# Geotechnical Report

# Targeted Critical Areas Geologic Hazards Evaluation

Energize Eastside Project
North Bellevue, Washington

*for*
**Puget Sound Energy**

November 5, 2020

GeoEngineers
Earth Science + Technology

DSD 002457

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17425 NE Union Hill Road, Suite 250
Redmond, Washington 98052
425.861.6000

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## Energize Eastside Project
## North Bellevue, Washington

**File No. 0186-871-07**

**November 5, 2020**

Prepared for:

Puget Sound Energy
P.O. Box 97034, EST-03W
Bellevue, Washington 98009

Attention: Ryan Wieder

Prepared by:

GeoEngineers, Inc.
17425 NE Union Hill Road, Suite 250
Redmond, Washington 98052
425.861.6000

Lisa J. Bona
Lisa J. Bona, LG
Senior Geologist

State of Washington
Engineering Geologist
620
Licensed Geologist
Galan W. McInelly

Galan W. McInelly
Galan W. McInelly, LG, LHG, LEG
Principal Geologist

LJB:GWM:leh

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## INTRODUCTION

GeoEngineers, Inc. (GeoEngineers) is pleased to present the results for this targeted critical areas evaluation of regulated geologic hazard areas in the Energize Eastside project corridor within the City of Bellevue (City). Our services have been provided in general accordance with the proposal between GeoEngineers and Puget Sound Energy (PSE).

The project area is located within the existing PSE transmission line corridor between the Lakeside Substation and the northern city limit, as depicted in the City Conditional Use Permit mapbook. We previously provided a geologic hazard evaluation for various routes under consideration, including the transmission corridor route evaluated within this document, in a separate report submitted to PSE on December 19, 2014. The geologic hazards evaluation included in this report focuses on compliance with the City's Critical Areas regulations, including a review of readily available public data for steep slopes and landslide hazard areas (geologic hazard areas) relative to proposed vegetation management/tree removal, pole replacement activities, and construction access routes.

For our evaluation, we identified specific locations for ground-truthing along the transmission corridor using a Web-based platform developed by The Watershed Company that shows proposed pole replacement and vegetation management/tree removal locations, overlain by geologic hazards. Our understanding of access to these locations is based on information provided by PSE, the Watershed Web-based platform, and plans developed for PSE by HDR Engineering, Inc. (HDR), dated April 3, 2017.

## BELLEVUE LAND USE CODE REGULATIONS

GeoEngineers reviewed local regulations in the Bellevue Land Use Code (LUC), Critical Areas Overlay District for Geologic Hazard Areas (20.25H.120) as of October 30, 2020. The project area that is proposed by PSE within the existing transmission corridor contains geologic hazard areas regulated by the City including landslide hazards, steep slope hazards, and their buffers. Erosion hazards in the City are regulated under the stormwater code and were not evaluated in this report.

### General Geologic Hazard Area Code

The City's criteria for defining geologic hazards and geologic hazard buffers (LUC 20.25H.120) are summarized below.

***A. Designation of Critical Areas.***

***The following geologic hazard areas are hereby designated critical areas subject to the regulations of this part:***

1. *Landslide Hazards. Areas of slopes of 15 percent or more with more than 10 feet of rise, which also display any of the following characteristics:*
    a. *Areas of historic failures, including those areas designated as quaternary slumps, earthflows, mudflows, or landslides.*
    b. *Areas that have shown movement during the Holocene Epoch (past 13,500 years) or that are underlain by landslide deposits.*

c. *Slopes that are parallel or subparallel to planes of weakness in subsurface materials.*

d. *Slopes exhibiting geomorphological features indicative of past failures, such as hummocky ground and back-rotated benches on slopes.*

e. *Areas with seeps indicating a shallow groundwater table on or adjacent to the slope face.*

f. *Areas of potential instability because of rapid stream incision, stream bank erosion, and undercutting by wave action.*

2. *Steep Slopes. Slopes of 40 percent or more that have a rise of at least 10 feet and exceed 1,000 square feet in area.*

3. *Coal Mine Hazards. Areas designated on the Coal Mine Area Maps or in the City's coal mine area regulations, LUC 20.25H.130, as potentially affected by abandoned coal mines; provided, that compliance with the coal mine area regulations shall constitute compliance with the requirements of this chapter in regard to coal mines.*

4. *Seismic Hazards. Areas of known faults or Holocene displacement, based on the most up-to-date information, or areas mapped areas of "moderate to high" or "high" hazard liquefaction susceptibility by the Washington Department of Natural Resources Liquefaction Susceptibility Map of King County, Washington, 2004, as amended.*

***B. Geologic Hazard Area Buffers. The following critical area buffers are established:***

1. *General Geologic Hazard Critical Area Buffers.*

   a. *Landslide hazards: Top-of slope buffer of 50 feet.*

   b. *Steep slopes: Top-of-slope buffer of 50 feet.*

2. *Existing Development. Where a primary structure legally established on a site prior to August 1, 2006, encroaches into the critical area buffer established in subsection B.1 of this section, the critical area buffer and setback shall be modified to exclude the footprint of the existing structure. Expansion of an existing structure into the critical area buffer shall be allowed only pursuant to the provisions of LUC 20.25H.065.*

