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10.0 PERTH COUNTY

10.1 Township of Perth East

Three municipal groundwater systems are located in the Township of Perth East: Milverton, Shakespeare and Tavistock. Only the Milverton Water Supply falls within the Grand River watershed.

10.1.1 Milverton Water Supply

The Milverton municipal well supply system is located in the Village of Milverton in the Township of Perth East. The drinking water system includes two bedrock wells: well #4 (PW4) (with a well depth of 48 m) and well #6 (PW6) (with a well depth of 66.7 m). Well #4 is adjacent to 35 Whaley Avenue. Well #4 was constructed in 1962 and obtains water from a sand-hard pan rock layer that starts approximately 43 m from the surface. Well #6 is located 25 metres west of the Spencer Street Reservoir and was constructed in 2004 (Milverton Annual Report, 2004).These wells are completed in the Amherstburg Formation. The bedrock is encountered at a depth of approximately 40 m. The drinking water system supplies a population of approximately 1,750 people as described in **Table 10-1.** The serviced areas of this system are shown on **Map 10-1**. Annual and monthly average pumping rates are shown in **Table 10-2.**

Table 10-1: Municipal Residential Drinking Water System Information for Milverton Drinking Water System

DWS Number	DWS Name	System Owner	GW or SW	System Classification[1]	Number of Users served[2]
220000503	Milverton Drinking Water System	Township of Perth East	GW	Large Municipal Residential System	1,750

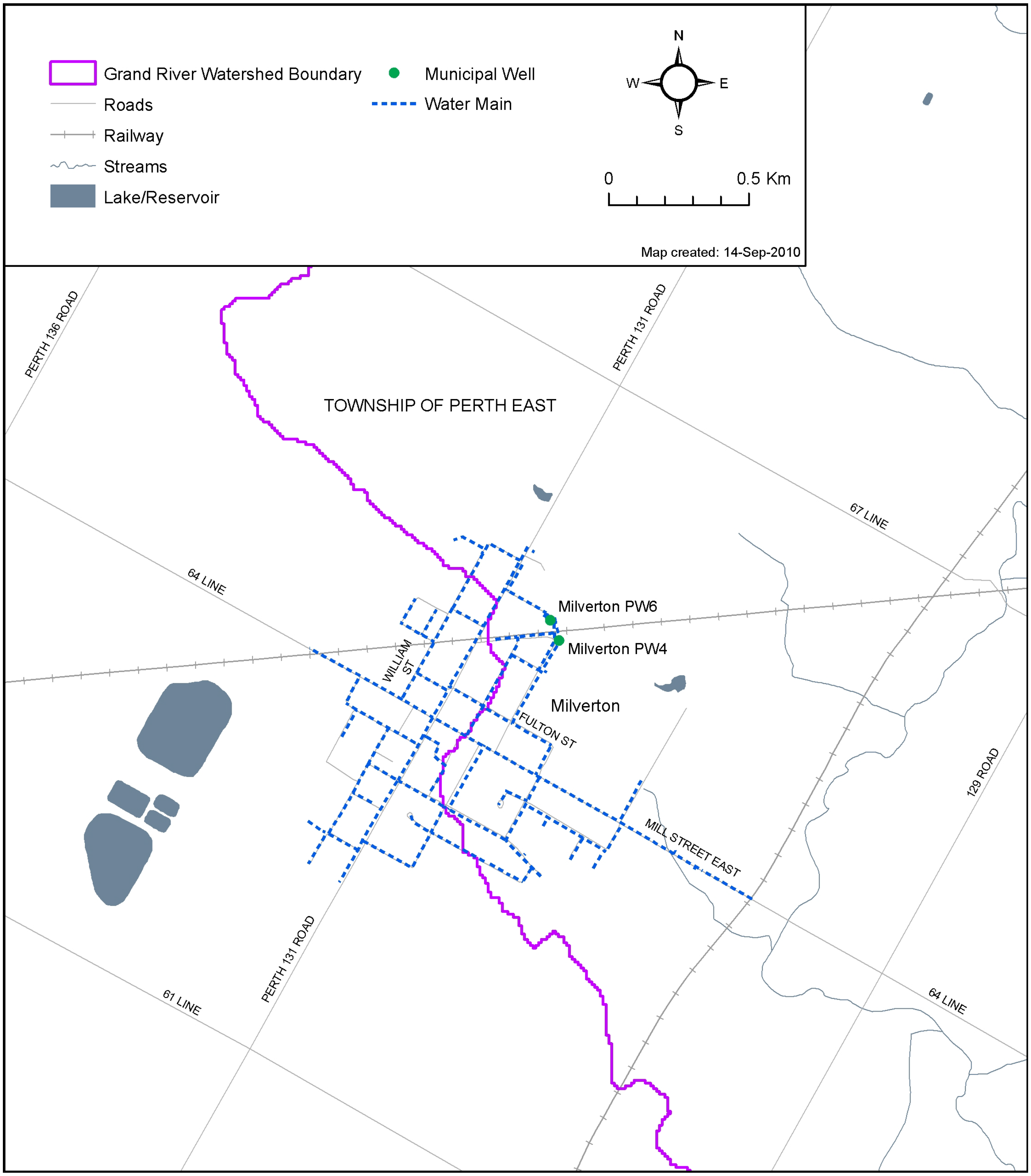
[1] as defined by O. Reg. 170/03 (Drinking Water Systems) made under the *Safe Drinking Water Act, 2002.*
[2] Based on Annual Report: Municipality of North Perth. Milverton Drinking Water System – 2017 Annual and Summary Reports

Table 10-2: Annual and Monthly Average Pumping Rates for Milverton Drinking Water System

Well or Intake	Annual Avg. Taking[1] (m^3/d)	Monthly Average Taking[1] (m^3/d)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Well #4 (PW4)	14	10.3	11.3	7.8	18.9	28.7	14.5	13.6	14.7	12.2	13.4	11.9	11.7
Well #6 (PW6)	417	373	377	385	393	486	478	463	463	458	422	357	343

[1] source: American Water Canada Ltd. 2009 Water System Reports for the Township of Perth East

Map 10-1: Milverton Water Supply Serviced Areas



10.1.2 Vulnerability Analysis

Delineation of Wellhead Protection Areas

The capture zones were delineated using a numerical model that was calibrated to the available hydrogeological data. The model was developed using the computer programs MODFLOW and MODPATH, and the procedures and results are described in detail by Schlumberger Water Services (Canada) Inc., 2010 reports on vulnerability, threats and Issues:

- *Vulnerability Assessment – Perth County Municipal Drinking Water Systems (March 2010);*
- *DRAFT Technical Memorandum Issues Assessment – Milverton and Shakespeare Municipal Drinking Water Systems (March 2010); and*
- *DRAFT Threats Assessment – Milverton and Shakespeare Municipal Drinking Water Systems (May 2010).*

Modelling Approach for the Milverton Water Supply

The Milverton numerical model was created as a three-dimensional MODFLOW model. The finite difference grid spacing consisted of 225 m regionally, with refinement to approximately 30 m in the vicinity of the wells.

