



TECHNICAL MEMORANDUM

TO: Whitney Holm, PE, LEED AP BD+C, Associate Principal, SCJ Alliance
FROM: Calvin McCaughan, PE, and Daniel Simpson, PE
DATE: April 11, 2024
RE: Geologically Hazardous Areas Assessment
 Kaiser Woods Geotechnical/Stormwater Investigation
 Olympia, Washington
 SCJ Project No. 23-001170
 Sage Project No. 027004

INTRODUCTION

Sage Geotechnical, LLC (Sage) completed a geologically hazard areas assessment in support of the Kaiser Woods Geotechnical/Stormwater Investigation project in Olympia, Washington. The study area includes the park and all areas within 300 feet (ft) of the park (Figure 1).

Sage completed its assessment in accordance with the standards in Chapter 18.32 of the *Olympia Municipal Code* (OMC) and with the scope outlined in its subconsultant agreement with SCJ Alliance (prime engineer).

PROJECT UNDERSTANDING

The City of Olympia (City, project owner) proposes to develop the 68-acre park with hiking and mountain bike trails. A new access lane and parking lot will be constructed on the south side of the park, along an existing gravel roadbed. Where feasible, dispersion will be used to manage stormwater. As of this writing, the park is largely undeveloped and includes only an informal user trail network and storage building.

Sage reviewed previous geotechnical studies of the park, including:

AESI. 2007. Technical Report: Geology, Ground Water, and Soils, Kaiser Heights, Olympia, Washington. Associated Earth Sciences, Inc. June 8.

GeoResources, LLC. 2006. Geotechnical Engineering Report (Resubmittal): Kaiser Heights Phase 1 and 2 Park Drive and Kaiser Road, Olympia, Washington. May 14.

Krazan. 2023. Limited Geotechnical Engineering Investigation: Kaiser Woods Park Development – Road Improvement, 2549 Black Lake Boulevard SW, Olympia, WA. Krazan & Associates, Inc. June 19.

Landau. 2020. Critical Area Report: Geologically Hazardous Areas, Kaiser Woods Park, Olympia, Washington. Landau Associates, Inc. October 6.

These studies did not include a geologically hazardous areas assessment of the proposed access lane and parking lot, nor did they address the feasibility of onsite stormwater dispersion. The

City has requested an updated assessment that includes all elements of the project (e.g., the trails, access lane, and parking lot).

SITE CONDITIONS

The site consists of the area between Kaiser Road Southwest and Park Drive Southwest. It is densely forested with deciduous and coniferous trees with an understory of vegetation common to the area. Many of the existing park trails are between 3 and 6 ft wide; they widen to 8 to 25 ft near the Park Drive Southwest entrance. The site slopes downward to the east/northeast at an average grade of approximately 12 percent; localized slopes range from 0 to 55 percent. Site topography and relevant site features are shown on Figure 1.

GEOLOGIC SETTING

Geologic information for the site and the surrounding area was obtained from the *Geologic Map of the Tumwater 7.5-minute Quadrangle, Thurston County, Washington* (Walsh et al. 2003). Vashon till (Qgt) is mapped in the northern portion of the site and consists of an unsorted, highly compact mixture of clay, silt, sand, and gravel with occasional cobbles and boulders. The southern portion of the site is underlain by Crescent Formation basalt (Evc), a material formed by the eruption of submarine volcanos.

SUBSURFACE CONDITIONS

Sage completed a reconnaissance of the study area on January 10, 2024. Based on the results of its reconnaissance and geologic/geotechnical data review, Sage concludes that site subsurface conditions include 0.5 to 15 ft of recessional outwash, glacial till, and weathered bedrock over bedrock (i.e., fresh, dark gray, aphanitic basalt).

The authors of previous geotechnical studies note perched groundwater layers at the contact between the overburden soil and bedrock.

GEOLOGICALLY HAZARDOUS AREAS ASSESSMENT

Erosion Hazard

In Section 18.32.650 of the *OMC*, erosion hazard areas (EHAs) are defined as areas with severe or high water-erosion potential. The U.S. Department of Agriculture-Natural Resources Conservation Service has developed a system for delineating soils with severe or high-water erosion potential. Because site soils have a slight to moderate water erosion hazard (USDA NRCS, accessed January 17, 2024), the site does not classify as an EHA.

