



UPPER THAMES RIVER ASSESSMENT REPORT

Section Summary - 7.0 Threats and Risk Assessment

Section Summaries

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

7.0 Threats and Risk Assessment

In order to protect drinking water sources, it is necessary to identify the activities within vulnerable areas that pose a threat to drinking water sources, and to assess the risks due to those threats. This section summary provides an overview of the Water Quality Threats and Risk Assessment work conducted in the Upper Thames River Source Protection Area (SPA). For more information, refer to Section 7.0 - Threats and Risk Assessment, of this Assessment Report. Water Quantity related threats and risks are described in Section 3.0 - Water Budget and Water Quantity Stress Assessment.

What is a Drinking Water Threat?

According to the Clean Water Act, a drinking water threat is an “activity or condition that adversely affects or has the potential to adversely affect the quality or quantity of any water that is or may be used as a source of drinking water.” Risk assessment is the process of assessing threats to determine their relative risk to the drinking water source. It considers the vulnerability of the area where the activity is being undertaken and the hazard associated with the activity.

Prescribed Drinking Water Threats

The Clean Water Act and General Regulation 287/07 provides a list of 21 prescribed drinking water threats. That list is reproduced in the Threats and Risk Assessment Section of the Assessment Report and summarized in Table 1.

Table 1. Summarized List of Prescribed Drinking Water Threats

• Application, handling and storage of agricultural source material (manure), non-agricultural source material (bio-solids), commercial fertilizer, pesticide or road salt
• Handling and storage of fuel, dense non-aqueous phase liquids, or organic solvents
• Management of runoff that contains aircraft de-icing chemicals
• Livestock grazing or pasturing land, outdoor confinement areas or farm-animal yards
• Snow storage
• Systems that collect, store, transmit, treat or dispose of sewage
• Waste disposal sites

Note: This table has combined similar types of activities that are identified in the regulation as distinct prescribed drinking water threats.

Other Activities

The Clean Water Act also allows the Source Protection Committee (SPC) to include activities that they consider to be drinking water threats but which are not prescribed drinking water threats. The SPC can also identify additional circumstances under which they consider the activity a prescribed drinking water threat.

An examination of the threats inventory available for review has not resulted in the identification of any other activities or circumstances at this point. The Thames-Sydenham and Region SPC has expressed a concern to the Ministry of Environment (MOE) over the risks associated with the transportation of materials through pipelines or other corridors. The SPC has also expressed a concern over the potential risk that geothermal systems pose to groundwater sources of drinking water. The SPC will give further consideration to these activities and may include them in a subsequent Assessment Report.



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Threats arising from Conditions

Conditions are a result of past activities. The types of situations that can be considered conditions are summarized in Section 6.0 - Conditions Assessment, of the Assessment Report. At the time of drafting of this Assessment Report, the SPC has not completed an extensive investigation to determine if there are any conditions. If more information becomes available to the SPC, the findings would be included in a subsequent Assessment Report.

Threats arising from Issues

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

The issues identified in the Upper Thames River SPA are summarized in Section 5.0 - Issues Evaluation, of the Assessment Report. According to the Clean Water Act Technical Rules, activities or conditions that contribute to drinking water quality issues (known to be partially or wholly due to anthropogenic sources), are deemed significant drinking water threats regardless of assigned vulnerability scores. This applies to intake protection zones and wellhead protection areas only, for drinking water systems identified in the Source Protection Area Terms of Reference. The risks that these significant threats pose must be reduced through the source protection plan. If an issue is identified and known to be partially or wholly due to anthropogenic sources, the activities that contribute to the issue and the areas where they occur (within vulnerable areas) must also be identified. Some issues are naturally occurring. The sources of the rest of the issues are yet to be determined, and this information is a data gap.

Risk Assessment

Through the vulnerability scoring approach, an activity may be determined to be a drinking water threat based on the vulnerable area it occurs in, the vulnerability score assigned to that area, the circumstance of the activity, and the hazard score associated with the activity.

