5.0 Mattawa

5.1 Introduction and Summary of Findings

The Town of Mattawa is situated at the confluence of the Mattawa and Ottawa Rivers at the extreme eastern boundary of the North Bay-Mattawa Source Protection Area (SP Area). The Town of Mattawa draws its municipal drinking water from two wells located on the northern shore of the Mattawa River. The entire study area was assigned a high susceptibility to surficial contamination due to the predominance of higher hydraulic conductivity sands and gravels, and a shallow water table in an unconfined aquifer setting. There are no significant or moderate stresses to the quantity of water.

A Wellhead Protection Area (WHPA) with four zones was delineated using computer modelling, based on the time it would take contaminants in the water to reach the wellhead. Times of travel range from two years to 25 years.

No issues or conditions were identified with the Mattawa municipal water supply. A municipal sewer line passing through the Wellhead Protection Area (WHPA) generates four pathogen threats classified as “significant”.

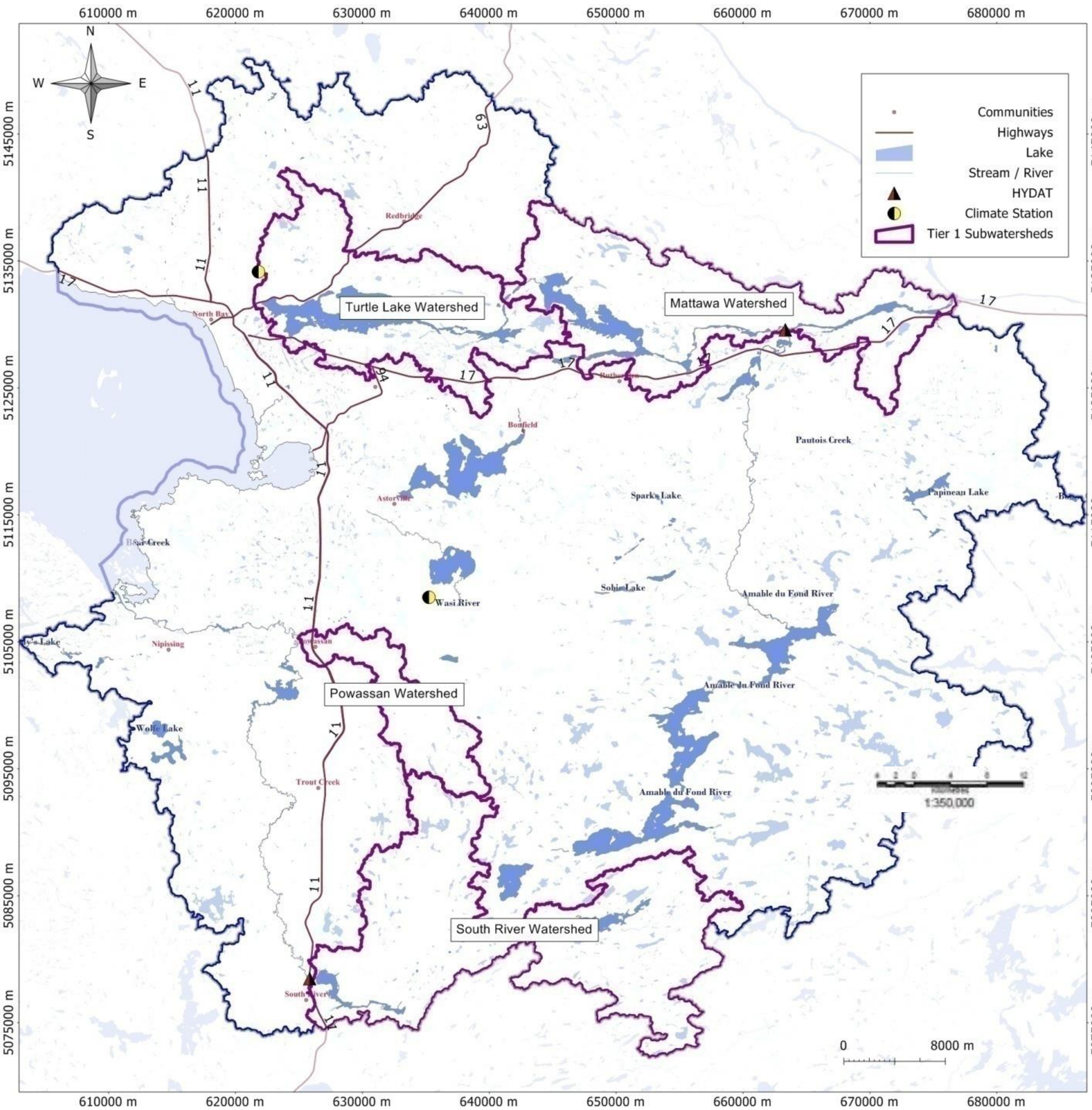
5.2 Water Budget and Water Quantity Stress Assessment

A water budget and water quantity stress assessment for each subwatershed is required by the *Clean Water Act (2006)* to determine whether the subwatershed will be able to meet current and future demands of all users.

General principles were explained earlier in Section 2.5 Conceptual Water Budget (Regional Analysis). The methodology specified in the Technical Rules Part III describes a tiered approach whereby all subwatersheds are subjected to a Tier One assessment and if stress is low during all months of the year, no further assessment is required. If stress levels are shown to be either moderate or significant, a more robust Tier Two assessment is completed and, similarly if that reveals moderate or significant stress, a Tier Three Local Risk Assessment must be undertaken. The information for this Section is based primarily on the Tier One Water Budget and Stress Assessment for the subwatershed supplying the Mattawa municipal groundwater supply (WESA, 2010). A Tier One assessment for the remainder of the subwatersheds in the SP Area is presented in Section 2.6.

The Mattawa River Quaternary subwatershed was split at the Turtle Dam such that the Town of Mattawa groundwater supply watershed was delineated extending from Turtle Dam east to the Town of Mattawa for a contributing area of 240 km^2. The portion of the Mattawa River Watershed that contributes to the groundwater intake is depicted along with the contributing subwatersheds for the municipal supplies for the Town of Powassan and the Village of South River in Figure 5-1.