3. *Buffer Modification. Modifications to the geologic hazard critical area buffer may be considered through a critical areas report, LUC 20.25H.230.*

***C. Structure Setbacks.***

1. *General. The requirements of this section apply along with any other dimensional requirements of the Land Use Code (see LUC 20.20.010, 20.20.130, 20.20.190 and Parts 20.25A through 20.25G). The most restrictive dimension controls [sic]. Structure setbacks are required in order to:*

   a. *Minimize long-term impacts of development adjacent to critical areas and critical area buffers; and*

   b. *Protect critical areas and critical area buffers from adverse impacts during construction.*

2. *Minimum Setback of Structures.*

    a. *Landslide hazards: Determined based on site-specific geotechnical studies to reflect site characteristics, including site topography and conditions that may be conducive to fast moving, shallow debris slides and flows.*

    b. *Steep slopes: Toe-of-slope setback of 75 feet.*

3. *Structure Setback Modification. Structure setbacks may be modified only through an approved critical areas report. (Ord. 6417, 5-21-18, § 39; Ord. 5680, 6-26-06, § 3)*

### Structure Setbacks

Although PSE poles are not regulated as structures per the City's LUC, we have provided guidance for structure setbacks. We reviewed the location of each proposed pole relative to the location of mapped critical areas provided by The Watershed Company in the Web-based platform. The critical area buffer and structure setback from the City's LUC for landslide hazards and steep slopes is provided in the LUC excerpt above and summarized in Table 1 below.

**TABLE 1. SELECTED PORTION OF CITY OF BELLEVUE CODE**

| Critical Area Category or Type | Critical Area Buffer Width | Structure Setback |
|---|---|---|
| Landslide hazards | Toe-of-slope: None<br>Top-of-slope: 50 feet | Toe-of-slope: Based on site-specific standards (generally pertains to building lots)<br>Top-of-slope: None |
| Steep slopes | Toe-of-slope: None<br>Top-of-slope: 50 feet | Toe-of-slope: 75 feet<br>Top-of-slope: None |

## METHODOLOGY

Our methodology to evaluate geologic hazards primarily relied on the following:

- Review published geologic maps;
- Review soil maps from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS);
- Review geologic hazard maps, including the City's Geologic Hazard areas maps and Landslide Deposits in the City of Bellevue (Department of Natural Resources [DNR] Final Draft – May 2018 and personal communication, DNR via Watershed 2019), for the following geologic hazards;
    - Landslide Areas and buffers
    - Steep Slopes (greater than 40 percent) and buffers
    - Potential for impacts in seismic (moderate to high or high liquefaction susceptibility) and coal mine hazard areas were not evaluated because no poles or vegetation management overlapped these hazard areas. However, because the Seattle Fault trace is located south of the Energize Eastside Project North Bellevue project area, there is potential for seismic shaking during fault rupture. Therefore, we recommend that new poles be installed in accordance with current seismic design standards.
- Review of digital imagery (King County and Google Earth);
- Review Light Detection and Ranging (LiDAR) data of the Bellevue, Washington area from the Washington DNR;

- Review a previous report, titled "*Geologic Hazards Evaluation and Preliminary Geotechnical Engineering Services*," submitted to PSE in December 2014, which assessed existing conditions in the Bellevue project area (GeoEngineers 2014); and
- Develop a response to specific critical area code requirements (see Code Compliance section of this report).

### Review of Published Geologic Maps and Geologic Hazard Maps

We reviewed geologic and geologic hazard maps from published King County 1:100,000 scale maps as well as digital geologic hazard data from the City as provided by The Watershed Company. The goal of this task was to better understand mapped geologic conditions and geologic hazards at the site relative to planned poles and areas for proposed tree removal. We also reviewed previous geologic and geotechnical reports completed in the vicinity of the project area.

### Review of Digital Area Photographs and LiDAR Imagery

Aerial photographs were reviewed using both King County iMap[1], as well as Google Earth images. This task was focused on observing changes in development and vegetation and if geologic hazard areas show some activity during the aerial photograph record. Also, LiDAR bare earth hillshade data provides a tool to observe surface relief without a vegetated canopy that is key to evaluating geologic hazards physical characteristics (scarps, flanks, toe of slide, hummocky topography) of the hazard area, if any.

## EXISTING CONDITIONS

### Desktop Study

This geologic hazard evaluation focuses on proposed construction access routes, vegetation management/tree removal, pole installation, and pole removal locations within geologic hazard areas, geologic hazard area buffers and structure setbacks.

As documented in GeoEngineers' 2014 report, the existing geology in the project area mainly consists of glacial drift, including exposures of advance continental glacial outwash and glacially consolidated till. Alluvium is encountered in the valley bottoms. The predominant soil types in the project area include Alderwood gravelly sandy loam (AgB, Agc and AgD), Arents, Alderwood material (AmB and AmC) and Everett very gravelly sandy loam (EvC and EvD) (NRCS 2019).