Vulnerable areas are Intake Protection Zones (IPZs), Wellhead Protection Areas (WHPAs), Highly Vulnerable Aquifers (HVAs) and Significant Groundwater Recharge Areas (SGRAs), as described in Section 4.0 – Vulnerability Assessment. There are no surface water intakes in the Upper Thames River SPA; therefore, no IPZs are delineated. Through the vulnerability scoring approach, an activity can only be identified as a threat if it is occurring in a vulnerable area and the vulnerability score of the area is greater than 4. If the vulnerability score is 8 or greater, the threat may be significant.

According to the Technical Rules: Assessment Report, WHPA-A, B, C, E and F can have vulnerability scores of 8 or greater. It is possible, therefore, to have significant threats in these zones, dependent upon the assigned vulnerability score.

Highly Vulnerable Aquifers (HVAs) are assigned a vulnerability score of 6, while Significant Groundwater Recharge Areas (SGRAs) are assessed a vulnerability score of 6, 4 or 2. Hence, there can be no significant threats in these vulnerable areas. Further, in SGRAs with vulnerability scores of 4 and 2, no threats can be identified, as discussed above.

The circumstances of the activity are then considered to determine whether that activity is deemed a significant drinking water threat. The circumstances are important in determining the level of risk associated with the activity in an area. The circumstances to be considered include the type of material, the quantity of material, and whether it might be released to surface water or groundwater.

Each circumstance of an activity is assigned a hazard score. The MOE has developed “Tables of Drinking Water Threats” based on the 21 prescribed threats. These MOE threats tables, as they are commonly referred to, provide the circumstances under which a prescribed activity may be a low, moderate or significant threat. The MOE threats tables help identify the level of risk associated with an activity in a vulnerable area. There are two separate tables for activities related to chemicals and for activities related to pathogens.

The risk score is calculated by multiplying the vulnerability score assigned to a vulnerable area with the hazard score of the activity thought to be a threat.

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

An activity is then deemed to be a significant, moderate or low threat depending on the calculated risk score. The MOE threats tables include the results of this calculation and identify the risk level associated with an activity, based on the vulnerability score of the area in which the activity is being undertaken.

Table 2 shows the relationship between the risk score calculated and the resulting threat level. A risk score of 80 or greater results in a significant threat level. Some exceptions include issue-based threats, which are deemed significant regardless of the vulnerability area and score (if the issue is partially or wholly due to anthropogenic causes, and is associated with an IPZ or WHPA included in the Terms of Reference), and activities related to Dense Non-Aqueous Phase Liquids (DNAPLs) which are significant threats in WHPA-A (100 m radius), B (2 year capture zone excluding A), and C (2 to 5 year capture zone).

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Table 2. Threat Level Determination

Risk Score	Threat Level
80 or more	Significant
60 or greater, but less than 80	Moderate
Greater than 40, but less than 60	Low
40 or less	No threats

Under the Clean Water Act, the SPC is required to determine the number of locations at which a significant threat is thought to occur. Also, a list of activities that are or “would be” threats is to be included. Generally, this requirement is addressed by including all activities listed in the prescribed lists even if they are not currently occurring in an area. Activities not currently occurring in the vulnerable areas “would be” threats if the activity were to occur in the future. The circumstances that result in them being significant threats must also be included in the Assessment Reports. These lists are provided in a series of tables included in Section 7.0 - Threats and Risk Assessment, of the Assessment Report.

In the Thames-Sydenham and Region, the threat and risk assessment work was done according to the Clean Water Act Technical Rules (November 2009), and the Threats and Risk Assessment Local Guidance Version 1.2 (September 9, 2009). This guidance document provides clarification and local interpretation of the relevant sections in the Clean Water Act, its regulations and the associated technical rules pertaining to the threats and risk assessment.

Table 3 provides the number of locations at which a significant threat may occur within the wellhead protection areas of the Upper Thames River SPA. There are no locations with activities that ‘are or would be’ significant threats within the WHPA-E, HVA and SGRA. This finding is due to the range of vulnerability scores of the WHPA-E, and as allowed for HVA and SGRA, as discussed above. WHPA-F was not required to be delineated. There are, however, locations where significant threats are occurring or would occur in the WHPA-A, B and C.

