within the vulnerable area determined in accordance with Part VII or Part VIII, as the case may be.</p>
<p>Rule 126</p>	<p><b>Conditions</b></p>	<p>Listing Conditions that result from past activities</p> <p>126. Without limiting the generality of subclause 15(2)(g)(ii) of the Act, the list of conditions that are drinking water threats prepared for the purpose of subclause 15(2)(g)(ii) of the Act shall include each of the following conditions that exist in a vulnerable area and that result from a past activity:</p> <p>(1) the presence of a non-aqueous phase liquid in groundwater in a highly vulnerable aquifer, significant groundwater recharge area or wellhead protection area;</p> <p>(2) 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</p> <p>(3) 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;</p> <p>(4) the presence of a contaminant in surface soil in a</p>	<p>15(2)(g)(ii)</p>



		<p>surface water intake protection zone if, the contaminant is listed in Table 4 of the Soil, Ground Water and Sediment Standards 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</p> <p>(5) 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</p>	
Rule 130	<b>Event Based Activity in IPZ-3</b>	<p>130. An activity listed as a drinking water threat in accordance with rule 118 or 119 is a significant drinking water threat in an IPZ-3 delineated in accordance with rule 68 at the location where the activity is carried on if modeling demonstrates that a release of a chemical parameter or pathogen from the activity would be transported through the surface water intake protection zone to the intake and result in the deterioration of the water for use as a source of drinking water for the intake.</p>	<p><b>Rule 118.</b> The activities prescribed to be drinking water threats for a vulnerable area in paragraphs 1 through 18 and paragraph 21 of subsection 1.1(1) of O. Reg. 287/07 (General) <b>may be collectively listed in the assessment report as “the activities prescribed to be drinking water threats in paragraphs 1 through 18 and paragraph 21 of subsection 1.1(1) of O. Reg. 287/07 (General)”</b>.</p> <p><b>Rule 119.</b> In addition to activities prescribed to be drinking water threats in paragraphs 1 through 18 and paragraph 21 of subsection 1.1(1) of O. Reg. 287/07 (General), <b>an activity shall be listed as a drinking water threat for a vulnerable area if,</b></p> <p><b>(1) the activity has been identified by the source protection committee as an activity that may be a drinking water threat;</b></p> <p>(2) in the opinion of the Director, (a) the chemical hazard rating of the activity is greater than 4, or (b) the pathogen hazard rating of the activity is greater than 4; and</p> <p>(3) the risk score for an area within the vulnerable area in respect of the activity calculated in accordance with rule 122 is greater than 40.</p> <p><b>Rule 68.</b> An area known as IPZ-3 shall be delineated for each type A and type B surface water intake and each type C and type D surface water intake located in Lake Nippising, Lake Simcoe, Lake St. Clair or the Ottawa River, associated with a drinking water</p>

			<p>system described in rule 58 and shall be composed of the following areas:</p> <ul style="list-style-type: none"><li>(1) Subject to rule 69, the area within each surface water body through which, modeling demonstrates, contaminants released during an extreme event may be transported to the intake;</li><li>(2) where the area delineated in accordance with subrule (1) abuts land,<ul style="list-style-type: none"><li>(a) a setback of not more than 120 metres inland along the abutted land measured from the high water mark of the surface water body that encompasses the area where overland flow drains into the surface water body; and</li><li>(b) the area of the Regulation Limit along the abutted land.</li></ul></li></ul>
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**Table 5 O. Reg. 287/07 (General) references to threats**

Section	Sub Title	Content	References within this Rule/Section
Section 1.1 (1)	<b>Prescribed</b> drinking water threats	<p>1.1 (1) The following activities are prescribed as drinking water threats for the purpose of the definition of “drinking water threat” in subsection 2 (1) of the Act:</p> <ol style="list-style-type: none"> <li>1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.</li> <li>2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.</li> <li>3. The application of agricultural source material to land.</li> <li>4. The storage of agricultural source material.</li> <li>5. The management of agricultural source material.</li> <li>6. The application of non-agricultural source material to land.</li> <li>7. The handling and storage of non-agricultural source material.</li> <li>8. The application of commercial fertilizer to land.</li> <li>9. The handling and storage of commercial fertilizer.</li> <li>10. The application of pesticide to land.</li> <li>11. The handling and storage of pesticide.</li> <li>12. The application of road salt.</li> <li>13. The handling and storage of road salt.</li> <li>14. The storage of snow.</li> <li>15. The handling and storage of fuel.</li> <li>16. The handling and storage of a dense non-aqueous phase liquid.</li> <li>17. The handling and storage of an organic solvent.</li> <li>18. The management of runoff that contains chemicals used in the de-icing of aircraft.</li> <li>19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.</li> <li>20. An activity that reduces the recharge of an aquifer.</li> <li>21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.</li> </ol>	Clean Water Act, 2006 Section 2 (1): definitions
Section 13 (1) Numbers 2 to 6	<b>Other information to</b>	13(1)The following information shall, in accordance with the regulations, the rules and the terms of reference, be included	Clean Water Act, 2006 <b>15(2) (i):</b> 'contain such other information as is

	<p>be contained in assessment report</p>	<p>in an assessment report under clause 15 (2) (i) of the Act:</p> <p>2. For each vulnerable area identified under clause 15 (2) (d) or (e) of the Act, an identification of the following areas within the vulnerable area:</p> <ul style="list-style-type: none"> <li>i. Areas where an <b>activity listed under subclause 15 (2) (g) (i)</b> of the Act <b>is or would be a moderate</b> drinking water threat.</li> <li>ii. Areas where an <b>activity listed under subclause 15 (2) (g) (i)</b> of the Act <b>is or would be a low</b> drinking water threat.</li> <li>iii. Areas where a <b>condition listed under subclause 15 (2) (g) (ii)</b> of the Act <b>is a moderate</b> drinking water threat.</li> <li>iv. Areas where a <b>condition listed under subclause 15 (2) (g) (ii)</b> of the Act <b>is a low</b> drinking water threat.</li> </ul> <p>3. For each area identified under subclause 15 (2) (h) (i) of the Act, the <b>circumstances</b> in which the activity listed under clause 15 (2) (g) of the Act <b>is or would be a significant</b> drinking water threat.</p> <p>4. For each area identified under subparagraph 2 i, the circumstances in which the activity listed under subclause 15 (2) (g) (i) of the Act <b>is or would be a moderate</b> drinking water threat.</p> <p>5. For each area identified under subparagraph 2 ii, the circumstances in which the activity listed under subclause 15 (2) (g) (i) of the Act <b>is or would be a low</b> drinking water threat.</p> <p>6. For each vulnerable area identified under clause 15 (2) (d) or (e) of the Act,</p> <ul style="list-style-type: none"> <li>i. <b>the number of locations</b> at which a person is engaging in an activity listed under subclause 15 (2) (g) (i) of the Act that <b>is or would be a significant</b> drinking water threat....</li> </ul>	<p>prescribed by the regulations'</p> <p><b>15 (2) (d) or (e):</b>  <i>(d) refers to identifying SGRAs and HVAs,  (e) refers to identifying IPZs and WHPAs</i></p> <p><b><u>15(2)(g)(i and ii):</u></b></p> <p>(g) list, for each vulnerable area identified under clauses (d) and (e),</p> <ul style="list-style-type: none"> <li>(i) <b>activities that are or would be</b> drinking water threats, and</li> <li>(ii) <b>conditions</b> that result from past activities and <b>that are</b> drinking water threats;</li> </ul> <p><b><u>15 (2) (h) (i):</u></b></p> <p>(h) identify, within each vulnerable area identified under clauses (d) and (e),</p> <ul style="list-style-type: none"> <li>(i) the areas where an activity listed under clause <b>(g) is or would be a significant</b> drinking water threat, and</li> <li>(ii) the areas where a condition listed under clause <b>(g) is a significant</b> drinking water threat; and</li> </ul>
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<p>Section 15 (2) (c) (iii)</p>	<p><b>Consultation on draft assessment report</b></p>	<p><b>As soon as reasonably possible after publishing the draft on the Internet, the source protection committee shall,</b>  (a)...  (b)...  (c) give a copy of the notice referred to in clause (a) to,  (i) the clerk. ....,  (ii) if any part of the reserve...,  (iii) <b>every person known to the source protection committee who is engaging in an activity listed under subclause 15 (2) (g) (i) of the Act that is or would be a significant drinking water threat,</b>  (iv)..  (v)..</p>	<p>Clean Water Act, 2006  <b><u>15(2)(g)( i and ii):</u></b>  (g) list, for each vulnerable area identified under clauses (d) and (e),  (i) <b>activities that are or would be</b> drinking water threats, and  (ii) <b>conditions</b> that result from past activities and <b>that are</b> drinking water threats;  <b>15 (2) (d) or (e):</b>  (d) refers to identifying SGRAs and HVAs,  (e) refers to identifying IPZs and WHPAs</p>
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**Table 6 Clean Water Act (2006) references to threats**

