

October 1, 2025

Acom Consulting, Inc.
5200 Meadows Road, Suite 150
Lake Oswego, OR 97035

Attn: Rick Matteson

**Re: Geologic Hazards Evaluation
 POR TUMALT
 11499 NE McLoughlin Parkway
 Cascade Locks, Oregon
 CWE Project: Acom-13-01-1**

INTRODUCTION AND PROJECT UNDERSTANDING

Columbia West Engineering, Inc. (Columbia West) is pleased to submit this geologic hazards evaluation for the POR TUMALT project located southwest of the intersection of NE McLoughlin Parkway and NE Gwen Avenue in Cascade Locks, Oregon. Based on review of civil development plans prepared by Duncanson Company, Inc. dated September 25, 2025, we understand the project includes construction of a 135-foot-tall monopole telecommunications tower and associated equipment. Plans show that the tower is proposed in a 50-foot by 50-foot equipment compound that will be sloped at approximately 1.4 percent and surfaced with crushed aggregate. The equipment compound will be accessed by a 12-foot-wide gravel road, which connects to the existing gravel driveway at the site. The grading plan shows that maximum cuts and fills for the equipment compound and access drive will be approximately 4 feet each. The site is shown relative to surrounding physical features on Figure 1. The site plan with proposed grading contours is shown on Figure 2.

As discussed in this letter, the surface geologic unit at the site is mapped as alluvial fan deposits below a steep ridge of Columbia River Basalt. There is a mapped active debris flow near the site, and landslide inventory mapping shows that the site is moderately susceptible to landslides. Due to the site's location within a landslide and debris flow hazard area, a geologic hazards evaluation is required to document compliance with the standards identified in Multnomah County Code (MCC) Section 38.5520 - Geologic Hazards Permit Standards (A) through (V). This geologic hazards evaluation also supports completion of Geologic Hazards Permit (GHP) Form 1, which is presented in Appendix A.

PURPOSE AND SCOPE

The purpose of our services was to prepare a geologic hazards evaluation for the site. Specifically, we completed the following tasks:

- Reviewed regional geologic mapping and hazard information available for the site vicinity.
- Reviewed the project location and scope to demonstrate compliance with MCC Section 38.55 - Geologic Hazards of the Chapter 38 - Columbia River Gorge National Scenic Area regulations.

- Conducted a reconnaissance of the site conditions, noting any significant debris flow paths, erosion, slope failures, steep slopes, groundwater seepage, rock outcrops, or other information pertinent to geologic conditions and hazards at the site.
- Reviewed light detection and ranging (LiDAR) bare earth imagery for the site.
- Completed, signed, and applied a Professional Engineer stamp to a GHP-1 form for development at the site.
- Prepared this geologic hazards evaluation letter addressing all criteria under MCC Section 38.5520 – Geologic Hazards Permit Standards (A) through (V) and includes the following:
 - Summary of the observed site conditions
 - Discussion of potential earthquake sources at the site
 - Evaluation of liquefaction and lateral spreading potential
 - Evaluation of fault rupture potential
 - Evaluation of erosion and landslide hazard potential
 - Evaluation of flooding potential
 - Recommended additional best management practices to be included in the plans and civil design

SITE CONDITIONS

GEOLOGY AND HAZARD MAPPING

The site lies within the Columbia River Gorge, a deep, linear physiographic feature that divides the Cascade Range and provides a natural corridor between the Willamette Valley and the interior Columbia Plateau. The Gorge was carved primarily by fluvial incision of the Columbia River, later dramatically modified by repeated late-Pleistocene Missoula floods, which scoured and deepened the valley. The area is characterized by steep basalt cliffs, prominent landslide complexes, and locally extensive talus and alluvial fan deposits adjacent to the Columbia River. The site is situated southwest of Cascade Locks, where the gorge narrows and topography is dominated by high-relief, forested slopes and abundant exposures of Columbia River Basalt Group flows.

