

# Thames-Sydenham and Region - Assessment Reports

## Municipal Summary - Highgate Water Supply System

### System Overview

<b>System</b>	Highgate Water Supply System
<b>Operating Authority</b>	Municipality of Chatham-Kent Public Utilities Commission
<b>Classification of System</b>	Drinking Water System – 1 (Large municipal residential)
<b>Pumping Rates</b>	Average Monthly 15,000 cubic meters Average Annual 182,500 cubic meters Maximum Annual 378,140 cubic meters
<b>Source</b>	Groundwater Under the Direct Influence of Surface Water (GUDI)
<b>Location</b>	The community of Highgate, north-east of Chatham, in the eastern portion of the Municipality of Chatham-Kent
<b>Number of Wells</b>	2 pumping 0 monitoring
<b>Approximate Population Served</b>	500
<b>Area served</b>	Community of Highgate



Figure 1: Highgate System Well Head Protection Areas and Vulnerability Scores

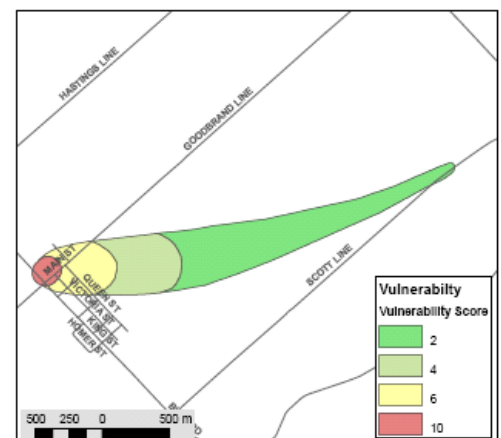
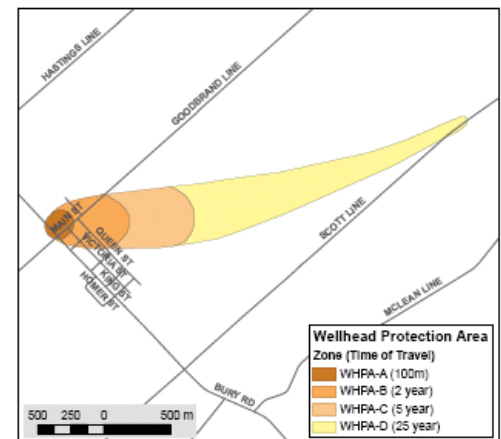
### Vulnerability Assessment

Wellhead Protection Areas or WHPA, as they are often referred to, are the vulnerable areas which are delineated around groundwater sources of drinking water. Wells are used to extract the water from aquifers in the ground. In the Lower Thames Valley Source Protection Area these WHPA have been delineated using numerical groundwater models. The models are used to calculate the time it takes for water to travel to the wells through the aquifer. Four areas are delineated based on the time of travel, while one is a fixed radius around the wells.

- WHPA-A – 100 meter radius around each well
- WHPA-B - 2 year time of travel to the well, excluding the WHPA-A
- WHPA-C – 2 to 5 year time of travel to the well
- WHPA-D – 5 to 25 year time of travel to the well

Two other WHPA (WHPA-E and F) can be delineated for groundwater wells which are under the direct influence of surface water. This work has yet to be completed in the Thames-Sydenham and Region.

In the Highgate WHPA, the vulnerability is assessed using one of the 4 methods described in the Clean Water Act Technical Rules: Assessment Report. This method is the Intrinsic Susceptibility Index or ISI. The ISI is an index of depth and permeability of the materials which offer protection to the aquifers against possible contamination. The ISI results in a score



## Thames-Sydenham and Region - Assessment Reports

---

which can be categorized as high, moderate or low. The ISI values were determined to be low, within and beyond the Highgate capture zones. Based on the WHPA zone and the ISI category, the Highgate wellhead vulnerable areas were assigned vulnerability scores of 2 to 10.

Further, information on constructed transport pathways was reviewed. Transport pathways are man made constructions such as oil wells that may circumvent the natural protective layers above a groundwater aquifer. In the Highgate WHPA, an increase in the vulnerability scores was determined to not be necessary upon examining available constructed transport pathway data. Natural transport pathways such as fracturing and karst are already considered under the vulnerability assessment. Figure 1 shows the Highgate well head protection area delineations and the vulnerability scoring.