Figure 5-1. Tier One Water Budget Subwatershed



The town is serviced by two overburden wells that tap into a gravel aquifer. Although Mattawa experienced almost a 12% decline in population between 2001 and 2006 (Statistics Canada, 2007), no significant change in population is expected in the upcoming years (Waterloo Hydrogeologic, 2006). Therefore future water demand and land use change are expected to be minimal and have minimal impact on the subwatershed water budget parameters. As a result, additional assessment into future scenarios is not necessary.

Water budget elements include precipitation, actual evapotranspiration (AET), surplus, recharge and runoff. All are expressed in mm to make them comparable to precipitation figures. The resulting water budget for the Mattawa subwatershed is shown below in Table 5-1.

Table 5-1. Estimated Water Budget Elements (Mattawa)

Month	Precipitation (mm)	AET (mm)	Surplus (mm)	Recharge (mm)	Runoff (mm)
January	64.8	0.0	64.8	1.8	2.0
February	49.8	0.0	49.8	0.9	1.0
March	64.7	0.0	64.7	0.5	0.5
April	64.9	20.7	44.2	27.2	29.7
May	81.5	76.2	5.3	80.4	87.8
June	88.4	106.4	0.0	40.2	43.9
July	95.4	117.1	0.0	20.1	21.9
August	94.3	99.9	0.0	10.0	11.0
September	109.5	67.0	0.0	5.0	5.5
October	92.5	29.9	59.7	16.8	18.3
November	92.7	0.0	92.7	8.4	9.2
December	70.7	0.0	70.7	3.6	4.0
Total	**969.1**	**517.2**	**451.9**	**214.9**	**234.6**
Gartner Lee (2007)	966	535	431	206	225

The resultant values are very similar (+/- 5%) to those estimated in Gartner Lee Ltd. (2007a) for the same regions. The total annual surplus should theoretically equal streamflow (Gartner Lee Ltd., 2007a). Analysis of continuous streamflow data collected at Environment Canada / Water Survey of Canada gauge 02JE020 (Mattawa River below Bouillon Lake) (Fig. 5-1) yields a total annual surplus of 452 mm. The total surplus predicted by the Thornthwaite-Mather soil moisture budget conducted by WESA also yielded a total surplus of 452 mm. The extremely close agreement between these two methods, as well as the close correlation between results obtained by WESA and Gartner Lee Ltd. (2007a), provides a high level of confidence in the water balance.

The groundwater supply is the water available for a subwatershed's groundwater users. Module 7 of the MOE Assessment Report Guidance Modules (MOE, 2007), which was the guidance at the time of the WESA study, recommends against using baseflow separation to determine groundwater supply if there are significant streamflow regulation structures in the watershed of interest. The Mattawa subwatershed contains three such structures: Turtle Lake Dam, Talon Lake Dam, and the Hurdman Dam. Consequently, groundwater supply was estimated to equal recharge as determined using a soil moisture model described in the WESA report. Annual recharge was estimated to be 214.6 mm, which results in an average monthly recharge of 17.9 mm. Considering the area of the watershed (240 km^2), the average groundwater supply is 1.63 m^3/s. Lateral groundwater flow was assumed to be negligible. Water reserve was set at 10% of the recharge.

Water use (demand) was calculated considering available datasets for the study area and the results compiled on monthly and annual scales. Municipal and communal use was determined using the Environment Canada Municipal Water and Wastewater Survey (Environment Canada, 2004b) as well as the Permit to Take Water (PTTW) database (MOE, 2009a). The only communal PTTW other than the Town of Mattawa is for the Samuel de Champlain Park. Water takings and returns were divided between deep groundwater, shallow groundwater, and surface water. The following assumptions were made:

- Most private wells are completed in bedrock, while municipal wells are completed in the overburden (Waterloo Hydrogeologic, 2006), therefore, it was assumed that takings are from deep groundwater and shallow groundwater, respectively;
- 2004 actual municipal water use values were used (753,572 m^3/yr) to be consistent with other values in the Municipal Water and Wastewater Survey and provide a conservative estimate of use (average use between 1997 and 2007 was 703,432 m^3/yr);
- Municipal water consumed includes water from population with sewage haulage;
- Municipal system losses are returned to shallow groundwater through infiltration;
- Communal water returns are to shallow groundwater by infiltration through septic beds and infiltration of surface runoff; and
- Environment Canada (2004b) states that 99% of serviced residents are on sewers and 0.8% are on septic. The remaining 0.2% was assumed to return to surface water.

Datasets included the following:

- Municipal and communal use (as specified above);
- Domestic use from private water supplies (based on Statistics Canada 2006) Agricultural use (livestock and irrigation).

Domestic use was calculated based on the population of Mattawa of 2,003 and an estimate that 0.1% of those are supplied by private wells with a total gross water taking of 128 m^3/yr (consumptive factor 0.2 assuming rest of water returned via septic systems to shallow groundwater).

Gross water takings for agricultural purposes are estimated at 52,517 m^3/yr, where livestock irrigation and crop irrigation are 46,748 and 5,759 m^3/yr. Total agricultural demand comprises approximately 4% of the total water takings and 18% of the total consumed.

The water use results developed for each of the sectors were amalgamated to estimate the cumulative water use for each of the systems (surface water, shallow groundwater, and deep groundwater). Results from all sectors are summarized on an annual scale in Tables 5-2a, b and c and graphically on Figure 5-2.