Geologic hazard mapping by the Oregon Department of Geology and Mineral Industries (DOGAMI) HazVu shows that surface geology consists of alluvial fan deposits derived from colluvial sources and drainage pathways that extend from the steep ridge located south of the site (DOGAMI 2025). Geologic mapping identifies this ridge as Grand Ronde Basalt of the Columbia River Basalt Group (Phillips 1987). The hazard mapping also shows that the site is located within an area of prehistoric debris flows (movement more than 150 years ago) and has active debris flows (movement less than 150 years ago) mapped east of the site. In addition, DOGAMI HazVu shows that the site is in an area mapped as moderately susceptible to landslides. Additional discussion related to mapped landslide susceptibility and debris flows are presented in the “Geologic Hazards” section.

As part of a previous geotechnical investigation conducted by Delta Oaks Group, one boring was completed in the location of the proposed monopole tower to a depth of 51.5 feet below ground surface (BGS; Delta Oaks Group 2024). Subsurface conditions encountered in the boring consist of medium dense to very dense silty gravel, which is consistent with the mapped alluvial fan and prehistoric debris flow deposits. The presence of boulders was also noted within the boring.

Based on standard penetration test (SPT) blow counts and soil moisture observations, Delta Oaks Group estimated that groundwater was encountered at a depth of approximately 20 feet BGS.

SEISMOLOGY

Recent research and subsurface mapping investigations within the Pacific Northwest appear to suggest the potential risk for a large earthquake event with strong localized ground movement may have been previously underestimated. Past earthquakes in the Pacific Northwest appear to have caused landslides and ground subsidence, in addition to severe flooding near coastal areas. Earthquakes may also induce soil liquefaction, which occurs when elevated horizontal ground acceleration and velocity cause soil particles to interact as a fluid as opposed to a solid. Liquefaction of soil can result in lateral spreading and temporary loss of bearing capacity and shear strength.

Three scenario earthquakes are possible with the local seismic setting. Two of the possible earthquake sources are associated with the Cascadia subduction zone (CSZ), and the third event is a shallow, local crustal earthquake that could occur in the North American Plate. The three earthquake scenarios are discussed below.

CSZ

The CSZ is the region where the Juan de Fuca Plate is being subducted beneath the North American Plate. This subduction is occurring in the coastal region between Vancouver Island and northern California. Evidence has accumulated suggesting that this subduction zone has generated eight great earthquakes in the last 4,000 years, with the most recent event occurring approximately 300 years ago (Weaver and Shedlock 1991). The fault trace is mapped approximately 50 to 120 kilometers (km) off the Oregon Coast.

Two types of subduction zone earthquakes are possible and considered in this report:

1. An interface event earthquake on the seismogenic part of the interface between the Juan de Fuca Plate and the North American Plate on the CSZ. This source is capable of generating earthquakes with a moment magnitude of 9.0+.
2. A deep intraplate earthquake on the seismogenic part of the subducting Juan de Fuca Plate. These events typically occur at depths of between 30 and 60 km. This source is capable of generating an event with a moment magnitude of up to 8.0.

Crustal Events

There are faults in the site vicinity that may be capable of generating potentially destructive horizontal accelerations. Table 1 provides information on local faults close to the site.

Table 1. Faults within Site Vicinity

Fault Name	Proximity to Site (km)	Mapped Length¹ (km)
Eagle Creek thrust fault	11	8
Bull Run thrust	18	9
Lacamas Lake fault	23	24

1. Reported by USGS (2025)

SURFACE CONDITIONS

To observe and evaluate surface conditions, we conducted a site reconnaissance of the site on September 12, 2025. The tower and associated improvements are proposed on a portion of a 10.14-acre property that is located at the southern terminus of NE McLoughlin Parkway. The property is occupied by a single-story building surrounded by gravel driveways and laydown yards. Various types of equipment, machinery, and material stockpiles are scattered throughout the central and southwest portions. The central portion of the property is relatively open and vegetated with grass. Forested conditions are present in the north portion and along the southern property boundary.

As shown on Figure 2, the monopole tower and equipment compound are proposed approximately 140 feet northwest of the existing building. The proposed access drive extends from the equipment compound to the existing gravel drive located adjacent to the building. The site is generally vacant and vegetated with mature trees, grass, and brush. Several feet of exposed gravelly fill soil is present north of the existing gravel driveway. Boulders were observed to be stockpiled near the fill material. The envelope of the equipment compound had not been cleared of vegetation at the time of our site reconnaissance.