Landslide Hazard

In Section 18.32.610 of the *OMC*, landslide hazard areas (LHAs) are defined as areas with a vertical height of 10 ft or more that may be subject to mass movement, particularly slopes 40

percent or steeper and slopes 15 percent or steeper with impermeable subsurface material and groundwater springs or seeps.

On January 10, 2024, Sage performed a reconnaissance of slopes within the study area. Sage used a handheld clinometer to verify the presence of slopes 40 percent and steeper. Areas with slopes 40 percent or steeper are shaded red on Figure 1.

Based on the results of Sage's slope reconnaissance and topographic data review, more than a dozen isolated slopes throughout the site are inclined at 40 percent or more and have a vertical relief of 10 ft or more. These slopes meet the criteria for an LHA outlined in *OMC* Section 18.32.610.A.1. Slopes steeper than 15 percent with groundwater seeps were observed near local low points, where surface water collects during the wet season. These slopes meet the criteria for an LHA in *OMC* Section 18.32.610.A.2.b.

No current or historical landslides are mapped at the site (DNR, accessed January 17, 2024), and no evidence of current or historical slope instability was observed in the study area. Steep site slopes consist of competent bedrock. In Sage's opinion, there is a negligible risk that deep-seated landsliding will occur at the site.

Seismic Hazard

In Section 18.32.660 of the *OMC*, seismic hazard areas are defined as areas subject to the damaging effects of a seismic event (e.g., slope failure, settlement, soil liquefaction, lateral spreading, or surface faulting). No active faults are mapped in the vicinity of the site (Czajkowski and Bowman 2014). During its January 2024 reconnaissance, Sage did not observe evidence of damage caused by previous earthquakes. Sage concludes that the site has a low susceptibility to soil liquefaction.

GEOTECHNICAL CONCLUSIONS

Basalt bedrock is uncommon in developed western Washington. If it were common, critical areas reporting requirements would likely include blanket exemptions for gently to moderately sloping bedrock at sites like this. In Sage's opinion, there is a low risk that soil erosion and landsliding will occur at the site. Typical earthwork practices (e.g., local clearing and cut-and-fill grading) will not have an adverse effect on critical areas.

Trails

Per *OMC* Section 18.32.620.H.1, trail construction within an LHA or its buffer requires administrative evaluation and authorization. In Sage's opinion, the stability of LHAs and their buffers will not be adversely affected by the proposed trail construction.

The study area includes more than a dozen isolated slopes that are 40 percent or steeper as well as groundwater seeps at the contact between the overburden soil/weathered bedrock and

bedrock. Sage does not recommend flagging these areas or their buffers on project drawings or during construction, as the areas do not require protection or present a risk to public safety.

Parking Lot and Access Lane

The new access lane and parking lot will be constructed along an existing roadbed with minor cut-and-fill grading. Approximately 25 percent of the access lane and parking lot alignment will be adjacent to an LHA (i.e., no buffer separating the alignment and the LHA). In Sage's opinion, the proposed alignment is acceptable, as site slopes are stable.

The proposed site improvements may qualify as Geological Hazard Areas – Alterations (*OMC* Section 18.32.605) and/or Landslide Hazard Areas – Hearing Examiner Authorized Uses and Activities (*OMC* Section 18.32.625.A). In Sage's opinion, the proposed improvements meet the criteria in *OMC* Section 18.32.605, A.1 through A.5.

Sage should review the final grading and drainage plans to ensure conformance with the criteria in *OMC* Section 18.32.605, A.1 through A.5.

Erosion Control

Erosion control measures, consistent with the requirements in the City's 2022 *Drainage Design and Erosion Control Manual*, should be implemented during project design and construction. Where improvements are adjacent to, or within, LHAs, clearing limits should be established prior to construction. Clearing limits are intended to restrict disturbance of near-surface soil.

The following erosion and sediment control measures should be implemented and maintained throughout project construction:

- Clearing limits shall be shown on project plans and marked in the field prior to clearing and grading activities. Clearing/disturbance of native vegetation should be avoided outside of the development footprint.
- Stormwater runoff shall be managed with best management practices (BMPs) approved by the local jurisdiction. Stormwater dispersion will not compromise slope stability.
- With approval from the City engineer, earthwork activities can be performed in the wet season (October through April), during periods of dry weather.
- Appropriate BMPs shall be used to stabilize temporary and permanent slopes. Disturbed areas shall be revegetated to provide long-term erosion control. Revegetation shall comply with local regulations.

