EXECUTIVE SUMMARY

The Pembina Valley Water Cooperative Inc (PVWC) currently operates a water system that supplies treated water to approximately 40,000 residents in the area primarily west of the Red River and south of the City of Winnipeg from water treatment plants on the Red River at Morris and Letellier, as well as from the Stephenfield Reservoir on the Boyne River. As part of their ongoing risk management strategy to ensure that the water supply is safe and secure, the PVWC has identified that the water supply is susceptible to periods of drought when it may not be possible to maintain the required flows from the surface water sources. The solution to this potential is to develop a supplemental water supply from an independent source that is capable of supplying at least emergency levels of water and is not susceptible to drought. The results of an initial evaluation of potential sources has identified groundwater within the Bedford Ridge area of the Sandilands Provincial Forest as a potential source. This study has been undertaken to confirm the availability of a supplemental water source capable of providing 50 litres per second (650 lgpm). It is recognized that future needs may necessitate expanding the system to provide up to 300 litres per second (3,950 lgpm), however this is not part of the current study. Assuming that the system is operated continuously at full flow, the initial annual water requirement would be 1,500 dam^3 per annum, with an ultimate potential annual water requirement of 9,500 dam^3 per annum.

The Bedford Ridge area was selected for investigation for its potential to host suitable groundwater resources because it is underlain by an extensive sequence of gravel, sand, silt and clay deposits which collectively form the Sandilands Glaciofluvial Aquifer Complex. This area has long been known to host extensive groundwater resources that are essentially undeveloped. The primary designated land-use within the area is forest management within the Sandilands Provincial Forest. The land is primarily crown owned and is managed to promote forest growth for timber harvesting. Other land uses are allowed in this area provided that they do not negatively affect the ability of the forest to regenerate between timber harvests. Other development in the area is limited, primarily due to the moderately severe to very severe limitations of the soil for use for arable agriculture. The lack of existing development reduces the possibility that this development would unduly affect existing users in the area.

The results of previous and current studies have shown that the overburden soil stratigraphy can be subdivided into four major stratigraphic units consisting of (in descending order) an Upper Sand Unit; an Upper Silt Unit; a Lower Sand Unit; and, a Lower Till Unit. Beneath the target area for this development, the bedrock consists of a thin veneer of Winnipeg Formation sandstones and shales underlain by Precambrian metamorphics. Within this sequence, the Upper Sand Unit, the Lower Sand Unit, and the sandstones are considered sufficiently permeable to host groundwater resources of sufficient capacity for this project. The studies have also shown that the Upper Silt Unit and Lower Till Unit are effective aquitards that limit the vertical movement of groundwater between the aquifer systems.

The groundwater exploration program undertaken as part of this study included the drilling of twenty test holes and the installation of monitoring wells to refine the stratigraphic interpretation and identify a suitable aquifer. This work determined that the preferred target aquifer for the development of this water supply is the Lower Sand Unit. The aquifer has very high quality water, a high transmissivity suitable for developing and sustaining the required flow rates, and a limited hydraulic connection to the nearby surface environment. Based on these positive preliminary results, preliminary and full scale aquifer pumping test were conducted. These pumping tests confirmed that the aquifer system had a suitable high transmissivity and high water quality, and that the hydraulic connection with the surface environment within the drawdown cone area was negligible.

Based on the assessment of the results of this study, the following conclusions were made:

- The full scale test well installed as part of this program was found to have a well capacity of approximately 100 litres per second (1,600 USgpm), double the project requirement of 50 litres per second (800 USgpm). The test well is therefore suitable for use as a permanent pumping well with minor modifications to the well head.

- The review of the available information indicates that the existing groundwater users are all located at a distance of at least 6 kilometres from the proposed pumping well site, except for one well located at a distance of 4 kilometres. The assessment of the potential drawdown in water levels (using conservative methods) at these distances due to project pumping has shown that the existing wells will not be adversely affected and that the changes in water levels will be within the normal range of fluctuation.

- Relative to the potential impacts to the existing environment, the results of this study have shown that the water balance within the shallow unconfined aquifer that interacts with the surface environment will not be affected by the proposed project pumping and therefore the environment will not be affected.

- The assessment of the available information has shown that the proposed groundwater withdrawal rate is approximately an order of magnitude less than the existing groundwater flow rate within the target Lower Sand Unit aquifer system. The withdrawal will therefore not deplete the groundwater reserve in storage and is therefore sustainable over the long term. The results also suggest that significantly more groundwater is available for development. However, the assessment of the potential full yield of the aquifer system is best deferred until the results of the long term monitoring of the aquifer systems response to this low level of pumping are available.

Based on these positive results, it is recommended that the project proceed to licensing, construction and operation. Once in operation, it is recommended that groundwater levels in selected monitoring wells be measured regularly and the results recorded for analysis of the long term response of the aquifer to pumping. Once this information is available, decisions can be made on the potential future expansion of the system to meet demands.