The site slopes down from the southeast to the northwest, with elevations ranging from approximately 170 to 150 feet. Grades range from approximately 10 to 20 percent, with localized steeper areas along the exposed fill slope. During our site reconnaissance, we did not observe any areas of groundwater seepage or encounter evidence of significant erosion, slope failures, or recent debris flows.

GEOLOGIC HAZARDS

LIQUEFACTION

Liquefaction is caused by a rapid increase in pore water pressure that reduces the effective stress between soil particles. Granular soil, which relies on interparticle friction for strength, undergoes a loss of strength until the excess pore pressures dissipate. In general, loose, saturated sand soil with low silt and clay content is the most susceptible to liquefaction. Silty soil with low plasticity is moderately susceptible to liquefaction under relatively higher levels of ground shaking.

Liquefaction susceptibility mapping published by DOGAMI HazVu shows that the site has very low liquefaction susceptibility (DOGAMI 2025). As previously discussed, a boring drilled by Delta Oaks Group in the location of the proposed tower encountered medium dense to very dense

gravel to a depth of 51.5 feet BGS. Accordingly, based on published hazard mapping and review of previous subsurface exploration completed for the project, liquefaction is not considered a hazard at the site.

LATERAL SPREADING

Lateral spreading is a liquefaction-related seismic hazard and occurs on gently sloping or flat sites underlain by liquefiable sediment adjacent to an open face, such as a riverbank. Liquefied soil adjacent to an open face can flow toward the open face, resulting in lateral ground displacement. Since liquefaction is not a hazard at the site, lateral spreading is not a geotechnical design consideration for the project.

FAULT RUPTURE

As discussed in the "Seismology" section, the nearest mapped fault to the site is the Eagle Creek thrust fault, which is located approximately 11 km southeast of the site (USGS 2025). As such, fault rupture is not considered a hazard at the site.

LANDSLIDES AND DEBRIS FLOWS

Landslides and slope stability are not a concern at the site under current or proposed conditions. Although DOGAMI HazVu maps the site within an area of "moderate" landslide susceptibility, this classification is based on the regional density of mapped landslides within generalized geologic units and is not based on site-specific topographic features or subsurface conditions. The site is characterized by gently sloping terrain underlain by a stable subsurface profile. Review of bare earth LiDAR data published by DOGAMI HazVu shows no evidence of prior slope instability at the site. Accordingly, there is no indication that the mapped "moderate" susceptibility reflects an actual landslide or slope stability hazard for the proposed project.

DOGAMI HazVu maps the site within an area of prehistoric debris flow deposits, with an active debris flow hazard area located east of the site. The active debris flow pathway does not extend onto the site and is mapped more than 100 feet from the proposed tower, equipment compound, and access drive. Importantly, the debris flow deposits underlying the site are mapped as prehistoric, indicating no evidence of movement within the past 150 years. The presence of mature, well-established vegetation across the site is consistent with long-term stability as mapped. Accordingly, the potential for debris flow impacts to the site is considered to be low.

EROSION

Based on the Web Soil Survey, soil in the site vicinity consists of Multnomah silt loam, which is not mapped as a "severe erosion hazard." Provided that standard erosion control measures and best management practices are implemented during project construction, the potential for significant soil erosion at the site is considered to be low.

FLOODING

Based on review of Federal Emergency Management Agency floodplain mapping provided by DOGAMI HazVu, the site is not located within the 100-year floodplain. The nearest 100-year floodplain is mapped over 1,500 feet away at a significantly lower elevation than the site. Accordingly, flooding is not considered to be a hazard for the proposed project.

RECOMMENDATIONS

While this evaluation has not revealed geologic hazards that will preclude or be adversely impacted by the proposed project, the following best practices should be incorporated into project plans and specifications:

- Foundation support for the proposed monopole tower should adhere to the recommendations presented in the geotechnical report prepared by Delta Oaks Group.
- Site preparation and structural fill placement should adhere to the recommendations presented in the geotechnical report prepared by Delta Oaks Group.
- Standard erosion and sediment control measures should be implemented during project construction to minimize erosion risks. Erosion can be minimized by performing construction activities during dry summer months.
- Mature vegetation should be preserved where feasible, particularly in sloped areas, as root systems provide added stability and erosion resistance.
- Surface runoff should be directed away from the proposed equipment compound and tower foundation. Concentrated stormwater should not be allowed to collect and flow directly across proposed fill slopes.
- A qualified geotechnical engineer should be retained during construction to observe and document conformance with project grading plans and associated specifications.

