

December 12, 2019

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SUBJECT: *GEOTECHNICAL ASSESSMENT
PROPOSED SINGLE FAMILY HOME, SHOP AND DRAINFIELD
LOT 13, TYBREN HEIGHTS ROAD, KELSO, WA*

Introduction

Per your request, Strata Design LLC (STRATA) has prepared this Report of Geotechnical Assessment with respect to proposed residential dwelling unit and shop building. The purpose of this report is to address the potential of landslide hazards relative to the steep slopes which are present at the site. The property is located within incorporated Kelso, Washington, as shown in the site vicinity map (Figure 1, attached).

The southern portion of the parcel is mapped within what is mapped as “active, deep seated landslide”, as depicted in Figure 1, based on the WA-DNR landslide inventory publication (Wegmann¹). Therefore, per City of Kelso development codes, a geotechnical report is required to be completed as part of the building and site development application. In preparation of this report, STRATA conducted a field reconnaissance and studied relevant geologic maps, roadside cut slope features, and observed backhoe excavated test holes.

In preparation of this report, STRATA conducted field reconnaissance, and observed soil exploration test holes. In addition, we reviewed available geologic maps, well log(s) and other published references and available information, and we provide site development recommendations.

Project Description

The proposed location for the building site on the property is shown in FIGURE 2. We understand the proposed development is to construct an accessory structure (pole building) nearest to the road easement, and construct a single family dwelling to the south of the pole building. Water service would be from the local water district. In September 2018, STRATA completed a geotechnical report for the adjoining vacant lot to the west (Lot 12)².

Local Geology

According to the Wegmann publication, which provided a geologic hazard study of the Cowlitz County Urban Corridor, the study site is located within the margins of a mapped deep-seated landslide. The landslide is cited in the publication as a subtle topographic depression, possibly originating along the contact between Troutdale formation (fluvial deposits) and the overlying Basaltic andesite. The study also cites a source of concentrated water discharge from an upgradient commercial rock quarry as a possible contributor to the slide. The quarry is located about ½ mile east.

From the online Natural Resources Conservation Service (NRCS) soil survey, the surface deposition at this property is designated as Coweeman silt loam in the upland (proposed development) portion of the site, and Olympic silt loam across the southern portion of the site. The area soil cover is listed as soil erosion category of severe.

¹ Wegmann, K.W., 2003, “Digital Landslide Inventory for the Cowlitz County Urban Corridor Kelso to Woodland”, Washington Division of Geology and Earth Resources, Report of Investigations 34, Version 1.0.

² Geotechnical Assessment report for Lot 12, Tybren Heights Road, Kelso, WA, by Strata Design, LLC, dated September 18, 2018

Area Landslides

The site lies in the Western Cascades geologic province near the northern margin of the Portland Basin, which forms the southern portion of the Puget Lowlands. Following mild folding, faulting and erosion, the bedrock units in the Western Cascade Range volcanic arc formed a low-relief terrain within which the Portland Basin began to develop. Basaltic lavas of the Miocene-age Columbia River Basalt Group and fluvial deposits of the ancestral Columbia River were deposited on the older Paleogene bedrock within the subsiding or 'pull-apart' Portland basin. Erosion during the geologically recent (late Pleistocene-age, +/- 14,000 ya) Missoula Catastrophic Floods, caused by periodic failure of the ice dam that impounded water in glacial Lake Missoula, is interpreted to have created a flow-through channel or terrace that is present below an elevation of about 300 feet. In the area around the town of Kalama, Washington, this flood-terrace feature is approximately ½ to ¾ miles wide and extends to the south for a distance of approximately four (4) miles. The stripped flood terraces can be identified by the wide, level and gently sloping ground surfaces with the occasional basalt bedrock ridges or buttes protruding above the flood plain surface. Basaltic and andesitic rock outcrops and flat-topped depositional surfaces with thin deposits of micaceous and pumiceous sands along their bases, indicate stripping by the rising and peak floodwaters and sedimentation by slack and receding floodwaters.

Characteristic throughout the Columbia River corridor region of Cowlitz County, larger ancient landslides occurred hundreds or even thousands of years ago as the result of geologic equilibrium actions during repeated cycles of heavy, sustained rainfall events and seismic activity.

SITE ASSESSMENT

The undersigned professional completed a reconnaissance of the study site to observe all potential geologic or landslide hazards that may be associated with the proposed site improvements. Work consisted of traversing the site and the nearby vicinity of about 200 feet or more each direction from the proposed grading areas. In addition, we evaluated the surrounding terrain utilizing our map of 2-foot elevation contours created from LiDAR point cloud data obtained by the DNR in 2016 (see Figure 2, attached).