Table 5-2a. Annual Water Use Results - Gross Takings (Mattawa)

Reservoir	Gross Annual Takings (m^3)					TOTAL
	Permitted Takings			Non-Permitted		
	Municipal and Communal[a]	Industrial and Commercial[b]	Other Permitted	Private Domestic	Agricultural[c]	
Surface Water	33,000					33,000
Shallow Groundwater	665,765	468,911				1,134,676
Deep Groundwater				128	52,517	52,645
TOTAL	698,765	468,911	0	128	52,517	1,220,321

Table 5-2b. Annual Water Use Results - Consumption (Mattawa)

	Annual Consumed (m^3)					
	Permitted Takings			Non-Permitted		
Reservoir	Municipal and Communal[d]	Industrial and Commercial	Other Permitted	Private Domestic	Agricultural	TOTAL
Surface Water	6,600					6,600
Shallow Groundwater	72,867	145,487				218,354
Deep Groundwater				26	51,363	51,389
TOTAL	79,467	145,487	0	26	51,363	276,343

Table 5-2c. Annual Water Use Results - Returns (Mattawa)

	Annual Returned (m^3)					
	Permitted Takings			Non-Permitted		
Reservoir	Municipal and Communal	Industrial and Commercial[b]	Other Permitted	Private Domestic[e]	Agricultural	TOTAL
Surface Water	269,116	323,424				592,540
Shallow Groundwater	350,182			102	1,154	351,438
Deep Groundwater						0
TOTAL	619,298	323,424	0	102	1,154	943,977

Notes:

[a] Includes system losses, which are assumed to return to surface water

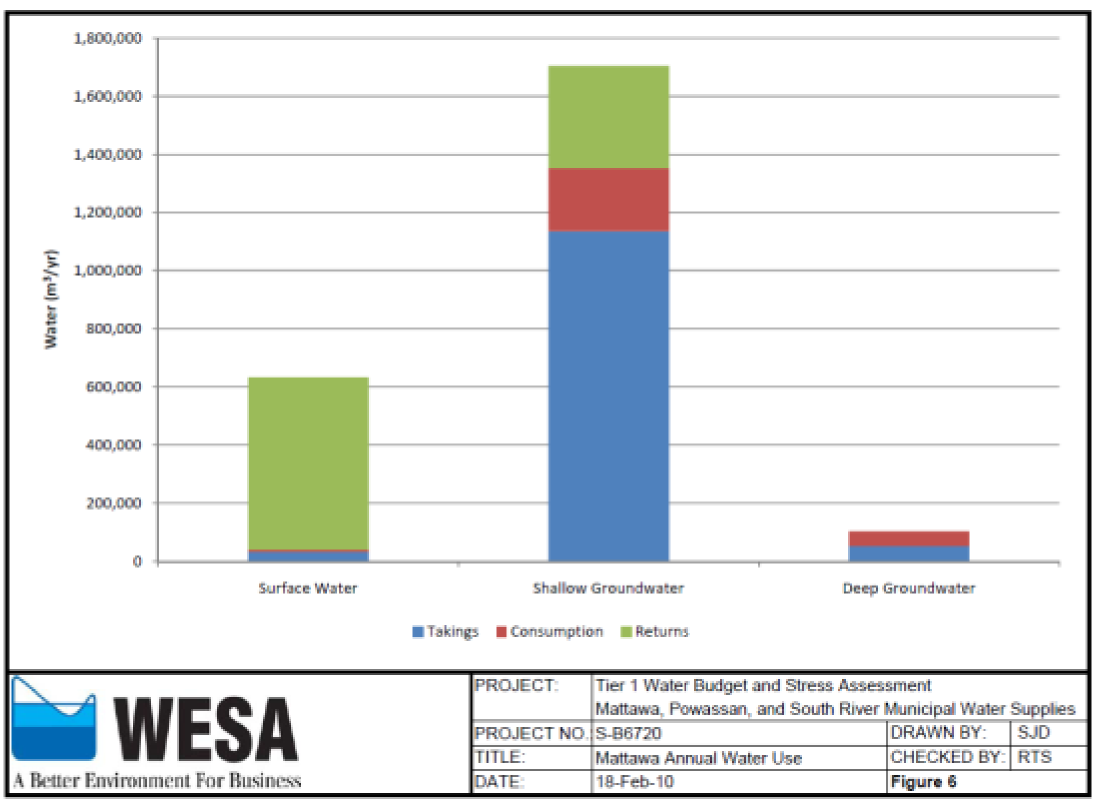
[b] Assume industrial and commercial water comes from shallow groundwater and returns to SW through sewer service

[c] Assume agricultural water comes from deep groundwater, since assuming source is same as private wells, and most private domestic wells are in deep bedrock

[d] Assume remaining 0.2% returns to surface water (99% on sewer and 0.8% on septic)

[e] Assume returns from private domestic wells discharges through septic systems to shallow groundwater

Figure 5-2. Annual Water Use (Mattawa)



Of the gross annual water takings within the study area, 97% are from groundwater; 93% from shallow groundwater and 4% from deep groundwater. The remaining 3% of takings are from surface water. Municipal/communal takings account for 57% of gross water takings while industrial/commercial accounts for 38%, and agricultural for 4%.

For total water consumed, 79% comes from shallow groundwater, 19% from deep groundwater and 2% from surface water. Surface water receives 63% of water returns, while shallow groundwater receives 37%, assumed to be primarily through infiltration and septic systems (it is assumed that water lost to the system is lost through leakage and returns to the shallow groundwater through infiltration). This is consistent with the mostly rural nature of the region.

Returns to surface water are concentrated in the areas serviced by sewers. Table 5-3 compiles net water takings for each of the systems. Positive values indicate that returns exceed takings. This is the case for surface water where an excess of 559,540 m_3 are returned annually. Both the shallow and deep groundwater systems have more water taken than returned: 783,238 and 52,645 m^3/yr, respectively. The net water takings exceed returns by 276,343 m^3/yr.

Table 5-3. Net Water Taking (Mattawa)

Reservoir	Net Water Takings (m^3)
Surface Water	559,540
Shallow Groundwater	-783,238
Deep Groundwater	-52,645
TOTAL	-276,343

Note: Positive values indicate that returns exceed takings.

Monthly water use results, including gross, consumed, and returned water were compiled for each month and show details for each system (surface water, shallow groundwater, and deep groundwater). There is not a significant difference in water demand between months as municipal/communal and industrial/commercial water use is consistent throughout the year. There is a slight increase in demand in July and August as a result of water used for crop irrigation.

5.2.1 Groundwater Stress Assessment

Groundwater stress is determined by examining the ratio of water demand (water takings) to water supply, while considering the reserve water required to maintain ecosystem function (MOE, 2007). The percent water demand is compared to a stress threshold (Table 5-4) to determine the stress level.