LIMITATIONS

We have prepared this letter for use by the addressee and members of the design and construction team for the proposed project. This report is subject to the limitations expressed in Appendix B.

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We appreciate the opportunity to be of service to you. Please call if you have questions concerning this feasibility study or if we can provide additional services.

Sincerely,


Greg L. Williamson, PE
Senior Geotechnical Engineer


Shawn M. Dimke, PE, GE
Principal Engineer



cc: Frankie Hoffman, Acom Consulting, Inc.

GLW:SMD:kat

Attachments

Document ID: Acom-13-01-1-100125-geol.docx

REFERENCES

Delta Oaks Group 2024. *Geotechnical Investigation Report; Tumalt; US-OR-5099; Proposed 135-Foot Monopole Tower; 11499 NE McLoughlin Parkway, Cascade Locks (Hood River County), Oregon 97014*, dated March 13, 2024.

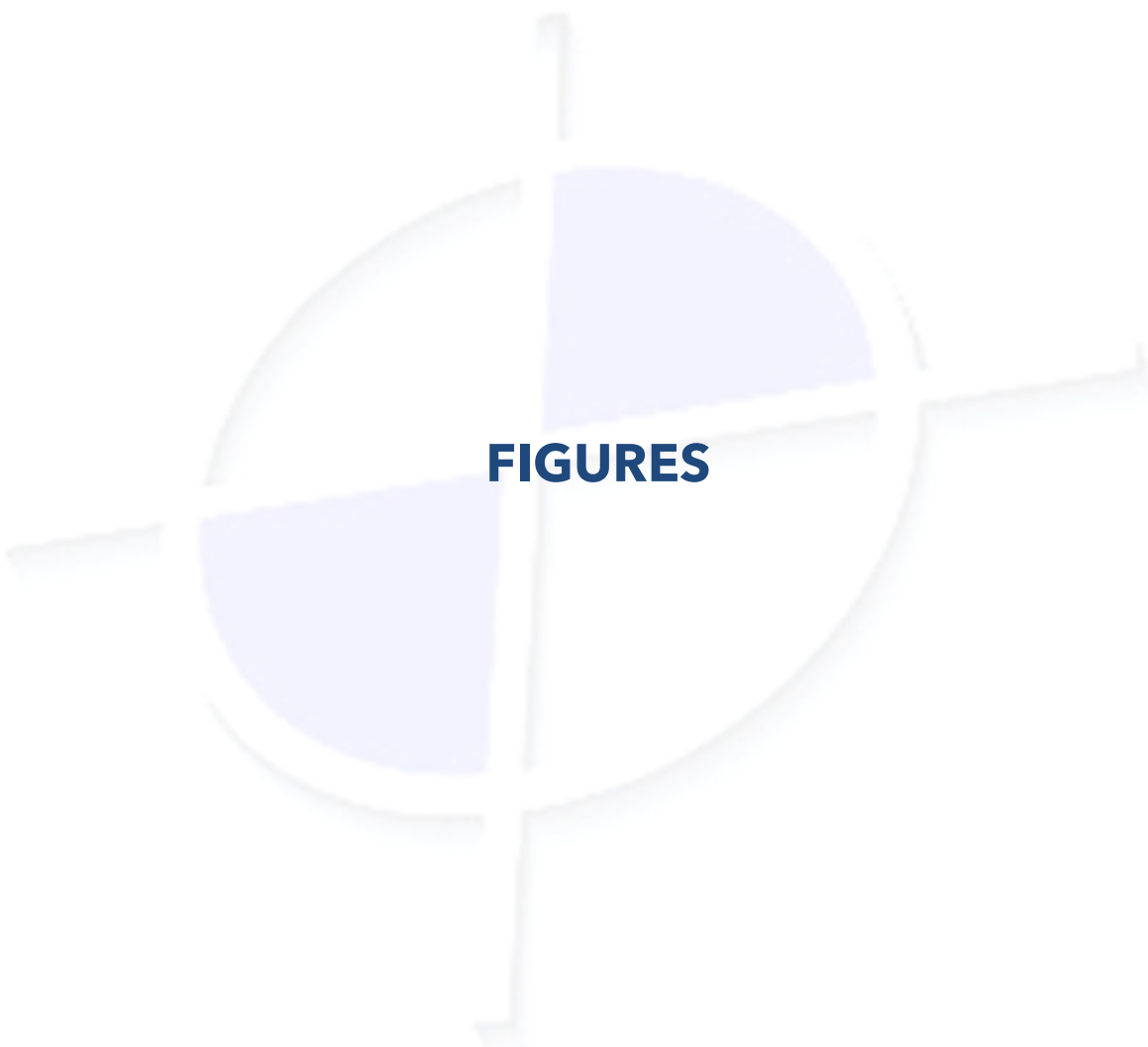
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USDA 2025. Web Soil Survey. National Resources Conservation Services.
<https://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>. Accessed September 2025.