In the original model (2003), hydraulic conductivities were assigned to each of the four model layers, with the uppermost layer corresponding to the overburden, the second layer to the bedrock/overburden contact zone (the weathered portion of the bedrock), and the bottom two layers of the model corresponding to the unweathered bedrock. In the original model, the groundwater flow was assessed for Well #4 and the now decommissioned Well #5. In the updated model (2006), the new Well #6 was assessed at a deeper depth than Well #4 or the decommissioned Well #5. The bottom of the screen extended to the bottom layer of the model. Refining the fourth layer into two layers mitigated any potential groundwater flow problem that might have occurred by having the screen located in the bottom-most layer of the model.

Uniform hydraulic conductivities were defined across the lower three model layers, with three distinct zones applied to the uppermost layer to account for the different overburden geologic conditions in the area. Previous Quaternary mapping (Karrow, 1993) was used to delineate the overburden hydraulic conductivity zones.

A recharge value of 70 mm/year was assigned throughout the model area, with the exception of a small area that was assigned a recharge of approximately 115 mm/year. The 115 mm/year zone corresponds to the hummocky topography of the Milverton moraine, where increased recharge can be expected. These recharge rates are consistent with base flow estimates, as discussed in the Perth Groundwater Study (WHI, 2003c).

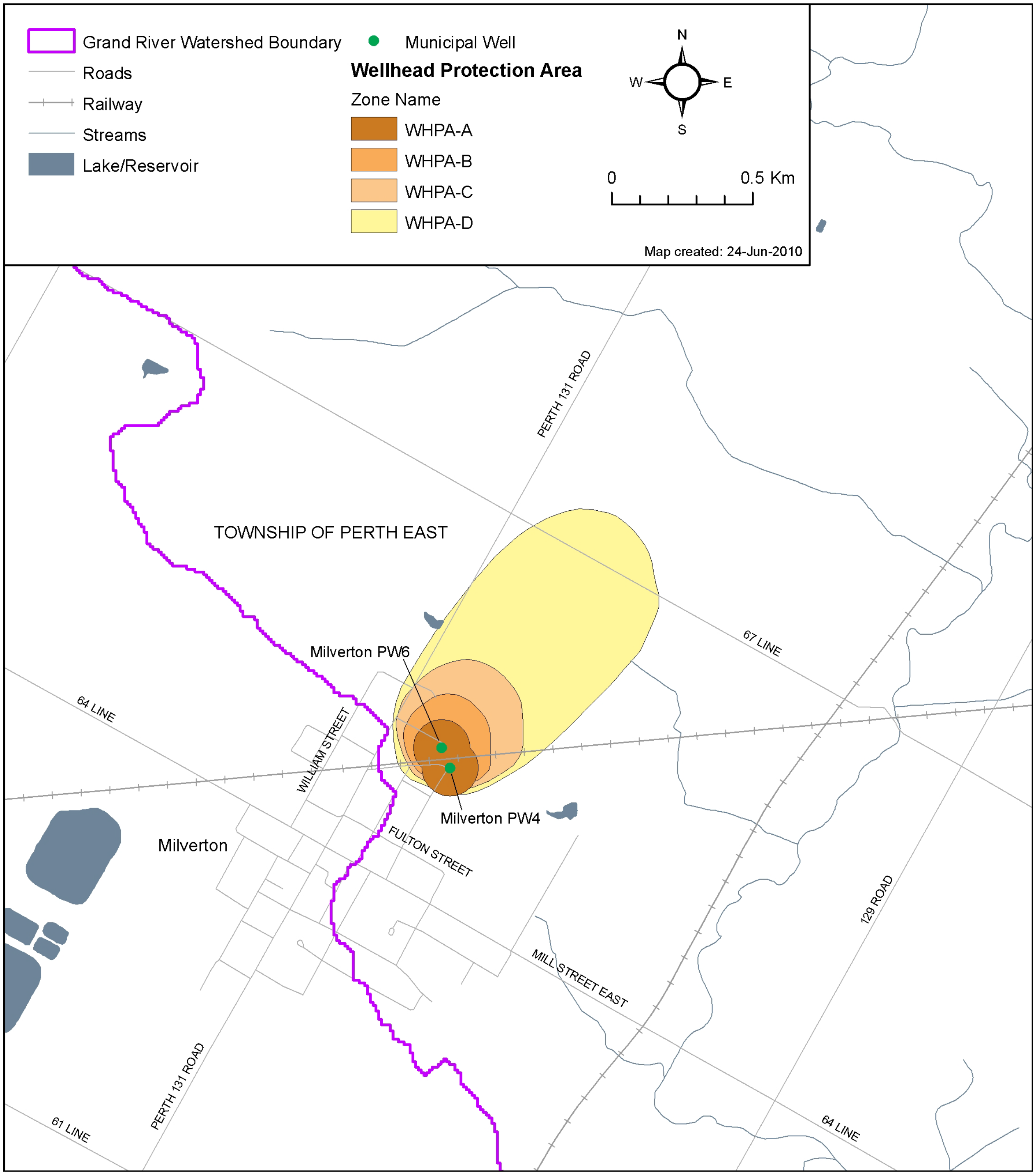
To represent the groundwater flow conditions in the groundwater flow model, constant head boundary conditions were defined along the northeast and southwest extents of the model in the bedrock layer and the overburden/bedrock contact zone layer (layers two, three and four of the model). No-flow boundaries were assigned along the northwest and southeast extents of the model. River boundary conditions were applied to account for the influence of the Nith River tributaries on the groundwater flow system in the Milverton area.

The bottom of the model was established 100 m below the bedrock overburden contact zone. At this boundary, a no-flow condition is applied, since flow is conceptualized to be horizontal and beyond the area of influence of the well.

Delineation of Milverton Wellhead Protection Areas

Capture zones for the Milverton production wells were determined for the 100-m radius, 2-, 5- and 25-year time of travel for both wells. Because the wells are fairly close together, the 100 m radius delineations intersect each other, and the Wellhead Protection Areas for the two wells have been merged, as presented on **Map 10-2.** The alignment of the WHPA is from northeast to southwest. The majority of the WHPA is located on rural land. The total area of the 25-year WHPA (including the 100 m areas) is 0.63 km^2.