### Peer Review of Vulnerability Assessment

The Source Protection Committee established a peer review committee to review the assessment of vulnerability. This peer review committee included consultants and academics who are experts in surface water or groundwater modeling. The peer reviewers reviewed the technical reports and met with the consultants and staff who were involved with the work. The peer reviewers provided opinions as to whether the work met the appropriate rules and guidance and that it was scientifically valid. They also provided comments which the consultants used to improve the documentation of their work.

### Issues

A drinking water issue is a parameter or pathogen shown to deteriorate, or trending towards a deterioration of raw (untreated) water quality for the purposes of drinking. The parameters which can be considered are identified in the Safe Drinking Water Act. Parameters are described in the Issues Evaluation section of the Assessment Report.

Issues were identified by following the Thames-Sydenham and Region Issues Evaluation Methodology (May 14, 2009). The evaluation is a two step process. Firstly, raw (untreated) water quality data is screened based on a comparison against a benchmark, generally half the safe concentration in treated water. Secondly, an investigation of the parameters flagged through the first step is undertaken to identify an issue. This includes a review of trends and spikes, consideration of existing water treatment plant capabilities and discussions with the water treatment plant operating authority. The benchmarks for parameters are generally the half the 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).

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

Should an issue be identified, the area and the activity contributing to a drinking water quality issue must also be identified. This work has yet to be completed and will be part of an amended Assessment Report. Further, the activities that contribute to the identified issue become a significant risk and must be mitigated through the source protection plan.

The drinking water quality issues in the raw (untreated) water to the Highgate municipal wells are identified in the Table 1 below. Certain parameters may be due to anthropogenic sources, i.e. due to the activities on land, or naturally occurring, or both. No pathogens are identified as issues in the raw (untreated) source water in the Lower Thames Valley SPA.

# Thames-Sydenham and Region - Assessment Reports

Parameter	Description	Natural/Anthropogenic
Fluoride	There are 14 instances since 2003 of fluoride concentrations in the raw water being above the treated water MAC benchmark of 1.5 mg/L and a further 6 instances where concentrations were above 50% of the MAC benchmark. The highest fluoride level was 2.0 mg/L, and average value was 1.65 mg/L.	Naturally occurring
Methane	Between 2004 to 2008, raw water methane levels are typically 17 to 55 L/m <sup>3</sup> , regularly above the treated water AO of 3 L/m <sup>3</sup> .	Naturally occurring
Organic nitrogen	Since 2004, the available raw water data levels of organic nitrogen measured above the treated water OG of 0.15 mg/L, with a highest level of 0.5 mg/L. The aquifer contains a high concentration of organic rich shale material from the underlying Kettle Point Formation.	Likely naturally occurring.

## Conditions

A condition is the result of a past activity which has the potential to pose a risk to a drinking water source. The Source Protection Committee is required to list it as a drinking water threat any "Condition" that it is aware. The Technical Rules: Assessment Report identifies the type of situations which can be considered a condition which are summarized below as they pertain to a Well Head Protection Area:

- the presence of a non-aqueous phase liquid in groundwater in a highly vulnerable aquifer, significant groundwater recharge area or wellhead protection area
- the presence of a 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

No Conditions have been identified in this Well Head Protection Area, however at the time of drafting of this Assessment Report, the Source Protection Committee has not completed an extensive investigation to determine if there are any conditions which need to be reported on. More work will be undertaken on identifying and assessing conditions and the Assessment Report will be amended if necessary.

## Threats and Risk Assessment

The Clean Water Act prescribes activities which may be considered drinking water threats. The activities associated with drinking water quality are summarized in the Threats and Risk Assessment Section of the Assessment Report. Risk Assessment is the process of assessing the threats to determine their relative risk to the drinking water source.

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. Figure 2a shows where activities related to chemical may pose a significant, moderate or low risk to the drinking water source. Figure 2b identifies the areas where an activity related to pathogens could pose a significant, moderate or low risk. Figure 2c identifies the areas where an activity related to dense non-aqueous phase liquids (DNAPLS) could pose a significant, moderate or low risk. Table 2 provides counts of locations of where significant threats may occur in the Highgate vulnerable areas.