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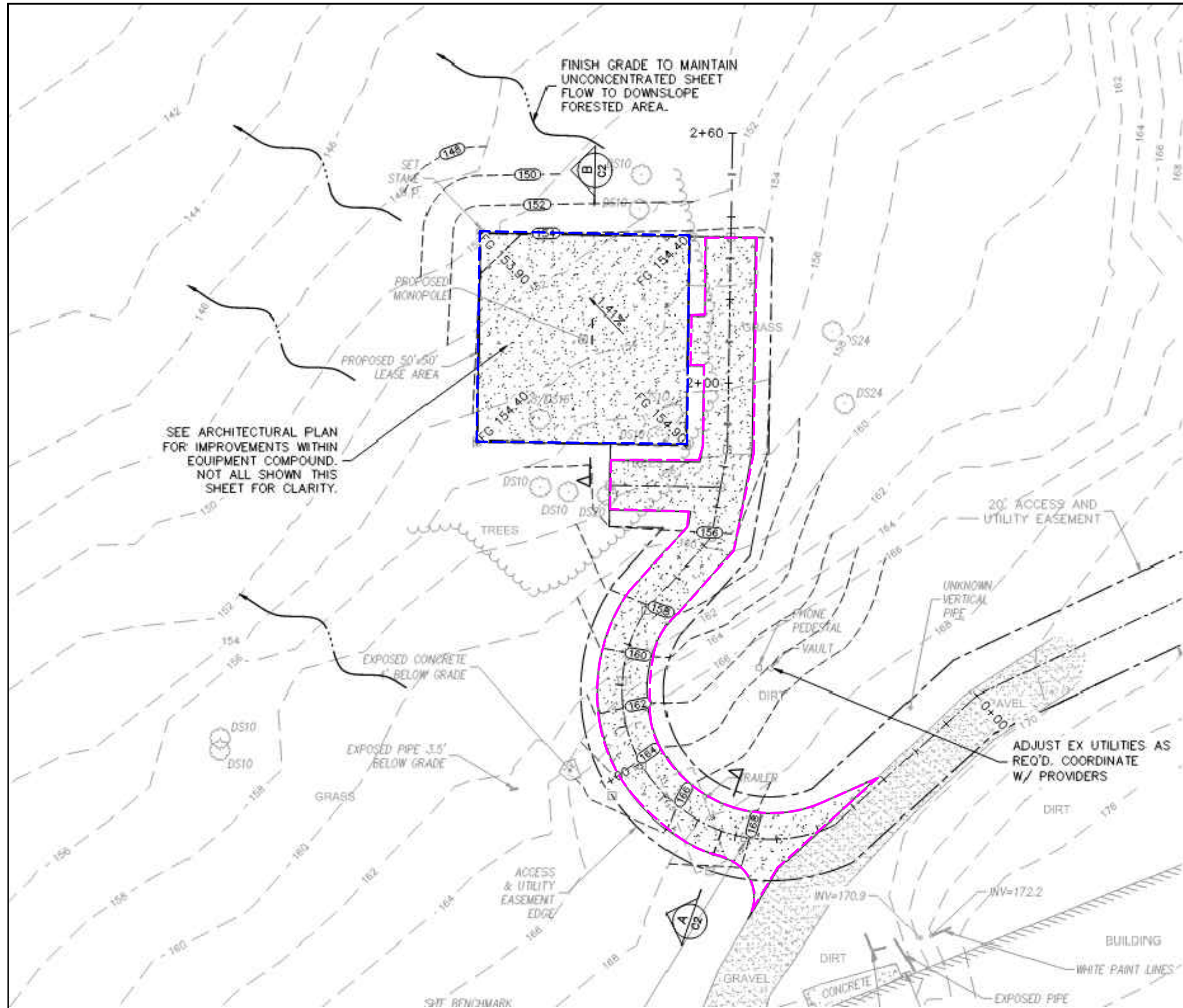
Weaver, C.S., and K.M. Shedlock 1991. Program for earthquake hazards assessment in the Pacific Northwest: U.S. Geological Survey Circular 1067, 29 pgs.



