Earth Solutions NW LLC
Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

September 13, 2023
ES-8009.02

Design Built Homes, LLC
11400 Southeast 8th Street, Suite 415
Bellevue, Washington 98004

Attention: Todd Sherman

Subject: Critical Area Consultation
Lorenzini Short Plat
4719 – 86th Avenue Southeast and 84XX Southeast 47th Street
Mercer Island, Washington

Dear Todd:

Per your request, Earth Solutions NW, LLC (ESNW) has provided this critical area consultation for the subject site. This letter includes a critical area report in general accordance with the City of Mercer Island requirements for both a landslide hazard and seismic hazard as described on the mapping provided by the city. Our scope of services for this phase of site work included reviewing the subsurface data gathered during past site exploration, observe the current site conditions and conditions surrounding the site in regards to slopes (performed in August 2023), review of the city code relating to critical areas, and authoring of this report.

The subject site is located on the west side of 86th Avenue Southeast, south of the intersection with Southeast 47th Street in mercer Island, Washington. The site is occupied by a single-family residence and associated improvements at the time of this report production. A slope is located on the south side of the residence which descends towards the south and the neighboring property which is in the process of being re-developed with a new residence. The new residence has been constructed using daylit construction of foundation elements into the subject slope which is designated as a landslide hazard by the City of Mercer Island mapping. The excavation for the neighboring residence has resulted in a condition where most of the slope (with exception of the section of slope which remains above a retaining wall) has been altered and removed. The remaining slope above the new retaining walls on the neighboring property is well-vegetated with plant species typical of the region.

The subject site is mapped as possessing a seismic hazard by the City of Mercer Island on-line critical areas maps. ESNW has provided a critical area report in general accordance with the city requirements per your request using data gathered during past site exploration, and conditions observed within the excavation for the neighboring property re-development.

ESNW has been requested to address The City of Mercer Island municipal code section 19.07.100 in how it relates to the subject project. The client has communicated they desire ESNW perform this reporting without additional subsurface exploration, and rely on past site experience. The code section is cited below (italics) and ESNW has provided a response to the code section following the citation. The critical areas report follows.

19.07.100 - Mitigation sequencing.

Except as otherwise provided in this chapter, an applicant for a development proposal or activity shall implement the following sequential measures, listed below in order of preference, to avoid, minimize, and mitigate impacts to environmentally critical areas and associated buffers. Applicants shall document how each measure has been addressed before considering and incorporating the next measure in the sequence:

A. *Avoiding the impact altogether by not taking a certain action or parts of an action. The applicant shall consider reasonable, affirmative steps and make best efforts to avoid critical area impacts. However, avoidance shall not be construed to mean mandatory withdrawal or denial of the development proposal or activity if the proposal or activity is an allowed, permitted, or conditional use in this title. In determining the extent to which the proposal should be redesigned to avoid the impact, the code official may consider the purpose, effectiveness, engineering feasibility, commercial availability of technology, best management practices, safety and cost of the proposal and identified changes to the proposal. Development proposals should seek to avoid, minimize and mitigate overall impacts based on the functions and values of all of the relevant critical areas and based on the recommendations of a critical area study. If impacts cannot be avoided through redesign, use of a setback deviation pursuant to section 16.06.110(C), or because of site conditions or project requirements, the applicant shall then proceed with the sequence of steps in subsections B through E of this section;*

B. *Minimizing impacts by limiting the degree or magnitude of the action and its implementation, using a setback deviation pursuant to section 19.06.110 (C), using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;*

C. *Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;*

D. *Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;*

E. *Compensating for the impact by replacing, enhancing, or providing substitute resources or environments, and/or;*

F. *Monitoring the impact and taking appropriate corrective measures to maintain the integrity of compensating measures.*

It is our opinion that there are no slope-related geologic hazards located on the subject site. We base this opinion on the subsurface data collected during our fieldwork, our review of the topographic survey for the subject site, and geologic hazard map. The soils appear to be uniform across the entirety of the subject site and throughout the sloped region under concern. There is no evidence of more permeable soil types (such as sand and clean gravel) sited above the glacial till or fine-grained deposits, which would be cause for concern over soil mobilization in the future on and around the subject site.

ESNW recommends foundation elements for the residential structure be seated in the firm native material, anticipated to be encountered at depths below two feet; and maintain a ten-foot linear setback from edge-of-footing to the face of slope. This may require a deviation from the code mandated setback and buffer, yet act to minimize additional surcharge/loading on the remnant-sloped region of the site to the south of the subject project area.

Best Management Practices (BMP) for erosion control will need to be employed during and after site development. This includes site grading to minimize erosion and soil mobilization, temporary erosion control measures during construction, and permanent vegetation to protect sloped areas from the effects of erosive forces.

ESNW has reviewed section 19.07.160 per client request. The code is cited below (italics).

19.07.160 - Geologically hazardous areas.

A. Designation and typing. Geologically hazardous areas are lands that are susceptible to erosion, landslides, seismic events, or other factors as identified by WAC 365-190-120. These areas may not be suited for development activities because they may pose a threat to public health and safety. Areas susceptible to one or more of the following types of hazards shall be designated as geologically hazardous areas: landslide hazard areas, seismic hazard areas, and erosion hazard areas.

Based on the presence of glacial till throughout the sloped region which presents a very stable geologic condition as it relates to slope stability. Furthermore, based on the homogeny of the soil throughout the profile of the sloped region (based on observations of the site and site to the south) there is no interbedding of sands and gravels, and the slope has been extremely diminished in overall relief resulting from grading on the adjacent property. It is ESNW's opinion that a landslide hazard may not exist following the re-grading of the sloped area based on the soil type and density and vertical relief and inclination of the remaining slope.