Steep slopes, steep slope buffers and steep slope structure setbacks overlap with 42 pole removal or proposed new pole locations along the transmission corridor. Additionally, proposed pole 5/8 and three old poles to be removed between poles 5/8 and 6/1 are located within the landslide hazard 50-foot top-of-slope buffer. There are additional areas where vegetation management/tree removal will occur in steep slopes or steep slope buffer. No new poles will be located near landslide toes-of-slope. Because the new poles will be embedded deeply, and because of the distal location of the new poles from landslide toes-of-slope, we determined that no additional assessment of setback from landslide hazards is necessary.

[1] http://kingcounty.gov/services/gis/Maps/imap.aspx

## Site Reconnaissance

We completed site reconnaissance on December 4, 2018 and March 19, 2019 to assess conditions in selected portions of the proposed transmission corridor. We evaluated five separate sections of the PSE corridor to review the pole replacement, vegetation management and access routes with respect to landslide areas and steep slopes, as outlined in the City's LUC 20.25H.120. The sections are described below, starting from the south, from just north of the Lakeside Substation to the northern Bellevue city limit. For the purposes of this report, the five sections are sorted primarily by site access; these sections consist of: the area between SE 26th Street and the Lakeside Substation; the area between SE 20th Street and Lake Hills Connector; the area between Lake Hills Connector and Main Street; the area just north of NE 24th Street (Pole 4/2); and the area just south of NE 60th Street (Overlake Farms).

Steep slopes with inclinations of 40 percent or greater were observed locally within the project area. The steep slopes where vegetation management, pole replacement and access are proposed generally are within a maintained utility corridor occupied by PSE transmission lines and underground petroleum pipelines (owned by Olympic Pipe Line [OPL]). The corridor is periodically maintained (i.e. mowed) by OPL.

There are some urban developed areas in geologic hazard areas and their buffers, such as just north of the Lakeside Substation, adjacent to the Chestnut Hill Academy, and the vicinity of Pole 4/4.

The area just north of the Lakeside Substation contains two proposed replacement poles, 7/5 and 7/4, that are within a steep slope structure setback. Access to these poles is from SE 26th Street. The south-facing and west-facing steep slopes are a mix of dense vegetation, with a moderately cleared, sloped area, just below an L-shaped retaining wall. The ground surface of the cleared area is covered with geotextile fabric. Some previously cut tree debris has been spread around the site. It is likely that working pads will be necessary to complete replacement pole installation and removal of the old poles. A small area of saturated ground with some standing water was observed at the toe of the slope and apparently discharges into a ditch that extends east to west just north of the substation.

A pole to be removed near new Pole 6/9 is located just south of SE 20th Street and is within a grassy City park. This pole is located within a steep slope top-of-slope 50-foot-buffer.

The area between SE 20th Street and Lake Hills Connector has five proposed pole replacement locations, 6/3 through 6/7, and a number of trees to be removed within geologic hazard areas, their buffers or structure setbacks. This portion of the powerline alignment is primarily accessed by an unimproved (i.e., packed dirt and gravel) access road/trail along the power line corridor. Proposed Pole 6/3 will be accessed from a residential driveway beginning at SE 10th Street to avoid a wetland south of the pole location. This section is characterized by a series of hill crests and valleys with localized areas of steep slope and steep slope buffers. Many trees have been identified for removal by PSE and consist of both deciduous and evergreen species.

Proposed Poles 6/2 through 5/6 and poles to be removed are located within steep slopes, and steep slope buffer or structure setback between Lake Hills Connector and Main Street. One pole to be removed, near proposed Pole 5/8, is located within a steep slope hazard area. Evidence of landslides were observed downslope of most existing and proposed pole locations in this area. These poles will be accessed from Main Street, along the unimproved road/trail beneath the transmission corridor. Multiple landscape trees in a steep slope top-of-slope buffer will be removed along the PSE corridor west of SE 2nd Street, adjacent to the maintenance facility for the Glendale Country Club golf course.

This section generally has a west-facing slope aspect. GeoEngineers observed landslide features with previous mitigation installed by others at two locations along this portion of the alignment. The southernmost landslide feature is adjacent to the access road/trail and nearly parallel with SE 7th Street. Between proposed poles 6/1 and 6/2, the access road/trail narrows at this location to about 3 feet wide, and a layer of quarry spalls is visible at the head of the landslide just west of the access road/trail. Access for construction equipment at this narrow point will be difficult. Possible widening of the existing access road would require coordination with OPL, who may require restrictions to driving over the pipeline. Before OPL can provide an analysis and subsequent requirements to potentially cross their pipeline, they need specific information from the selected contractor, such as types, weights and axle configuration of construction equipment. Therefore, alternatives to access the area south of the construction are discussed below. The second landslide is located just north of proposed Pole 5/8. This landslide area has been buttressed with quarry spalls by others. Neither landslide area shows visible evidence of recent movement.