Stormwater Dispersion

In Sage's opinion, onsite stormwater dispersion will not compromise slope stability. Because the site is underlain by shallow, impermeable bedrock, the volume and velocity of stormwater

runoff could be substantial. The civil engineer/designer should account for runoff when designing the stormwater system.

Tree Preservation

In Sage's opinion, removing vegetation within clearing limits will not have a significant impact on LHAs, and mitigation is not required to stabilize slopes. A licensed arborist should determine if trees outside the clearing limits will be affected by the proposed improvements. If trees are likely to be affected, the arborist should establish measures for protecting them.

Construction Excavations and Grading

Construction excavations may encounter refusal on shallow bedrock. A complete evaluation of this construction challenge is not within the scope of Sage's geologically hazardous areas assessment.

Sage understands that near-surface soils may be leveled to establish trails. Sage recommends limiting grading activities within the steep slopes shown on Figure 1. Where possible, trails crossing steep slopes should run perpendicular to slope contours to minimize grading.

Plan Review Letter and Special Reports

Sage should review final grading, drainage, erosion control, and landscape/revegetation plans to ensure conformance with the criteria in *OMC* Section 18.32.605, A.1 through A.5. The results of the review should be summarized in a plan review letter that is tracked as a project requirement.

For development within an LHA or its buffer, special reports are to be prepared for the drainage and erosion control plan, the grading plan, the geotechnical report, and the landscape plan (*OMC* Section 18.32.635.A). Rather than prepare special reports for each plan, Sage proposes to prepare a comprehensive plan review letter, pursuant to the waiver of special reports in *OMC* Section 18.32.635.B.5.

USE OF THIS TECHNICAL MEMORANDUM

Sage Geotechnical, LLC has prepared this technical memorandum for the exclusive use of SCJ Alliance and the City of Olympia for specific application to the Kaiser Woods Geotechnical/Stormwater Investigation project in Olympia, Washington. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of Sage Geotechnical. Reuse of the information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Sage Geotechnical, shall be at the user's sole risk. Sage Geotechnical warrants that, within the limitations of scope, schedule, and budget, its services have been provided in a manner consistent with that level of skill and care ordinarily exercised by members of the profession currently practicing in the same locality and

under similar conditions. Sage Geotechnical makes no other warranty, either express or implied.

CLOSING

We trust that this memorandum provides you with the information needed to proceed with the project. If you have questions or comments, please contact Calvin McCaughan at calvinm@sagegeotechnical.com.

