

# Okanagan Basin Water Supply and Demand Study: Hydrology Investigations and Modelling for Water Resource Planning

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Managing water resources in the semi-arid Okanagan Basin requires detailed information on current and future water demand, and an understanding of how supply and demand will change in response to climate change. In 2004 the Province of B.C. began the Okanagan Water Supply and Demand Project (OWSDP), which is providing the scientific basis for future water and land use planning in the Basin. The OWSDP includes a number of component studies, including a climate model, an irrigation demand model, groundwater study, lake evaporation model, and a detailed surface water hydrology study that included development of a basin-wide hydrology model, which is the subject of this presentation. The model will be used to predict future water supply and demand under a range of scenarios that consider population growth, climate change, and land disturbance (e.g. Mountain Pine Beetle).

The hydrology/modelling study began by compiling hydrometric records from the Basin and selected nearby streams, and summarizing the data that reflects natural streamflows. Since surface water storage and withdrawals are common in the Okanagan, the majority of streamflow records are considered regulated. Determining natural flows from regulated records was accomplished by removing effects of human management from the record; a process termed streamflow naturalization. Despite a reasonable number of current and historical streamflow stations in the Basin, several streams have never had measurements of flow. For these locations, a number of estimation approaches were used, depending data availability. The result was the development of naturalized flow records for more than 80 key locations within the basin covering an 11-year calibration period (1996-2006). This provides water managers with a water supply baseline data set, and established the basis for model development.

The Okanagan Basin Hydrologic Model (OBHM) was constructed using the MIKE SHE and MIKE 11 models developed by DHI Water & Environment, Inc. MIKE SHE is a numerical hydrologic model that simulates all of the major components of the land-based phases of the hydrologic cycle, including snowmelt, evapotranspiration, overland flow, unsaturated flow, and groundwater flow. The model was calibrated against the available natural

hydrographs, the high confidence level naturalized hydrographs developed in the hydrology study, and snow water equivalent data from throughout the basin. Additionally, the model output was compared against moderate and low confidence level naturalized hydrographs, estimates of lake evaporation from the lake evaporation study, and published estimates of the overall water budget. Once calibrated, the MIKE SHE model was used to predict changes in streamflow under several climate change scenarios. It was also adapted to simulate the complete water balance of the basin, including licensed water withdrawals and flow regulation on the main Okanagan River. The calibrated model will be used by OBWB and BC Environment to guide water allocation and management decisions.

## Hugh Hamilton

Hugh Hamilton is Senior Environmental Scientist with Summit Environmental Consultants Ltd. He has a Ph.D. degree from the University of Toronto and more than 22 years experience in soil and water conservation, environmental impact assessment, and water resource management. He works out of Summit's Vernon, BC office, working with clients throughout Western Canada.