There are two possible locations that may require special construction methods for access to poles south of proposed Pole 5/8. The first is located west of SE 5th Street, where two sewer manholes are located along the edges of the access road/trail. We suggest that the project's contractor consider placing some fill or a bridge of some type temporarily over one or both of the manholes to allow construction equipment to pass.

The second location that will require special access considerations is proposed Pole 6/2. There are three possible routes for access from which the project's contractor may choose, each with different challenges. The first is an existing gravel access road extending west from the east end of SE 7th Street in steep slope buffers. The road has bollards where SE 7th Street ends and crosses a culverted small stream. Limbing of a number of landscape trees and potential removal of one evergreen tree from private property likely would be required to allow construction equipment to pass along this road. The fill over the culvert also likely would need to be temporarily widened. A second access alternative would partially cross a steep slope buffer. The project's contractor may consider placing fill temporarily over the OPL and the end of the gravel road from the west end of SE 7th Street and create a ramp past the narrow point in the access road. The third alternative for access to proposed Pole 6/2 would be north from Lake Hills Connector, in a steep slope hazard area. The guard rail at this location would need to be temporarily removed to allow a crane to travel northeast along the existing access road/trail. A second crane could be staged on Lake Hills Connector near the top of the slope. Use of this access route likely would require removal of several significant deciduous trees, along with smaller trees and a snag along the trail. Some larger trees on the north side of the access road/trail likely would need low branches trimmed. We suggest that fill material be placed on top of the existing access road/trail over cut tree stumps immediately north of Lake Hills Connector in order to widen the access route, and the fill graded to decrease the inclination of the access road if this access route is used. A stream and wetland are located at the base of the new fill slope and could be impacted temporarily by modifying the access road/trail.

A number of trees are to be removed in steep slopes and steep slope buffer and structural setback immediately north and south of Kelsey Creek, just south of Bel-Red Road. Another tree is to be removed from a steep slope top-of-slope buffer just north of proposed Pole 4/5. Several trees are to be removed from a landslide toe-of-slope structural setback north of Pole 6/4.

One of the proposed poles at location 4/4 and one of the existing poles to be removed are located directly south of Washington State Route 520 (SR 520) in a steep slope toe-of-slope structure setback. This site is located within a parking lot and is generally level. The steep slope (highway embankment) is vegetated with grass and invasive Himalayan blackberries.

The area just north of NE 24th Street around proposed Pole 4/2 includes proposed vegetation management and has a steep slope and steep slope buffer area with east- and south-facing slope aspects. The slope is densely vegetated with both deciduous and evergreen tree species and terminates at a retaining wall adjacent to a parking lot (to the east). Vegetation management is proposed well above the retaining wall. Access to the new and old pole sites will be from the NE 24th Street along the grassy utility corridor.

The northernmost section is located south of NE 60th Street on Overlake Farms. We were not able to access this section because the property owner did not respond to PSE's request for access. Proposed pole site 2/4, one old pole and several trees are located in a steep slope hazard area or steep slope buffer. LiDAR imagery was used to evaluate the area for slope instability. No evidence of landslides or slope instability was visible on LiDAR imagery.

## IMPACT ASSESSMENT

GeoEngineers reviewed the proposed construction activities within the geologic hazard areas, their buffers and structure setbacks relative to the expected impacts that may result, based on information provided by PSE staff and our experience with previous, similar evaluations.

### Construction Access

Temporary and existing maintained access routes for track-mounted or wheeled equipment will be used to construct new poles and remove old poles and for vegetation management. Equipment access may potentially increase the risk of localized erosion in geologic hazard areas and their buffers and temporary impacts to wetland vegetation. Wetlands that overlap with geologic hazard areas or their buffers include the access to proposed Pole 7/4, one possible access to proposed Pole 6/2, and trees to be removed between proposed Poles 6/3 and 6/4. Minor regrading and the temporary addition of small amounts of quarry spalls or gravel may be necessary to stabilize portions of the existing access routes. Additionally, timber driving mats may be needed to drive across wetland areas. However, driving on timber mats likely is not feasible on slopes greater than about 5 percent during construction. If timber mats cannot be used, then temporary fill may be needed on the access route and would need to be removed once construction is complete. The access routes may require either prior removal of marked trees and/or trimming of overhanging limbs to access the pole sites.

Substantial import of fill and grading may be required for access in areas between proposed Pole 6/1 and Lake Hills Connector (see discussion in Existing Conditions section above). Geotechnical evaluation of substantial volumes of fill placed immediately adjacent to or on steep slopes or landslides should be conducted prior to placing the fill. No adverse impacts to geologic hazard areas from fill placement are anticipated if geotechnical recommendations are implemented properly.

### Vegetation Management/Tree Removal

There are two primary ways in which tree removal activities may impact slope stability in landslide and steep slope hazard areas. The first is root decay, which causes both the numbers of roots and the tensile strength of the remaining individual roots to decrease with time (Burroughs and Thomas 1977). Studies show that the period of minimum root strength is typically from 3 to 5 years after harvest (Ziemer 1981a; 1981b) but can extend up to 10 to 20 years depending on the tree species. For example, minimum root strength in evergreens is typically 10 years after harvest, alders have a minimum root strength of 5 to

10 years after harvest, and maples typically maintain full root strength after harvest (because they regrow from the existing stump). The reductions in root strength result in a net decrease in the cohesive strength of the near-surface soil mass.