SAGE GEOTECHNICAL, LLC



Calvin McCaughan, PE
Principal Geotechnical Engineer



4/11/2024



Daniel Simpson, PE
Principal Geotechnical Engineer

CAM/MCS/DCS

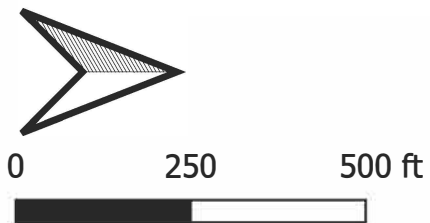
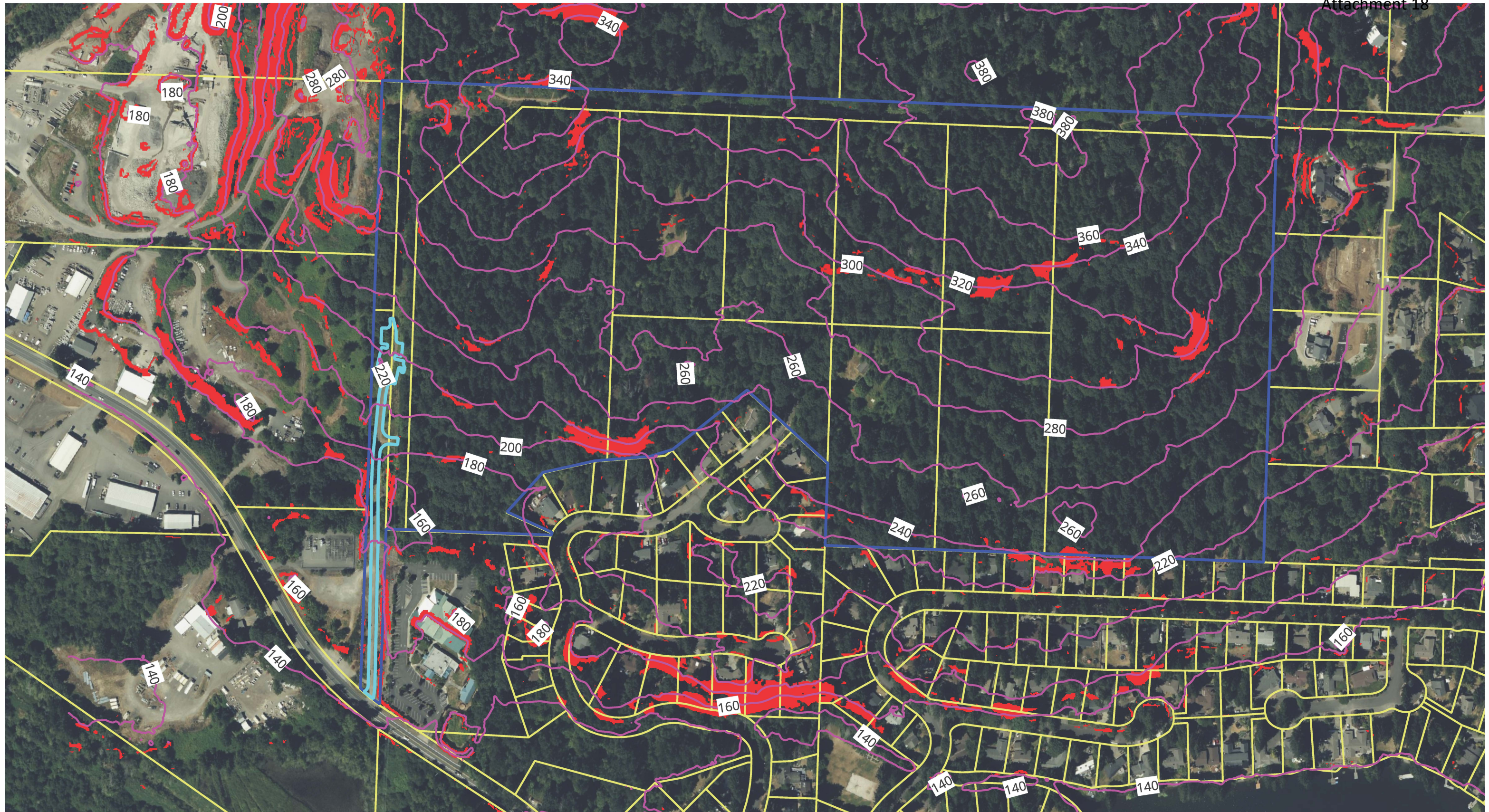
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Attachments: Figure 1. Site Plan and Slope Analysis

REFERENCES

- City of Olympia. Article IV. General Regulations, Chapter 18.32. Critical Areas. In: *Olympia Municipal Code*. Current through Ordinance 7378, passed November 21, 2023.
- City of Olympia. 2022. *Drainage Design and Erosion Control Manual*. City of Olympia Public Works – Water Resources, Storm and Surface Water Utility. November 28.
- Czajkowski, J.L., and J.D. Bowman. 2014. *Faults and Earthquakes in Washington State*. Washington Department of Natural Resources. Division of Geology and Earth Resources.
- DNR. “Washington Geologic Information Portal.” Washington Department of Natural Resources. Accessed January 17, 2024. Available online at: <https://geologyportal.dnr.wa.gov/>.
- USDA NRCS. “Web Soil Survey.” U.S. Department of Agriculture-Natural Resources Conservation Service. Accessed January 17, 2024. Available online at: <https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>.

Walsh, T.J., R.L. Logan, H.W. Schasse, and M. Polenz. 2003. Geologic Map of the Tumwater 7.5-minute Quadrangle. Washington State Department of Natural Resources.



Legend	
	Park Boundary
	Thurston County Parcels
	Proposed Road
	Lidar Contours (Thurston County 2011)
	Slope Calculation
	Slope \geq 40 Percent

Site Plan and Slope Analysis	
Kaiser Woods Geotechnical/Stormwater Investigation	
Olympia, Washington	Figure: 1