FIGURES



Geotechnical ■ Environmental ■ Special Inspections Columbia West Engineering, Inc.	PROJECT NO.: ACOM-13-01-1 OCTOBER 2025	VICINITY MAP POR TUMALT CASCADE LOCKS, OREGON	FIGURE 1
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APPENDIX A

APPENDIX A

GHP FORM 1

This appendix presents the completed GHP Form 1, which addresses MCC Section 39.5085 (C)(3)(c) - Geologic Hazards Permit Application Information Required and MCC Section 38.5515 (C)(3)(c) - Geologic Hazards Permit Application Information Required.



GEOLOGIC HAZARDS PERMIT (GHP) FORM 1



Land Use Planning Division

www.multco.us/landuse ▪ Email: land.use.planning@multco.us ▪ Phone: (503) 988-3043

GEOTECHNICAL RECONNAISSANCE AND STABILITY PRELIMINARY STUDY

Note: Response to each question below must be completed or verified by a Certified Engineering Geologist or Geotechnical Engineer, including a State of Oregon Registration Stamp and Number in the space provided on page four. This form addresses Multnomah County Code Section 39.5085(C)(3)(c); 38.5515(C)(3)(c), Geologic Hazards Permits.

Site Address: 11499 NE McLoughlin Parkway, Cascade Locks, Oregon 97014

Legal Description: Section 2, Township 1 North, Range 6 East, Willamette Meridian

Property Owner's Name: Agnes Heuker

Firm Preparing Report: Columbia West Engineering, Inc.

Address: 8880 SW Nimbus Avenue, Suite A

City: Beaverton **State:** Oregon **Zip:** 97008

Preparer's Name: Shawn M. Dimke, PE, GE

Phone Number: 971-384-1666

GENERAL PROPERTY INFORMATION

1. a. Maximum Slope on Property: Approx. 35% Area in which it is located: Fill slope north of existing gravel driveway.
Average Slope of Property: Approx. 12%
- b. Are there any wetlands or streambeds on the property? (Please Circle) Yes ☐ No ☒
If yes, please show on topographical survey or sketch.
- c. Volume of soil or earth material disturbed, stored, disposed of or used as fill: 715 cubic yards per civil plans.
- d. Total area of proposed ground disturbance:
14,200 (square feet) _____ (acres)

Were building plans considered when completing this form? (Please Circle) ☒ Yes ☐ No
If yes, please note the author and date the plans were prepared.

Civil development plans prepared by Duncanson Company, Inc. and dated September 25, 2025.

2. What is the general topography of the property? Please attach a topographic survey or sketch with pertinent notes.

Gently sloped down from southeast to northwest. Refer to Figure 2 for proposed grading plan and existing condition contours.

3. Are there any visible signs of instability or other potentially adverse site features (Landslides, slumps, mud flow, creep, ravines, fills, cuts, seeps, springs, ponds, etc.) within the surrounding area for a minimum distance of 100 feet beyond the subject property boundaries? Describe and indicate on attached topographic survey or sketch.

Nothing of significance observed. Some fill is present on the site, but is not expected to adversely impact proposed development and is inconsequential to our geologic hazards evaluation.

