



Real time monitoring of slope conditions using the VENUS underwater cabled observatory

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Concerns by scientists, engineers and authorities for the stability of the Fraser Delta slope have resulted in a design for an array of instruments to monitor liquefaction and failure events, utilizing the Victoria Experimental Network Under the Sea (VENUS). The top of the Fraser Delta slope is an area of rapid deposition, oversteepening and consequential failure, in part due to fixing of the main river channel. It is known that the bed at shallow depth also fails periodically due to tidal drawdown resulting in excess pore pressures. Furthermore, measurement and modelling results show that the slopes in this area are significantly weakened by gas in the surface sediments, seismic events, erosion and undercutting by swiftly moving tidal currents, and perhaps even by ground water flow on the delta slope.

Piezometers capable of making seismic, ground water and deformation measurements will be deployed to measure water pressures, pore pressures, extent of gas, earthquakes, liquefaction, strain and flows over time scales ranging from milliseconds to years. The array will consist of six freefall seismic piezometers, ranging in water depths from 10m to 100m. An additional 'sacrificial' package will be placed in an area of known high activity in the hope of capturing events leading to failures. Deployment, power requirements and networking of the instruments will be facilitated by the VENUS Project, which will allow continuous, high bandwidth and real time observations so that the parameters described above can be studied in great detail. Eventually the instruments may be used as an early warning system to life-threatening failures and ensuing tsunamis, which are known to occur in this area. At the forefront of cabled underwater observatory technologies, VENUS will facilitate development of methods and geotechnical instruments for use in related fields. For example, a nearby instrument package will measure many aspects of sediment transport on the top of the

slope. There is also interest in using the VENUS array as a test ground for offshore gas hydrate studies.