Tree removal can modify surface and subsurface hydrology. Tree removal may increase soil moisture by reducing canopy interception and evapotranspiration. Ground-based yarding and excavation equipment, that could be potentially used, can compact soil, and may alter hydrologic processes.

Elevated groundwater levels have the potential to decrease the stability of slopes in the transmission corridor by reducing the shear strength of the soil and by adding additional weight. The probability of landslides occurring in the transmission corridor from increased groundwater levels depends on the magnitude of the increase and the existing stability of the slope. The magnitude of potential changes in groundwater levels from tree removal is highly variable and depends on several factors, including the tree size, silviculture, subsurface conditions, and topography.

In localized areas, we anticipate a temporary decrease in evapotranspiration of 15 to 50 percent (Sias 2003). The decrease in evapotranspiration depends on the quantity of trees and the area of ground cover to be removed with trees representing a larger decrease in evapotranspiration. The largest impact likely will occur during the first year after tree removal. The decrease in evapotranspiration also effects the rate of infiltration and subsequent soil saturation, which is similarly dependent on the degree of vegetation removal. PSE's proposed vegetation management plan will include selective removal of trees so increases in infiltration will be considerably less than wholesale removal of continuous forest canopy. Based on the relatively scattered and/or small clumps of trees to be removed, we estimate that changes in evapotranspiration will be much less than 50 percent; and, therefore, potential impacts to slope stability from increased infiltration will be low. Our estimate is based on selective vegetation management, the planned use of Best Management Practices (BMPs) to reduce soil erosion and replanting of shrubs and trees that are compatible with an existing utility corridor. We anticipate that the potential impacts to geologic hazard areas from the proposed vegetation removal will be considerably less than the impacts during original construction of the existing power line, as vegetation will be maintained within the corridor.

### Pole Installation and Removal

Where new poles are proposed in steep slope or landslide hazard areas, a temporary working bench, or work pad, may be necessary to install and/or remove existing poles. Work pads at some locations may be irregular in shape because of specific on-site restrictions, such as slope geometry. Minor regrading and the temporary addition of small amounts of quarry spalls and/or gravel might be necessary to stabilize portions of the existing access routes. The access routes also may require removing or trimming trees. We recommend that vegetation clearing activities be restricted to that necessary to stage equipment for pole installation and removal. If proper BMPs are implemented, we anticipate no adverse impacts to geologic hazard areas from pole installation and removal.

Recommendations for the design and construction of poles are presented in our *Geotechnical Engineering Services* report dated June 8, 2016. In general, most of the site soils along the proposed transmission corridor consist of glacially-consolidated deposits. These soils should provide adequate support for the new poles, and it is our opinion that once the pole is installed, the pole will not adversely impact slope stability since the pole footprint is small.

### Man-made Areas

The City's LUC does not distinguish between natural and man-made steep slope areas in terms of critical areas regulations. We observed two locations within the North Bellevue alignment where man-made steep slopes overlap with geologic hazard areas. New Poles 7/5 and 7/4 are located in a steep slope structure setback north of the Lakeside Substation, as described in the Existing Conditions section.

The second man-made area is located directly south and adjacent to SR 520 in a parking lot at new Pole 4/4, within a steep slope toe-of-slope structure setback. The slope grade above the existing and proposed poles is approximately 40 percent and likely was a result of regrading during construction of SR 520. The poles to be removed and replaced are located in a relatively flat parking area at the base of the slope.

As outlined in the City's LUC 20.25H.125, pole-type construction is the preferred method of construction within steep slope areas. Pole installation has a much smaller footprint than residential or commercial building development contemplated in the regulations. Based on the relatively small footprint of a new pole, it is our opinion that the new poles will have little to no effect on slope stability within steep slopes, their buffers and structure setbacks, provided that proper BMPs are implemented.

## CONCEPTUAL IMPACT MITIGATION STRATEGY

### Establish Access Routes

Most of the access routes in geologic hazard areas and their buffers will be along an existing road/trail system. Where vegetation clearing is required to establish access to the work site, such as north of the Lakeside Substation, appropriate site-specific BMPs should be implemented, such as using silt fencing on the downslope side of the access route, leaving stumps in place and covering with temporary fill or mats.

After access use is complete, where it is deemed necessary, limited regrading of the access route is recommended where needed to avoid concentrating surface runoff along tracks, ruts, or other potential flow paths. Following completion of construction activities, any gravel or spalls added to temporarily stabilize the access route not located on current access road/trail should be removed. The access route then will be regraded to a stable free-draining configuration, and treated with appropriate Temporary Erosion Sediment Control (TESC) measures, such as mulching and/or placing erosion control nets and blankets and installation of water bars as needed to control runoff, and seeded, as necessary. If nets and blankets are determined a necessary BMP, proper installation specifications per the manufacturer's recommendations should be followed.

