Targeted Critical Areas Geologically Hazardous Areas Evaluation

Energize Eastside Project
Redmond, Washington

for
Puget Sound Energy

March 15, 2019

GeoEngineers
Earth Science + Technology

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File No. 0186-871-07

March 15, 2019

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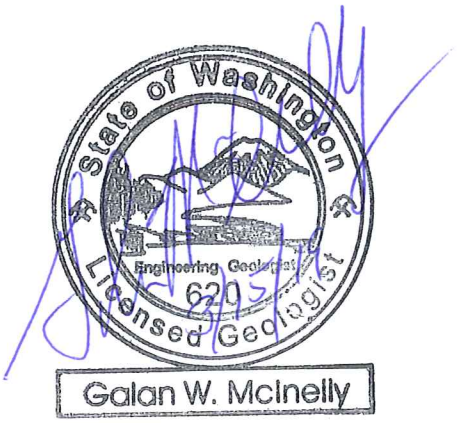

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INTRODUCTION

GeoEngineers, Inc. (GeoEngineers) is pleased to present the results for a targeted critical areas evaluation of the Energize Eastside project corridor within the City of Redmond (City), in which regulated geologically hazardous areas are present.

The project area is located along existing Puget Sound Energy (PSE) rights-of-way (ROW) in the transmission corridor that connects to the Sammamish Substation within the City of Redmond. We previously provided a geologic hazard evaluation for various routes under consideration, including the project selected 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 desktop review for landslide, erosion and seismic hazards (geologic hazard areas) relative to proposed vegetation management/tree removal and pole replacement activities. This report provides recommendations for restoration of construction areas in geologic hazard areas present in the project area, including restoration of construction access routes, pole installation and pole removal sites. PSE has provided a map developed by others that shows locations of proposed pole replacement activities, including proposed vegetation management/tree removal zones, proposed and existing poles, and construction access routes. PSE has indicated that all existing poles will be removed after the new poles are installed.

REDMOND ZONING CODE REGULATIONS

GeoEngineers reviewed local regulations in the Redmond Zoning Code (RZC) under Critical Areas Regulations (21.64) for Geologically Hazardous Areas (21.64.060). The project area that is proposed by PSE within the existing transmission corridor, contains geologically hazardous areas regulated by the City, including erosion, landslide and seismic hazard areas.

Definitions of Geologically Hazardous Areas

The RZC 21.64.060 defines geologically hazardous areas and their regulated buffers as follows:

21.64.060.A.1.a Erosion Hazard Areas

Erosion hazard areas are lands or areas underlain by soils identified by the U.S. Department of Agriculture Soil Conservation Service (SCS) as having "severe" or "very severe" rill and inter-rill erosion hazards. This includes, but is not limited to, the following group of soils when they occur on slopes of 15 percent or greater: Alderwood-Kitsap (AkF), Alderwood gravelly sandy loam (AgD), Kitsap silt loam (KpD), Everett (EvD), and Indianola (InD).

21.64.060.A.1.b Landslide Hazard Areas

Landslide hazard areas are areas potentially subject to significant or severe risk of landslides based on a combination of geologic, topographic, and hydrogeologic factors. They include areas susceptible because of any combination of bedrock, soil, slope, slope aspect, structure, hydrology, or other factors. They are areas of the landscape that are at a high risk of failure or that presently exhibit downslope movement of soil and/or rocks and that are separated from the underlying stationary part of the slope by a definite plane

of separation. The plane of separation may be thick or thin and may be composed of multiple failure zones depending on local conditions, including soil type, slope gradient, and groundwater regime.

Landslide hazard areas include:

i. *Areas of historic failures, such as:*

   A. *Areas designated as quaternary slumps or landslides on maps published by the United States Geologic Survey (USGS); or*

   B. *Those areas designated by the United States Department of Agriculture (USDA) Soil Conservation Service (SCS) as having a "severe" limitation for building site development.*

ii. *Areas containing a combination of slopes steeper than 15 percent, springs or groundwater seepage, and hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock;*

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 that epoch;*

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

v. *Slopes having gradients steeper than 80 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; or*

vii. *Any area with a slope 40 percent or steeper with a vertical relief of 10 feet or more.*

21.64.060.A.1.c Seismic Hazard Areas

Seismic hazard areas are lands subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement, soil liquefaction, or surface faulting.