Table 3. Number of Locations of Significant Drinking Water Threats

System - wellfield	Vulnerable Area	Vulnerability Score	Number of Locations of Significant Threats
Middlesex County and City of London			
Birr	WHPA-A	10	13
	WHPA-B	6	0
	WHPA-C	4	0
	WHPA-D	2	0
City of London - Fanshawe wells	WHPA-A	10	6
	WHPA-B	10	1
	WHPA-C	8	0
	WHPA-D	Not applicable*	Not applicable
	WHPA-E	7	0
City of London - Hyde Park wells	WHPA-A	10	2
	WHPA-B	10	1
	WHPA-B	6, 8	0
	WHPA-C	6	1
	WHPA-C	4, 8	0
	WHPA-D	2, 4, 6	0
Dorchester	WHPA-A	10	5
	WHPA-B	10	64
	WHPA-B	6	0
	WHPA-C	4, 8	0
	WHPA-D	2, 6	0
	WHPA-E	6.3	0
Melrose	WHPA-A	10	16
	WHPA-B	10	10
	WHPA-C	6, 8	0
	WHPA-D	2, 4, 6	0
Thorndale	WHPA-A	10	6
	WHPA-B	6	1
	WHPA-C	4	0
	WHPA-D	2	0

*WHPA reaches steady state in WHPA-C; therefore, there is no WHPA-D

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System - wellfield	Vulnerable Area	Vulnerability Score	Number of Locations of Significant Threats
Oxford County			
Beachville	WHPA-A	10	6
	WHPA-B	6, 8	0
	WHPA-C	4, 8	1
	WHPA-D	2, 4, 6	0
Embro	WHPA-A	10	20
	WHPA-B	6	4
	WHPA-C	4	0
	WHPA-D	2	0
Hickson	WHPA-A	10	10
	WHPA-B	8	0
	WHPA-C	4	0
	WHPA-D	2	0
Ingersoll	WHPA-A	10	21
	WHPA-B	6, 8, 10	22
	WHPA-C	2, 6	16
	WHPA-D	2, 4*, 6*, 8*	0
Innerkip	WHPA-A	10	2
	WHPA-B	8	0
	WHPA-C	6, 8	0
	WHPA-D	2, 4	0
Lakeside	WHPA-A	10	6
	WHPA-B	6	0
	WHPA-C	4	0
	WHPA-D	2	0
Mount Elgin	WHPA-A	10	17
	WHPA-B	6	0
	WHPA-C	4	0
	WHPA-D	2	0
Tavistock	WHPA-A	10	5
	WHPA-B	6	10
	WHPA-C	4	1
	WHPA-D	2	0
Thamesford	WHPA-A	10	6
	WHPA-B	6, 8*, 10*	6
	WHPA-C	4, 8*, 10*	0
	WHPA-D	2, 4, 8*, 10*	0
	WHPA-E	6.3	0
Woodstock - urban wells	WHPA-A	10	6
	WHPA-B	6, 8	20
	WHPA-C	2, 6	55
	WHPA-D	2, 4, 6*, 8*, 10*	0
Woodstock - Thornton wellfield and Tabor wellfield	WHPA-A	10	20
	WHPA-B	8, 10	225
	WHPA-C	2, 6, 8	0
	WHPA-D	2, 4	0
	WHPA-E	7	0

*Note: Vulnerability scores listed for these WHPA are a result of overlapping areas. See Section 4 in the Assessment Report for details.