4. Is any earthwork proposed in connection with site development?

(Please Circle) ☒ Yes ☐ No

If yes, please indicate depth and extent of cuts/fills; describe fill types.

Maximum cuts and fills of approximately 4 feet each are proposed for the equipment compound and access drive. Structural fill is proposed to support the access road and construct the equipment compound.

5. In your opinion, will the proposed earthwork cause potential stability problems for the subject and/or adjacent properties?

(Please Circle) ☐ Yes ☒ No

IF YES, EXPRESS PROBABILITY:

(Please Circle) ☐ Very Probable ☐ Possibly ☐ Possible, but remote

If Very Probable or Possibly, please explain.

6. In your opinion, will the proposed development (structures, foundations, parking area, streets, etc.) create potential stability problems for the subject and/or adjacent properties?

(Please Circle)

Yes

☒ No

IF YES, EXPRESS PROBABILITY:

(Please Circle)

Very Probable

Possibly

Possible, but remote

If Very Probable or Possibly, please explain.

7. In your opinion would the subsurface disposal of sewage effluent on the site (i.e., drain fields) have an adverse affect on stability of the site or adjacent area?

(Please Circle)

Yes

☒ No

IF YES, EXPRESS PROBABILITY:

(Please Circle)

Very Probable

Possibly

Possible, but remote

If Very Probable or Possibly, please explain.

8. If answer is Very Probable or Possibly to questions 4 or 5, is it your opinion, on the basis of a visual evaluation, that adequate stability might be achieved by preferred siting of the development, alternative foundation support, earthwork, drainage, etc.?

(Please Circle)

Yes

No

If yes, please explain.

9. Do you recommend additional geotechnical studies (i.e., mapping, testing pits or borings, stability analysis, etc.) prior to site development?

(Please Circle)

Yes

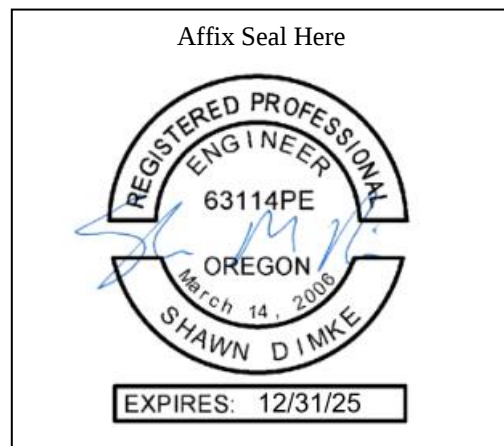
☒ No

If yes, please explain.

By signing and affixing the required stamp below, the Certifying Engineering Geologist or Geotechnical Engineer certifies that the site is suitable for the proposed development.

Signature SL MR

Date October 1, 2025





APPENDIX B

APPENDIX B REPORT LIMITATIONS AND IMPORTANT INFORMATION

Report Purpose, Use, and Standard of Care

This report has been prepared in accordance with standard fundamental principles and practices of geotechnical engineering and/or environmental consulting, and in a manner consistent with the level of care and skill typical of currently practicing local engineers and consultants. This report has been prepared to meet the specific needs of specific individuals for the indicated site. It may not be adequate for use by other consultants, contractors, or engineers, or if change in project ownership has occurred. It should not be used for any other reason than its stated purpose without prior consultation with Columbia West Engineering, Inc. (Columbia West). It is a unique report and not applicable for any other site or project. If site conditions are altered, or if modifications to the project description or proposed plans are made after the date of this report, it may not be valid. Columbia West cannot accept responsibility for use of this report by other individuals for unauthorized purposes, or if problems occur resulting from changes in site conditions for which Columbia West was not aware or informed.

Report Conclusions and Preliminary Nature

This geotechnical or environmental report should be considered preliminary and summary in nature. The recommendations contained herein have been established by engineering interpretations of subsurface soils based upon conditions observed during site exploration. The exploration and associated laboratory analysis of collected representative samples identifies soil conditions at specific discreet locations. It is assumed that these conditions are indicative of actual conditions throughout the subject property. However, soil conditions may differ between tested locations at different seasonal times of the year, either by natural causes or human activity. Distinction between soil types may be more abrupt or gradual than indicated on the soil logs. This report is not intended to stand alone without understanding of concomitant instructions, correspondence, communication, or potential supplemental reports that may have been provided to the client.

