



November 18, 2015

Mr. Travis Saunders  
City of Mercer Island Development Services  
9611 SE 36<sup>th</sup> St.  
Mercer Island, Washington 98040-3732

Subject: Geotechnical Third Party Review  
5637 E. Mercer Way  
Mercer Island, Washington  
Perrone Consulting Project #15124

Dear Mr. Saunders:

We have reviewed Geo Group NW October 28, 2015 letter which provides additional subsurface information and geotechnical engineering analyses for the proposed residential project at 5637 East Mercer Way, Mercer Island, Washington. The Geo Group NW submittal was provided in response to our September 4, 2015 letter indicating deficiencies in the geotechnical engineering investigation. This letter summarizes our review of the recent submittal. The item numbers listed here correspond to the items in our September 4, 2015 letter.

Request 1

*Provide a site plan with the locations of borings B-1 and B-2 and any additional subsurface explorations necessary to evaluate subsurface conditions on the steep slope.*

The requested information was provided by drilling an additional boring B-3 and providing a site plan with the exploration locations.

Request 2

*Provide an interpreted subsurface profile through the critical slope section including the steep slope, headscarp area, and the building site. The profile should include design groundwater levels, engineering soil properties, and the location of the proposed structures.*

The additional boring provided sufficient information to develop the requested subsurface profile which was provided in the submittal along with engineering soil properties. In our opinion Geo Group NW interpretation of Unit 1 in Table 1 as glacial advance outwash is incorrect and should be identified as landslide debris. The Standard Penetration Test blow counts are too low for undisturbed glacial advance outwash soils and the topographic conditions are more consistent with a landslide. However, since we generally agree with the engineering soil properties provided in Geo Group NW Table 1 the submittal provides the requested information.

### Request 3

*Provide the results of slope stability analyses of the critical slope section for static and seismic conditions, including the effect of liquefaction on soil strength properties.*

Slope stability computations were provided for long term static and seismic conditions. The results indicated a long term static factor of safety of 1.26 and a seismic factor of safety of 0.94. Since neither of these factors of safety achieve the minimum acceptable values (1.5 for static and 1.0 for seismic) the proposed catchment wall is needed to mitigate the long term landslide risk.

In our opinion the horizontal seismic coefficient,  $k_h = 0.15g$  that was used in the seismic slope stability analysis is not in accordance with the standard of practice and IBC 2012 which is incorporated as part of the City of Mercer Island's Building Code. We assume that  $k_h$  was appropriately taken as  $\frac{1}{2}$  the design peak ground acceleration,  $a_p$ , which suggests that  $a_p = 0.3g$ . However, the design peak ground acceleration for this site per IBC 2012 is approximately  $0.6g$  and the corresponding  $k_h = 0.3g$ . Revised seismic slope stability computations with the larger ground accelerations should be provided and the output results should show the limits of the slide mass with factors of safety less than or equal to 1.0.

As noted in our September 4, 2015 letter, "...we cannot presume the slope will be stable during construction or during the life of the structure without further evaluation and analysis." Accordingly additional slope stability analyses should be performed to assess the stability of temporary excavations and any temporary slope stabilization measures that will be needed to construct the foundation walls near the bottom of the slope.

### Request 4

*Based on the results of the stability analyses, provide design parameters for the foundation/catchment wall including impact forces and an estimate of the wall height based on the volume of future landslide debris.*

Due to the less than acceptable factors of safety for static and seismic slope stability, a catchment wall is needed to mitigate the effects of a landslide. Geo Group NW has recommended a 6 ft high catchment wall based on the results of the static and seismic slope stability analyses. The seismic slope stability analyses should be revised based on higher  $k_h$  values consistent with IBC 2012 (see Request 3). These results should be used to provide catchment wall design parameters for impact forces and wall height needed to contain the unstable volume of landslide material defined by the slope stability analyses.

### Request 5

*Provide an estimate of downdrag loads on the pin pile foundations due to liquefaction and settlement of 15 to 20 ft of loose soil around the pin piles.*

Based on the results of liquefaction analyses using the appropriate seismic peak ground acceleration,  $a_p$ , provide calculations with an estimate of pile down drag loads to be used for pile design.

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We trust that this information suits your current needs. If you have questions or need additional information, please contact us.

Very Truly Yours,  
PERRONE CONSULTING, INC., P.S.

11/18/15  


Vincent J. Perrone, Ph.D., P.E.  
Principal Engineer