Where permanent fill is placed, proper implementation of geotechnical recommendations during construction, along with appropriate erosion control BMPs, should be implemented.

### Vegetation Management/Tree Removal

For vegetation management/tree removal in the City within the mapped geologic hazard areas, GeoEngineers suggests the following options for mitigating impacts.

In general, the sites should be accessed by foot to reduce equipment impacts. Hand cutting with chainsaws is recommended to trim branches and remove trees. Stumps should remain in place in order to provide stability until transmission compatible vegetation reestablishes but can be cut to ground level. Branches,

limbs, trunks and other tree debris should be chipped and scattered around the removal site within the transmission corridor to the extent possible. Where chipping is not feasible, reasonably sized unchipped tree debris can be scattered.

In areas where tree removal is clustered, erosion control BMPs, such as grass seeding, leaving stumps, scattering straw mulch and/or replacement planting of native shrubs or small trees, are recommended to reduce concentrated runoff and minimize erosion.

In areas where tree removal is widely spaced within steep slope and landslide buffer areas, the trees should be cut, stumps left in place, and trimmed branches and trunks scattered in the transmission corridor to the extent possible. If scattering branches and trunks would impact public access and use, or maintenance of the OPL, the debris should be removed from the site.

Where vegetation is removed from private property, all tree debris should be removed from the owner's property and communication with the property owner is suggested to identify possible reseeding, replacement tree or shrub, or landscaping options. If agreeable to the property owner, it is possible that the tree trunk can be cut and left below ground surface to maintain root strength, and a replacement tree or shrub may be planted near the trimmed trunk.

### Pole Installation and Removal

Areas disturbed for installation and removal of poles will require TESC BMPs. Clearing activities will be restricted to that necessary to access each pole location.

Where a bench (work pad) is required to install or remove a pole on a steep slope or landslide hazard area, the recommendations presented above for temporary access routes also apply. Appropriate erosion control BMPs should be implemented during construction, and the disturbed area should be regraded and restored after pole construction activities are completed using seed and mulch and/or revegetating, and the area treated with appropriate BMPs to prevent transport of sediment during rain events. Soil removed from the new pole excavations should be scattered into vegetation away from any landscaped areas and old poles removed from the site. If the work area is wet or has standing water, driving mats should be used under equipment and all soils should be removed from the site for off-site disposal.

For poles located in geologic hazards areas, if not removed entirely, the old poles should be cut off approximately 1 to 2 feet below the ground surface and the remaining portion of each pole left in place. If new poles are installed on slopes steeper than 2H:1V (horizontal to vertical), they should be embedded at least 3 feet deeper than the typical design embedment.

### Man-made Areas

We have identified two areas where man-made steep slopes overlap with critical areas: the area around proposed Poles 7/5 and 7/4 and the area around proposed Pole 4/4. The steep slope located at Poles 7/5 and 7/4 has a retaining wall separating the PSE transmission corridor from a school property. The steep slope that is located above Pole 4/4 appears to be part of the original SR 520 construction grading. As outlined above in Pole Installation and Removal, if a working bench is necessary to install or remove poles in these locations the area should be regraded and restored to the pre-construction state. During construction, appropriate BMPs should be used to prevent erosion and sedimentation delivery to nearby drainages. Any areas where vegetation is removed from the slope during construction of Poles 7/4 and 7/5 should be reseeded or replanted as quickly as possible.

### Structure Setbacks

We reviewed the location of each proposed pole relative to the location of mapped geologic hazard areas and the associated setbacks. The critical area buffer and structure setback from the City's LUC for landslide hazards and steep slopes is provided in Table 1.

Some of the pole locations described in this report include the replacement of existing poles within the 75-foot setback for steep slopes. No new poles are located near the toes-of slope for landslide hazards; therefore, we conclude that no additional assessment regarding structure setback is necessary. It is our opinion that the proposed pole installation will not impact slope stability if appropriate BMPs are used and soil cuttings for pole installation either are scattered on site or removed.

### Site-Specific Recommendations

In general, most of the site soils at the proposed pole locations consist of glacially-consolidated deposits. These soils should provide adequate support for the new poles, and it is our opinion that once a pole is installed, the pole will not adversely impact slope stability because the pole foundation footprint is small. Site-specific recommendations to mitigate for potential impacts during construction are presented in Table 2.

