TERRA ASSOCIATES, Inc.
Consultants in Geotechnical Engineering, Geology
and
Environmental Earth Sciences

December 29, 2022
Project No. T-5915-3

Mr. Stephen Nornes
Presbyterian Homes & Services and Senior Housing Partners
2823 Hamline Avenue N
Roseville, Minnesota 55113

Subject: Geotechnical Report Addendum
Wesley Homes Expansion
Puyallup, Washington

Reference: Geotechnical Report, Wesley Homes Puyallup, 39th Avenue SE, Puyallup, Washington, Project No. T-5915-3, prepared by Terra Associates, Inc., revised date November 14, 2016

Dear Mr. Nornes:

This geotechnical report addendum has been prepared in response to comments from the City of Puyallup Planning Division. The comments were outlined in a Development Review Team (DRT) letter dated November 23, 2022. Specifically, the city has requested our current referenced report be updated to address geologically hazardous areas focusing on the steep sloped area west of the planned 36 bed care center building and infiltration feasibility for hardscape permeable pavements.

Project Description

The project consists of completing the development by constructing two previously planned buildings that were not constructed when the first phase was constructed. One building (Brownstone) is located in the southeast corner of the site with the second building (Care Center) located west and adjacent the existing Lodge building. Based on review of preliminary grading plans prepared by Barghausen Consulting Engineers, stamp dated June 21, 2022, the Care Center building will have its main floor level constructed at elevation 458 feet with the southeast Brownstone building floor constructed at elevation 475 feet. Review of Architectural drawings prepared by In Site Architects, indicates the Care Center will have a lower level constructed at floor elevations of 454 feet in the northern half of the building rising up to elevation 457 feet in the southern half of the building. The northern lower floor portion of the building will feature a fitness area that will include an indoor pool. The southern portion of the building will serve are below grade parking matching the parking grade of the adjacent Lodge building.

Geologically Hazardous Areas

Erosion Hazard

Title 21.06.1210 of the Puyallup Municipal Code (PMC) defines erosion hazardous areas as follows:

- Erosion hazard area are those areas identified by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) or identified by a special study as having a "moderate to severe,""severe," or "very severe" erosion potential.

The NRCS maps the soils on the site as Neilton gravelly loamy sand, 8 to 25 percent slopes. This soil category has a severe erosion potential ranking. Therefore, the site is an erosion hazard area as defined by the PMC. In our opinion, the erosion hazard can be adequately mitigated by implementing appropriate erosion control best management practices (BMP's) during and following construction. These practices would include temporary and permanent drainage control elements and cover measures that would prevent erosion from occurring.

Landslide Hazard

The PMC defines landslide hazard areas as follows:

a. Landslide hazard areas include areas subject to landslides based on a combination of geologic, topographic, and hydrologic factors. They include any areas susceptible to landslide because of any combination of bedrock, soil, slope (gradient), slope aspect, structure, hydrology, or other factors, and include, at a minimum, the following:

   i. Areas of historic failures, such as:

      1. Those areas delineated by the United States Department of Agriculture Natural Resources Conservation Service as having a significant limitation for building site development;

      2. Those coastal areas mapped as class u (unstable), uos (unstable old slides), and urs (unstable recent slides) in the Department of Ecology Washington coastal atlas; or

      3. Areas designated as quaternary slumps, earthflows, mudflows, lahars, or landslides on maps published by the United States Geological Survey or Washington Department of Natural Resources.

   ii. Areas with all three of the following characteristics.

      1. Slopes steeper than 15 percent;

      2. Hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock; and

      3. Springs or groundwater seepage.

iii. Areas that have shown movement during the holocene epoch (from 10,000 years ago to the present) or which are underlain or covered by mass wastage debris of this epoch;

iv. Slopes that are parallel or subparallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials;

v. Slopes having gradients steeper than eighty percent subject to rockfall during seismic shaking;

vi. Areas potentially unstable as a result of rapid stream incision, stream bank erosion, and undercutting by wave action, including stream channel migration zones;

vii. Areas that show evidence of, or are at risk from snow avalanches;

viii. Areas located in a canyon or on an active alluvial fan, presently or potentially subject to inundation by debris flows or catastrophic flooding; and

ix. Any area with a slope of 40 percent or steeper and with a vertical relief of 10 or more feet except areas composed of bedrock. A slope is delineated by establishing its toe and top and measured by averaging the inclination over at least 10 feet of vertical relief.