Rule/Section	Sub Title	Content	References within this Rule/Section
Section 15 (2) (g) and (h)	Assessment reports contents	<p><b>An assessment report shall, in accordance with the regulations, the rules and the terms of reference ,....</b></p> <p><b>(g) list, for each vulnerable area</b> identified under clauses (d) and (e),</p> <ul style="list-style-type: none"> <li>(i) activities that <b>are or would be drinking water threats</b>, and</li> <li>(ii) conditions that result from past activities and <b>that are drinking water threats</b>;</li> </ul> <p><b>(h) identify, within each vulnerable area</b> identified under clauses (d) and (e),</p> <ul style="list-style-type: none"> <li>(i) the areas where an activity listed under clause (g) <b>is or would be a significant</b> drinking water threat, and</li> <li>(ii) the areas where a condition listed under clause (g) <b>is a significant</b> drinking water threat; and</li> </ul> <p>(i).....</p>	<p><b>Clean Water Act 15 (2) (d) or (e):</b>  <i>(d) refers to identifying SGRAs and HVAs,</i>  <i>(e) refers to identifying IPZs and WHPAs</i></p>

## 10 Appendix B – Significant Threats Data Requirements

This appendix will contain the data requirements associated with Deliverable 16. The following are provided as examples only and will be replaced with a proper database definition of the fields and data to be submitted.

- Location of the activity (geospatial information – points, lines, polygons) in a geodatabase with object ID's associated with data included in a table below
- Roll#/ PIN of the property (or properties) on which the activity is being undertake, if appropriate and a specification of the date or version of the property data used to identify the parcel) for corridors this would not be applicable.
- Vulnerability score used in assessing the risk associated with this activity
- Activity being considered a threat (ActivityID)
- Circumstances associated with the activity(CircumstanceID)
- Person or company engaged in the activity (if known)
- Circumstances associated with the activity (rolled up to the property parcel)
- Details of the activity being undertaken on the site such as whether there are multiple occurrences at this location and whether it is know to be undertaken by multiple parties
- Risk score calculated based on the above
- An indication of the relative level of uncertainty (high or low)associated with the level of risk at that location
- Assumptions made regarding the activity and circumstances and the level of uncertainty associated with those assumptions
- The source of the information utilized in this assessment needs to be identified





# **Lower Thames Valley Source Protection Area Assessment Report**

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## **Threats and Circumstances Tables**

# **Lower Thames Valley Source Protection Area Assessment Report**

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## Threats Tables

The tables included and referenced in this appendix are intended to provide information on the types of activities which are or would be significant, moderate or low threats, as well as the circumstances which would result in the activity being a significant, moderate or low threat.

The province developed tables of drinking water threats which are posted on the MOE website (<http://www.ene.gov.on.ca/en/water/cleanwater/cwa-technical-rules.php>). These tables include the prescribed activities that can be identified as threats, the vulnerable areas where they can be identified as threats, the circumstances which make them threats and the level of risk that they pose in that area under those circumstances. The Technical Rules require that assessment reports identify the activities which would be threats and the areas where, within the vulnerable areas, they would be considered significant, moderate or low threats. The tables included and referenced in this appendix are intended to help satisfy that requirement.

The tables in this appendix should be read in conjunction with the maps related to Section 7 – Threats and Risk Assessment and the tables included on those maps. These maps, included in Appendix 1 of the Assessment Report, identify the areas where activities are or would be significant, moderate or low threats. The tables on the maps indicate the vulnerability and vulnerable area in which the activities would be significant, moderate or low threats. The tables included in this appendix indicate which activities in each of those vulnerable areas (as identified by the vulnerability score) would be significant, moderate or low. The tables are numbered based on the appendix that they are contained in (A10), the series (1), the vulnerable area (I2 for IPZ-2, WB for WHPA-B), and the vulnerability score (4.6) (eg. A10-1-I2-4.6 would indicate the activities which would be threats in an IPZ-2 with a vulnerability score of 4.6). The tables are included in the appendix in alpha-numeric order.

To determine the circumstances which would result in activities being significant, moderate or low, one can refer to the province's tables of drinking water threats discussed in the previous paragraph. The province has also developed individual tables which list the activities as either significant, moderate or low for a specific type of

vulnerable area and with a specific vulnerability score. There are 76 tables many of which are up to or over 50 pages. As such they have not been included in this Assessment Report, but are available on the internet. A link to the tables is provided at <http://www.sourcewaterprotection.on.ca/threats>.

An interactive threats tool has also been developed to search, query and filter the threats tables. This tool is based on the lookup tables which the province utilized to develop the tables of drinking water threats. This tool continues to be refined and updated as the province issues updated versions of the lookup tables. It is provided "*as is- with no warranty as to its accuracy or completeness*". The tool allows the user to explore the activities and the circumstances around those activities and determine the potential level of risk that would result in that area. As the work is continually being updated and improved it is important that the user refer to the official version of the tables of drinking water threats to confirm the results from the threats tool. This tool can be accessed from the web page <http://www.sourcewaterprotection.on.ca/threats>.

<b>Table A10-1-I1- 5</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-1 with a vulnerability score of 5	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	Yes	Yes
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	Yes	Yes
3. The application of agricultural source material to land.	No	No	No	No	Yes	Yes
4. The storage of agricultural source material.	No	No	No	No	Yes	Yes
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	Yes	Yes
7. The handling and storage of non-agricultural source material.	No	No	No	No	Yes	Yes
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	Yes	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	Yes	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	Yes	n/a
12. The application of road salt.	No	n/a	No	n/a	Yes	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	Yes	n/a
14. The storage of snow.	No	n/a	No	n/a	Yes	n/a
15. The handling and storage of fuel.*	No	n/a	No	n/a	Yes	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	Yes	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	Yes	Yes
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a
<b>Notes:</b> - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA. * In areas where event based modelling was used to assess potential threats, this activity may also be considered a significant drinking water threat under the circumstances modelled.						

<b>Table A10-1-I1- 6</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-1 with a vulnerability score of 6	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	Yes	Yes	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	Yes	Yes	Yes	Yes
3. The application of agricultural source material to land.	No	No	No	Yes	Yes	No
4. The storage of agricultural source material.	No	No	No	Yes	Yes	Yes
5. The management of agricultural source material.	No	No	No	No	No	Yes
6. The application of non-agricultural source material to land.	No	No	No	Yes	Yes	Yes
7. The handling and storage of non-agricultural source material.	No	No	No	Yes	Yes	Yes
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	Yes	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	Yes	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	Yes	n/a
12. The application of road salt.	No	n/a	No	n/a	Yes	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	Yes	n/a
14. The storage of snow.	No	n/a	No	n/a	Yes	n/a
15. The handling and storage of fuel.*	No	n/a	No	n/a	Yes	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	Yes	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	Yes	Yes	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	Yes	n/a
<b>Notes:</b> - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA. * In areas where event based modelling was used to assess potential threats, this activity may also be considered a significant drinking water threat under the circumstances modelled.						

