
RANKIN INLET - WATER BALANCE ASSESSMENT

Executive Summary

NUNAVUT WATER BOARD
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Exhibit No.: <u>3</u>

The Community of Rankin Inlet currently depends on Nipissar Lake to service its year-round municipal water supply requirements. Given that the Nipissar Lake watershed is frozen over for approximately seven to nine months a year, the raw water supplies within Nipissar Lake at the outset of winter need to be sufficient to service the community over the winter until snowmelt runoff replenishes the lake during the following freshet.

In addition to the seasonal restrictions limiting replenishment of the Community's raw water supply, work completed by FSC Architects & Engineers and Resource Management Strategies Inc. in 2009 concluded that increased water consumption associated with continued population growth was exceeding annual water yields within the Nipissar Lake basin.

A water supply pipeline from the nearby Char River to augment water supplies in Nipissar Lake was consequently constructed; however, concerns regarding the viability of this secondary supply source have been expressed in light of sustainable flow and water depth objectives imposed by the Nunavut Water Board (NWB) and Canada Department of Fisheries and Oceans (DFO).

While continued population growth in view of finite basin yields is cited as the primary water supply stressor, concerns regarding the Community's water supply have also been articulated in view of changing climate normals that may further decrease net basin yields to Nipissar Lake and the Char River.

Lower Landing Lake, immediately upstream of the Char River intake, was evaluated as a potential tertiary water supply alternative to ascertain its long-term viability for delivering sustainable water supplies to the Community. Although this source would open up an additional supply of water for the community, water takings from Lower Landing Lake need to be considered in the context of flow regime within the Char River. Based on DFO guidelines, water takings will need to be limited to within 10% of the flow in Char River. Two water taking options were considered in order to meet demand; firstly, a pump rate that matched 10% of the instantaneous flow within Char River until freshet ends; and secondly, a water taking configuration that would allow for continuous pumping throughout the open water season up to 10% of the total annual flow within Char River. Although the first option would technically meet the literal definition of DFO's water taking guideline, this option was dismissed due to the logistical complications of varying pump rates over several orders of magnitude. The second option, although minor reductions in the hydroperiod for Char River are anticipated, was considered optimal as it allowed for a constant pump rate to be applied over the full open water season while addressing the spirit of the DFO guideline. It is noteworthy that the Char River is not considered to provide permanent habitat for fish while there are no other known uses for water within the Char River.

Using field data collected during this and previous studies, as well as meteorological and bathymetric data available from government sources, Golder Associates (Golder) developed an integrated water balance model that allows supplementation needs and water supply availability to be estimated for prospective consumption rates and future climate scenarios.

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In general terms, small increases in basin yields and shorter anticipated winter durations associated with climate change projections are estimated to marginally reduce over-winter supplementation needs. Similarly, projected longer summer periods will increase the available supplementation window.

In view of projected population growth, Lower Landing Lake is estimated to be able to provide sufficient supplementary water supplies to offset the water taking deficit from Nipissar Lake under low and moderate daily consumption rates (i.e., 1,600 m³/day and 3,300 m³/day, respectively). Under significantly increased population sizes, when consumption rates reach approximately 5,300 m³/day, the annual deficit at Nipissar Lake will exceed 10% of the median outflow conditions of Lower Landing Lake. For context, this finding suggests that flows in Char River would likely decrease by more than 10% of baseline conditions once population growth has exceeded that projected for the year 2082 (7,800 people), even if the existing per capita consumption rate (0.68 m³/person/day) is maintained.

While this report provides reasonable long-term context to the availability of water under future daily consumption rates and climate scenarios, the results should be used only for the purposes of long-term water supply planning rather than short-term water budgeting. A water supply forecasting tool will be provided under separate cover for shorter term budgeting.