**Table 2 – Number of Locations where Significant Threats Could Occur**

<b>Chemicals</b>	
WHPA-A	21
<b>Pathogens</b>	
WHPA-A	20
<b>DNAPLS</b>	
WHPA-A	1

Does not include possible threats associated with the application of agricultural and non-agricultural source material to land, and the application of commercial fertilizer and road salt to land

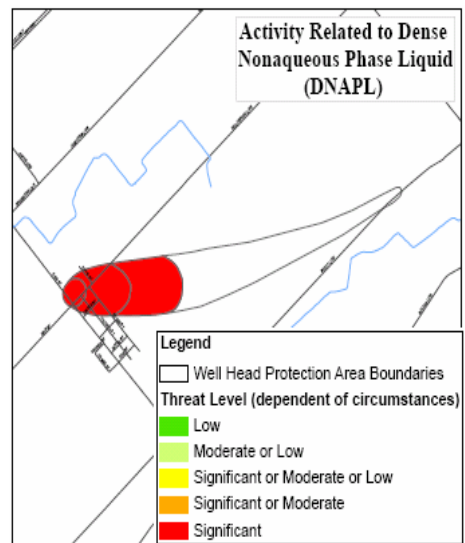
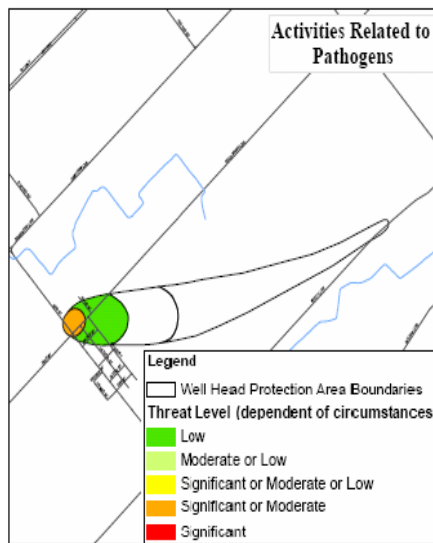
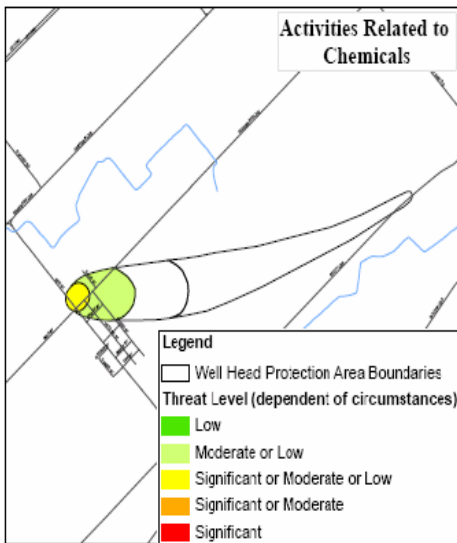
# Thames-Sydenham and Region - Assessment Reports

The circumstances under which the activity is undertaken are important in determining the level of risk associated with the activity in these areas. 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.

Figure 2a – Areas where activities related to Chemicals can be threats

Figure 2b – Areas where activities related to Pathogens can be threats

Figure 2c – Areas where activities related to DNAPLs can be threats



The MOE has developed a "Tables of Drinking Water Threats" which identify the level of risk associated with an activity. The level of risk is dependant on the vulnerability score of the area that it is occurring in and the circumstances under which the activity is occurring. Pathogens, chemicals and dense non-aqueous phase liquids are considered in separate tables in the MOE tables.

## Local Drinking Water Threats

The Clean Water Act also allows the Source Protection Committee to identify other activities which they consider threats to drinking water but are not listed in the MOE threats table referenced above. For activities identified in the MOE threats tables the Source Protection Committee can also identify additional circumstances under which they consider the activity a drinking water threat. The Source Protection Committee has not identified any local threats or circumstances at this point.

## Data Gaps

There is no long term (more than ten years) groundwater quality data available for parameters specified in the Clean Water Act. Continued data collection in the future would aid in determining trends and better facilitate future issues evaluation.

At the time of completion of the Threats and Risk Assessment the percent of impervious area was not available. As a result the level of threat associated with the application of agricultural and non-agricultural source material to land, and the application of commercial fertilizer and road salt to land have not been determined yet.