<b>Table A10-1-I1- 7</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-1 with a vulnerability score of 7	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	Yes	Yes	Yes	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	Yes	Yes	Yes	Yes
3. The application of agricultural source material to land.	No	No	Yes	Yes	Yes	No
4. The storage of agricultural source material.	No	No	Yes	Yes	Yes	Yes
5. The management of agricultural source material.	No	No	No	No	No	Yes
6. The application of non-agricultural source material to land.	No	No	Yes	Yes	Yes	Yes
7. The handling and storage of non-agricultural source material.	No	No	Yes	Yes	Yes	Yes
8. The application of commercial fertilizer to land.	No	n/a	Yes	n/a	Yes	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	Yes	n/a
10. The application of pesticide to land.	No	n/a	Yes	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	Yes	n/a	Yes	n/a
12. The application of road salt.	No	n/a	Yes	n/a	Yes	n/a
13. The handling and storage of road salt.	No	n/a	Yes	n/a	Yes	n/a
14. The storage of snow.	No	n/a	Yes	n/a	Yes	n/a
15. The handling and storage of fuel.*	No	n/a	Yes	n/a	Yes	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	Yes	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	Yes	n/a	Yes	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	Yes	No	Yes	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	Yes	n/a
Notes: - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA. * In areas where event based modelling was used to assess potential threats, this activity may also be considered a significant drinking water threat under the circumstances modelled.						

<b>Table A10-1-I2- 4</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-2 with a vulnerability score of 4	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	Significant		Moderate		Low	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	No	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	No	No
3. The application of agricultural source material to land.	No	No	No	No	No	No
4. The storage of agricultural source material.	No	No	No	No	No	No
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	No	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	No	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	No	n/a
9. The handling and storage of commercial fertilizer.	No	n/a	No	n/a	No	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	No	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	No	n/a
12. The application of road salt.	No	n/a	No	n/a	No	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	No	n/a
14. The storage of snow.	No	n/a	No	n/a	No	n/a
15. The handling and storage of fuel.	No	n/a	No	n/a	No	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	No	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	No	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	No	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a
<b>Notes:</b> - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.						



<b>Table A10-1-I2- 4.2</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-2 with a vulnerability score of 4.2	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	No	Yes
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	Yes	Yes
3. The application of agricultural source material to land.	No	No	No	No	No	Yes
4. The storage of agricultural source material.	No	No	No	No	No	Yes
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	No	Yes
7. The handling and storage of non-agricultural source material.	No	No	No	No	No	Yes
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	No	n/a
9. The handling and storage of commercial fertilizer.	No	n/a	No	n/a	No	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	No	n/a
12. The application of road salt.	No	n/a	No	n/a	No	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	No	n/a
14. The storage of snow.	No	n/a	No	n/a	No	n/a
15. The handling and storage of fuel.	No	n/a	No	n/a	No	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	No	n/a	No	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	No	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	No	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	No	Yes
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a
<b>Notes:</b> - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.						

<b>Table A10-1-I2- 4.8</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-2 with a vulnerability score of 4.8	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	Yes	Yes
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	Yes	Yes
3. The application of agricultural source material to land.	No	No	No	No	Yes	Yes
4. The storage of agricultural source material.	No	No	No	No	Yes	Yes
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	Yes	Yes
7. The handling and storage of non-agricultural source material.	No	No	No	No	Yes	Yes
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	Yes	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	Yes	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	Yes	n/a
12. The application of road salt.	No	n/a	No	n/a	Yes	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	Yes	n/a
14. The storage of snow.	No	n/a	No	n/a	Yes	n/a
15. The handling and storage of fuel.*	No	n/a	No	n/a	Yes	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	Yes	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	Yes	Yes
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a
<b>Notes:</b> - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA. * In areas where event based modelling was used to assess potential threats, this activity may also be considered a significant drinking water threat under the circumstances modelled.						

Table A10-1-I2- 5.6 Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-2 with a vulnerability score of 5.6	Threat level dependant on circumstances related to the activity					
	Significant		Moderate		Low	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
Prescribed Drinking Water Threat (Activity)	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	Yes	Yes
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	Yes	Yes
3. The application of agricultural source material to land.	No	No	No	No	Yes	Yes
4. The storage of agricultural source material.	No	No	No	No	Yes	Yes
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	Yes	Yes
7. The handling and storage of non-agricultural source material.	No	No	No	No	Yes	Yes
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	Yes	n/a
9. The handling and storage of commercial fertilizer.	No	n/a	No	n/a	Yes	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	Yes	n/a
12. The application of road salt.	No	n/a	No	n/a	Yes	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	Yes	n/a
14. The storage of snow.	No	n/a	No	n/a	Yes	n/a
15. The handling and storage of fuel.	No	n/a	No	n/a	Yes	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	Yes	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	Yes	Yes
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a

Notes:

- n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.

<b>Table A10-1-I3- 1.8</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-3 with a vulnerability score of 1.8	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	No	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	No	No
3. The application of agricultural source material to land.	No	No	No	No	No	No
4. The storage of agricultural source material.	No	No	No	No	No	No
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	No	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	No	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	No	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	No	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	No	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	No	n/a
12. The application of road salt.	No	n/a	No	n/a	No	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	No	n/a
14. The storage of snow.	No	n/a	No	n/a	No	n/a
15. The handling and storage of fuel.*	No	n/a	No	n/a	No	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	No	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	No	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	No	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a

Notes:  
 - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.  
 \* In areas where event based modelling was used to assess potential threats, this activity may also be considered a significant drinking water threat under the circumstances modelled.

<b>Table A10-1-I3- 2.7</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-3 with a vulnerability score of 2.7	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	No	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	No	No
3. The application of agricultural source material to land.	No	No	No	No	No	No
4. The storage of agricultural source material.	No	No	No	No	No	No
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	No	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	No	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	No	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	No	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	No	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	No	n/a
12. The application of road salt.	No	n/a	No	n/a	No	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	No	n/a
14. The storage of snow.	No	n/a	No	n/a	No	n/a
15. The handling and storage of fuel.*	No	n/a	No	n/a	No	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	No	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	No	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	No	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a
<b>Notes:</b> - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA. * In areas where event based modelling was used to assess potential threats, this activity may also be considered a significant drinking water threat under the circumstances modelled.						

<b>Table A10-1-I3- 3.6</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-3 with a vulnerability score of 3.6	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	No	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	No	No
3. The application of agricultural source material to land.	No	No	No	No	No	No
4. The storage of agricultural source material.	No	No	No	No	No	No
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	No	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	No	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	No	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	No	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	No	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	No	n/a
12. The application of road salt.	No	n/a	No	n/a	No	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	No	n/a
14. The storage of snow.	No	n/a	No	n/a	No	n/a
15. The handling and storage of fuel.*	No	n/a	No	n/a	No	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	No	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	No	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	No	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a
Notes: - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA. * In areas where event based modelling was used to assess potential threats, this activity may also be considered a significant drinking water threat under the circumstances modelled.						

<b>Table A10-1-I3- 4.5</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-3 with a vulnerability score of 4.5	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	<b>Chemical</b>	<b>Pathogen</b>	<b>Chemical</b>	<b>Pathogen</b>	<b>Chemical</b>	<b>Pathogen</b>
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	Yes	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	Yes	No
3. The application of agricultural source material to land.	No	No	No	No	Yes	No
4. The storage of agricultural source material.	No	No	No	No	Yes	No
5. The management of agricultural source material.	No	No	No	No	Yes	No
6. The application of non-agricultural source material to land.	No	No	No	No	Yes	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	Yes	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	Yes	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	No	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	Yes	n/a
12. The application of road salt.	No	n/a	No	n/a	Yes	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	Yes	n/a
14. The storage of snow.	No	n/a	No	n/a	Yes	n/a
15. The handling and storage of fuel.*	No	n/a	No	n/a	No	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	No	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	Yes	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a

**Notes:**

- n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.

\* In areas where event based modelling was used to assess potential threats, this activity may also be considered a significant drinking water threat under the circumstances modelled.