Because this report is based upon observations obtained at the time of exploration, its adequacy may be compromised with time. This is particularly relevant in the case of natural disasters, earthquakes, floods, or other significant events. Report conclusions or interpretations may also be subject to revision if significant development or other manmade impacts occur within or in proximity to the subject property. Groundwater conditions, if presented in this report, reflect observed conditions at the time of investigation. These conditions may change annually, seasonally or as a result of adjacent development.

Additional Investigation and Construction Observation

Columbia West should be consulted prior to construction to assess whether additional investigation above and beyond that presented in this report is necessary. Even slight variations in soil or site conditions may produce impacts to the performance of structural facilities if not adequately addressed. This underscores the importance of diligent construction observation and testing to verify soil conditions do not differ materially or significantly from the interpreted conditions utilized for preparation of this report.

Therefore, this report contains several recommendations for field observation and testing by Columbia West personnel during construction activities. Actual subsurface conditions are more readily observed and discerned during the earthwork phase of construction when soils are exposed. Columbia West cannot accept responsibility for deviations from recommendations described in this report or future performance of structural facilities if another consultant is retained during the construction phase or Columbia West is not engaged to provide construction observation to the full extent recommended.

Collected Samples

Uncontaminated samples of soil or rock collected in connection with this report will be retained for thirty days. Retention of such samples beyond thirty days will occur only at client's request and in return for payment of storage charges incurred. All contaminated or environmentally impacted materials or samples are the sole property of the client. Client maintains responsibility for proper disposal.

Report Contents

This geotechnical or environmental report should not be copied or duplicated unless in full, and even then only under prior written consent by Columbia West, as indicated in further detail in the following text section entitled Report Ownership. The recommendations, interpretations, and suggestions presented in this report are only understandable in context of reference to the whole report. Under no circumstances should the soil boring or test pit excavation logs, monitor well logs, or laboratory analytical reports be separated from the remainder of the report. The logs or reports should not be redrawn or summarized by other entities for inclusion in architectural or civil drawings, or other relevant applications.

Report Limitations for Contractors

Geotechnical or environmental reports, unless otherwise specifically noted, are not prepared for the purpose of developing cost estimates or bids by contractors. The extent of exploration or investigation conducted as part of this report is usually less than that necessary for contractor's needs. Contractors should be advised of these report limitations, particularly as they relate to development of cost estimates. Contractors may gain valuable information from this report, but should rely upon their own interpretations as to how subsurface conditions may affect cost, feasibility, accessibility and other components of the project work. If believed necessary or relevant, contractors should conduct additional exploratory investigation to obtain satisfactory data for the purposes of developing adequate cost estimates. Clients or developers cannot insulate themselves from attendant liability by disclaiming accuracy for subsurface ground conditions without advising contractors appropriately and providing the best information possible to limit potential for cost overruns, construction problems, or misunderstandings.

Report Ownership

Columbia West retains the ownership and copyright property rights to this entire report and its contents, which may include, but may not be limited to, figures, text, logs, electronic media, drawings, laboratory reports, and appendices. This report was prepared solely for the client, and other relevant approved users or parties, and its distribution must be contingent upon prior express written consent by Columbia West. Furthermore, client or approved users may not use, lend, sell, copy, or distribute this document without express written consent by Columbia West.

Client does not own nor have rights to electronic media files that constitute this report, and under no circumstances should said electronic files be distributed or copied. Electronic media is susceptible to unauthorized manipulation or modification, and may not be reliable.

Consultant Responsibility

Geotechnical and environmental engineering and consulting is much less exact than other scientific or engineering disciplines, and relies heavily upon experience, judgment, interpretation, and opinion often based upon media (soils) that are variable, anisotropic, and non-homogenous. This often results in unrealistic expectations, unwarranted claims, and uninformed disputes against a geotechnical or environmental consultant. To reduce potential for these problems and assist relevant parties in better understanding of risk, liability, and responsibility, geotechnical and environmental reports often provide definitive statements or clauses defining and outlining consultant responsibility. The client is encouraged to read these statements carefully and request additional information from Columbia West if necessary.