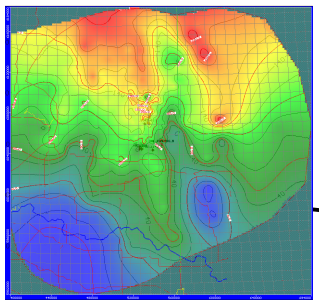
WATERLOO NUMERICAL MODELLING CORP.

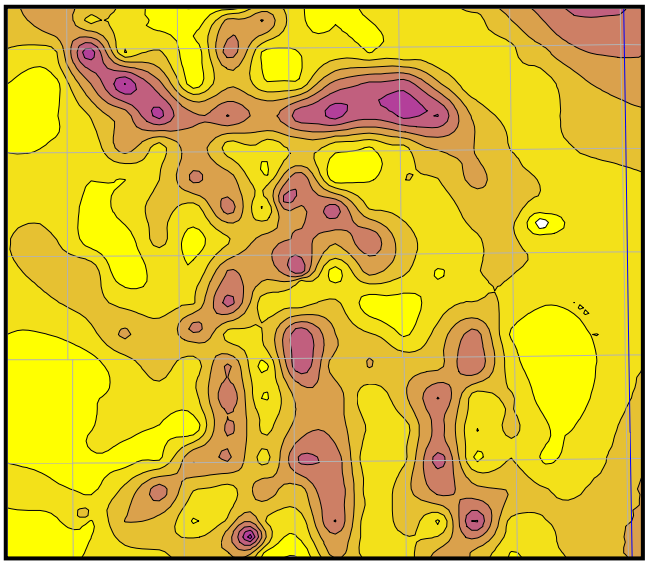
Assessment of Basal McMurray Watersands for Long-Term Production Requirements

Overview

The purpose of the study was to assess the Basal McMurray watersands as a viable resource of brackish water for use in light oil recovery operations. The study included the development of oil production forecasts for all operators in the Cold Lake Region and the amount of brackish water required to meet these targets. Utilizing the model, the cumulative effects of long-term brackish water withdrawal were assessed.



Top Elevation of the Basal McMurray Aquifer



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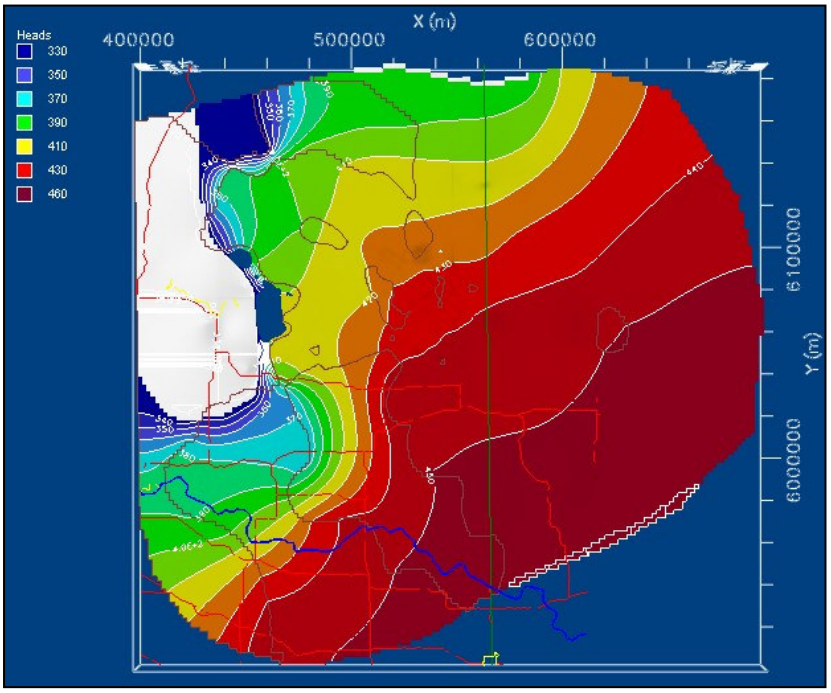
Project Scope

The project had three main phases. The first phase involved the completion of a baseline study of the McMurray Formation geologic environment and development of a conceptual hydrogeologic model. The second phase was to construct and calibrate a numerical groundwater model to existing conditions. As part of the calibration process, a detailed sensitivity analysis was completed to quantify the impact of model parameter uncertainty. The third phase of the study utilized the calibrated model for simulating various production forecasts of the Cold Lake operators.



Model Calculated Heads

Project Results

The calibrated groundwater flow model proved to be a useful tool in determining that the Basal McMurray aquifer has sufficient resources for the anticipated production forecasts. The model was also used in determining the distribution of withdrawal rates to minimize the overall drawdown in the aquifer. After each model run, the water levels within each of the pumping wells was calculated to prevent scenarios where the pumped heads fell below the top of the aquifer. Another use of the calibrated groundwater flow model was to determine whether alternate well locations had the ability of supplying additional brackish water to the operator.

157 Queen Street N. Kitchener, ON, N2H 2H8
(519) 576-4858 ph. (519) 576-8971 fax
admin@wnmcorp.com, www.wnmcorp.com