<b>Table A10-1-I3- 5.4</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-3 with a vulnerability score of 5.4	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	Yes	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	Yes	No
3. The application of agricultural source material to land.	No	No	No	No	Yes	No
4. The storage of agricultural source material.	No	No	No	No	Yes	No
5. The management of agricultural source material.	No	No	No	No	Yes	No
6. The application of non-agricultural source material to land.	No	No	No	No	Yes	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	Yes	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	Yes	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	Yes	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	Yes	n/a
12. The application of road salt.	No	n/a	No	n/a	Yes	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	Yes	n/a
14. The storage of snow.	No	n/a	No	n/a	Yes	n/a
15. The handling and storage of fuel.*	No	n/a	No	n/a	Yes	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	Yes	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	Yes	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a
<b>Notes:</b> - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA. * In areas where event based modelling was used to assess potential threats, this activity may also be considered a significant drinking water threat under the circumstances modelled.						



<b>Table A10-1-I3- 6.3</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in an IPZ-3 with a vulnerability score of 6.3	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	Yes	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	Yes	No	Yes	No
3. The application of agricultural source material to land.	No	No	No	No	Yes	No
4. The storage of agricultural source material.	No	No	No	No	Yes	No
5. The management of agricultural source material.	No	No	No	No	Yes	No
6. The application of non-agricultural source material to land.	No	No	No	No	Yes	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	Yes	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	Yes	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	Yes	n/a
10. The application of pesticide to land.	No	n/a	Yes	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	Yes	n/a
12. The application of road salt.	No	n/a	No	n/a	Yes	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	Yes	n/a
14. The storage of snow.	No	n/a	No	n/a	Yes	n/a
15. The handling and storage of fuel.*	No	n/a	No	n/a	Yes	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	n/a	n/a	n/a	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	Yes	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	Yes	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	Yes	n/a
<b>Notes:</b> - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA. * In areas where event based modelling was used to assess potential threats, this activity may also be considered a significant drinking water threat under the circumstances modelled.						

<b>Table A10-1-HV-6</b> Circumstance which would result in a threat by prescribed activity in a HVA with a vulnerability score of 6	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	Yes	No	Yes	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	Yes	No	Yes	No
3. The application of agricultural source material to land.	No	No	No	No	Yes	No
4. The storage of agricultural source material.	No	No	No	No	Yes	No
5. The management of agricultural source material.	n/a	No	n/a	No	n/a	No
6. The application of non-agricultural source material to land.	No	No	No	No	Yes	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	Yes	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	Yes	n/a
9. The handling and storage of commercial fertilizer.	No	n/a	No	n/a	Yes	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	Yes	n/a
12. The application of road salt.	No	n/a	No	n/a	Yes	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	Yes	n/a
14. The storage of snow.	No	n/a	No	n/a	Yes	n/a
15. The handling and storage of fuel.	No	n/a	No	n/a	Yes	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	Yes	n/a	Yes	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	Yes	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	Yes	No
Notes: - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.						

<b>Table A10-1-SG-2</b> Circumstance which would result in a threat by prescribed activity in a SGRA with a vulnerability score of 2	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	No	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	No	No
3. The application of agricultural source material to land.	No	No	No	No	No	No
4. The storage of agricultural source material.	No	No	No	No	No	No
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	No	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	No	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	No	n/a
9. The handling and storage of commercial fertilizer.	No	n/a	No	n/a	No	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	No	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	No	n/a
12. The application of road salt.	No	n/a	No	n/a	No	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	No	n/a
14. The storage of snow.	No	n/a	No	n/a	No	n/a
15. The handling and storage of fuel.	No	n/a	No	n/a	No	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	No	n/a	No	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	No	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	No	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	No	No
<b>Notes:</b> - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.						

<b>Table A10-1-SG-4</b> Circumstance which would result in a threat by prescribed activity in a SGRA with a vulnerability score of 4	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	Significant		Moderate		Low	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	No	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	No	No
3. The application of agricultural source material to land.	No	No	No	No	No	No
4. The storage of agricultural source material.	No	No	No	No	No	No
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	No	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	No	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	No	n/a
9. The handling and storage of commercial fertilizer.	No	n/a	No	n/a	No	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	No	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	No	n/a
12. The application of road salt.	No	n/a	No	n/a	No	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	No	n/a
14. The storage of snow.	No	n/a	No	n/a	No	n/a
15. The handling and storage of fuel.	No	n/a	No	n/a	No	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	No	n/a	No	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	No	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	No	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	No	No
Notes: - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.						

<b>Table A10-1-SG-6</b> Circumstance which would result in a threat by prescribed activity in a SGRA with a vulnerability score of 6	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	Significant		Moderate		Low	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	Yes	No	Yes	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	Yes	No	Yes	No
3. The application of agricultural source material to land.	No	No	No	No	Yes	No
4. The storage of agricultural source material.	No	No	No	No	Yes	No
5. The management of agricultural source material.	n/a	No	n/a	No	n/a	No
6. The application of non-agricultural source material to land.	No	No	No	No	Yes	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	Yes	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	Yes	n/a
9. The handling and storage of commercial fertilizer.	No	n/a	No	n/a	Yes	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	Yes	n/a
12. The application of road salt.	No	n/a	No	n/a	Yes	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	Yes	n/a
14. The storage of snow.	No	n/a	No	n/a	Yes	n/a
15. The handling and storage of fuel.	No	n/a	No	n/a	Yes	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	Yes	n/a	Yes	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	Yes	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	Yes	No
Notes: - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.						

<b>Table A10-1-WA-10</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in a WHPA-A with a vulnerability score of 10	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Yes	Yes	Yes	No	Yes	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	Yes	Yes	Yes	Yes	Yes	No
3. The application of agricultural source material to land.	Yes	Yes	Yes	No	No	No
4. The storage of agricultural source material.	Yes	Yes	Yes	No	No	No
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	Yes	Yes	Yes	Yes	No	No
7. The handling and storage of non-agricultural source material.	Yes	Yes	Yes	Yes	No	No
8. The application of commercial fertilizer to land.	Yes	n/a	Yes	n/a	No	n/a
9. The handling and storage of commercial fertilizer.*	Yes	n/a	Yes	n/a	Yes	n/a
10. The application of pesticide to land.	Yes	n/a	Yes	n/a	Yes	n/a
11. The handling and storage of pesticide.	Yes	n/a	Yes	n/a	Yes	n/a
12. The application of road salt.	Yes	n/a	Yes	n/a	Yes	n/a
13. The handling and storage of road salt.	Yes	n/a	Yes	n/a	Yes	n/a
14. The storage of snow.	Yes	n/a	Yes	n/a	No	n/a
15. The handling and storage of fuel.	Yes	n/a	Yes	n/a	Yes	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	Yes	n/a	No	n/a	No	n/a
17. The handling and storage of an organic solvent.	Yes	n/a	Yes	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	Yes	n/a	Yes	n/a	Yes	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	Yes	Yes	Yes	No	No	No
Local Threat - The transportation of fuel	No	n/a	Yes	n/a	Yes	n/a

Notes:

- n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.

<b>Table A10-1-WB-6</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in a WHPA-B with a vulnerability score of 6	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	Yes	No	Yes	Yes
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	Yes	No	Yes	Yes
3. The application of agricultural source material to land.	No	No	No	No	Yes	Yes
4. The storage of agricultural source material.	No	No	No	No	Yes	Yes
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	Yes	Yes
7. The handling and storage of non-agricultural source material.	No	No	No	No	Yes	Yes
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	Yes	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	Yes	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	Yes	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	Yes	n/a
12. The application of road salt.	No	n/a	No	n/a	Yes	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	Yes	n/a
14. The storage of snow.	No	n/a	No	n/a	Yes	n/a
15. The handling and storage of fuel.*	No	n/a	No	n/a	Yes	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	Yes	n/a	No	n/a	No	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	Yes	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	Yes	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	Yes	Yes
Local Threat - The transportation of fuel	No	n/a	No	n/a	Yes	n/a
Notes: - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA. * In areas where event based modelling was used to assess potential threats, this activity may also be considered a significant drinking water threat under the circumstances modelled.						

<b>Table A10-1-WC-2</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in a WHPA-C with a vulnerability score of 2	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	No	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	No	No
3. The application of agricultural source material to land.	No	No	No	No	No	No
4. The storage of agricultural source material.	No	No	No	No	No	No
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	No	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	No	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	No	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	No	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	No	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	No	n/a
12. The application of road salt.	No	n/a	No	n/a	No	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	No	n/a
14. The storage of snow.	No	n/a	No	n/a	No	n/a
15. The handling and storage of fuel.	No	n/a	No	n/a	No	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	Yes	n/a	No	n/a	No	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	No	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	No	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	No	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a

Notes:

- n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.