21.64.060.B Landslide Hazard Area Buffers

1. *Landslide hazard area buffers shall be measured from the top and toe, and along sides of the slope.*
2. *Minimum Landslide Hazard Area Buffer. Required buffers shall be 50 feet. The width of the buffer shall reflect the sensitivity of the landslide hazard area in question and the types and density of uses proposed on or adjacent to the geologic hazard. In determining the appropriate buffer width, the Committee shall consider the recommendations contained in any technical report required by these regulations and prepared by an applicant's qualified consultant.*
3. *Buffer Reduction. Buffers may be reduced to a minimum of 15 feet when a qualified professional demonstrates through technical studies that the reduction will adequately protect the proposed and surrounding development from the critical landslide hazard.*
4. *Increased Buffer. The buffer may be increased where the Technical Committee determines a larger buffer is necessary to prevent risk of damage to proposed and existing development.*

EXISTING CONDITIONS

This geohazard assessment focuses on proposed project construction activities, including temporary access routes, vegetation management/tree removal, pole installation and pole removal within geologically hazardous areas regulated by the City. GeoEngineers completed a site reconnaissance on December 4, 2018 to assess the proposed project area. Before our site visit, we reviewed previous reports that characterized local and regional geology (Booth and Wisher 2006 and Washington Division of Geology and Earth Resources, Digital Report 2, Digital Geologic Maps of the 1:100,000 Quadrangles of Washington). We reviewed the City's on-line geologically hazardous areas maps, geology and soil maps and Light Detection and Ranging (LiDAR) of the Redmond, Washington region.

As documented in the 2014 GeoEngineers report prepared for PSE to assess existing geologic conditions in the Redmond project area, the existing geology in the identified areas mainly consists of glacial drift, including exposures of advance continental glacial outwash and glacially consolidated till. Alluvium is encountered in the valley bottoms. Soil types mapped by the USDA Natural Resources Conservation Service in the project area include Alderwood gravelly sandy loam (AgC and AgD), Earlmont silt loam (Ea), Indianola loamy sand (InA) and Tukwila muck (Tu) (Natural Resources Conservation Service [NRCS] 2017).

There are landslide and erosion hazard areas within the Redmond project area within a system of ravines and ridges north of Redmond Way. The steep slopes are in a maintained ROW corridor occupied by PSE transmission lines and an underground petroleum pipeline and is periodically maintained (i.e., mowed and brush trimmed) by PSE and the petroleum pipeline company. Some of the selected tree removal that is proposed will occur in ravines and the steep slopes. There are no mapped faults in the project area (Washington Department of Natural Resources [WDNR] 2019) and we did not observe any surface expression of faulting or rupturing which would indicate impacts from seismic activity.

Our observations of existing conditions from our data review and field observations are summarized in Table 1.