The proposed home site, shop site and drainfield areas of the site are within the more upland portion of the site, within native topography with grades draining north to south at between 10 and 15 percent. The site was stripped in late 2018, exposing a medium stiff silt (native) subgrade for the surface. No seeps or springs were observed within this portion of the site. Based on the surface expressions or patterns, we see no visual evidence of significant degrees of fill placement within a 50 foot surrounding proximity of the proposed development locations. The proposed foundation for the home and pole barn would be placed on existing site grades which drain from north to south on grade of 5 to 15 percent.

We did not observe patterns of irregular and/or hummocky ground or structural evidence of landslide activity within the proposed development zone, or near 50 feet buffer. As shown in Figure 2, the development zone is defined as the topography to the north of the distinct drainage draw that flows east to west/southwest across the lot. Based on our reconnaissance, the subsurface soils exhibit relatively stiff consistency (suitable for structure placement). Within soil test pits, we did not observe soil unit contacts between units that would appear to act as slip planes or seepage pathways.

Based on our observations of the soil test pits excavated, soils explored are observed to be light gray silts and clays with increasing stiffness at about 5 feet depth.

Based on the ground morphology of the southern portion of the property, we recommend this portion of the site be designated as a no-development area, and maintained in their naturally occurring states as riparian and woodland. As noted in the Wegman landslide study, the morphology within the southern portion of the tax lot resembles a transition stage between 'dormant-young' and 'dormant-mature'.

Conclusions / Recommendations

Given that the proposed development impacts are limited to the upland, low relief portions of the property (Figure 2), we believe, the proposed development can be carried forth per these recommendations in a manner of maintaining overall slope stability and minimizing soil erosion loss. Outside of the limited area of grading and structure development shown in Figure 2, we advise the protecting the native topographic conditions of the site. To promote stormwater dispersion across the slope areas, exposed bare soil areas should be re-seeded with native grass mixes, and/or riparian (woodland) seed mixes.

For the described project scope and location, development along with adhering to building codes and best management practices is unlikely to trigger future landslides at the site and surrounding area.

Our summary of key findings and considerations applicable to development of the site are the following:

- Within the scope of this reconnaissance, no former fill areas, of scale of concern, are identified to exist throughout the property.
- Seasonally perched groundwater conditions appear to exist in many portions of the site. Installation of drainage measures surrounding the structure foundation zones should be considered.
- Grades should be developed and maintained to drain perimeter surface and roof runoff away from foundation subgrade soils and prevent ponding.
- Cut slopes should be revegetated to prevent erosion hazards. Surrounding grades should be shaped to allow continuance of drainage away from proposed structures.

In accordance with current building codes, we recommend the foundation plans include subdrain lines, generally placed within 6-inches of the bottom of the footing, and no further than 18" horizontal distance from the outer face. All foundation drain lines should be 'tight-lined' to a suitable, non-erosive discharge area a minimum of 10-feet distance from the structure. We recommend that footings be embedded through all soils containing or organic/root zones.

In general, stormwater runoff resulting from the site grading development should prevent areas of local surface ponding from occurring, unless engineered. We advise that gravel (quarry spall, etc.) pads be placed at the outlet locations of pipe(s).

Limitations

We have provided current design recommendations based on prior site explorations that indicate the soil conditions at only those specific locations and only to the depths explored. These observations do not account for potential variations in soil types, thickness, or water level that may exist between or away from the explorations. If subsurface conditions vary from those encountered in our site exploration, STRATA should be alerted to the change in conditions so that we may provide additional recommendations, if necessary. Observation by experienced geotechnical personnel should be considered an integral part of the construction process. The owner is responsible for insuring that the project designers and contractors implement our recommendations. This study consisted of visual examinations and a review of readily available geologic resources judged pertinent to the evaluation. Accordingly, the limitations of this study must be recognized.

Sincerely,
STRATA DESIGN, LLC





LANDSLIDE DATA SOURCE: WEGMANN, K.W., 2006, "DIGITAL LANDSLIDE INVENTORY FOR THE COWLITZ COUNTY URBAN CORRIDOR KELSO TO WOODLAND", WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES, REPORT OF INVESTIGATIONS 35.

Legend

- Sag Ponds
- Inactive Landslide Area (not field surveyed)
- Deep Seated Landslide Area
- Active Landslide Area
- Potentially Unstable Slope Area
- Approximate location of a Spring



LANDSLIDE INVENTORY MAP
 LOT 13, TYBREN HEIGHTS RD
 KELSO, WA

FIGURE
 1



TOPOGRAPHY SOURCE: 2-FT CONTOUR INTERVALS (WA-DNR, 2016 LIDAR SURVEY)