Table 5-4. Groundwater Stress Thresholds Based on Annual and Monthly Percent Water Demand

Groundwater Quantity Stress Level Assignment	Average Annual (%) Water Demand	Maximum Monthly (%) Water Demand
Significant	≥ 25%	≥ 50%
Moderate	> 10% and < 25%	> 25% and < 50%
Low	≤ 10%	≤ 25%

The annual and maximum monthly percent groundwater demands for the Town of Mattawa supply subwatershed are 0.58% and 0.64%, respectively. Table 5-5 presents the monthly and annual demand, supply and reserve values used to calculate the percent demand.

Table 5-5. Percent Groundwater Demand (Mattawa)

Month	Consumption	Supply	Reserve	%Demand
January	0.09	17.9	1.79	0.58
February	0.08	17.9	1.79	0.53
March	0.09	17.9	1.79	0.58
April	0.09	17.9	1.79	0.56
May	0.09	17.9	1.79	0.58
June	0.09	17.9	1.79	0.56
July	***0.10***	***17.9***	***1.79***	***0.64***
August	***0.10***	***17.9***	***1.79***	***0.64***
September	0.09	17.9	1.79	0.56
October	0.09	17.9	1.79	0.58
November	0.09	17.9	1.79	0.56
December	0.09	17.9	1.79	0.58
Annual	**1.12**	**215**	**21.5**	**0.58**

*Note: **Bold italics** indicate months with maximum monthly percent demand.*

A subwatershed is considered low stress if the average annual percent demand is less than or equal to 10% and if the maximum monthly percent demand is less than or equal to 25%. As a result, the Town of Mattawa municipal supply subwatershed is considered low stress and does not require a Tier Two Assessment.

5.2.2 Uncertainty

The limitations inherent to each dataset individually, combined with the discrepancies between datasets, all introduce various levels of uncertainty which are ultimately compounded into the results.

Because this study is conducted at the regional scale, results must be interpreted in their context and would require confirmation and refinement through further investigation at the local scale. Also, the various datasets used in the analysis are a ‘snapshot in time’: population census is as of 2006, while municipal water use data is current as of 2004. Obtaining more up to date data would reduce the error associated with the combination of datasets from varying dates.

The greatest source of uncertainty in estimating water use comes from the Provincial Permits to Take Water (PTTW) database. Determining permit validity from information contained in the database (expiry date, whether a permit has been revoked, etc) is challenging, and would require review of individual permits to increase confidence in the data. Only water takings greater than 50,000 L/d are included in the PTTW database, while water use from smaller users is unknown. The PTTW database only contains information on maximum allowable withdrawals, while actual takings are unknown with the exception of a municipal water supply. However, the uncertainty associated from this limitation was reduced in part by applying the monthly and consumptive use factors specified in the provincial guidance document (MOE, 2007) and AquaResource (2005).

Other sources of uncertainty include limited information available for some sectors. There may be an unaccounted number of smaller industrial and commercial users. Water taking for livestock is exempt from the permitting requirements, regardless of the volume taken. Similarly, no information is available for recreational or ecological users.

Considering the significant sources of uncertainty, the uncertainty associated with the Tier One Water Budget and Stress Assessment is considered high. However, the percent demand for this system is well below the defined thresholds, and as such no additional work is likely required to address the uncertainty.

5.3 Groundwater System Characteristics

The information contained in the following Sections assessing the water quality component of the vulnerability and threats to the Mattawa system was taken primarily from the two 2009 Technical Assessment Reports on the Municipality of Mattawa prepared by Waters Environmental Geosciences entitled

- Groundwater Vulnerability Analysis, and (2009d)
- Groundwater Risk Assessment. (2009b)

The Town of Mattawa well field consists of two municipal wells, housed in a single structure located on the northeast corner of the intersection of Bisset Street and Fourth Street, in the Town of Mattawa (Figure 5-3). The Mattawa River flows east, then bends to the north east before it enters the Ottawa River. The well field is located on the north shore of the Mattawa River, approximately 60 m from the riverbank, and the site is elevated approximately 5 m above the river level. The UTM co-ordinates of the well building (in *NA*D83) are 676227 mE and 5131742 mN (Ministry of the Environment, 2008). The system services the entire population of 2,270 (2006 census). Table 5-6 below summarizes the construction details of the wells. The sand and gravel soils are typical of the area.