Map 10-2: Milverton Water Supply Wellhead Protection Area



Vulnerability Scoring in Wellhead Protection Areas

The Intrinsic Susceptibility Index (ISI) is based on the geologic logs of water well records within the study area. The ISI is calculated based on the thickness and nature of the materials composing the geologic log down to the water table, or, in a confined system, to the top of the aquifer. This method involves assigning a numerical coefficient to each of the geologic units found above the water table of the aquifer of interest, or above the top of the aquifer for the confined case. The more protective (impermeable) a material is, the higher its coefficient will be. This geologic coefficient is then multiplied by the corresponding unit thickness to determine the ISI value for each geological layer in a well log until either the water table is reached for an unconfined aquifer, or down to the base of the confining unit for a confined aquifer from the surface. This procedure is repeated for each well record within the study area.

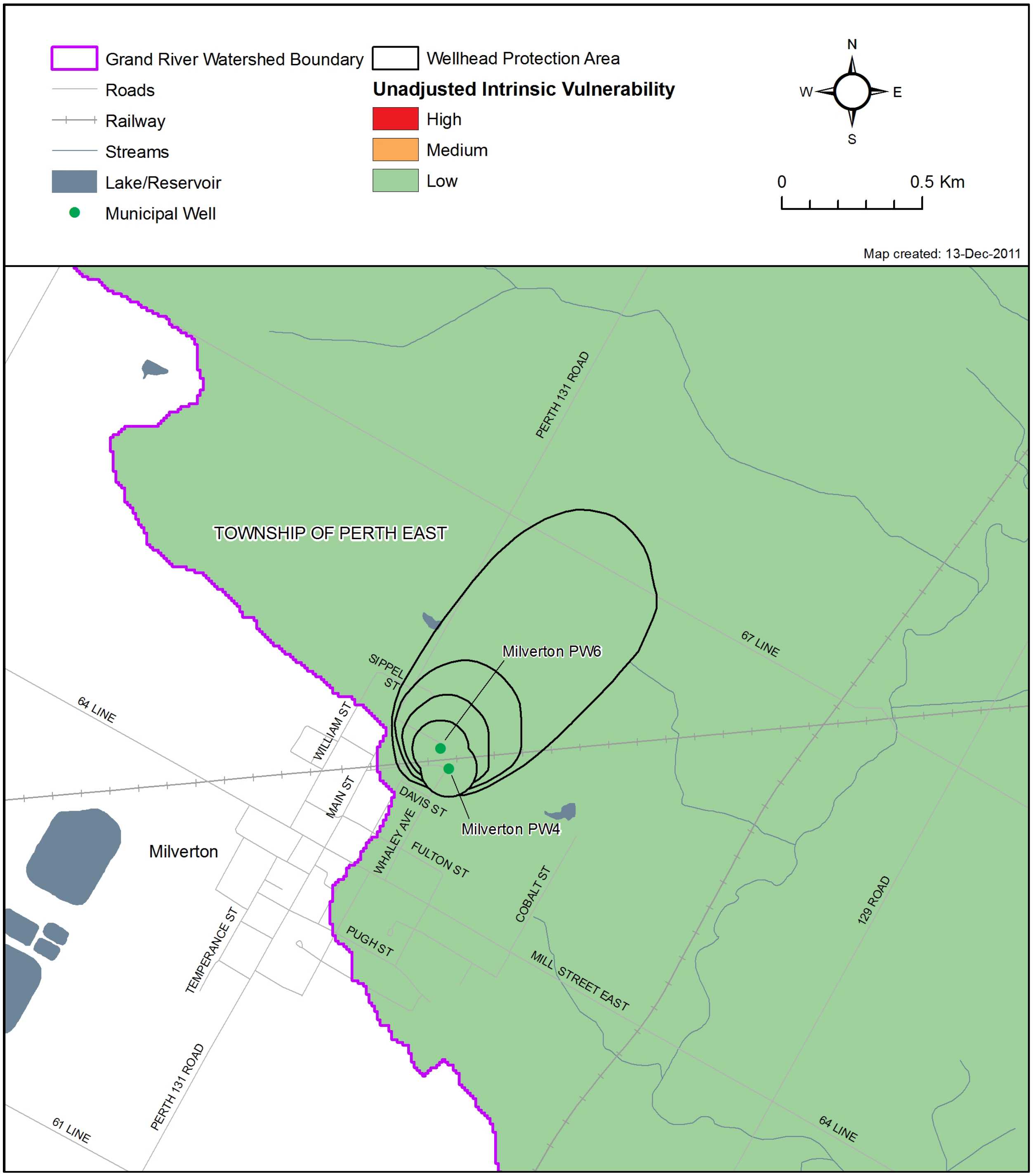
The overall aquifer vulnerability was calculated using the WHPA delineations and ISI scores. The vulnerability scores for the WHPA were assigned by intersecting the ISI value of the aquifer with the WHPAs time of travel zones (100-m, 2-year, 5-year and 25-year).

Due to the low vulnerability scoring noted using the ISI method, SAAT was used to complete the vulnerability scoring to keep consistent with the regional mapping. Due to the low vulnerability there were no scoring changes between the ISI and SAAT methods, no additional changes are necessary based on professional judgment. The unadjusted intrinsic vulnerability for the Milverton Drinking Water System is shown on **Map 10-3.**