TABLE 1. EXISTING CONDITIONS FOR POLE REPLACEMENT SITES AND ACCESS ROUTES

Pole Replacement Sites and Access Routes	Geologically Hazardous Areas	Notes
0/11	Landslide and Erosion Hazard Areas	The area around replacement Pole 0/11 includes a forested area and moderately cleared areas on the underground pipeline ROW. Trees on the slope consist primarily of alders with a few other deciduous trees. The slope has ground cover both near the existing trees and in the open areas consisting of grass, blackberry and willow shrubs. The slope is north facing and terminates at the bottom of a ravine where a wetland has been identified by others in a mapped wetland. An asphalt driveway used for City utility maintenance is located directly south of the proposed pole location. A three-pole H-frame currently exists at the site.
0/10	Landslide and Erosion Hazard Areas	The project site is on a ridgeline with ravines on either side. Wetlands have been identified on both the north and south sides of the ridgeline at the bottoms of the ravines. The hillslopes are forested with primarily alder and other deciduous trees. The slopes and surrounding area have ground cover including blackberry, willow shrubs and tall grasses. A three-pole H-frame currently exists at the site.
0/7	Landslide Hazard Area Buffer	The project site is located on the northeast slope of a large ravine. The slope to the south of the pole location includes a forested area and moderately cleared areas in the PSE ROW. Trees on the slope consist primarily of alder with occasional conifers. The cleared portion of the slope has ground cover including grass, blackberry and willow shrubs. The slope is south facing and is in an area of both erosion and landslide hazards as mapped by the City. One pole currently exists at the site.
0/5	Landslide Hazard Area	The project site is located on the north slope of a large ravine. The slope includes a forested area and moderately cleared areas in the underground pipeline ROW. Trees on the slope consist primarily of alder. The slope has ground cover including grass, blackberry and willow shrubs. The slope is south facing and terminates at the bottom of a ravine where a wetland has been identified by others.
Access Route to Proposed Pole Replacement Site 0/10	Landslide and Erosion Hazards	A proposed access route begins at Pole 0/5 and tracks downhill through a wetland area and crosses and a stream. The access route has a measured slope of greater than 40 percent and follows the underground pipeline ROW. The ground becomes saturated near the bottom of the slope, where a wetland and stream have been identified. Moving southward, the slope from the wetland to Pole 0/10 is inclined at about 30 percent, facing north. Vegetation along the access route consists of mowed grass in the pipeline ROW and alder and willow shrubs outside of the grassy corridor.
Access Routes to new and old Poles East of New Poles 0/5 and 0/9, including access to new Poles 0/9 through 0/1 and Existing Poles 0/9 to 0/1	Landslide and Erosion Hazards, and/or Seismic Hazard	Most of this area can be accessed via the PSE-maintained ROW. Some areas are overgrown with grass, willow shrubs and blackberry bushes. A wetland is identified in the eastern most portion of the ROW where poles 0/6, 0/5, 0/4 and 0/2 are located. The ground in the mapped wetland near the Sammamish Substation was visibly wet in areas during our site visit. There are no faults mapped in the project area and during our site reconnaissance we did not observe any indication of seismic activity, such as ground fractures, slumps or spreading.

IMPACT ASSESSMENT

GeoEngineers reviewed the proposed construction activities within the geologically hazardous areas relative to the expected impacts, based on information provided by PSE staff and our experience with previous construction projects.

Construction Access Impacts

Temporary and maintained access routes for track-mounted or wheeled equipment will be used to construct new poles and remove old poles. Equipment access may potentially increase the risk of localized erosion in steep slope and erosion-prone areas and temporary impacts to wetland vegetation. Minor regrading and addition of small amounts of quarry spalls or gravel might be necessary to stabilize portions of the existing access routes. Additionally, timber driving mats may be needed to temporarily cross stream(s) and move through wetland areas. However, driving equipment on timber mats is likely not feasible on slopes greater than about five percent. The existing access routes may require either prior removal of select trees and/or trimming of overhanging limbs to access the pole sites.

Vegetation Management/Tree Removal Impacts

There are two primary ways in which tree removal activities may impact slope stability in landslide (steep slopes) and erosion hazard areas. After tree removal, root decay 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.

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

Elevated groundwater levels, which can be impacted by tree removal, have the potential to decrease the stability of slopes in the project area by reducing the shear strength of the soil and by adding additional weight. The probability of landslides occurring in the project area 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 general, tree removal has the potential to temporarily decrease slope stability in steep slope/landslide hazard areas because of the increase of infiltrated groundwater caused by a reduction in evapotranspiration in the first year from removal of vegetation. However, fewer impacts are expected in areas where tree removal is isolated to one or two trees and the steep slope/landslide hazard area is otherwise stable and well vegetated. Additionally, fewer impacts are expected at the toe of the slope, compared to tree removal within the body or at the top of the slope. Further, we anticipate that the potential impacts from the proposed vegetation removal will be considerably less than the impacts that occurred

during original construction of the existing power line, as vegetation has been maintained within the corridor.