Figure 5-3. Mattawa Study Area

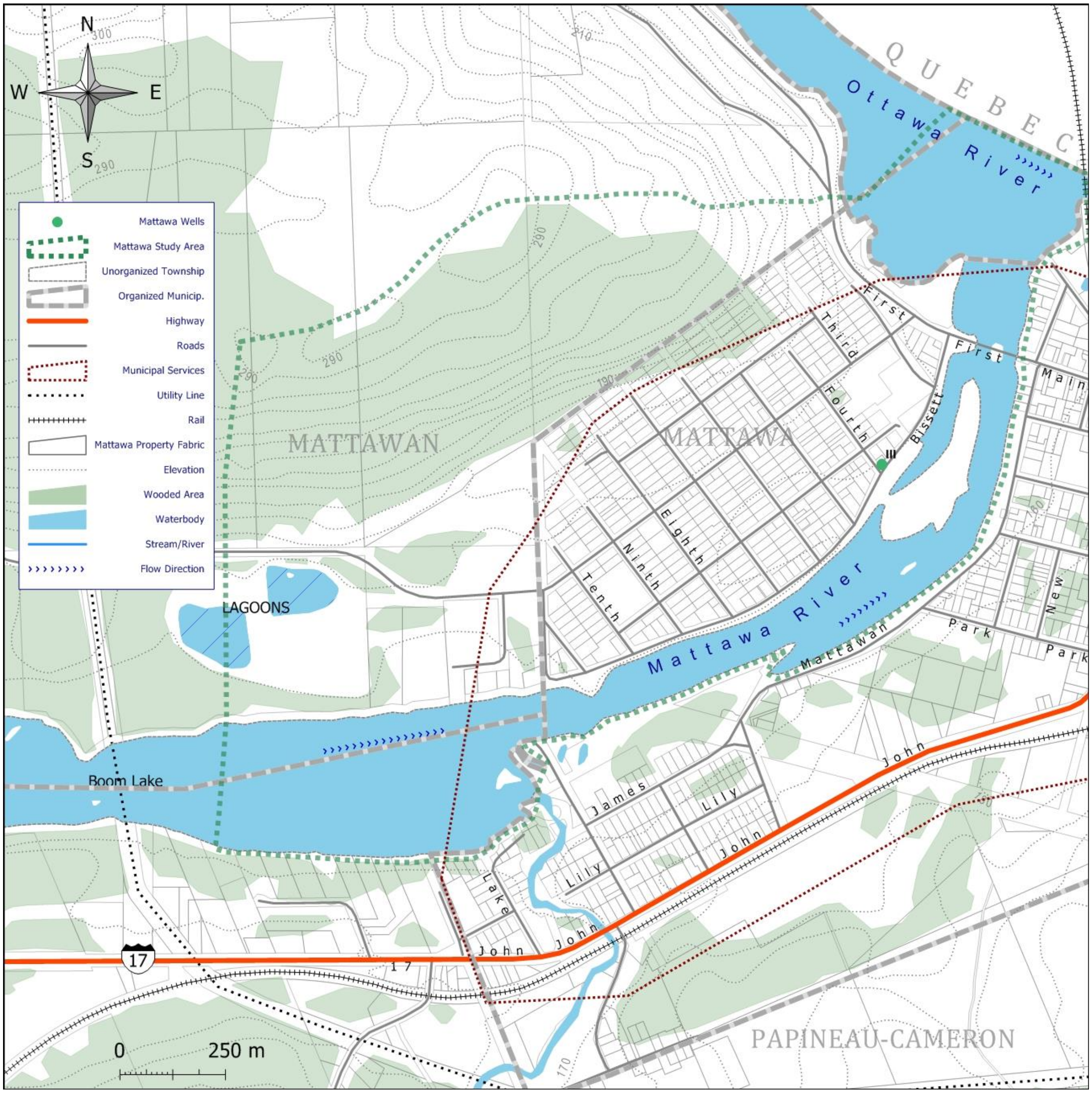


Table 5-6. Specifications for the Two Mattawa Municipal Wells

Well No.	1	2
Year drilled	1958	1949
Drilling Company	International Water Supply Ltd. (London)	International Water Supply Ltd. (London)
Depth Below Grade	26.5 m	23.6 m
Steel Casing - Diameter - Depth	406 mm (16 inch) 22.0 m	305 mm (12 inch) 20.6 m
Stainless Steel Screen - Slot Size - Diameter - Length - Depth	No. 6 406 mm (16 inch) 4.6 m 26.4 m	No. 6 305 mm (12 inch) 3.0 m 23.6 m
Packing	Gravel Packed	Gravel Packed
Outer Working Casing - Diameter - Depth	660 mm (26 inch) 18.8 m	560 mm (22 inch) 18.6 m
Static Water Level at Completion (Below grade)	5.2 m	5.4 m
Registration No.	43-00581	43-00579
Formation encountered during drilling	Sand and gravel, with boulders	Sand and gravel, with occasional boulders

Water consumption data were obtained from the Municipality, for the time period January 1997 to December 2007, and examined for overall trends. Although there is a degree of scatter in the plot (attributed to some seasonal effects coupled with well maintenance activities), an overall trend towards lower consumption was noted. The highest total consumption was for May of 1998, averaging 2,907 m^3/day (900 m^3/day being taken from Well No. 1 and 2,007 m^3/day being taken from Well No. 2). This was about 50% higher than the long term average over the entire period, 1,940 m^3/day.

These values are well below the maximum permitted pumping rate for both wells combined of 6,546 m^3/day (Permit to Take Water No. 02-P-5059; MOE, 2009a). For the present wellhead protection modelling analysis, the average consumption rate of 1,940 m^3/day was used. Since the wells are only a few metres apart, the simulation used a single well pumping at this combined rate.

The review of available information indicated that there is no proposed expansion to the water distribution system.

Despite their close proximity to the Mattawa River, the municipal wells have not been classified as being ground waters under the direct influence of surface waters (GUDI). There have been no problems with water quality detected.

5.4 Delineation and Scoring of Vulnerable Areas

5.4.1 Defining the Vulnerable Areas (Wellhead Protection Areas)

As explained in the Groundwater Methodology Section 3.2.2 delineation of the vulnerable area for a Type I drinking water system under the *Clean Water Act (2006)* is based on the time it takes water to travel in the aquifer to the wellhead. Four subzones known of the wellhead protection area (WHPA) were identified; time of travel (TOT) was determined using computer based three-dimensional groundwater flow modelling:

- WHPA-A is the area within 100 m
- WHPA-B extends beyond the 100 m zone to a line marking the 2-year TOT
- WHPA-C extends from the WHPA -B limit out to the 5-year TOT
- WHPA -D extends from the WHPA-C limit out to the 25-year TOT

Several years previous, a regional groundwater study was conducted (Waterloo Hydrogeologic, 2006) which also used computer modelling to delineate a wellhead protection area. The current study used a more recent version of the same software, local mapping and additional data to create a revised model. The resulting vulnerable areas with scores are illustrated in Figure 5-4.

5.4.2 Vulnerability Scoring

Water well records for the area are limited, so available data regarding subsurface conditions was supplemented using local knowledge to determine the susceptibility of the aquifer (to contamination from the surface). Since the wellheads are located in a residential area, the municipality is familiar with ground conditions from construction of sewer lines and roads. The Intrinsic Susceptibility Index (ISI) for a location is based on soil characteristics and the depth to water. The entire study area was assigned a high susceptibility to surficial contamination due to the predominance of higher hydraulic conductivity sands and gravels, and high water table, in an unconfined aquifer setting. Shallow bedrock exposure over the upland portions of the site also contributes to high susceptibility although not a factor in the ISI calculation. Therefore the vulnerability scores (Table 5-7) for each WHPA as per Technical Rule 83, Table 2(a) are as follows:

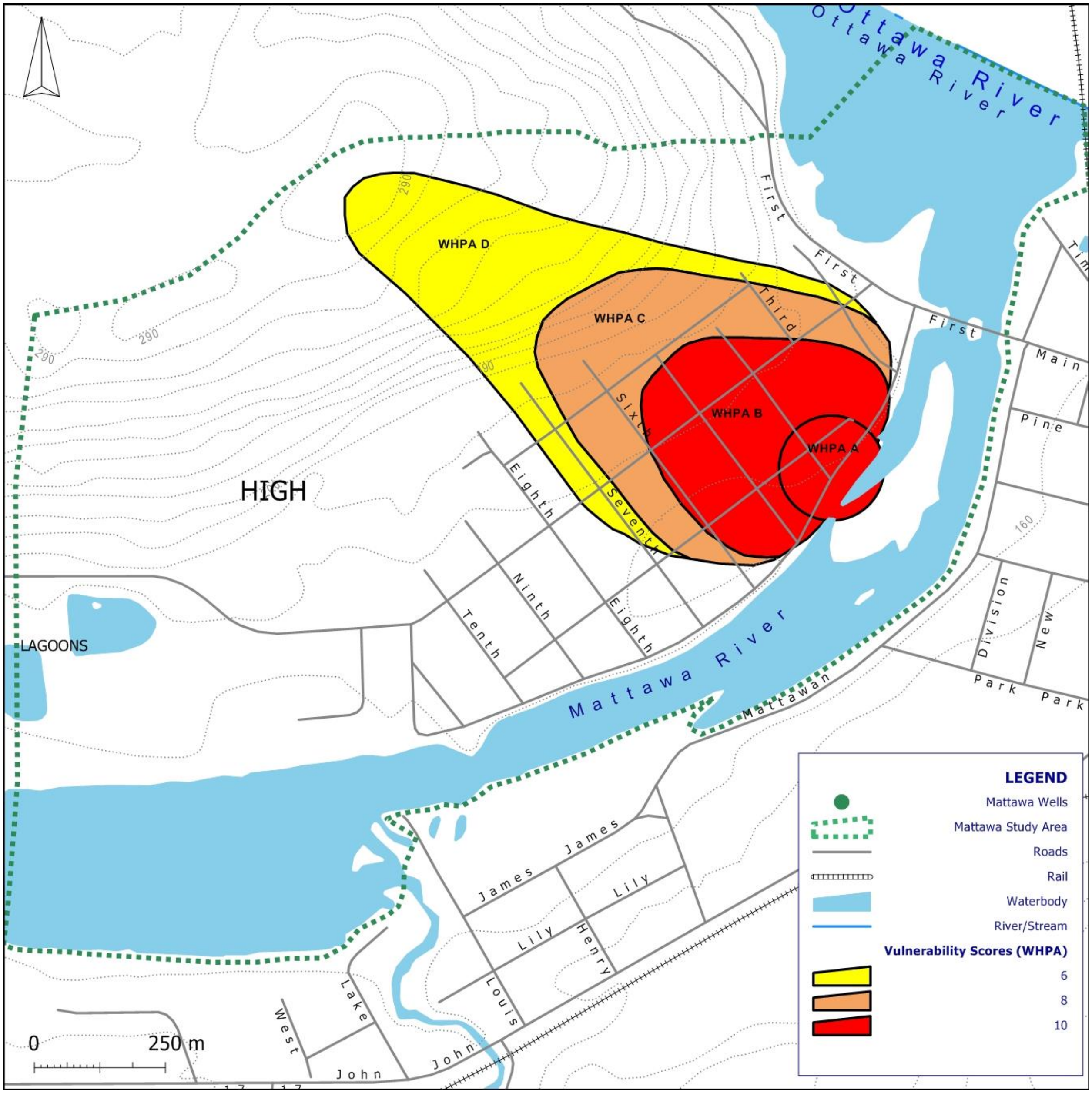
Table 5-7. Vulnerability Scores for the Mattawa Vulnerable Areas

WHPA	Score
A and B	10
C	8
D	6

Wellhead protection areas and their vulnerabilities are depicted in Figure 5-4.

Since the entire vulnerable area is already scored as highly susceptible to contamination, the existence of any surface conditions or transport pathways that could enhance contaminant flow would be irrelevant to scoring and so were not considered.

Figure 5-4. Mattawa Wellhead Protection Area and Vulnerability Scores



5.4.3 Uncertainty Analysis

The uncertainty associated with the delineation and scoring of each vulnerable area must be reviewed and then rated as either high or low. This study used a new conceptualization of the groundwater model but came up with similar results to the 2006 NBMCA Groundwater Study (Waterloo Hydrogeologic).

When the vulnerable areas derived by modelling for each study are compared, there is reasonably close agreement suggesting uncertainty is low. Overall, however, a lack of detailed subsurface information was an issue for the broad landscape within the model domain. In some areas the geological conditions were extrapolated based on marginal data, and reliance was placed on published geological interpretations by others. Therefore Waters Environmental Geosciences Ltd. (2009b) assessed the uncertainty of the delineations of the WHPA zones delineated by modelling as high except for the WHPA-A, which is simply defined by a circle extending 100 m around the wellhead, so the uncertainty for that area is low.

Any discrepancies are not expected to have significant implications on the usefulness of the findings for the intended purpose, source protection planning. Although there is some question as to where exactly to draw the lines defining the vulnerable area and its zones, the differences are not large and the broad area was determined to be highly susceptible to infiltration of water-borne contaminants. This assessment of vulnerability is low uncertainty.

5.5 Issues Identification

Based on a review of available data for raw and treated water and discussions with the Ministry of Environment it was determined that were no issues associated with the Mattawa groundwater supply. It is acknowledged that raw water quality data is relatively limited because regular analysis is not required.

5.6 Threats Identification and Assessment

Threats are defined as those activities or conditions that could cause contamination of drinking water by a chemical or pathogen within one of the Wellhead Protection Areas (WHPA). Activities must be assessed and reported whether or not they currently occur within the vulnerable areas. Ontario Regulation 287/07 Section 1.1 (1) under the *Clean Water Act (2006)* lists 19 activities that may result in threats to drinking water quality. (Table 3-4,Two additional prescribed activities pose threats to quantity).