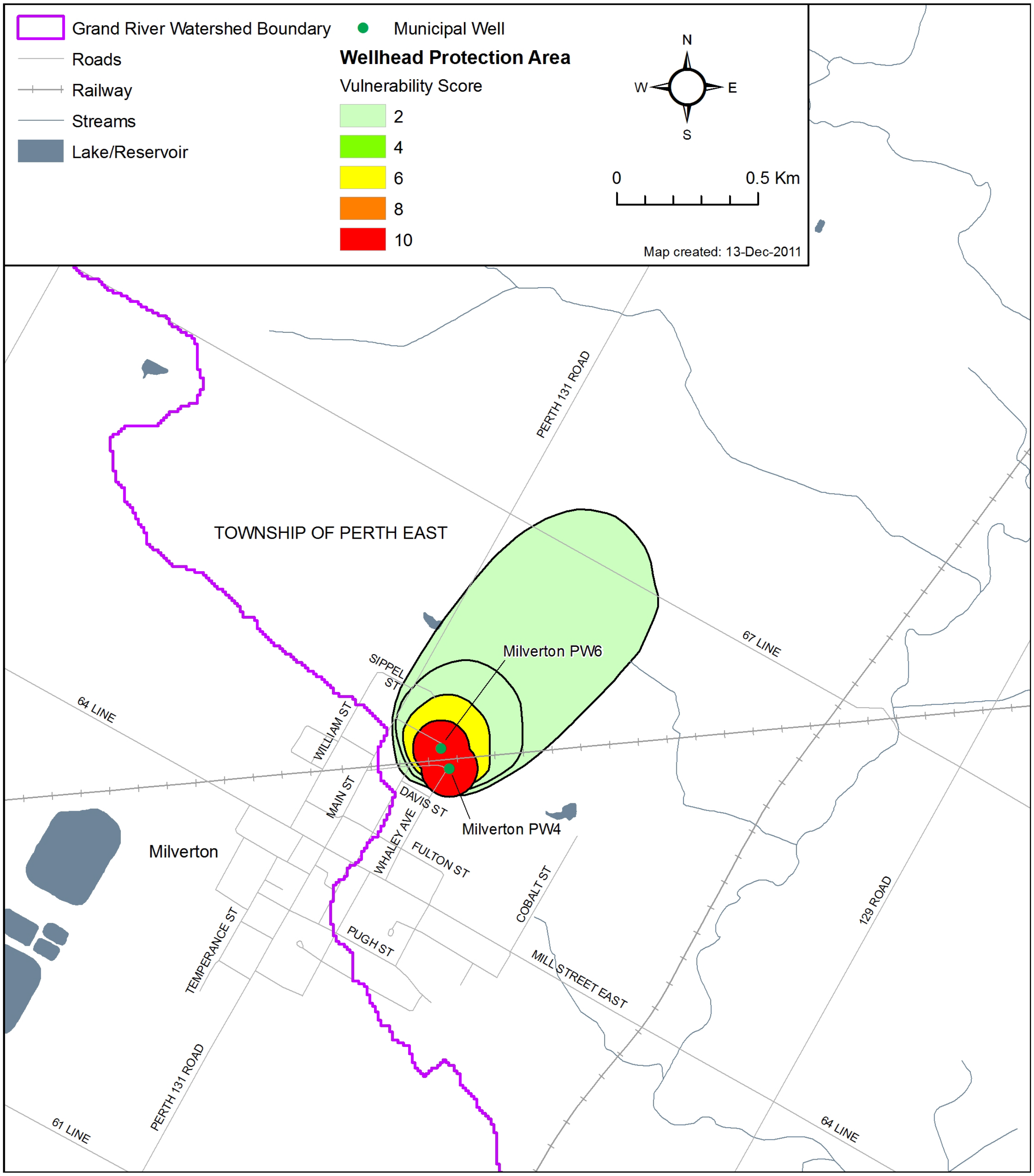
Vulnerability Scoring in the Milverton WHPAs

In the study area two aquifers exist: a shallow and unconfined aquifer in the overburden and a deeper and confined bedrock aquifer. Since the objective of the vulnerability calculation is to assess the vulnerability of the bedrock aquifer, the top of the bedrock aquifer is used as the limit to which the geological material scores are accumulated. The bedrock aquifer is confined. Within the WHPAs, the ISI values throughout the majority of the study area are low as presented on **Map 10-4.**

Map 10-3 Milverton Water Supply Unadjusted Intrinsic Vulnerability



Map 10-4: Milverton Water Supply Wellhead Protection Area Final Vulnerability



Identification of Transport Pathways and Vulnerability Adjustment in the Milverton WHPAs

One potential well was found using MOE water well records within the 25-year capture zone close to the western border of this zone. This well does not reach the municipal aquifer and does not represent a transport pathway. A small number of wells were noted in the 25-year capture zone by the well operator for Milverton, but no locations were available for these wells to be mapped. These wells are not considered to be a high risk for the drinking water system, even in the case where they would puncture the municipal aquifer. Located in the 25 years WHPA, which has a vulnerability score of two, the wells would augment the vulnerability to a value of four only. Therefore, no adjustments were made to the vulnerability scoring or maps.

Uncertainty in the WHPA and Vulnerability Scoring for the Milverton Water Supply System

The uncertainty of capture zones related to the well field of Wells #4 and #6 is low as the model is believed to reliably represent local hydrogeological conditions. The capture zones are sufficiently large so that changes in hydrogeological parameters do not significantly impact the size and shape of the WHPAs.

The vulnerability of the model domain is low and all individual ISI values are well above 80 (limit between the medium and low vulnerability categories); therefore, the associated uncertainty is assumed to be low.

Managed Lands within the Milverton WHPAs

Managed lands are lands that may receive agricultural source material (ASM), non-agricultural source material (NASM) or commercial fertilizer. Details on managed lands calcualtions are in Chapter 3 of this Assessment Report.

The ISI surrounding all of the Milverton wells is low, therefore only WHPA-A and WHPA-B were required to undergo assessment for managed lands.

The results of the calculations for managed lands are provided in **Table 10-3** and **Map 10-5**.

Table 10-3: Percent Managed Lands in the Milverton Wellhead Protection Areas

<table>
<tr><th>Township</th><th>Location</th><th>Well</th><th>WHPA-A</th><th>WHPA-B</th><th>WHPA-C</th><th>WHPA-D</th></tr>
<tr><td rowspan="2">Perth</td><td rowspan="2">Milverton</td><td>PW4</td><td rowspan="2">44.57%</td><td rowspan="2">60.67%</td><td rowspan="2">N/A</td><td rowspan="2">N/A</td></tr>
<tr><td>PW6</td></tr>
</table>

The coding of N/A indicates that the vulnerability score in this area is 4 or less, and this area has not been assessed.

Assumptions While Assigning Non-Agricultural Managed Lands

Some default values were used for estimating NAML based on the air photo interpretations and for ease of calculating. Roads generally had right-of-ways that were about 50% of the parcel size while the rest was the actual roadway, so most of these parcels were given NAML percentage of 50%. Parks or other open green-space that were interpreted as turf or grass were all assumed to have commercial fertilizers applied and thus defined as managed lands.

Livestock Density within the Milverton Wellhead Protection Areas

Livestock density is used as a surrogate measure of the potential for generating, storing and land applying ASM as a source of nutrients in vulnerable areas. Detailed methods to calculate livestock density are described in Chapter 3 of this Assessment Report.

The results of the calculations for livestock density for Milverton's WHPAs are provided in **Table 10-4** and **Map 10-6**.

Table 10-4: Livestock Density (NU/acre) in the Milverton Wellhead Protection Areas

