

10. Alder Creek and Upper Strasburg Creek Stormwater Management Planning

The goals and targets for the watershed have been put forward in this report. The objective of the SWM plan recommendations is to meet those targets. There are also a number of key issues in the watersheds that must be addressed through a SWM Plan.

10.1 Key Issues

There are a number of issues related to stormwater management in portions of the watersheds due to their importance to groundwater recharge and the unique hummocky topography that contributes to the rates of recharge.

Portions of the Alder Creek watershed and the Upper Strasburg Creek subwatershed are high infiltration areas lying within the Waterloo Moraine. As indicated in this report, the area provides significant recharge to water supply wells and the Mannheim ASR. As such, any recommended stormwater management plan must provide for the maintenance of infiltration while, at the same time, maintain the quality of surface water and groundwater.

10.1.1 Road Salt

The Region of Waterloo has been implementing programs to reduce the impact of road de-icing salt (sodium chloride) to drinking water supplies since 1997, including working with the City of Kitchener and the Region's transportation groups to implement salt reduction programs as part of their operations. In determining the approach to assess salt loading to groundwater, the following observations must be considered:

- Application of de-icing compounds on roads, parking lots, and sidewalks; snow removal is mandated by provincial legislation and is necessary to keep them safe. Rock salt is the most inexpensive de-icing compound. Alternatives to rock salt are at least 40 times more expensive and will likely only be used when absolutely necessary. Not applying de-icing salts is likely not an option, however, application can be substantially reduced on minor roads.
- Region and municipal transportation departments undertake winter maintenance activities in accordance with provincial guidelines that vary depending on road type and the amount of traffic volume.
- Most wells in Waterloo Region have elevated salt levels and show increasing trends. The highest levels of chloride and sodium occurring in areas with highest road densities (for example, downtown urban areas). Very high levels of chloride (several thousand mg/L) have been found in snow piles removed from roads within Waterloo Region and in the shallow groundwater directly adjacent to the roads. Approximately 10 percent of the Region's supply wells have chloride levels above the aesthetic level of 250 mg/L, Ontario Drinking Water Standards.

As development occurs, two types of salt-impact assessments are normally required to be undertaken: (1) an assessment of the impact of the development on the environment, and, (2) an area wide assessment of the cumulative impact on the supply wells. The former is typical for all development applications to ensure that the development does not have an impact on the natural heritage or environmental features immediately surrounding the development. The latter is necessary as the creation and salting of new roads represents an increased salt-mass loading where these roads occur within the capture zone of the supply wells.

Assessing the risk to groundwater quality associated with road salt can be evaluated using the Reasonable Use Concept (RUC methodology provided within *Guidelines B-7 – Incorporation of the Reasonable Use concept into MOEE Groundwater Management Activities* [MOE, 1994]). The RUC was not strictly developed for this purpose; however, it does provide a framework for assessing impacts to groundwater and has been used for assessment within the Upper Blair Creek (Kitchener) Functional Drainage Study (Stantec, 2007) and subdivision applications in Waterloo.

The principal normally applied for each development is the chloride levels in the groundwater for each development area must meet RUC Criteria for chloride both at the boundary (“footprint” impact) and to the municipal supply well. The boundary impact should be measured at the Area boundaries as illustrated in Figure 10-1. If all efforts to undertake an Area-based assessment fail, the individual property boundary can be utilized. The RUC Criteria is established to be the concentration leaving the site boundary that does not exceed the background, plus a percentage increase of the difference between the drinking water standard and the background concentration. For aesthetic parameters such as chloride, the percentage is 50 percent.

For the development-scale assessment, the background level would be the concentration in the groundwater prior to anthropogenic impacts (2.5 mg/L). For the supply-well scale assessment, the background level would also consider the concentration that the current road network is contributing to the water quality at the well. Key factors to be included in the assessment are the recharge rate and volume, salt application rates, fraction of salt and infiltrates, and the road types, winter maintenance service level, and the density of roads in the area of development.

As part of their ongoing salt assessment, the Region undertook a preliminary assessment of the salt loading to groundwater following the RUC approach. The assessment involved calculation of chloride concentrations in groundwater resulting from development of areas as part of the expansion of the Urban Area in 2004. The assessment utilized a mass-balance modelling approach developed for the Region by Stantec as part of their Road Salt Management and Chloride Reduction Study (Stantec, 2005). The assessment calculated both the concentration of chloride in the groundwater at the property boundary of each of four sub areas within the Urban Area expansion and the cumulative concentration of chloride at nearby municipal supply wells. The delineation of the four areas correlated to areas unique geologic settings, infiltration rates, current land use, and runoff characteristics. The model utilized infiltration rates and municipal well capture zones derived from the Alder Creek Groundwater Study and estimated road densities and salt application rates from neighbouring subdivisions within the City of Kitchener.