Pole Installation and Removal

Where new poles are proposed in sloped areas, such as within landslide and erosion hazard areas, a temporary working bench, or work pad, may be necessary to install and/or remove the poles. Work pads are ideally roughly 50 feet by 50 feet in dimension. The work pad is likely to be irregular in shape at pole location 0/10 because of the slope geometry. Minor regrading and the 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 removal or trimming of trees.

CONCEPTUAL IMPACT MITIGATION STRATEGY

We understand that the contractor selected for this project will prepare a Temporary Erosion and Sediment Control (TESC) Plan for their Storm Water Pollution Prevention Plan (SWPPP). We present some possible Best Management Practices (BMPs) below that may be appropriate for use in the suite of BMPs selected by the contractor to minimize potential impacts during construction and for restoration of disturbed areas. The actual use of BMPs will be adaptive as construction is conducted, depending on site-specific conditions and construction timing.

General Erosion and Sedimentation Control BMPs

- Preserving natural vegetation where possible.
- Temporary and permanent seeding. The seed mix used at each location should be specified depending on whether erosion control or restoring a wetland or wetland area is the main driver.
- Mulching.
- Nets and blankets.
- Surface roughening.
- Silt fence.
- Compostable wattles.

Access Route BMPs

Where vegetation clearing is required to establish access to the work sites, appropriate site-specific BMPs will be documented in the project SWPPP and reviewed by the project Certified Erosion and Sediment Control Lead (CESCL). Recommended BMPs can include, but are not limited to: outsloping road surfaces, crowning road surfaces (where appropriate, such as at ridge tops and where roads climb gently inclined surfaces) and installing water bars or rolling dips at regularly spaced intervals to avoid concentrating surface water flow along the road surface(the spacing depends on the grade of the route, the soil type present, and proximity to streams). After access use is complete, where it is deemed necessary, limited regrading of the access route is recommended 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 will be removed, the access route will be regraded to disperse runoff and treated with appropriate TESC measures, such as mulching and/or placing nets and blankets and

installation of water bars as needed to control runoff, and seeded, as necessary. If nets and blankets are determined to be a necessary BMP, proper installation specifications per the Stormwater Management Manual for Western Washington (SMMWW) (Washington State Department of Ecology, updated 2019) and manufacturer's recommendations should be followed.

Where an access route is not currently improved, the access routes will be temporary and will be restored following construction of the transmission line. During construction in the transmission corridor, access routes will require equipment movement across mapped wetlands and streams. Extra care to not impact the wetlands and streams and should be taken by minimizing access width and using timber mats where the slope grades are feasible. Large bulldozers capable of winching, such as Caterpillar D9s, may be used as necessary to support excavator equipment on steep slopes. Excavators equipped with grousers on their stabilizer pads also may lessen the impact of mobilizing equipment across steep slopes. Alternatively, articulated equipment (such as spiders or other specialized equipment) may be used.

Vegetation Management/Tree Removal BMPs

For vegetation management/tree removal proposed by PSE within the mapped geologically hazardous areas, GeoEngineers suggests the following options for mitigating impacts of vegetation management/tree removal.

In general, to limit impacts on slope stability from vegetation management/tree removal in landslide (steep slope) and erosion hazard areas or landslide hazard area buffers, 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 slope stability until transmission line- 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 PSE ROW, if possible. Where chipping is not feasible, reasonably-sized unchipped tree debris can be scattered. If the quantity of vegetative debris results in unreasonable cluttering of the site, smaller pieces may be removed.

In areas where tree removal is clustered or areas where the underlying soil has been exposed, erosion control BMPs, such as seeding, mulch placement, netting and blanket installation, leaving stumps and/or replacement planting of native shrubs or small trees, are recommended to reduce concentrated flows and minimize disturbance.

Pole Installation and Removal BMPs

Areas disturbed for installation and removal of poles also will require temporary erosion and sedimentation control BMPs as identified in the project SWPPP. Clearing activities will be restricted to that necessary to access each pole location.