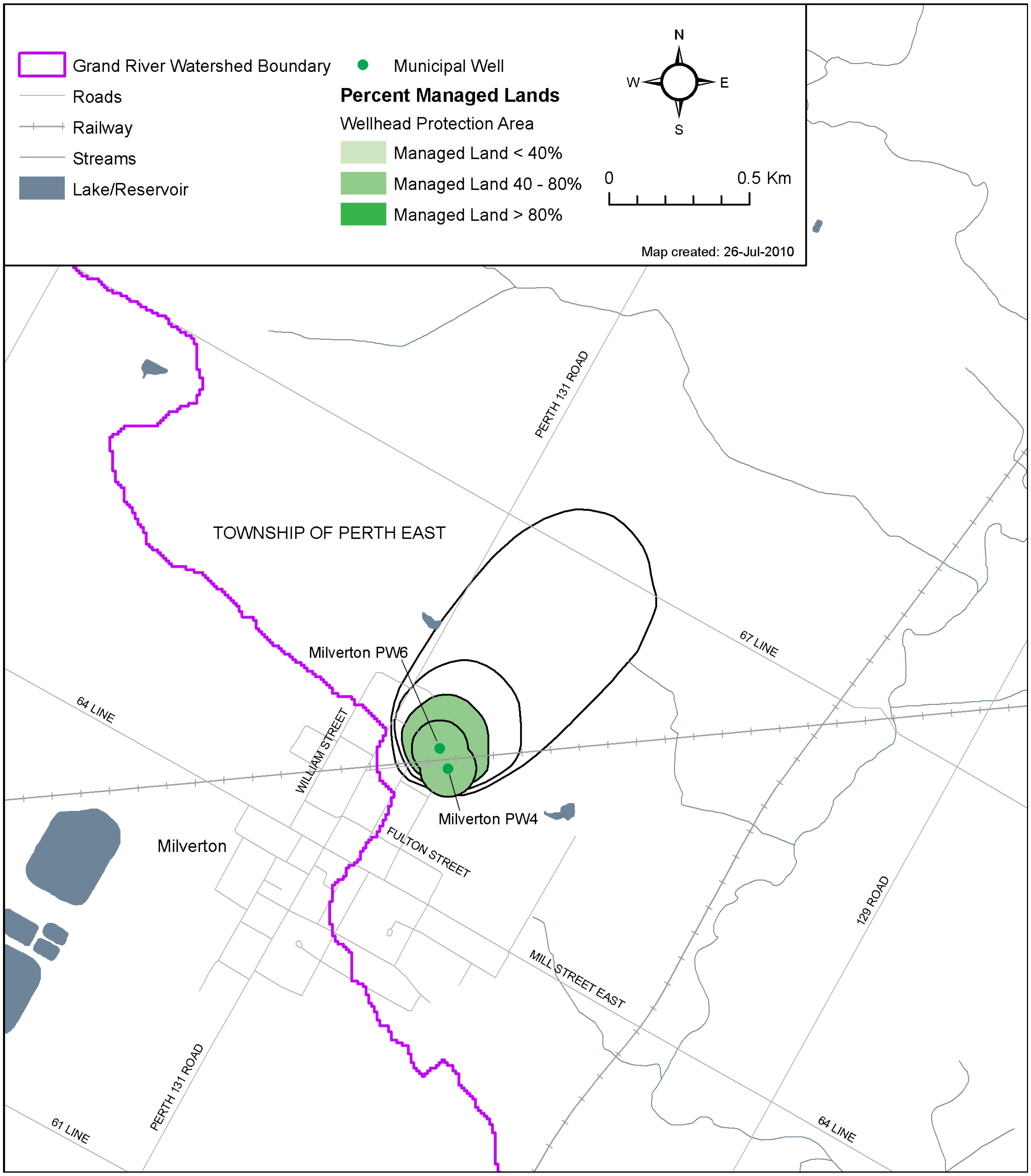
Township	Location	Well	WHPA-A	WHPA-B	WHPA-C	WHPA-D
Perth	Milverton	PW4	0	0.40	N/A	N/A
		PW6				

The coding of N/A indicates that the vulnerability score in this area is 4 or less, and this area has not been assessed.

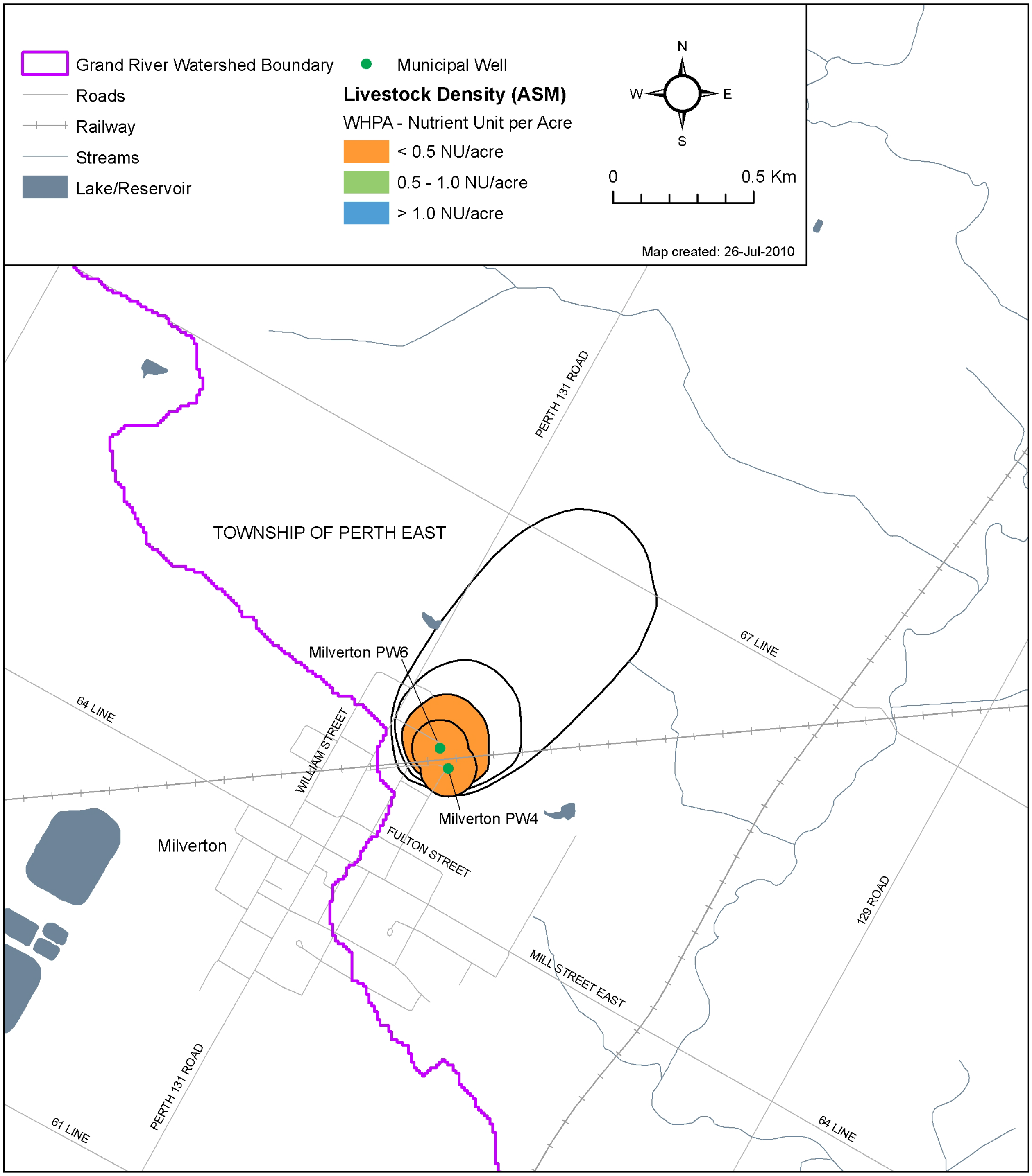
Percent Impervious Surface Area within the Milverton Wellhead Protection Areas

Percent impervious surface area for the Milverton WHPA was calculated using the moving window average method, which is described further in Chapter 3 of this Assessment Report. The resulting impervious surfaces map is shown in **Map 10-7**. Percent imperviousness ranges from 8 to <80% in the 100m, 2-year and minor area of the 5-year WHPAs, as these WHPAs contain a large proportion of the urban area of Milverton. Most of the 5-year and 25-year WHPAs are classified as having percent imperviousness ranging from 1 to <8%, as this area is located mainly within a rural setting.

