An Overview of Fresh Water Resources in the Edmonton-Calgary Corridor

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Abstract

Alberta Geological Survey (AGS) maps and quantitatively inventories the nonsaline and saline groundwater resources in Alberta. Though there is really only a single groundwater resource in Alberta with gradations of salinity, the AGS program structures its activities based on relative groundwater salinity to ensure a strong linkage between AGS outcomes to Alberta's policy and regulatory framework for groundwater.

This study considers surface water and shallow, nonsaline groundwater as a single fresh water resource. Understanding patterns of groundwater storage potential and yield, and the natural exchange of water between the groundwater and surface water systems is vital for sustainable fresh water management. The AGS and Alberta Environment have partnered to map the nonsaline groundwater resources of Alberta. The Edmonton–Calgary Corridor (ECC) is the first area of the province being mapped. The ECC study area is bound by surface water drainage basins, and has an area of approximately 50 000 km^2. Greater demand for fresh water resources has accompanied the rapid urban/industrial development in the ECC. In certain basins in the province, surface water allocations are already highly restricted, or fully allocated, indicating that groundwater withdrawals will increase. Increased groundwater usage may negatively impact many of the streams in Alberta due to an overall flow reduction because of decreased baseflow contributions.

The results of annual water budget analysis and physical characterization of the hydrogeologic framework are shown as hydrological and hydrogeological map series. Atmospheric water fluxes were characterized using Environment Canada climate data (precipitation and temperature) and empirical relationships to estimate evapotranspiration. Hydrograph analysis was completed on available hydrometric data to assign runoff/baseflow values to topographically defined, low-order catchment areas. This improved the spatial distribution of recharge (calculated as water budget residual) and identified areas with extensive groundwater-surface water interaction. The maps provide a synoptic overview of fresh water resources within the study area and the patterns of water exchange between atmospheric, groundwater, and surface water domains. The results presented will be compiled in the ECC Groundwater Atlas, which will be an important resource for water policy decisions, fresh water management strategies, and future development in the ECC.