Where a temporary bench (work pad) is required to install or remove a pole on a landslide (steep slope) or erosion 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 (unless regrading will result in additional site impacts) using seed and mulch and/or revegetating with shrubs. Soil removed from the new pole excavations should be scattered onsite and old poles should be removed from the site. All temporary work pads in wetland areas should be restored. If the work area is wet or has standing water,

driving mats should be used under equipment where feasible and excavated soils should be removed and disposed offsite.

For poles located in geologically hazardous areas, 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 poles are installed on slopes steeper than 2H:1V or within seismic hazard area, they should be designed and constructed in accordance with the geotechnical recommendations provided in the GeoEngineers report dated June 8, 2016.

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 since the pole foundation footprint is small.

Mapped landslide, erosion and seismic hazard areas and wetlands are observed locally within the project area. The site is located north of Redmond Way and includes twelve proposed pole locations. It is our opinion that the poles within the hazard areas described in Table 2 can be installed with a low risk of impact to the geologically hazardous area, provided that our recommendations and appropriate TESC BMPs, as described below, are implemented.

TABLE 2: GENERAL RECOMMENDATIONS FOR IMPACT MITIGATION FOR MAPPED GEOLOGICALLY HAZARDOUS AREAS

Pole Replacement Sites and Access Routes	Geologically Hazardous Areas	Discussion and Recommendations
New Pole 0/11 and Removal of Old Poles at 0/7	Landslide and Erosion Hazard Areas	The site is accessible from an asphalt pullout off Redmond Way. The pole to be replaced is about 10 feet to the north of the pullout, on the adjacent slope. Because of the close proximity of the steep slope, heavy equipment should stay at least 10 feet back from the edge of the steep slope. The trees to be removed from the area can be cut into smaller pieces and it is recommended the debris be left on site whenever feasible. 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. Cutting off and leaving the existing poles in place below ground will minimize impacts to the slope.
New Pole 0/10 and Removal of Old Pole at 0/6	Landslide and Erosion Hazard Areas	Site access will be very difficult because of the steep slopes on the access route on both the north and south sides of the ravine. Trees in the ravine along the access route to Pole 0/10 should trimmed as needed rather than removing in wetland and stream critical areas. In the upper third of the steep slope where trees will grow into the powerlines at an earlier date, the trees should be removed. Tree clearing should be performed by foot and trees can be cut into smaller pieces and the debris left on site when feasible. We recommend that low impact equipment be used to install the proposed pole in this location. Timber mat should be used to track over wetland areas where the slopes are not too great and across the stream. 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, silt fencing and wattles as necessary. Cutting off and leaving the existing poles in place below ground will minimize impacts to the slope. Pruning of the trees will be required on a periodic basis during long-term corridor maintenance, however tree removal will not occur in critical areas.
New Poles 0/7, 0/5, 0/4, 0/2 and 0/1	Landslide, Landslide Buffer, Erosion and Seismic Hazard Areas	The sites are accessible from existing dirt and gravel access routes. It is likely that little to no impact to the slopes in the area will occur during replacement pole installation. Some trees will be removed from the area around the existing substation, but the area is mostly flat or gently sloping. Soil spoils should be scattered or removed from the site and TESC BMPs should be used to minimize impact to the steep slope BMPs to be used may include combinations of silt fencing, wattles, mulching, seeding and revegetation. Where slopes greater than 2:1 (horizontal to vertical) are located nets and blankets should be used as necessary. Cutting off and leaving the existing poles in place below ground will minimize impacts to the slope. Wetland areas will be modified and restored in accordance with the Willows Creek Stream Relocation Project in this area.

Pole Replacement Sites and Access Routes	Geologically Hazardous Areas	Discussion and Recommendations
Removal of Old Poles 0/5 to 0/1	Landslide, Erosion and Seismic Hazard Areas	The sites are accessible from existing dirt and gravel access routes. It is likely that little to no impact to the slopes in the area will occur during pole removal. Some trees will be removed from the area around the substation, but the area is mostly flat or gently sloping. The site will be restored in accordance with Willows Creek Stream Relocation Project revegetation plan that will be provided in the project's Critical Areas Report. Soil spoils should be scattered or removed from the site and TESC BMPs should be used to minimize erosion. BMPs to be used onsite may include combinations of silt fencing, wattles, mulching, seeding and nets and blankets as necessary. If applicable, cutting off and leaving the existing poles below ground will minimize impacts to the slope.