**TABLE 2. SUMMARY TABLE OF POLE REPLACEMENT SITES WITHIN MAPPED GEOLOGIC HAZARD AREAS**

| Pole Replacement Sites | Geologic Hazard Areas | Discussion and Recommendations |
|---|---|---|
| Lakeside Substation: New Poles 7/5 and 7/4 and Removal of Old Poles | Steep Slope 75-foot Setback | This location is accessible from SE 26th Street and the PSE transmission corridor. Steep man-made slopes are located north of Lakeside Substation adjacent to Chestnut Hill Academy. Some areas of wet saturated ground were present at the base of the slope during our site visit and should be avoided during construction. Trees to be removed from the area can be cut into smaller pieces and the debris left on site. If any grading occurs during site activities, the slopes should be returned to pre-construction grade. Soil spoils should be scattered or removed from the site and TESC BMPs should be used to minimize impact to the steep slope until vegetation is reestablished. BMPs may include combinations of mulching, seeding, nets or blankets, and wattles as necessary, and/or replacement of the existing geotextile fabric. |
| New Poles 6/7 through 5/6, and Removal of Old Poles | Steep Slopes, Steep Slope 50-foot Buffer or Landslide 50-foot Buffer | This portion of this alignment is accessible from SE 20th Street, SE 10th Street, Main Street and an existing access road/trail (see above Existing Conditions for special considerations for accessing proposed Pole 6/2). The debris from the trees can be cut and left on site. Soil spoils should be scattered or removed from the site and TESC BMPs should be used to minimize impact to the steep slope until vegetation is reestablished. BMPs to be used may include combinations of mulching, seeding, nets or blankets, silt fencing and wattles as necessary. |

| Pole Replacement Sites | Geologic Hazard Areas | Discussion and Recommendations |
|---|---|---|
| Adjacent to WA SR520:<br>New Pole 4/4 and Removal of Old Poles | Steep Slope<br>75-foot Structure Setback | The area is accessible through an industrial area off NE 20th Street. The new pole and old pole locations are located within a parking lot. This area does not have any trees that are designated to be removed by PSE. Soil spoils should be scattered in the existing vegetation and mulched/seeded or removed from the site, and the pre-existing surface restored. |
| North of NE 24th Street:<br>New Pole 4/2 and Removal of Old Poles | Steep Slopes or Steep Slope<br>50-foot Buffer | The site is accessed from NE 24th Street. Blackberry bushes and residential fences separate access from NE 24th Street to the pole location. Track-mounted equipment may be necessary for the installation/excavation of the poles within this portion of the alignment. Soil spoils should be scattered or removed from the site and TESC BMPs should be used to minimize impact to the steep slope until vegetation is reestablished. BMPs to be used may include combinations of mulching, seeding, nets or blankets, silt fencing and wattles as necessary. |
| New Pole 2/4 and Removal of Old Poles | Steep Slope or Steep Slope<br>50-foot Buffer | Access to the site is across private property owned by Overlake Farms. We were not able to access this site because the property owners did not grant access. From our desktop review of the site, it is our opinion that the trees to be removed from the area can be cut and the debris should be removed from the site. Soil spoils should be scattered or removed from the site and TESC BMPs should be used to minimize impact to the steep slope until vegetation is reestablished. BMPs to be used may include combinations of mulching, seeding, nets or blankets, silt fencing and wattles as necessary. Cutting off and leaving the existing poles in place will help minimize impacts to the slope. Track-mounted or limited access equipment may be necessary for the installation/excavation of the poles within this portion of the alignment. |

It is our opinion that the poles within the hazard areas described in the table above can be installed with a low risk of impact to the geologic hazard areas, their buffers or structure setbacks, provided that our recommendations and appropriate BMPs are implemented.

## CODE COMPLIANCE

In addition to generally applicable performance standards set forth in the City's LUC 20.25H.055 and 20.25H.065, development within a landslide hazard or steep slope critical area or the critical area buffers of such hazards shall incorporate the following additional performance standards in design of the development, as applicable. The requirement for long-term slope stability shall exclude designs that require regular and periodic maintenance to maintain their level of function.

### *20.25H.125 Performance standards – Landslide hazards and steep slopes*

A. *Structures and improvements shall minimize alterations to the natural contour of the slope, and foundations shall be tiered where possible to conform to existing topography.*

**Response to Code Requirement:** No structures will be constructed as part of the proposed project. Site improvements (pole removal, pole replacement, access improvements and vegetation management/tree removal) are not anticipated to adversely impact the natural contour of slopes. The proposed site activities including vegetation management, tree removal, and temporary access roads (associated with the proposed pole replacement activities) will maintain overall existing site topography. However, it is anticipated that a temporary working bench may be necessary to install poles in some locations. Also, there is one location just south of proposed Pole 6/2 where the natural contour of the slope may be modified slightly by adding permanent fill to the existing road/trail if the site is accessed from Lake Hills Connector. New fill placement would be geotechnically engineered and contoured to mimic existing topography. No adverse impacts from fill placement are anticipated if geotechnical recommendations are implemented.

B. *Structures and improvements shall be located to preserve the most critical portion of the site and its natural landforms and vegetation.*

**Response to Code Requirement:** No structures will be constructed as part of the proposed project. Site improvements include localized vegetation management, including tree removal, and use of existing access routes where possible (associated with the proposed pole replacement activities). The proposed tree removal and surface disturbance will be limited to reduce potential impacts to natural landforms and vegetation. Tree removal is limited to that needed for pole installation and to meet federal North American Electric Reliability Corporation (NERC) standards to maintain safe clearances between vegetation and utility lines. The access to proposed Pole 6/3 was sited to avoid a wetland.

