



MEMORANDUM

DATE: April 6, 2016

TO: Joe Brogan, Foster Pepper

FROM: Garry Horvitz, PE, LEG, Hart Crowser, Inc.

RE: **Geotechnical Considerations Related to Removal of Bulkhead,
Runstad Residence, Blakely Island, Washington**
17921-00



This technical memorandum was prepared by Garry Horvitz PE, LEG, a professional engineer and engineering geologist with more than 40 years of experience in the field of geotechnical engineering. In accordance with SJCC 18.35.130(G)(3)(f)(vii) the qualifications of Garry Horvitz meet the San Juan County definition of a "qualified professional".

The purpose of this memorandum is to comment on, and provide recommendations related to, the potential impacts associated with removal of the existing riprap rock protection (i.e., "the Project") that was constructed along the shoreline of the Runstad residence on Blakely Island. This memo complements a memo prepared by Jon Houghton, dated April 6, 2016, reference, "**Potential Effects of Removal of New Shoreline Protection on Runstad Property on Blakely Island**". Our original conclusions and recommendations are presented in a technical memorandum dated December 17, 2015, a copy of which is attached for reference.

The primary conclusion of the attached memorandum is that the existing slope is unstable by calculation. As a result of the winter storm that occurred at the site, the existing slope along the beach was oversteepened and began the process of raveling back. Left untreated, it was our conclusion that the slope would eventually erode back such that the existing roadway and utilities would be undermined.

It is our professional opinion that it would technically inappropriate to consider removing all or a portion of the Project. The slope is already calculated to be unstable and in danger of further erosion. Removal of the Project would act to oversteepen the slope and to increase its vertical height by removal of the rock below the level of the now existing beach. Over time, this unprotected slope would continue to



fail.¹ This failure action would consist of small periodic landslides which would create an ever increasing height of unprotected oversteepened slope which would, in turn, lead to ever increasing instability. In this manner the slope will work its way back to the road and utilities and further upland over time.

Therefore, removal of the Project at this time would endanger the Runstad's property. Alternatively, as we have stated in our December 17, 2015 memorandum, the most likely successful measure to be taken to stem the erosion of the slope would be to construct a large and heavy steel can concrete wall structure in the upland adjacent to the roadway such that as the shoreline erodes back this wall would then be exposed. This would result in a vertical steel sheetpile wall along the shoreline in lieu of the existing riprap and vegetated slope.

Therefore, it becomes obvious, from a technical perspective, that maintaining the existing Project is both necessary and is the most reasonable and cost effective solution to be protective of both the beach and the private property.

¹ The feasibility of soft-shore protection measures has been previously assessed and determined to be inappropriate for this site. See Coast and Harbor Engineering, November 26, 2012.