<b>Table A10-1-WC-4</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in a WHPA-C with a vulnerability score of 4	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	Significant		Moderate		Low	
	Chemical	Pathogen	Chemical	Pathogen	Chemical	Pathogen
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	No	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	No	No
3. The application of agricultural source material to land.	No	No	No	No	No	No
4. The storage of agricultural source material.	No	No	No	No	No	No
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	No	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	No	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	No	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	No	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	No	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	No	n/a
12. The application of road salt.	No	n/a	No	n/a	No	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	No	n/a
14. The storage of snow.	No	n/a	No	n/a	No	n/a
15. The handling and storage of fuel.	No	n/a	No	n/a	No	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	Yes	n/a	No	n/a	No	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	No	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	No	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	No	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a
<b>Notes:</b> - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.						

<b>Table A10-1-WD-2</b> Circumstance which would result in a threat by prescribed activity or local drinking water threat in a WHPA-D with a vulnerability score of 2	<i>Threat level dependant on circumstances related to the activity</i>					
<b>Prescribed Drinking Water Threat (Activity)</b>	<b>Significant</b>		<b>Moderate</b>		<b>Low</b>	
	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>	<i>Chemical</i>	<i>Pathogen</i>
1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	No	No	No	No	No	No
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	No	No	No	No	No	No
3. The application of agricultural source material to land.	No	No	No	No	No	No
4. The storage of agricultural source material.	No	No	No	No	No	No
5. The management of agricultural source material.	No	No	No	No	No	No
6. The application of non-agricultural source material to land.	No	No	No	No	No	No
7. The handling and storage of non-agricultural source material.	No	No	No	No	No	No
8. The application of commercial fertilizer to land.	No	n/a	No	n/a	No	n/a
9. The handling and storage of commercial fertilizer.*	No	n/a	No	n/a	No	n/a
10. The application of pesticide to land.	No	n/a	No	n/a	No	n/a
11. The handling and storage of pesticide.	No	n/a	No	n/a	No	n/a
12. The application of road salt.	No	n/a	No	n/a	No	n/a
13. The handling and storage of road salt.	No	n/a	No	n/a	No	n/a
14. The storage of snow.	No	n/a	No	n/a	No	n/a
15. The handling and storage of fuel.	No	n/a	No	n/a	No	n/a
16. The handling and storage of a dense non-aqueous phase liquid.	No	n/a	No	n/a	No	n/a
17. The handling and storage of an organic solvent.	No	n/a	No	n/a	No	n/a
18. The management of runoff that contains chemicals used in the de-icing of aircraft.	No	n/a	No	n/a	No	n/a
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.	n/a	n/a	n/a	n/a	n/a	n/a
20. An activity that reduces the recharge of an aquifer.	n/a	n/a	n/a	n/a	n/a	n/a
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.	No	No	No	No	No	No
Local Threat - The transportation of fuel	No	n/a	No	n/a	No	n/a
<b>Notes:</b> - n/a means that the combination of zone and activity is not applicable. In the case of activities 19 and 20 which pertain to water quantity threats, these will only be identified in a WHPA-Q1 or Q2, through a Tier 3 Water Budget. Current information indicates that there are none of these identified in the LTVSPA.						

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## ***Appendix 11 – Glossary of Terms and Acronyms***

Glossary of Terms and Acronyms has been replaced by one included with the Source Protection Plan

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## ***Appendix 12 – References***

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[http://www.ebr.gov.on.ca/ERS-WEB-External/content/about.jsp?f0=aboutTheRegistry.info&menuIndex=0\\_1](http://www.ebr.gov.on.ca/ERS-WEB-External/content/about.jsp?f0=aboutTheRegistry.info&menuIndex=0_1)  
<http://www.ene.gov.on.ca/envision/techdocs/4167e.htm>  
<http://www.ene.gov.on.ca/envision/techdocs/4167e.htm>  
[http://publicdocs.mnr.gov.on.ca/View.asp?Document\\_ID=16696&Attachment\\_ID=34970](http://publicdocs.mnr.gov.on.ca/View.asp?Document_ID=16696&Attachment_ID=34970)  
<http://www.omafra.gov.on.ca/english/nm/nasm.html>  
[http://www.e-laws.gov.on.ca/html/statutes/english/elaws\\_statutes\\_90o40\\_e.htm#BK51](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o40_e.htm#BK51)  
<http://www.ene.gov.on.ca/envision/land/decomm/condition.htm>  
[http://www.sararegistry.gc.ca/default\\_e.cfm](http://www.sararegistry.gc.ca/default_e.cfm)  
[http://www.e-laws.gov.on.ca/html/regs/english/elaws\\_regs\\_070288\\_e.htm#Top](http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_070288_e.htm#Top)  
[http://www.e-laws.gov.on.ca/html/statutes/english/elaws\\_statutes\\_02s32\\_e.htm](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_02s32_e.htm)  
[https://www.placestogrow.ca/index.php?option=com\\_content&task=view&id=4&Itemid=9](https://www.placestogrow.ca/index.php?option=com_content&task=view&id=4&Itemid=9)  
[http://www.e-laws.gov.on.ca/html/statutes/english/elaws\\_statutes\\_90e19\\_e.htm](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90e19_e.htm)  
<http://www.on.ec.gc.ca/greatlakes/default.asp?lang=En&n=D11109CB-1>  
<http://www.ec.gc.ca/raps-pas/Default.asp?lang=En&n=299C927C-1>  
[http://www.e-laws.gov.on.ca/html/regs/english/elaws\\_regs\\_070284\\_e.htm](http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_070284_e.htm)  
[http://www.ene.gov.on.ca/envision/env\\_reg/er/documents/2009/010-7573%202.pdf](http://www.ene.gov.on.ca/envision/env_reg/er/documents/2009/010-7573%202.pdf)  
<http://www.ene.gov.on.ca/en/water/cleanwater/provincialTables.php>  
<http://www.ene.gov.on.ca/en/water/cleanwater/cwa-technical-rules.php>

# **Lower Thames Valley Source Protection Area Assessment Report**

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## ***Appendix 13 – MOE Communications***

# **Lower Thames Valley Source Protection Area Assessment Report**

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# **Lower Thames Valley Source Protection Area Assessment Report**

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## **Direction to Amend AR**

# Lower Thames Valley Source Protection Area Assessment Report

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Ministry of  
the Environment

Source Protection Programs  
Branch

14<sup>th</sup> Floor  
40 St. Clair Ave. West  
Toronto ON M4V 1M2

Ministère de  
l'Environnement

Direction des programmes de protection  
des sources

14<sup>e</sup> étage  
40, avenue St. Clair Ouest  
Toronto (Ontario) M4V 1M2



Log: ENV1174IT-2010-116

October 29, 2010

Mr. Robert Bedggood  
Thames and Sydenham and Region  
Source Protection Committee Chair  
Upper Thames River CA  
1424 Clarke Road  
London, ON  
N5V 5B9

Mr. Jerry Campbell  
General Manager  
Lower Thames Valley SPA  
100 Thames St  
Chatham, ON  
N7L 2Y8

Dear Mr. Bedggood and Mr Campbell:

You submitted your proposed Assessment Report for the Lower Thames Valley Source Protection Area on April 20, 2010. I have completed my review of the proposed Assessment Report and in accordance with my authority under Section 17(2)(b) of the *Clean Water Act, 2006*, I hereby direct that the Assessment Report be amended and resubmitted to me, according to the following numbered directions and in consultation with ministry staff, no later than January 15, 2011.

Please note that there are additional details and context provided where necessary to support the numbered directions but these additional details do not form part of the directions.

1. The AR be revised to include the required technical work, mapping, and enumeration of significant drinking water threats associated with managed land, livestock density, and impervious surfaces that is consistent with the requirements of the technical rules;
2. The AR be revised to include the technical work associated with the IPZ-2 delineation for the West Elgin emergency intake;
3. The AR be revised to ensure the public is given the information needed to determine the areas where activities are or would be a significant, moderate and low drinking water threats and the circumstances that apply.