C. *The proposed development shall not result in greater risk or a need for increased buffers on neighboring properties.*

**Response to Code Requirement:** The proposed development includes vegetation management, including tree removal, and use of existing access routes (associated with the proposed pole replacement activities) that will be followed by mitigation measures to reduce potential impacts to geologic hazards that include landslide and steep slope hazards. Mitigation measures include a variety of BMPs to reduce potential impacts to geologic hazards in the vicinity of neighboring properties. BMPs include plant replacement, scattering trimmed or removed tree debris, and chipping wood to reduce potential impacts to work areas as appropriate. Removal of vegetation by hand and/or using limited access machinery will reduce potential impacts to landslide and steep slope hazard areas. It is our opinion that the proposed project will not require increased buffers and will not result in a greater risk to neighboring properties.

D. *The use of retaining walls that allow the maintenance of existing natural slope area is preferred over graded artificial slopes where graded slopes would result in increased disturbance as compared to use of retaining wall.*

**Response to Code Requirement:** In the transmission corridor, no retaining walls or grading activities are proposed relative to the proposed vegetation management, tree removal and access route activities (associated with the proposed pole replacement activities). If permanent fill is used on the access route between Lake Hills Connector and proposed Pole 6/2, it will be geotechnically engineered such that no retaining walls will be required.

E. *Development shall be designed to minimize impervious surfaces within the critical area and critical area buffer.*

**Response to Code Requirement:** No substantial new impervious surfaces are proposed relative to the proposed vegetation management, tree removal and access route activities (associated with the proposed pole replacement activities) within mapped critical area and mapped critical area buffers of the transmission corridor.

F. *Where change in grade outside the building footprint is necessary, the site retention system should be stepped, and regrading should be designed to minimize topographic modification. On slopes in excess of 40 percent, grading for yard area may be disallowed where inconsistent with these criteria.*

**Response to Code Requirement:** No substantial change in grade is proposed relative to the proposed vegetation management, tree removal and access route activities (associated with the proposed pole replacement activities) within the transmission corridor.

G. *Building foundation walls shall be utilized as retaining walls rather than rockeries or retaining structures built separately and away from the building wherever feasible. Freestanding retaining devices are only permitted when they cannot be designed as structural elements of the building foundation.*

**Response to Code Requirement:** No building foundations are proposed relative to the proposed vegetation management and tree removal activities associated with the proposed pole replacement activities within the transmission corridor. However, for stability purposes, drilled pier foundations will be used on select poles in the corridor where appropriate. No soldier pile and retaining walls will be necessary to retain any grade changes that may be required.

H. *On slopes in excess of 40 percent, use of pole-type construction which conforms to the existing topography is required where feasible. If pole-type construction is not technically feasible, the structure must be tiered to conform to the existing topography and to minimize topographic modification.*

**Response to Code Requirement:** No pole-type structures are proposed relative to the proposed vegetation management and tree removal activities. The new poles will meet the preferred construction type (which is pole-type construction).

I. *On slopes in excess of 40 percent, piled deck support structures are required where technically feasible for parking or garages over fill-based construction types.*

**Response to Code Requirement:** No structures requiring pile deck support are proposed relative to the proposed vegetation management and tree removal activities. The new poles will meet the preferred construction type (which is pole-type construction).

J. *Areas of new permanent disturbance and all areas of temporary disturbance shall be mitigated and/or restored pursuant to a mitigation and restoration plan meeting the requirements of LUC 20.25H.210. (Ord. 5680, 6-26-06, § 3).*

**Response to Code Requirement:** Temporary disturbance for the proposed vegetation management and tree removal activities and access routes (associated with the proposed pole replacement activities) within the existing transmission corridor will be mitigated by scattering and/or chipping trimmed limbs and logs, replanting vegetation, and using limited access

equipment or accessing only by foot as appropriate. In the event that work areas are wet or have standing water, timber driving mats will be used under all equipment. Additionally, for poles located in geologic hazard areas, the old poles will be cut off approximately 1 to 2 feet below ground surface and the remaining portion of each pole left in place.

If fill is placed to widen and regrade the existing access road/trail just north of Lake Hills Connector for access to proposed Pole 6/2, potential impacts will be mitigated by conducting a geotechnical evaluation and design for the proposed fill, and constructing the access improvements in accordance with geotechnical recommendations.

## LIMITATIONS

We have prepared this report for the exclusive use of PSE and their authorized agents for the Energize Eastside Project located in Bellevue, Washington.

The purpose of our services was to review landslide, erosion and seismic hazard impacts in relation to construction activities, vegetation management/tree removal and temporary access routes (associated with the proposed pole replacement activities) along the transmission line corridor within the City. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

It is not the intent of GeoEngineers to list and identify all applicable safety codes, standards and/or regulations relating to work to be performed for the Energize Eastside Project. The Contractor and its subcontractors are solely responsible for identifying, determining and adhering to all applicable safety codes, standards and regulations.

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