Conditions, as defined by Part XI.3 of the Technical Rules, refer to past activities that have produced contaminants that may result in significant drinking water threats and include the presence of:

- a non-aqueous phase liquid in groundwater in a highly vulnerable aquifer, significant groundwater recharge area or wellhead protection area;
- a single mass of more than 100 L of one or more dense non-aqueous phase liquids (DNAPLs) in surface water in a surface water IPZ;
- a contaminant in groundwater in a highly vulnerable aquifer, significant groundwater recharge area or wellhead protection area, if the contaminant is listed in, and its concentration exceeds the potable groundwater standard in, Table 2 of the Soil, Ground Water and Sediment Standards;
- a contaminant in surface soil in a surface water IPZ if the contaminant is listed in, and its concentration exceeds the standard for industrial/commercial/community property in, Table 4 of the Soil, Ground Water and Sediment Standards; or
- a contaminant in sediment if the contaminant is listed in, and its concentration exceeds the standard in, Table 1 of the Soil, Ground Water and Sediment Standards.

In addition to identification and assessment of conditions, there are two additional components within the Threats Approach to addressing drinking water threats to comply with the Technical Rules. These involve:

- the LISTING of activities that would be significant, moderate or low threats if they were conducted within the vulnerable areas, and
- the ENUMERATION of significant threats (activities or conditions) that presently exist in the vulnerable areas.

Since no conditions were identified, the assessment of the Mattawa system involved the *threats approach*, which is based on listing the prescribed activities that are or would be drinking water threats within the vulnerable areas, and the *issues approach*, which is based on activities or conditions that contribute to existing drinking water issues listed under Rule 114.

5.6.1 Threats Approach

Part XI.4 of the Technical Rules describe the methods for identifying significant, moderate and low drinking water threats related to activities in the vulnerable area of a drinking water intake.

A threat is deemed significant, moderate or low depending on:

1. the vulnerable area in which the activity occurs or would occur;
2. the vulnerability score of the vulnerable area; and
3. a set of prescribed activities and corresponding circumstances that constitute a threat

The Technical Rules require activities that would be a significant, moderate or low drinking water threat within the vulnerable areas to be listed in the Assessment Report, *regardless of whether or not the activities presently exist in the vulnerable area.* For an activity to pose even a low threat, the vulnerability score of the area in which it occurs must be greater than or equal to 6 for a groundwater system.

Lists of significant, moderate and low drinking water threats related to chemicals and pathogens were compiled for each of the vulnerable areas of the Mattawa drinking water intake based on the MOE Tables of Drinking Water Threats.

Existing activities were compared to the MOE Tables of Drinking Water Threats, where the prescribed activities that pose a threat were classified as significant, moderate or low based on their circumstances.

Threats Approach - Potential Activities & Circumstances

Based on the resulting vulnerability scores the possible threat levels were identified for each of the vulnerable areas (Table 5-8). Due to the vulnerability scores within the WHPAs, only WHPA-A, B and C may contain potential significant chemical threats, and only WHPA-A & B may contain significant pathogen threats (only WHPA-A and B may contain pathogen threats). Refer to Figure 5-4 above for further support of the vulnerable areas where activities are or would be significant, moderate or low drinking water threats.

Table 5-8. Areas within Mattawa Wellhead Protection Area where Activities are or would be Significant, Moderate and Low Drinking Water Threats

Threat Type	Vulnerable Area	Vulnerability Score	Threat Level Possible		
			Significant	Moderate	Low
Chemicals	WHPA-A	10	✓	✓	✓
	WHPA-B	10	✓	✓	✓
	WHPA-C	8	✓	✓	✓

	WHPA-D	6		✓	✓
Pathogens	WHPA-A	10	✓	✓	
	WHPA-B	10	✓	✓	
	WHPA-C	8			
	WHPA-D	6			

The circumstances under which these threats may be considered as significant, moderate or low are referenced in the MOE Provincial Table of Circumstances. These tables can be used to help the public determine where activities are or would be significant, moderate and low drinking water threats. A summary of the list of Provincial Tables relevent to each vulnerable area in Mattawa is provided in Table 5-9.

The Provincial Table headings listed within Table 5-9 (i.e. CW10S) represent one of 76 tables and are titled using a combination of acronyms explained in the chart below. The MOE Provincial Tables of Circumstances can be found at

http://www.ene.gov.on.ca/environment/en/legislation/clean_water_act/STDPROD_081301.html

Acronym	Definition
C	Chemical
P	Pathogen
D	Dense Non-Aqueous Phase Liquid
W	Wellhead protection area
IPZ	Intake protection zone
IPZWE	IPZ and WHPA-E
(number)	Vulnerability score
A	Any vulnerability score
S	Significant
M	Moderate
L	Low

For example: CW10S is a table of:
C - **C**hemical Threats in a
W- **W**ellhead Protection Area with a vulnerability score of
10 - **10,** categorized as a
S - **S**ignificant threat

Table 5-9. Summary of Tables of Circumstances Related to Threat Levels and Vulnerability Scores in the Mattawa Wellhead Protection Area

Threat Type	Vulnerable Area	Vulnerability Score	Threat Classification and Provincial Table Reference Code		
			Significant	Moderate	Low
Chemical	WHPA-A, B	**10**	CW10S	CW10M	CW10L
	WHPA-C	**8**	CW8S	CW8M	CW8L
	WHPA-D	**6**	NA	CW6M	CW6L
Dense Non-Aqueous Phase Liquids (DNAPLs)	WHPA-A,B,C	**Any**	DWAS	NA	NA
	WHPA-D	**6**	NA	DWHVASGRA6M	DWHVASGRA6L

Pathogen	WHPA-A, B	**10**	PW10S	PW10M	NA
	WHPA-C	**8**	NA	PW8M	PW8L
	WHPA-D	**6**	NA	NA	PW6L

Note: The table references refer to the Provincial Tables of Circumstances.