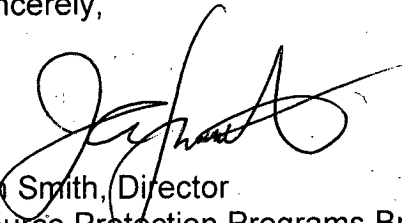
Additional context for this direction: The current report has a methodology section in

11. The AR be revised to include the correct design capacity of the West Elgin water treatment plant as per a public comment received during the 30-day consultation period;
12. Once the AR is revised based on these directions, the Source Protection Authority shall consult with the Source Protection Committee and with those persons or bodies impacted by the changes in an appropriate manner before resubmitting the amended AR in accordance with the Act and provide proof thereof with the resubmitted AR;
13. The SPA shall include with the resubmitted AR a memo or document outlining the changes made to the AR, as per these directions, including chapter references in the AR where changes were made; and
14. The SPA shall submit the revised AR to the ministry in the form of both a hard copy and electronic version for the ministry's review.

Please contact your Liaison Officer to arrange a meeting with ministry staff at the Source Protection Programs Branch to discuss these directions in more detail.

Thank you for your work to protect Ontario's sources of drinking water.

Sincerely,



Ian Smith, Director  
Source Protection Programs Branch  
Ministry of the Environment

- c: Brian King, Chairman, Lower Thames Valley  
Chris Tasker, Project Manager, Thames and Sydenham and Region SPA  
Keith Willson, Manager, Source Protection Approvals  
Heather Malcolmson, Manager, Source Protection Planning  
Teresa McLellan, Liaison Officer, Source Protection Implementation  
Melanie Ward, Group Leader, Source Protection Approvals  
Charley Worte, Conservation Ontario  
Ian Cameron, Ministry of Natural Resources



an appendix but has maps and text in the report that is not clearly linked to the methodology. As a result, it is difficult to understand if and where an activity poses a risk.

4. The AR be revised to correct the reference to the provincial tables of circumstances, to reflect 76 tables, not 73;
5. The discussion in the AR around issues and when activities become significant drinking water threats within a vulnerable area be revised to clearly describe that only activities documented through technical rule 115, pertaining to systems in the Terms of Reference, become significant drinking water threats within the delineated issue contributing area;
6. The AR be revised to clarify that the SPC can only add local threats, other than the 21 prescribed drinking water threats, upon approval of the Director;
7. The AR be revised to document issues that meet the tests in rule 114 in accordance with technical rule 115.

Additional context for this direction: Any issues that do not meet the test in rule 114 are documented as per technical rule 115.1. The rules do not allow that the AR include work plans to investigate issues. The only situation where a workplan is allowed in the technical rules related to issues is if an issue is documented as per rule 115, where the issue contributing area (technical rule 115(3)) and the identification of threats (technical rule 115(4)) can not be completed, a work plan as per rule 116 is required;

8. The AR be revised to ensure correct references are made to the rules that describe what are conditions throughout the report;

Additional context for this direction: The definition of condition should be amended in the report as per the technical rules as well as that there is more than one way that a condition could be identified as a significant drinking water threat including the event based approach where the condition has or could cause an issue at an intake.

9. The AR be revised to remove the work plan included to identify the WHPA E and F for the Highgate well.

Additional context for this direction: Since there are no issues identified for this well there is no requirement in the technical rules to delineate WHPA F. In addition, since this system is being reclassified to no longer be GUDI the well does not meet the test in rule 49, which requires WHPA E to be delineated if the interaction of surface water and groundwater decreases the time of travel;

10. The AR be revised to correctly reflect the issues or event based approaches of identifying threats.

Additional context for this direction: It is important for the AR to include an explanation that the vulnerability score is not the only method of identifying threats to Great Lake systems;



# **Lower Thames Valley Source Protection Area Assessment Report**

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Approval of AR

# **Lower Thames Valley Source Protection Area Assessment Report**

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Ministry of  
the Environment

Source Protection Programs  
Branch

14<sup>th</sup> Floor  
40 St. Clair Ave. West  
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Ministère de  
l'Environnement

Direction des programmes de protection  
des sources

14<sup>e</sup> étage  
40, avenue St. Clair Ouest  
Toronto (Ontario) M4V 1M2



Log: ENV1174IT-2010-35

February 4, 2011

Mr. Robert Bedggood  
Thames and Sydenham and Region  
Source Protection Committee Chair  
Upper Thames River CA  
1424 Clarke Road  
London, ON  
N5V 5B9

Mr. Jerry Campbell  
General Manager  
Lower Thames Valley SPA  
100 Thames St  
Chatham, ON  
N7L 2Y8

Dear Mr. Bedggood and Mr. Campbell:

Thank you for the resubmission of your amended proposed Assessment Report for the Lower Thames Valley Source Protection Area on January 18, 2011. I have completed my review of the amended proposed Assessment Report and in accordance with my authority under clause 17(3)(a) of the *Clean Water Act, 2006*, I hereby approve your amended Assessment Report.

At this time, I would like to remind you that the Source Protection Authority is required to make the approved Assessment Report available to the public as soon as reasonably possible on the Internet and in any other manner the Authority considers appropriate.

In addition, I would also like to take this opportunity to remind you that your Source Protection Plan is due for submission to the Minister of the Environment on or before August 20, 2012.

I appreciate the efforts of the Source Protection Committee and Authority in going beyond the regulatory consultation requirements by offering to send CDs of the draft proposed and proposed Assessment Report to interested parties and for posting the amended proposed Assessment Report on the Internet providing an additional opportunity for public input.

Thank you for your work to protect Ontario's sources of drinking water.

Sincerely,



Ian Smith, Director  
Source Protection Programs Branch  
Ministry of the Environment

- c:     **Brian King, Chairman, Lower Thames Valley**  
       **Chris Tasker, Project Manager, Thames and Sydenham and Region SPA**  
       **Keith Willson, Manager, Source Protection Approvals**  
       **Heather Malcolmson, Manager, Source Protection Planning**  
       **Teresa McLellan, Liaison Officer, Source Protection Implementation**  
       **Melanie Ward, Group Leader, Source Protection Approvals**  
       **Charley Worte, Conservation Ontario**  
       **Mike Garraway, Ministry of Natural Resources**  
       **Sara Moore-German, Program Analyst, Source Protection Approvals**

## **Transportation of Fuel Approval**

# Lower Thames Valley Source Protection Area Assessment Report

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Ministry of the Environment  
and Climate Change

Source Protection Programs  
Branch

14<sup>th</sup> Floor  
40 St. Clair Ave. West  
Toronto ON M4V 1M2

Ministère de l'Environnement et de  
l'Action en matière de changement  
climatique

Direction des programmes de protection  
des sources

14<sup>e</sup> étage  
40, avenue St. Clair Ouest  
Toronto (Ontario) M4V 1M2



September 15, 2014

Mr. Chris Tasker,  
Thames, Sydenham and Region Source Protection Project Manager  
Upper Thames River Conservation Authority,  
1424 Clarke Road London, Ontario, N5V 5B9

Dear Mr. Tasker:

We are in receipt of your email dated August 22, 2014 requesting a Director's opinion under Technical Rule 119 on the addition of the following local threat for the Lower Thames Valley Source Protection Area (LTVSPA):

- Transportation of fuel along provincial highways, county and local roads, railways and waterways along corridors that pass through vulnerable areas in the LTVSPA.

This activity, among other activities, was approved as a local threat for the St. Clair Region Source Protection Area (SCRSPA) on September 11, 2011.

In accordance with my authority under Rules 119, 120, or 121, I am of the opinion that the hazard rating is greater than 4 for this activity. Therefore, the transportation activity as set out in Table 1 is approved as local threat in the LTVSPA. Table 1 is presented in a format similar to the tables of drinking water threats and provides the vulnerability score necessary for an activity to be a significant, moderate or low drinking water threat.