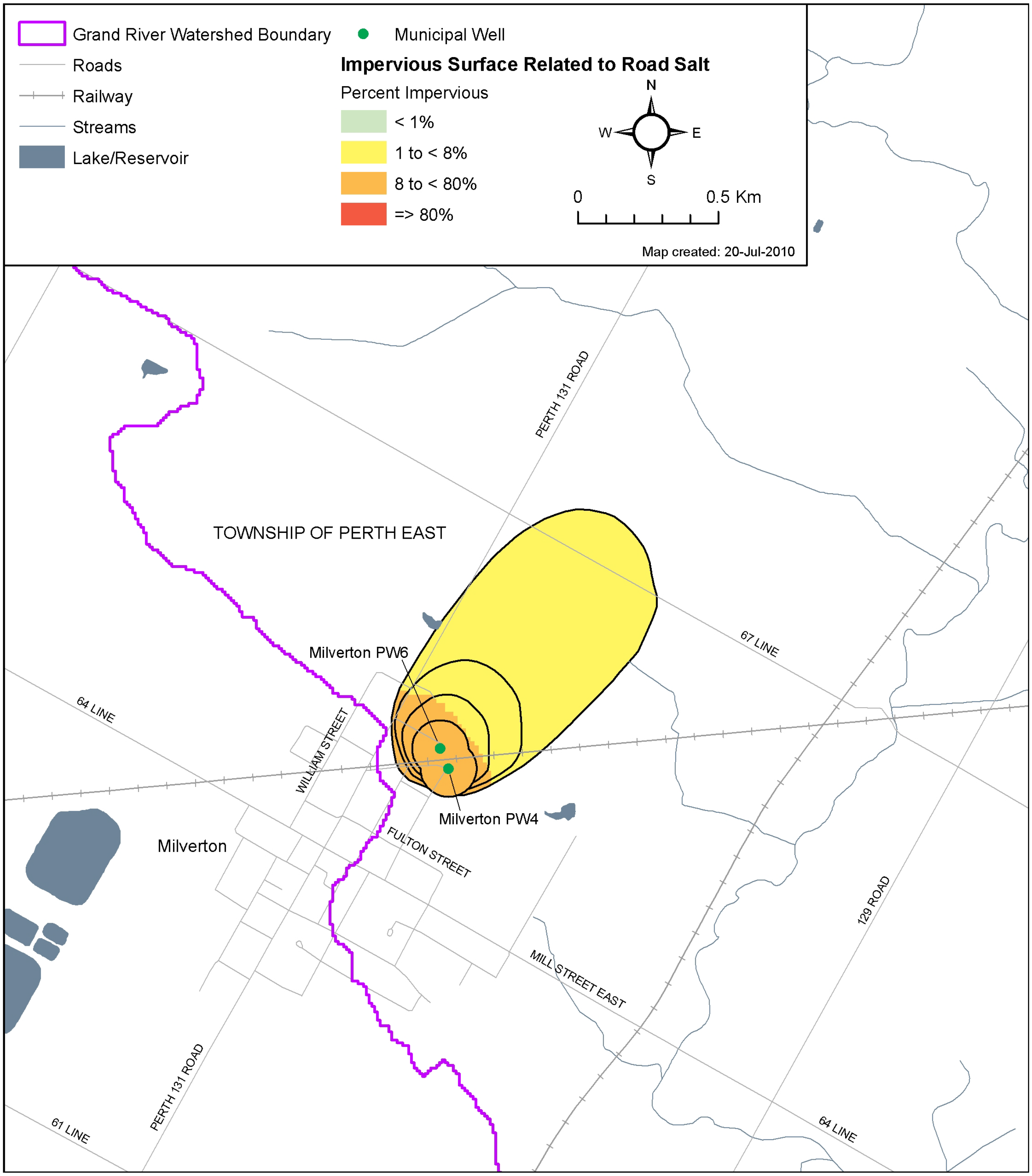
Map 10-5: Milverton Water Supply Percent Managed Lands



Map 10-6: Milverton Water Supply Livestock Density



Map 10-7: Milverton Water Supply Percent Impervious Surfaces



10.1.3 Milverton Drinking Water Quality Threats Assessment

The Ontario Clean Water Act, 2006 defines a Drinking Water Threat as “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, and includes an activity or condition that is prescribed by the regulation as a drinking water threat.” A Prescribed Drinking Water Threats table in Chapter 3 lists all possible drinking water threats.

Identification of Significant, Moderate and Low Drinking Water Threats for the Milverton Water Supply

Table 10-5 provides a summary of the threat levels possible in the Milverton Water Supply for Chemical, Dense Non-Aqueous Phase Liquid (DNAPL), and Pathogens. A checkmark indicates that the threat classification level is possible for the indicated threat type under the corresponding vulnerable area / vulnerable score; a blank cell indicates that it is not. The colours shown for each vulnerability score correspond to those shown in **Map 10-4**.

Table 10-5: Identification of Drinking Water Quality Threats in the Milverton Water Supply WHPAs

Threat Type	Vulnerable Area	Vulnerability Score	Threat Classification Level		
			Significant 80+	Moderate 60 to <80	Low >40 to <60
Chemicals	WHPA-A	10	✔	✔	✔
	WHPA-B	6		✔	✔
	WHPA-C/D	2			
Handling / Storage of DNAPLs	WHPA-A/B/C	Any Score	✔		
	WHPA-D	2			
Pathogens	WHPA-A	10	✔	✔	
	WHPA-B	6			✔

Conditions Evaluation for the Milverton Water Supply

After review of the data obtained and discussions with municipal staff, there is no evidence of condition-related drinking water threats in the Milverton. Nevertheless, the absence of such information is expected considering that such data rarely becomes public. Therefore, it is possible that condition-related drinking water threats do exist; however, no data is available to either confirm or refute this possibility.

10.1.4 Drinking Water Quality Issues Evaluation

A drinking water Issue is identified as the occurrence of a parameter or pathogen in water at a surface water intake or well at a concentration that results in or may result in the deterioration of the quality of the water for use as a source of drinking water (MOE, 2009b). The activities that contribute to identified Issues that have, at least in part, an anthropogenic origin are deemed a significant drinking water threat.