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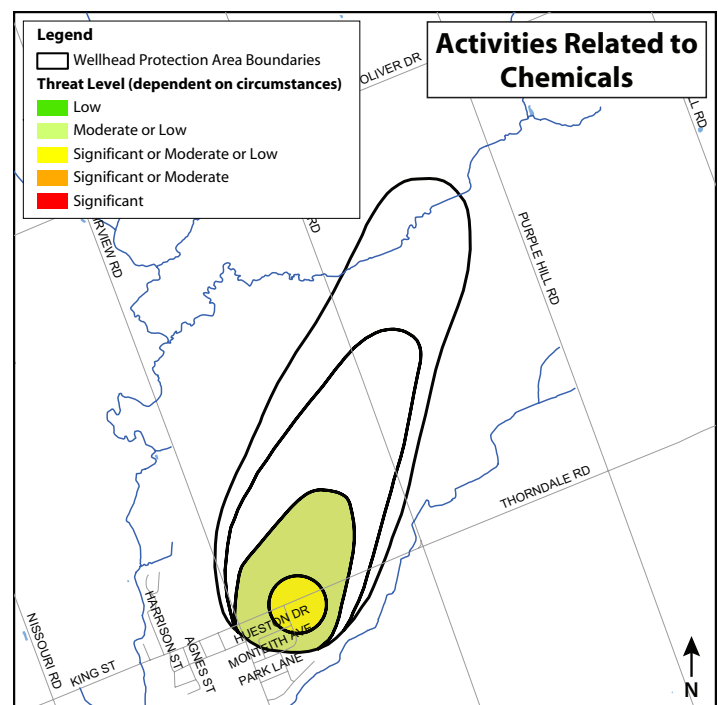
System - wellfield	Vulnerable Area	Vulnerability Score	Number of Locations of Significant Threats
Perth County, City of Stratford and Town of St. Marys			
Mitchell	WHPA-A	10	5
	WHPA-B	6	2
	WHPA-C	4	0
	WHPA-D	2	0
Shakespeare	WHPA-A	10	2
	WHPA-B	6	1
	WHPA-C	4	0
	WHPA-D	2	0
Sebringville	WHPA-A	10	0
	WHPA-B	10	0
	WHPA-C	4	0
	WHPA-D	2	0
St. Pauls	WHPA-A	10	1
	WHPA-B	6	0
	WHPA-C	4	0
	WHPA-D	2	0
Stratford	WHPA-A	10	16
	WHPA-B	6	4
	WHPA-C	4	1
	WHPA-D	2	0
St. Marys	WHPA-A	10	7
	WHPA-B	6, 8, 10	21
	WHPA-C	4, 6	0
	WHPA-D	2, 4, 6	0
	WHPA-E	7.2	0
(Not applicable)	HVA	6	0
(Not applicable)	SGRA	6, 4 and 2	0

Maps, such as those illustrated in Figure 1, show the areas within WHPA in the Upper Thames River SPA where activities are or would be drinking water threats.

More information on drinking water quality threat levels as well as detailed threats mapping is provided in Section 7.0 - Threats and Risk Assessment.

For each vulnerable area, lists of activities that are or would be significant, moderate and low drinking water quality threats are provided in Appendix 10. For drinking water system specific threats information and mapping, refer to the System Summaries in Appendix 3.

Figure 1. Areas where activities are or would be threats in a Wellhead Protection Area



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Tier 2 Risk Assessment

A tier 2, or site-specific, risk assessment to confirm the number of locations at which significant threats occur would be conducted while developing the source protection plans, if needed. As part of the consultation on this Assessment Report, those who are believed to be engaging in a significant threat will be notified, to allow their participation in the tier 2 risk assessment.

The tier 2 work involves the examination of land use activities and the circumstances under which they are undertaken, through site visits and discussions with the landowners. The outcome of the tier 2 risk assessment will be part of a subsequent Assessment Report.

Data Gaps

At the time of drafting of this Assessment Report, the SPC has not completed an extensive investigation to determine if there are any conditions. If more information becomes available to the SPC to identify and assess conditions, this work would be part of a subsequent Assessment Report.

Most of the identified issues are naturally occurring. The sources of the rest of the issues are yet to be determined. If more information becomes available to the SPC, and the issues contributing area and activities must be determined, they would be included in a subsequent Assessment Report.

For more information contact your local Conservation Authority or visit our website



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