We understand you may be evaluating this activity using the event based modelling approach allowed under Technical Rules 68 and 130. Under that approach, the vulnerability scores in Table 1 are not used to evaluate the threat: instead modelling determines if the activity is a significant threat. The table has been provided to meet the Technical Rules requirements associated with adding a local threat.

Your rationale for the inclusion of this local threat along with a copy of this letter must be included in your amended assessment report.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ling Mark', with a small flourish at the end.

Ling Mark, Director  
Source Protection Programs Branch  
Ministry of the Environment and Climate Change

c:

Robert Bedggood, Source Protection Region Chair, Thames, Sydenham and  
Region Source Protection Committee  
Heather Malcolmson, Manager, Source Protection Approvals  
Marie LeGrow, Manager, Source Protection Planning  
Teresa McLellan, Liaison Officer, TSR, Source Protection Implementation

ACTIVITY, CIRCUMSTANCES, AND AREAS WHERE THE ACTIVITY IS SIGNIFICANT, MODERATE OR LOW THREAT  
Lower Thames Valley Source Protection Area

TABLE 1: TRANSPORTATION OF FUELS

TRANSPORTATION OF FUELS	Activity	Vulnerability Score to produce a Significant DWT		Vulnerability Score to produce a Moderate DWT		Vulnerability Score to produce a Low DWT	
		IPZ-1,2,3, WHPA-E	WHPA-A, B, C, C1, D	IPZ-1,2,3, WHPA-E	WHPA-A, B, C, C1, D	IPZ-1,2,3, WHPA-E	WHPA-A, B, C, C1, D
	1. The transportation of Petroleum hydrocarbons (PH) F1 (C6-10). 2. PH F1 (C6-10) is transported in a quantity of 25-250 L or 25-250 kg. 3. A spill may result in the release of PH F1 (C6-10) to surface water.	---	---	---	---	10 - 7.2	10 - 8
	1. The transportation of Petroleum hydrocarbons (PH) F2 (>C10-16). 2. PH F2(>C10-16) are transported in a quantity of 25-250 L or 25-250 kg. 3. A spill may result in the release of PH F2(>C10-16) to surface water.	---	---	---	---	10 - 7.2	10 - 8
	1. The transportation of Petroleum hydrocarbons (PH) F3 (>C16-34). 2. PH F3 (>C16-34) is transported in a quantity of 25-250 L or 25-250 kg. 3. A spill may result in the release of PH F3 (>C16-34) to surface water.	---	---	10	---	9 - 6.4	10 - 8
	1. The transportation of Petroleum hydrocarbons (PH) F4 (>C34-50). 2. PH F4(>C34-50) is transported in a quantity of 25-250 L or 25-250 kg. 3. A spill may result in the release of PH F4(>C34-50) to surface water.	---	---	---	---	10 - 7	10 - 8
	1. The transportation of BTEX compounds. 2. BTEX compounds is transported in a quantity of 25-250 L or 25-250 kg. 3. A spill may result in the release of BTEX compounds to surface water.	---	---	10	10	9 - 6.4	8
	1. The transportation of Petroleum hydrocarbons (PH) F1 (C6-10). 2. PH F1 (C6-10) is transported in a quantity of >250-2500 L or >250-2500 kg. 3. A spill may result in the release of PH F1 (C6-10) to surface water.	---	---	10	10	9 - 6.4	8
	1. The transportation of Petroleum hydrocarbons (PH) F2 (>C10-16). 2. PH F2 (>C10-16) are transported in a quantity of >250-2500 L or >250-2500 kg. 3. A spill may result in the release of PH F2 (>C10-16) to surface water.	---	---	10	10	9 - 6.3	8

**TRANSPORTATION OF FUELS**

Activity	Vulnerability Score to produce a Significant DWT		Vulnerability Score to produce a Moderate DWT		Vulnerability Score to produce a Low DWT	
	IPZ-1,2,3, WHPA-E	WHPA-A, B, C, C1, D	IPZ-1,2,3, WHPA-E	WHPA-A, B, C, C1, D	IPZ-1,2,3, WHPA-E	WHPA-A, B, C, C1, D
<ol style="list-style-type: none"> <li>1. The transportation of Petroleum hydrocarbons (PH) F3 (&gt;C16-34).</li> <li>2. PH F3 (&gt;C16-34) is transported in a quantity of &gt;250-2500 L or &gt;250-2500 kg.</li> <li>3. A spill may result in the release of PH F3 (&gt;C16-34) to surface water.</li> </ol>	---	---	10-9	10	8.1-6	8
<ol style="list-style-type: none"> <li>1. The transportation of Petroleum hydrocarbons (PH) F4 (&gt;C34-50).</li> <li>2. PH F4 (&gt;C34-50) is transported in a quantity of &gt;250-2500 L or &gt;250-2500 kg.</li> <li>3. A spill may result in the release of PH F4 (&gt;C34-50) to surface water.</li> </ol>	---	---	10	10	9-6.3	8
<ol style="list-style-type: none"> <li>1. The transportation of Petroleum hydrocarbons (PH) F4 (&gt;C34-50) to surface water.</li> <li>2. BTEX compounds is transported in a quantity of &gt;250-2500 L or &gt;250-2500 kg.</li> <li>3. A spill may result in the release of PH F4 (&gt;C34-50) to surface water.</li> </ol>	---	---	10-9	10	8.1-6	8-6
<ol style="list-style-type: none"> <li>1. The transportation of Petroleum hydrocarbons (PH) F1 (C6-10).</li> <li>2. PH F1 (C6-10) is transported in a quantity of &gt;2500 L or &gt; 2500 kg.</li> <li>3. A spill may result in the release of PH F1 (C6-10) to surface water.</li> </ol>	---	---	10	10	9-6.4	8-6
<ol style="list-style-type: none"> <li>1. The transportation of Petroleum hydrocarbons (PH) F2 (&gt;C10-16).</li> <li>2. PH F2 (&gt;C10-16) are transported in a quantity of &gt;2500 L or &gt; 2500 kg.</li> <li>3. A spill may result in the release of PH F2 (&gt;C10-16) to surface water.</li> </ol>	---	---	10	10	9-6.3	8-6
<ol style="list-style-type: none"> <li>1. The transportation of Petroleum hydrocarbons (PH) F3 (&gt;C16-34).</li> <li>2. PH F3 (&gt;C16-34) is transported in a quantity of &gt;2500 L or &gt; 2500 kg.</li> <li>3. A spill may result in the release of PH F3 (&gt;C16-34) to surface water.</li> </ol>	---	---	10-9	10	8.1-6	8-6
<ol style="list-style-type: none"> <li>1. The transportation of Petroleum hydrocarbons (PH) F4 (&gt;C34-50).</li> <li>2. PH F4 (&gt;C34-50) is transported in a quantity of &gt;2500 L or &gt; 2500 kg.</li> <li>3. A spill may result in the release of PH F4 (&gt;C34-50) to surface water.</li> </ol>	---	---	10	10	9-6.3	8-6
<ol style="list-style-type: none"> <li>1. The transportation of BTEX compounds.</li> <li>2. BTEX compounds is transported in a quantity of &gt;2500 L or &gt; 2500 kg.</li> <li>3. A spill may result in the release of BTEX compounds to surface water.</li> </ol>	---	---	10-9	10-8	8.1-6	6

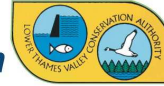
# **Lower Thames Valley Source Protection Area Assessment Report**

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## **IPZ-3 Alternate Method**

# **Lower Thames Valley Source Protection Area Assessment Report**

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Thames - Sydenham and Region  
c/o Upper Thames River Conservation Authority  
1424 Clarke Road, London, ON, N5V 5B9

December 4, 2014

Ling Mark  
Director - SOURCE PROTECTION PROGRAMS BRANCH  
14th Floor, 40 St Clair Ave W,  
Toronto, ON, M4V1M2

Dear Ling,

Re: **Request for use of alternative method under rule 15.1 for Stoney Point IPZ-3 extending up the Thames River watershed**

The Thames-Sydenham and Region Source Protection Committee (SPC) is preparing to consult on an amended proposed Source Protection Plan (SPP) and updated Assessment Reports (AR). Part of the work in the updated AR for the Lower Thames Valley Source Protection Area includes the delineation of an IPZ-3 for the Stoney Point Intake (an intake located in the Essex Region Source Protection Area) extending up the Thames River and its tributaries. In delineating this IPZ-3 the SPC has identified a challenge which could be relieved through an alternative delineation method as allowed by rule 15.1 of the Director's Technical Rules, 2009. A similar request was granted related to the delineation of the IPZ-2 for Wallaceburg in the St Clair Region Assessment Report.

