Quaternary and environmental geology of the proposed Site C hydroelectric dam Peace River region, British Columbia

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The Site C hydroelectric dam project represents the third stage of B.C. Hydro's development of the Peace River. Construction of the dam will result in the flooding of approximately 80 km of the valley between Hudson Hope and Fort St. John. Concerns about the environmental impact of dam construction led the Geological Survey Branch of British Columbia to support study of the Quaternary and environmental geology of the region.

Weakly consolidated Cretaceous shales and sandstones underlie the Peace River region. The Quaternary stratigraphy consists of a succession of preglacial braided stream gravels, basal melt-out tills, other diamicton types, and minor amounts of coarse glaciofluvial sediment derived from both the Laurentide Inlands is to the east and Cordilleran glaciers to the west, and thick sequences of glaciolacustrine silt and clay. The region was completely glaciated on at least one occasion during the Quaternary, but the eastern and western ice masses did not coalesce during the Late Wisconsinan. Glacial lake development is the major influence on the region's physiography. Holocene fluvial and colluvial deposits are present along the Peace River and its major tributaries. Minor mid-Holocene aeolian deposits present in the northeast represent the Hypsithermal, a dry climatic episode.

Aggregate exploitation in the region is confined to the glaciofluvial deposits, and to terraces of coarse fluvial sediments along the Peace River. The scarcity of aggregate poses a potential problem for construction. Peat resources in the region are also limited, and economic exploitation is not feasible at present.

The major environmental geological hazard in the region is slope failure. Valley slopes throughout the region are highly subject to slumping, mass flow, creep, and other forms

of colluviation. Most failures are centred in the Cretaceous shale, especially in bentonitic units. ^{14}C dating of palaeo-failures has revealed that mass movement processes have been vigorously active since deglaciation. Failure rates and extents are greatly enhanced by lubrication of the strata. Construction of the Site C dam could induce extensive slope failure along the entire reach of the Peace River, unless proper engineering precautions are taken.