Table 5-10. Enumeration of Circumstances under which Prescribed Activities are or would be Significant Threats to the Mattawa Municipal Groundwater System

Activities Prescribed to be Drinking Water Threats	# of Significant Threat Circumstances	
	Chemical	Pathogen
The application of agricultural source material to land.	5	1
The application of commercial fertilizer to land.	5	
The application of non-agricultural source material to land.	5	1
The application of pesticide to land.	11	
The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	135	6
The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	244	1
The handling and storage of a dense non-aqueous phase liquid.	28	
The handling and storage of an organic solvent.	20	
The handling and storage of commercial fertilizer.	1	
The handling and storage of fuel.	36	
The handling and storage of non-agricultural source material.	6	2
The handling and storage of pesticide.	13	
The handling and storage of road salt.	2	
The management of runoff that contains chemicals used in the de-icing of aircraft.	2	
The storage of agricultural source material.	6	3
The storage of snow.	38	
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.	2	2
Number of circumstances under which the threat is or would be significant	**561**	**16**

Threats Approach - Existing Significant, Moderate and Low Threats

The identification of specific groundwater quality threats in the Mattawa vulnerable areas was based on inputs from several sources including published environmental and land-use databases (maintained, for example, by the Ministry of the Environment, Technical Standards and Safety Authority and the Municipality), field reconnaissance work by North Bay-Mattawa Conservation Authority staff, air photo interpretation and land use mapping reviews.

Each occurrence of an activity prescribed to be a drinking water threat was evaluated as significant, moderate or low based on the circumstances of that occurrence and using the MOE Tables of Drinking Water Threats.

Based on a review of the above information, the field work and a subsequent review of initial findings, 13 occurrences relating to two activities prescribed by MOE were confirmed as a significant (S) threat (Table 5-12). Four of the significant threats within the Mattawa vulnerable area are pathogen threats related to the location of the municipal sewage infrastructure in close proximity to the WHPA-A and WHPA-B areas. Nine of the significant threats are chemical threats related to the storage of home heating fuel oil in WHPA-B.

A total of 25 activities were identified as posing a moderate threat and seven were identified as low.

Table 5-11. Existing Threats within Mattawa Wellhead Protection Area

Activity Prescribed to be a Threat	WHPA-A	WHPA-B			WHPA-C		WHPA-D	Circumstance Reference #
	Vs=10	Vs=10	Vs=8	Vs=6	Vs=8	Vs=6	Vs=6	
		S (9)						1359 1360 1369 1370
The handling and storage of fuel.		M (4)			M (16)		L (6)	1354
The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	S (2)	S (2)						1958
	M (2)	M (2)			M (1)		L (1)	663

* *Occurrences in columns with bold boxes represent one parcel with multiple circumstances*

5.6.2 Issues Approach to Threat Identification

There are no drinking water issues, in accordance with Rule 114 and 115 in the Mattawa Wellhead Protection area.

5.6.3 Conditions

There are no known conditions that exist in the vulnerable areas of the Mattawa drinking water intake.

5.6.4 Local Threat Considerations

The North Bay-Mattawa Source Protection Committee is concerned about the threat posed by the transportation of hazardous substances along a number of roads within the Mattawa Wellhead Protection Area (WHPA) which creates the potential for a spill to occur.

Although there is no prescribed threat activity related to transportation of hazardous substances under the Clean Water Act, Technical Rule 119 allows Source Protection Committees to request that an activity be listed as a drinking water threat if:

1. The activity has been identified by the Source Protection Committee as an activity that may be a drinking water threat; and
2. The Director indicates that the chemical or pathogen hazard rating for the activity is greater than 4.

The Source Protection Committee submitted a formal request to the Ministry of Environment for the addition of the transportation of hazardous substances as a non-prescribed (local) drinking water threat in the SP Area. This request was approved by the Director on February 8, 2011 (Appendix G). Included in the approval are the circumstances and hazard ratings for the activities considered.

Table 5.12 shows where significant, moderate and low threats relating to the transportation of hazardous substances are located in the Mattawa WHPA. Both chemical and pathogen significant threats exist within Mattawa WHPA-A and B (Figure 5-4). The pathogen threat relates to the transportation of septage, for which a spill may result in the presence of pathogens in ground water. Significant chemical threats relate to the transportation of sulphuric acid or sodium hydroxide in quantities greater than 2,500 litres, for which a spill may decrease or increase, respectively, the pH of groundwater beyond acceptable limits.

Table 5-12. Areas within Mattawa Wellhead Protection Area where Transportation of Hazardous Substances is Considered a Significant, Moderate or Low Drinking Water Threat

Threat Type	Vulnerable Area	Vulnerability Score	Threat Level Possible		
			Significant	Moderate	Low
Chemicals	WHPA-A	10	✓	✓	
	WHPA-B	10	✓	✓	
	WHPA-C	8		✓	✓
	WHPA-D	6			✓
Pathogens	WHPA-A	10	✓		
	WHPA-B	10	✓		
	WHPA-C	8		✓	
	WHPA-D	6			✓

5.7 Gap Analysis and Recommendations

With respect to issues identification, data on raw water quality is largely unavailable because there are no requirements to collect it. However, since the only treatment provided in the Mattawa system is chlorination, most parameters analyzed for in treated water would not be reduced during treatment. Therefore, data on treated water quality should generally be adequate to identify issues.

From a scientific viewpoint, additional supplemental analysis of the water chemistry would be of benefit in tracking any long-term trends in water quality, for those parameters not mandated by the Certificate of Approval for the water system. As a suggestion, it has been recommended (Waters Environmental Geosciences Ltd., 2009b, Groundwater Risk Assessment) that a complete water quality scan of the raw water characteristics (major ion analysis, heavy metals analysis, nutrient indicators and general water chemistry parameters) be undertaken annually, complementing the analysis required by the Certificate of Approval.

Uncertainty scores were assigned to the various vulnerable areas. In many instances, high uncertainties were assigned because of a lack of detailed subsurface information. In the interest of continuous improvement, as new subsurface data become available, it is recommended that they be periodically assessed against the current conceptual model of the local geological setting so that any anomalous information is corrected for future planning cycles.

Although the Town of Mattawa has provided municipal sewage collection to all residences in the vulnerable area for more than fifty years, there was never a bylaw requiring hook-up and there are no records available to verify hook up. Therefore confirmation has not been made that there are no on-site septic systems still in operation. Such a system would be classified as a significant threat in WHPA-A or WHPA-B.