The delineation of this new IPZ-3 for the Stoney Point intake in the Assessment Report is based on modelling which identifies that fuel released at various points in the vicinity of the mouth of the Thames River can reach the Stoney Point intake at concentrations which result in a deterioration of the water for the purposes of drinking. Additional work was undertaken to assess the impacts of similar releases in the upstream areas of the tributaries which flow to the mouth of the Thames.

Rules 68(1) and 69 limit the IPZ-3 within the surface water body to those areas where contaminants may be transported to the intake as a result of an extreme event. Rule 68(2) requires that the IPZ-3 shall be composed of a setback on land which is the greater of 120 m from the high water mark or the Conservation Authority Regulation Limit. If the 120m setback is used, the setback is only to contain those areas where overland flow drains into the surface water body. The inclusion of the Regulatory Limit does not have the same requirement as the 120 m setback to include only those areas which drain to the watercourse. The Regulatory Limits for the lower reaches of the Thames

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Lower Thames Valley Conservation Authority  
100 Thames Street, Chatham, Ontario,  
N7L 2Y8

St. Clair Region Conservation Authority  
205 Mill Pond Cres., Strathroy, Ontario,  
N7G 3P9

Upper Thames River Conservation Authority  
1424 Clarke Road, London, ON  
N5V 5B9

phone 519-354-7310, fax 519-352-3435

phone 519-245-3710, fax. 519-245-3348

phone 519-451-2800, fax 519-451-1188

River are provided in the attached map. They are characterized by large expansive Regulation Limits which extend beyond an extensive dyking and pumping scheme. While the dykes are intended to protect the areas from all but the most severe floods they also prevent the direct drainage of those areas back into the watercourse. Further, some of these areas covered by the Regulation Limit do not actually drain to the watershed in which the release is being modelled. Many of those that do drain back to the modelled watercourses do so through pumps. Those pumps result in dilution of the contaminant behind the dyke. The resulting concentrations are considerably less than the concentrations shown through modelling to result in deterioration at the intake. Including the full Regulatory Limit in the delineation of IPZ-3 would lead to a situation where the IPZ-3 includes extensive areas which were: not modelled; under the circumstances modelled a spill would not result in the deterioration of water quality at the intake for the purposes of drinking; or drain to other watercourses. For these reasons these areas would be excluded from the Event Based Area (EBA) and the SPC maintains that they should also be excluded from the IPZ-3 which has been delineated to include the EBA.

We are therefore requesting that you provide us with a written confirmation to depart from the requirement to use the greater setback prescribed in technical rules of the 68(2[a]) or 68(2[b]). We would instead apply only technical rule 68 (2[a]) for the purpose of IPZ-3 delineation for the Stoney Point intake extending up the Thames River. By confirming this departure from the rules the IPZ-3 in this area would include only those lands from which contaminants released during the extreme event modelled may be transported to the intake at a concentration which would deteriorate the quality of water for the purposes of drinking.

We thank you for your consideration of this request and look forward to being able to include the results from this work in an updated Assessment Report for the Lower Thames Valley Source Protection Area. If you have any questions on this please do not hesitate to contact Jason Wintermute at the Lower Thames Valley Conservation Authority.

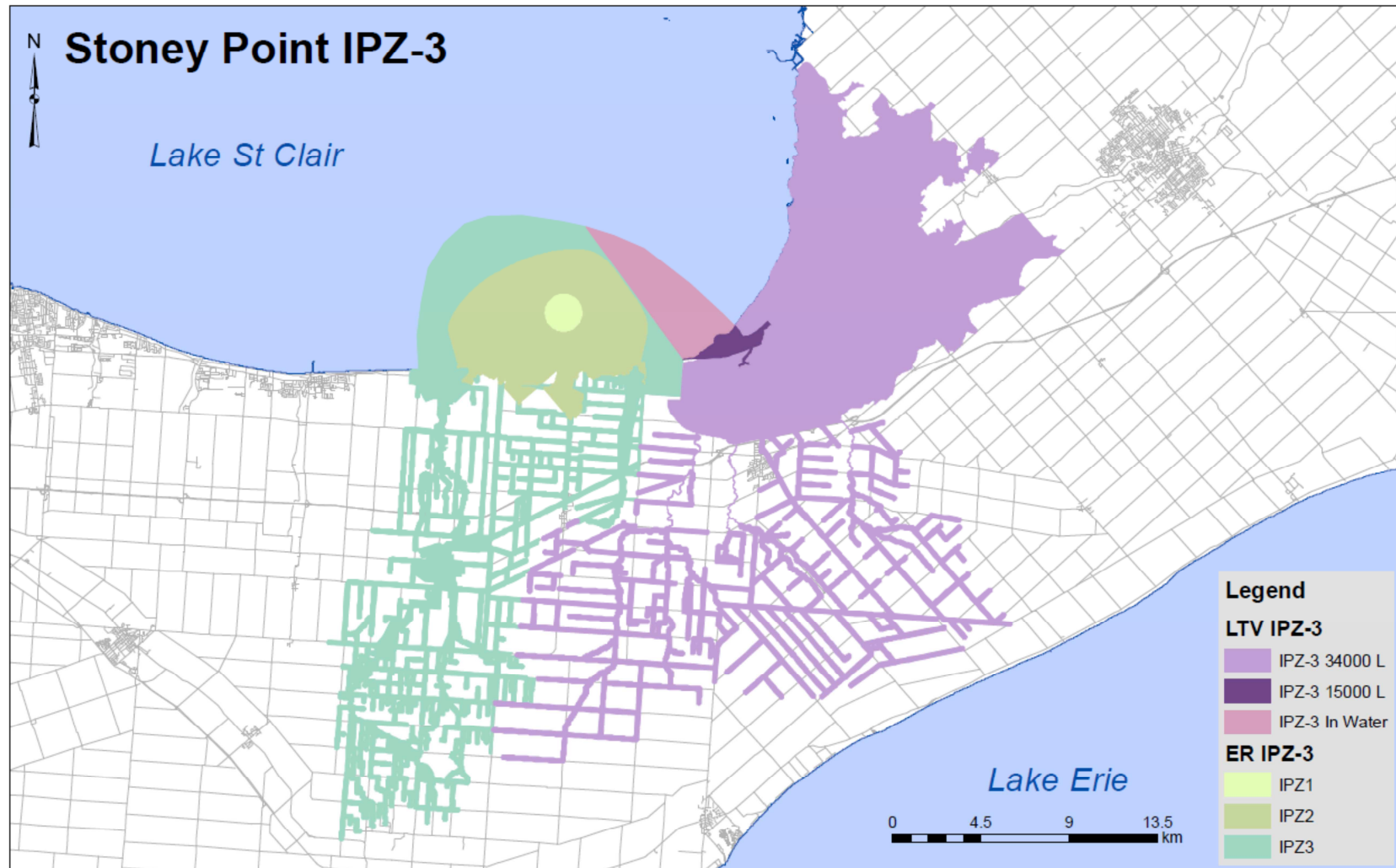
Sincerely Yours,  
THAMES-SYDEHAM AND REGION



Robert Bedggood, Chair  
Source Protection Committee

cc Chris Tasker, UTRCA  
Jason Wintermute, LTVCA  
Don Pearson, LTVCA  
George Jacoub, MOECC  
Teresa McClellan, MOECC





**Potential IPZ-3 including CA Regulated Area.** The extensive regulated area would include large areas which modelling has not been applied to. Some of these areas do not drain to the waterbodies within which the modelled spills were assessed. Although the EBA may be restricted based on the modelling results, this would leave an extensive IPZ-3 beyond the areas included based on modelling.

