

# Ellisport Engineering, Inc.

December 20, 2019

To: To Whom It May Concern

Subject: Manlowe Bulkhead – Emergency Permit

Location: 10750 Broomgerrie Road  
Bainbridge Island, WA 98110

Reference: - *Manlowe Comparison Photos 12-9-19* pdf memo by Ellisport Engineering, Inc.  
- *Geotechnical Engineering Study 10750 and 10760 Northeast Broomgerrie Road*  
by Earth Solutions NW LLC, October 19, 2012 and revised December 12, 2012.  
- *Geotechnical Evaluation Failing Bulkhead* by Earth Solutions NW, 12/17/19

**It is our opinion that the Manlowe rock bulkhead is in a state of progressive failure and should be replaced immediately through an emergency permit.**

## Discussion

We have twice visited the Manlowe site (May and December 2019) to observe the condition of the existing rock bulkhead. Our pdf document, *Manlowe Comparison Photos*, shows the changes in the beach and bulkhead changes in the ensuing 7 months. The most startling December change is the drastic lowering of the beach, exposing the bottom of the base rocks of the existing bulkhead (which were embedded in May). Reference the *Manlowe Comparison Photos* memo pictures while reviewing the following findings:

- The beach sand level has dropped between 18"-24". The base rocks are completely exposed, no longer embedded below beach level. This leaves them prone to sliding.
- The undermined base rocks are moving/settling/tilting/shifting due to tidal/wave action.
- The geotechnical engineer's evaluation discussed the hill "downset" below the trail, resulting from the rock bulkhead movement. He further discusses that failure of the entire bulkhead is "imminent", resulting "in a progressive failure of the descending slope areas, likely resulting in significant impacts to the residential structure above". He recommends that "steps be taken immediately to replace the bulkhead" because "the bulkhead could fail during the current winter storm season."
- The geotech report discusses that the rock bulkhead protects soils that are not glacially compacted, but instead are "landslide/colluvium" deposits. These soils are prone to rapid erosion, should the bulkhead be lost.
- The bulkhead has experienced a partial collapse at the northern end. We believe that a primary cause was the loss of beach sands covering the base rock, allowing the rocks to move and topple.
- We noted additional undermining and rock movement at the existing concrete stairs.



- Using the design soils information from the 2012 ESNW geotechnical study, we've calculated twelve spreadsheet rock stability analyses at different stations along the length of the bulkhead. These analyses incorporate estimates of the size of rock, height of bulkhead, and assumption that the toe rock is completely exposed (no passive soil pressure to resist sliding). Note that we did not include any dynamic effects caused by wave action, nor the buoyant forces on the rock.
- The rock bulkhead height varies from about 6' to approximately 17'. In nearly all cases, our analysis found the rock sliding factor of safety is less than the required minimum of 1.5. For rock 12' or higher, the sliding factor of safety is 1.0 or less. Also, for rock 12' or higher, the rock overturning factor of safety is less than the required minimum of 1.5.
- We believe that a progressive failure of the existing rock bulkhead is presently occurring, and that failure of large sections of the bulkhead is possible during this current winter storm season. We agree with the geotechnical engineer that bulkhead failure is imminent. If the bulkhead fails, soil erosion of the bank will progress quickly towards the house, threatening both the structure and occupants.
- Even if the migratory beach sands return to cover the bulkhead toe rocks, damage to the bulkhead will remain through voids, unconsolidated toe soils, and rock movement/shifting/instability.

To address the above issues, the complete rock bulkhead must be replaced through an emergency permit process to protect the Manlowe house and property from further damage. We have provided engineered drawings to support this work.

Please feel free to contact if you have questions. Thank you.

*Stephen T. Kicinski*  
Stephen T. Kicinski, PE