CODE COMPLIANCE

We reviewed the RZC as it pertains to development in geologically hazardous areas. Below is an analysis of how the Energize Eastside pole replacement project complies with applicable performance standards for development in regulated geologically hazardous areas.

21.64.060.D Alteration of Geologically Hazardous Areas.

> *(1) The City shall approve, condition, or deny proposals in a geologically hazardous area as appropriate based upon the effective mitigation of risks posed to property, health, and safety. The objective of mitigation measures shall be to render a site containing a geologically hazardous site as safe as one not containing such hazard. Conditions may include limitations of proposed uses, modification of density, alteration of site layout, and other appropriate changes to the proposal. Where potential impacts cannot be effectively mitigated, or where the risk to public health, safety and welfare, public or private property, or important natural resources is significant notwithstanding mitigation, the proposal shall be denied.*
>
> **Response to Code Requirement:** In order to mitigate long-term effects to property, health and safety that might be caused by disturbing geologically hazardous areas, the project will: minimize vegetation removal to the extent possible, or leaving roots in place when it is necessary to remove trees; construct work sites that are graded to disperse stormwater runoff on steep slopes; use BMPs during construction to minimum erosion that could otherwise cause destabilization of geologically hazardous areas; and complete permanent restoration of disturbed areas, including replanting to restore root strength in areas where vegetation is removed. Temporary BMPs will be installed until transmission line-compatible vegetation can be reestablished in disturbed areas.

(2) Landslide Hazard Areas. Development shall be prohibited in landslide hazard areas except as noted below:

a. Pin pilings or footings for decks are permitted provided that they do not impact the stability of the slope, as demonstrated by geotechnical studies; and

b. The installation and construction of streets and/or utilities, subject to the criteria and process set forth in RZC 21.76.070.E, Alteration of Geologic Hazard Areas.

Response to Code Requirement: This project is construction/replacement of an existing utility and, therefore, is allowed provided that RZC 21.64.060.E performance standards are met.

Discussion of how the performance standards will be met follows.

21.64.060.E Geologically Hazardous Area Performance Standards.

(1) Relevant performance standards from RZC 21.64.020.F, RZC 21.64.020.G, and RZC 21.64.030.D, as determined by the Committee, shall be incorporated into mitigation plans.

Response to Code Requirement: The performance standards listed, which correspond to riparian stream corridors, fish and wildlife habitat conservation areas and wetland areas, respectively, are provided in the Critical Areas Report.

(2) Development within a geologically hazardous area shall meet the following basic requirements unless it can be demonstrated that an alternative design that deviates from one or more of these standards provides equivalent or greater long-term slope stability. The following performance standards shall be reflected in proposals within landslide and erosion hazard areas:

(a) *Geotechnical studies shall be prepared by a qualified consultant to identify and evaluate potential hazards and to formulate mitigation measures;*

(b) Construction methods will reduce or not adversely affect geologic hazards;

(c) 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: This report constitutes our geotechnical evaluation of potential hazards and our recommended mitigation measures (taken in conjunction with our geotechnical report [GeoEngineers 2016]). This project is the replacement of existing 115 kV wood transmission poles with steel 230 kV poles. Site improvements (pole replacement, temporary access routes, and vegetation management/tree removal) are not anticipated to adversely impact the natural contour of the slopes. The proposed site activities that include temporary and minor grading for access and work areas during construction will maintain overall existing site topography once the locations are restored to the extent feasible.

(d) *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: This project is the replacement of existing 115 kV wood transmission poles with steel 230 kV poles. Site improvements include localized vegetation management/tree removal and removal of old poles. Trees stumps will be left in place and low-impact tree removal methods will be used. Temporary construction access routes will be used, and will be limited in disturbance and site surface will be restored after construction activities are completed. The proposed structures and improvements will be constructed and restored so as to limit potential impacts to natural landforms and vegetation.