The east flank of the drainage swale immediately west and adjacent to the Care Center building is a 50 percent slope with vertical relief in excess of 20 feet. Therefore, it is a landslide hazard area as defined by the PMC. This is a manmade drainage constructed to convey runoff flows from a wetland complex south of 37th Avenue SE along the east side of the Lowes retail development north to Bradley Lake.

Recent reconnaissance of the slope area found no evidence of slope instability or erosion. The slope is well vegetated with a thick grass cover along with scattered young deciduous and coniferous trees and some brush. Tree growth is generally straight with no significant signs of leaning or pistol butted trunks.

The west side of the Care Center building is located on the slope. The proposed lower floor grade of the building will require placement of four to five fee of fill material to establish the floor subgrade along the western building margin with excavations of five to ten feet required in the central and eastern portions of the building. Provided site grading and building support is completed in accordance with recommendations outlined in the referenced geotechnical report, construction of the Care Center building at the planned location would have no adverse impact on the slope. These recommendations include excavation and removal of unsuitable fill material from below the central and northern portions of the building and replacing these soils with compacted structural fill. Alternatively supporting the building in this unsuitable fill area on foundation piles or on ground improved using rammed aggregate piers can also be considered.

Seismic Hazard

The PMC defines seismic hazard areas as follows:

- Seismic Hazard Areas. Seismic hazard areas are areas subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement or subsidence, soil liquefaction, or tsunamis.

Settlement and soil liquefaction conditions occur in areas underlain by cohesionless, loose, or soft-saturated soils of low density, typically in association with a shallow ground water table.

Seismic considerations as discussed in the referenced report continue to remain valid for the project. The exception to this is the seismic design parameters. The parameters in the referenced report are based on the 2015 International Building Code (IBC). Per the current 2018 IBC, for site class C, the following parameters should be used in calculating seismic forces:

Seismic Design Parameters (IBC 2018)

Spectral response acceleration (Short Period), S_{Ms}	1.509
Spectral response acceleration (1 – Second Period), S_{M1}	0.651
Five percent damped .2 second period, S_{Ds}	1.006
Five percent damped 1.0 second period, S_{D1}	0.434

These values were determined using latitude/longitude coordinates 47.156423/-122.283429 and the Structural Engineers Association of California (SEAOC) ground motion parameter calculator accessed on December 27, 2022 at the web site https://www.seismicmaps.org.

Infiltration Feasibility

Our discussion regarding infiltration feasibility as outlined in the referenced report continues to remain valid for the project. Based on conditions observed during phase I construction, it is also our opinion that site conditions are not suitable for using permeable pavements. During phase I construction shallow seepage conditions developed along the east side of the Lodge building and west and adjacent the soldier pile wall construction on the east property line. Persistent shallow seepage affected the subgrade and resulted in seepage into the lower garage level of the Lodge building. Shallow subsurface drains had to be installed to mitigate the seepage impacts. Even if field testing were to indicate infiltration rates of .3 inches per hour or greater were present at the pavement subgrade elevations, because of likely restrictions to flow at shallow depths, which could possibly redirect infiltrated water towards the building or the west drainage slope, use of permeable pavements is not recommended.

We trust the information presented is sufficient for your current needs. If you have any questions or require additional information, please call.

Sincerely yours,
TERRA ASSOCIATES, INC.

Theodore J Schepper 12-29-22

Theodore J. Schepper, P.E.
Senior Principal Engineer

Cc: Ms. Jill Krance, In Site Architects
Mr. Dan Balmelli, P.E., Barghausen Consulting Engineers