

2016-2017 PROJECT PLAN SUMMARY

Project Name:	W1-2-4 Modelling - Regional Hydrology / Climatology
Type of Project:	Focused Study
Delivery Agent:	ECCC/AEP
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Budget:	\$ 445,000

Project Description:

Climate and land-use/land cover change (LULC) may pose a threat to the Lower Athabasca River (LAR) vulnerability and finite water resources. The combined impacts may produce changes in the availability of water resources including timing, magnitude, frequency and quality. This study will enable the development of a comprehensive integrated modelling framework to investigate the combined impact of climate variability and land-use change on the hydrological processes and water quality of the watershed (for past, present and future projections (scenarios)), and to inform on adaptive management strategies for monitoring programs.

Project Objectives:

To provide critical knowledge and improved predictive capability to quantify the impacts of climate change and land use/land cover changes on water availability and sediment/contaminant transport in the LAR. Knowledge generated from this aspect of the focused study will inform core monitoring programs (i.e. hydrology, water quality, sediment transport and biological) and stakeholders of the hydro-climatic conditions that may impact monitoring needs and management decisions. This focused work will also assist with scenario development (what-if) and analysis around extreme events.

Key Outcomes:

- Assessment of existing data (i.e. Bathymetry, LiDAR and other monitoring data) used in the models to identify data gap and make recommendations for future data collection, if deemed necessary.
- Development of new and existing hydrological modelling for the Athabasca River by incorporating additional data sets.
- Investigate the possibility of initiating land use change modelling (e.g. Cellular Automata model etc.) for Athabasca River watershed to predict the land use/land cover changes in the basin.
- Advance common Alberta/ECCC water quality modelling platform (Environment Fluid Dynamics Code (EFDC)) for assessment, predictions and validation of Athabasca River water quality issues. This will include further development and update to the 1D and 2D models of sediment/contaminant transport and water quality for the lower Athabasca River with the latest geo-swath based bathymetry data (collected in 2014-15 FY) and being processed by the University of Calgary.
- Scenario building (what-if) and analysis especially around the impact of potential breach of

Oil Sands Monitoring (OSM)

- tailings ponds to the receiving environment.
- Explore the possibility of applying a Physical Habitat Simulation System (PHABSIM) model to simulate the relationship between streamflow and physical habitat for various life stages of a species of fish or a recreational activity.

Geographic Scope:

- Hydro-climatology analyses and hydrologic modelling will focus on the LAR.
- Reach specific region on lower Athabasca River below Fort McMurray encompassing multiple components (i.e. benthic invertebrates, groundwater, sediment dynamics)
- River ice/sediment dynamics modelling and analysis on Athabasca River approx. 35 km upstream of Fort McMurray (Highway 63 Bridge) to 15 km downstream (distances are approximate and may be revised, depending on initial findings). Note- River ice/sediment dynamic modelling was carried out in 2015-16.
- Tributary specific work on Ells and Steepbank Rivers.

Associated Data:

This project will generate model outputs and it is not essential to store the model output from a data management perspectives. Reports include Scientific manuscripts for journal publications.