Data Sources for the Drinking Water Quality Issues Evaluation

Data used for the screening phase of the Issues identification was extracted from the following documents or document types:

- Annual drinking water reports

- Watershed Characterization report
- Local groundwater quality studies, where available. In cases where potential water quality issues were flagged, additional information was extracted from the following data sources:

    - 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 were reviewed based on the relevant methodology outlined in this document to confirm Issues.
    - Drinking Water Information System (DWIS): This dataset provides Schedule 1 (indicator microbial) data and some chemical parameter data. Data on the flagged parameters were reviewed based on the relevant methodology outlined in this document to confirm Issues.
    - Provincial Groundwater Monitoring Network (PGMN) data (2003-2006): this dataset was used to compare elevated concentrations of contaminants in the drinking water wells to baseline groundwater data the watershed. The occurrence of similarly elevated values over a large portion of the watershed was considered to be evidence for a natural origin of the constituent.

Interviews with well operators were an important component of this study. A questionnaire was prepared for each drinking water system and discussed in person with each well operator.

Water Quality Issues Evaluation for the Milverton Water Supply

A discussion of all 158 parameters included in Schedules 1, 2 and 3 exceeds the scope of this study. Below is a list of the parameters where exceedances of the 50% Maximum Allowable Concentration (MAC/2), Aesthetic Objective (AO) or Operational Guideline (OG) were found in at least one groundwater sample. Water quality data was analyzed up to 2008.

Sodium concentrations can be increased by anthropogenic processes and naturally. The main anthropogenic origin is road salting. Natural occurrence of sodium is generally due to the dissolution of rock salt minerals (NaCl), mixing with seawater or mixing with deep saline groundwater.

Sodium exceeded the health advisory level of 20 mg/L consistently in Milverton. The sodium is believed to be generally of a natural origin; however, the contribution of some sodium originating from road de-icing products cannot be excluded. The ODWQS does not require drinking water to remain below the health advisory standard, but requests that the occurrence of sodium levels above 20 mg/L should be notified to the local Medical Officer of Health, so that this information may be communicated to local physicians for their use with patients on sodium restricted diets. None of the available sodium analyses exceeded the aesthetic objective threshold of 200 mg/L, which is considered to be the health related threshold for the major part of the population. None of the interviewed well operators have identified an increasing trend of sodium over the last years or considered sodium to be an Issue in their drinking water well. For these reasons, sodium was not identified as an Issue under Technical Rule 114.

Fluoride can occur naturally in groundwater at levels that exceed the ODWQS. Natural sources include minerals such as fluorite and apatite, as well as desorption of previously sorbed fluoride ions from clay surfaces. The main anthropogenic source includes fertilizers. High fluoride levels affect dental health. Fluoride exceedances are a frequent occurrence in Southern Ontario, including Perth County. The origin has been interpreted to be of natural origin in most cases in Perth County. The ODWQS of fluoride is 1.5 mg/L

Fluoride was found to exceed the drinking water standard in Milverton. Additional fluoride concentrations from samples collected at the drinking water systems and also at PGMN monitoring locations were compiled and all concentrations above the 50% MAC in this dataset were analysed. The data led to the conclusion that elevated fluoride concentrations are a widespread phenomenon in Perth County and that there is no indication of an increasing trend in the Milverton Water Supply System.

The bedrock aquifer is well protected by a thick sequence of silt and till which make a fluoride source at ground surface highly improbable. It was also found that shallow wells had generally lower fluoride concentrations than the deep wells, which also is opposite to the expected concentration gradient, if fluoride contaminated water was infiltrating from the surface. High fluoride values have been reported in many groundwater quality studies in south-western Ontario, in particularly for wells producing water from the Lucas and Dundee Formations. These formations constitute the aquifers of most of the studied drinking water systems. It is concluded that the origin of fluoride in all investigated drinking water systems is of natural origin and fluoride is not considered an Issue under Technical Rule 114.

Arsenic is a highly toxic metalloid which may occur naturally at levels that exceed the ODWQS. Arsenic may be from natural causes, such as the weathering of rocks. Inorganic arsenic may originate from the chemicals used while producing pressure treated lumber, and found in some pesticides. The ODWQS MAC for arsenic is 25 µg/L. In May 2006, Health Canada lowered the national CDWQG to 10 µg/L based on recent information on the carcinogenicity of ingested arsenic. Ontario is currently reviewing the adoption of a more stringent ODWQS of 10 µg/L for arsenic.

Elevated arsenic concentration near or above the 50% MAC threshold were encountered in Milverton. In Milverton, the arsenic level of 15 µg/L exceeded the 50% ODWQS in 2007. A duplicate analysis only provided a concentration of 8 µg/L. However, in the absence of a third sample, the more conservative value of 15 µg/L was used as the representative concentration.

Provincial Groundwater Monitoring Network (PGMN) data and data from various groundwater studies compiled in WHI in 2007 was consulted to establish a baseline of arsenic concentrations in bedrock wells. Since the elevated arsenic levels occur over a wide area within Oxford County and in deep wells which are well protected from contamination from the surface, the occurrence of arsenic in Milverton is considered natural in origin.

After review of additional arsenic data within the study area, no arsenic levels above the ODWQS was found, and no indication of trending towards the ODWQS was encountered. It should be noted that the available data was too limited to establish a detailed understanding of the temporal distribution of arsenic. The well operators of Milverton were aware of the elevated arsenic values, but were not aware of any trending for this constituent. Since the ODWQS was not exceeded in any of the available analyses, arsenic was not identified as an Issue under Technical Rule 114. However, given the toxicity of this parameter and the fact that the drinking water standard for arsenic may be lowered in the future to the internationally accepted level of 10 µg/L, the parameter should be closely monitored in the systems of Milverton.

Iron may originate from both natural and anthropogenic sources. Oxidation of well equipment is a common anthropogenic source. Iron is a common constituent of minerals in limestone and dolostone, such as siderite, goethite and ferrihydrite. High iron concentrations are a common phenomenon in Southern Ontario, including Perth County, and these concentrations are believed to be of natural origin. Iron is included in Table 4 (Operational Parameters) and is not considered to represent a health threat. The ODWQS for iron is 0.3 mg/L.

Hardness is defined as the sum of earth alkaline metals calcium and magnesium expressed as calcium carbonate ($CaCO_3$). Calcium and magnesium are both typically of natural origin originating from the dissolution of calcium carbonate from limestone ($CaCO_3$) or dolomite ($MgCa(CO_3)_2$). Hardness is included in Table 4 (Operational Parameters) of the ODWQS and is not considered to represent a health threat. The ODWQS defines range of acceptable hardness of 80-100 mg/L $CaCO_3$. This threshold is exceeded in most inspected samples of the investigated drinking water systems.