(e) *Structures and improvements shall be clustered to avoid geologically hazardous areas*;

Response to Code Requirement: All structures to be constructed in Redmond will be power poles. The construction of power poles inherently requires a small land footprint for installation. Because of the nature of power pole placement and the limited number of poles in the project area, clustering will not be necessary to avoid geologically hazardous areas.

(f) *Unless otherwise provided or as part of an approved alteration, removal of vegetation from an erosion or landslide hazard area or related buffer shall be prohibited*;

Response to Code Requirement: Vegetation removal will be required along the proposed transmission line upgrade route. Vegetation removal is limited to what is necessary to perform the pole replacement and clearing of identified trees along the PSE ROW to maintain a 20-foot clearance from electrical transmission lines, which is required under federal vegetation management standards for transmission lines (NERC FAC-003-4 [*Transmission Vegetation Management]*). Primarily the trees consist of alder and other deciduous species, with occasional conifers. The trees to be removed will be cut off, leaving the stumps and roots in place, limbed, and the woody debris will be spread over the area. Restoration BMPs and erosion control BMPs will also be used, including replanting in accordance with a planting plan developed by others.

(g*) Development shall be designed to minimize impervious surface coverage*;

Response to Code Requirement: Gravel or quarry spalls may be used in building and maintaining temporary access routes. All impermeable materials such as gravel and quarry spalls will be removed from the site post construction. The quantities of gravel or quarry spalls that may be used are expected to be small in volume, removed once construction is completed, and have no practical impact while being used onsite.

(h) *Disturbed areas should be replanted as soon as feasible pursuant to an approved landscape plan;*

(i) Clearing and grading regulations as set forth by the City shall be followed;

(j) Use of retaining walls that allow maintenance of existing natural slope areas are preferred over graded artificial slopes;

Response to Code Requirement: Disturbed areas shall be replanted as soon as practicable with appropriate native seed and/or shrub species as recommended in the planting plan to be developed by others. In the transmission corridor, no retaining walls or permanent grading activities

are proposed. Where temporary grading is necessary, those areas will be recontoured to match existing conditions following pole replacement worksite and/or construction access route restoration.

(k) *Temporary erosion and sedimentation controls, pursuant to an approved plan, shall be implemented during construction*;

Response to Code Requirement: BMPs will be used to limit erosion during and after construction and will be appropriate for site-specific conditions.

(l*) A master drainage plan shall be prepared for large projects as required by the City Engineer;*

Response to Code Requirement: A master drainage plan will not be required for this project.

(m*) A monitoring program shall be prepared for construction activities permitted in geologically hazardous areas;*

Response to Code Requirements: PSE will monitor the transmission ROW on a regular basis during construction and will correct any deficiencies as necessary.

(n) Development shall not increase instability or create a hazard to the site or adjacent properties, or result in a significant increase in sedimentation or erosion; and

(o) Point discharges from surface water facilities and roof drains onto or upstream from an erosion or landslide hazard area shall be prohibited except as follows:

(i) *Conveyed via continuous storm pipe downslope to a point where there are no erosion hazard areas downstream from the discharge;*

(ii) Discharged at flow durations matching predeveloped conditions, with adequate energy dissipation, into existing channels that previously conveyed storm water runoff in the predevelopment state; or

(iii) Dispersed discharge upslope of the steep slope onto a low-gradient undisturbed buffer demonstrated to be adequate to infiltrate all surface and storm water runoff, and where it can be demonstrated that such discharge will not increase the saturation of the slope. (Ord. 2259)

Response to Code Requirement: BMPs will be implemented so that there is no increase in slope instability, or creation of a hazard to the sites or adjacent properties. Proper BMPs to control erosion and sedimentation will be implemented. No point discharges onto or upstream of erosion or landslide areas will be created.

LIMITATIONS

We have prepared this report for the exclusive use of PSE and their authorized agents for the Energize Eastside Project located in Redmond, Washington. Our services have been provided in general accordance with the proposal between GeoEngineers and PSE dated August 17, 2018. Formal authorization was received from PSE on August 23, 2018.

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 of Redmond. 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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