Iron and manganese likely exceed the aesthetic objective in Milverton. Concentrations of iron and manganese above the ODWQS aesthetic objectives are a widely observed phenomenon in Perth County. These elevated values are believed to be of a natural origin. All of the drinking water systems with elevated iron concentrations have a sodium silicate water treatment in place. None of the interviewed well operators have observed an increasing trend of iron concentrations or considered iron to be an Issue in their drinking water system. Therefore, iron and manganese were not identified as an Issue under Technical Rule 114, but should be monitored in the systems of Milverton.

Total coliform bacteria include different types of coliform bacteria and are commonly found in the environment (e.g., soil or vegetation). If only total coliform bacteria are detected in drinking water, this indicates that water from the natural environment is entering the water supply. Milverton wells 4 and 6 were both sampled 52 times in 2007, and all raw water analyses tested negative for bacteriological parameters.

Summary of Water Quality Issues Evaluation for the Milverton Water Supply

Concentrations that were above the screening benchmark were found for sodium (20 mg/L health advisory threshold) and fluoride (0.75 mg/L 50% MAC limit). Similar results have been reported in the past for these constituents. Arsenic reached a level of 15 µg/L in 2007, exceeding the screening benchmark. Therefore arsenic was flagged. Significantly higher values ranging from 35 to 72 µg/L were measured in a hydrant (Drinking Water System Regulation 170/03, 2007b). These high concentrations are explained in the drinking water report as the result of the absorption of arsenic on precipitated iron, which could then accumulate in stagnant parts of the piping system. Such high values were never found in the raw water or in distribution water.

Therefore, no water quality Issues were identified in the Milverton Water Supply System.

Limitations and Uncertainty for the Water Quality Issues Evaluation for the Milverton Water Supply

The current investigation concluded that none of the studied drinking water systems have a confirmed water quality Issue as defined by the Technical Rules of the Clean Water Act. This finding could be wrong if either there were exceedances in the past between sampling events, or, if contaminants had occurred in elevated concentrations in the past but were not analysed. Both conditions seem unlikely.

Firstly, it is unlikely that a contaminant plume would pass through the drinking water source within one year and completely disappear before the next sampling round. Secondly, the list of parameters included in the Drinking water surveillance program is sufficiently comprehensive, so that the scenario of non-analysed contaminants is unlikely. As a result, the uncertainty associated with the Issues identification results is considered to be low.

10.1.5 Enumeration of Significant Drinking Water Quality Threats

Methodology for the Enumeration of Significant Drinking Water Quality Threats

Data for the potential contaminants sources enumeration was obtained primarily from field surveys that were conducted to verify the presence of different land uses within the vulnerable areas that could adversely affect groundwater quality or quantity of water and may interfere with the use of a drinking water source.

Threats were identified according to the type of activities that were identified on these areas and the potential of using certain chemicals or materials that are usually attached to these types of activities. However, the certainty of knowing what type of activity was undertaken or what chemical or material was used was generally low as there was no contact between our field personnel and the owners or the workers on any of these properties.

Interviews were conducted with the well operator of the water supply system. The well operator were asked whether they are aware of historic activities or conditions that may represent a threat to the drinking water. For all parameters that exceeded ODWQS levels, the well operator was asked whether he was aware of any activity or Condition which could be associated with this.

Enumeration of Significant Drinking Water Threats for the Milverton WHPAs

During the field survey in the Milverton WHPAs, one farm and cropland property was identified as being a potential threat related to agricultural practices (possibly point and non- point sources). Different activities associated with agricultural practices were identified, this included storing of agricultural material, land spraying, food processing, and livestock farming. Specific threats identified includes the use of fertilizers, use of pesticides and herbicides, storage of fuel tanks, and manure piles, which can be a potential source of chemical or pathogen contamination.

A range of manufacturing sites and machine shops were identified in Milverton during the field survey which included different manufacturing practices that involved the production of voltage regulators and boosters. An automotive shop (including car and tire dealers, garages, and car repair shops), one funeral home, and some livestock wholesaling locations were found. One veterinarian’s office and two new houses development sites were located during the survey as well.

The number of significant Prescribed Drinking Water Threats identified during this assessment is tabulated in **Table 10-6**. The four identified threats are related to manufacturing sites and machine shops. All identified firms could potentially store toxic chemicals in sufficient quantities to pose a significant threat to the drinking water.

Table 10-6: Milverton Water Supply Significant Drinking Water Quality Threats			
PDWT[1] #	**Threat Subcategory[2]**	**Number of Activities**	**Vulnerable Area**
15	Handling and Storage Of Fuel	1	WHPA-A
16	Handling and Storage Of A Dense Non Aqueous Phase Liquid (DNAPL)	3	WHPA-A
Total Number of Activities		**4**	
Total Number of Properties		**3**	

1: Prescribed Drinking Water Threat Number refers to the prescribed drinking water threat listed in O.Reg 287/07 s.1.1.(1).
2: Where applicable, waste, sewage, and livestock threat numbers are reported by sub-threat; fuel and DNAPL by Prescribed Drinking Water Threat category

Note: Certain types of activities on residential properties that are incidental in nature and that are significant drinking water threats are not enumerated. These threats include the application of commercial fertilizer on residential properties, the storage of organic solvents (dense non-aqueous phase liquids) on residential properties, and the storage of fuel (e.g., heating fuel tanks) on residential properties in natural gas serviced areas.

Note: The County of Perth does not consider storm sewer piping to be part of a storm water management facilty.

Limitations and Uncertainty for the Enumeration of Significant Drinking Water Quality Threats for the Milverton Water Supply

In many cases the results of the windshield survey did not provide all required information to determine the risk score of an identified threat. For example, the type and quantity of toxic material present could not be determined without meeting the people operating on the land parcel. Professional judgment was used to conservatively estimate the nature and amount of stored material.

Where information was missing to determine the circumstances under which a threat occurred, conservative assumption was used. This led to a significant number of threats, many of which need to be confirmed by a more detailed analysis including interviews with land owners. Given the conservative approach that was chosen in this study, the uncertainty that current land uses, posing a threat to the drinking water, were missed, is low. At the same time, it is likely that some of the threats, which were identified as significant, are not a threat in reality. The uncertainty of the current threat of land uses based on the windshield survey is considered to be high.

No high resolution aerial photography was available for Perth County. In the absence of this data, the visual inspection was performed on a lower resolution image in Google Earth. The information and geographic locations of many of the historic threats are approximate and the information may be incomplete or outdated. The uncertainty of any interpretation based on the historic threats is therefore high. This is considered to be the most important data gap.

Overall, the available information was considered to be appropriate for conducting this investigation. However, since some significant data gaps were identified, the uncertainty of the reported threats location and category is considered to be high.