A seismic hazard is mapped for the subject site. Glacial till is present throughout the subsurface of the site and within the sloped area to the south of the project area. No groundwater seepage was observed during past site exploration or within the exposed slope on the neighboring property to the south of the subject site. In our opinion there is no liquefaction hazard on the subject site and slope to the south based on the presence of glacial till and lack of a near-surface groundwater table.

B. General review requirements. Alteration within geologically hazardous areas or associated buffers is required to meet the standards in this section, unless the scope of work is exempt pursuant to section 19.07.120, exemptions, or a critical area review 1 approval has been obtained pursuant to section 19.07.0909(A).

1. When an alteration within a landslide hazard area, seismic hazard area or buffer associated with those hazards is proposed, the applicant must submit a critical area study concluding that the proposal can effectively mitigate risks of the hazard. The study shall recommend appropriate design and development measures to mitigate such hazards. The code official may waive the requirement for a critical area study and the requirements of subsections (B)(2) and (B)(3) of this section when he or she determines that the proposed development is minor in nature and will not increase the risk of landslide, erosion, or harm from seismic activity, or that the development site does not meet the definition of a geologically hazardous area.

ESNW has provided a critical area study within this document.

2. Alteration of landslide hazard areas and seismic hazard areas and associated buffers may occur if the critical area study documents find that the proposed alteration:

a. Will not adversely impact other critical areas;

b. Will not adversely impact the subject property or adjacent properties;

c. Will mitigate impacts to the geologically hazardous area consistent with best available science to the maximum extent reasonably possible such that the site is determined to be safe, and;

d. Includes the landscaping of all disturbed areas outside of building footprints and installation of hardscape prior to final inspection.

3. Alteration of landslide hazard areas, seismic hazard areas and associated buffers may occur if the conditions listed in subsection (B)(2) of this section are satisfied and the geotechnical professional provides a statement of risk matching one of the following:

a. An evaluation of site-specific subsurface conditions demonstrates that the proposed development is not located in a landslide hazard area or seismic hazard area;

b. The landslide hazard area or seismic hazard area will be modified or the development has been designed so that the risk to the site and adjacent property is eliminated or mitigated such that the site is determined to be safe;

c. Construction practices are proposed for the alteration that would render the development as safe as if it were not located in a geologically hazardous area and do not adversely impact adjacent properties, or;

d. The development is so minor as not to pose a threat to the public health, safety and welfare.

In our opinion, there is no geologic hazard present on the site based on the presence of glacial till, limited slope relief, and lack of groundwater on the site or within the sloped region remaining following the grading and wall installation on the adjacent site to the south.

In our opinion, the proposed alteration would render the development as safe as if it were not located in a geologically hazardous area and do not adversely impact adjacent properties.

C. Development standards—Landslide hazard areas. Development is allowed within landslide hazard areas and associated buffers, when the following standards are met:

1. A critical area study shall be required for any alteration of a landslide hazard area or associated buffer;

2. Buffers shall be applied as follows. When more than one condition applies to a site, the largest buffer shall be applied:

a. Steep slopes. Buffer widths shall be equal to the height of a steep slope, but not more than 75 feet, and applied to the top and toe of slopes;

b. Shallow landslide hazard areas shall have minimum 25-foot buffers applied in all directions, and;

c. Deep-seated landslide hazard areas shall have 75-foot buffers applied in all directions.

ESNW has provided a critical area study out of a sense of thoroughness within this document. However, it is the opinion of ESNW that there are no critical areas present on the subject site in the form of erosion hazards, landslide hazard, or seismic hazard. ESNW bases this opinion on the fact that glacial till is present across the site and surrounding area, lack of a significant slope following excavation for the neighboring residence to the south, and the lack of a groundwater table. We have recommended a ten-foot horizontal foundation setback from the face of any slope on the site or surrounding the site. In our opinion, any other buffer will be unnecessary.

D. Development standards—Seismic hazard areas. When development is proposed within a seismic hazard area:

1. A critical area study shall be required and shall include an evaluation by a qualified professional for seismic engineering and design, a determination of the magnitude of seismic settling that could occur during a seismic event, and a demonstration that the risk associated with the proposed alteration is within acceptable limits or that appropriate construction methods are provided to mitigate the risk of seismic settlement such that there will be no significant impact to life, health, safety, and property.

2. *Identification of seismic hazard areas. Seismic hazard areas shall be identified by a qualified professional who references and interprets information in the U.S. Geological Survey Active Faults Database, performs on-site evaluations, or applies other techniques according to best available science.*

3. *When development is proposed on a site with an active fault, the follow provisions shall apply:*

    a. *A 50-foot minimum buffer shall be applied from latest Quaternary, Holocene, or historical fault rupture traces as identified by the United States Geological Survey or Washington Geological Survey map databases or by site investigations by licensed geologic professionals with specialized knowledge of fault trenching studies, or;*

    b. *Mitigation sequencing shall be incorporated into the development proposal as recommended based on geotechnical analysis by a qualified professional to prevent increased risk of harm to life and/or property.*

ESNW has provided a critical areas study within this document (see below).

E. Development standards—Erosion hazard areas.

1. *All development proposals shall demonstrate compliance with chapter 15.09, storm water management program.*

2. *No development or activity within an erosion hazard area may create a net increase in geological instability on or off site.*

In our opinion, there is little to no risk of erosion on the subject site based on the presence of glacial till soils across the site and surrounding area. These soils present a cemented condition which results in a very low erosion risk.

F. Development standards—Additional criteria for specific activities.

1. *Trail building within geologically hazardous areas shall be subject to the following:*

    a. *Trail surfaces shall be constructed of pervious materials and may not be wider than five feet, and;*

    b. *Trails shall be located to minimize the need for tree removal.*

2. *Land clearing, grading, filling, and foundation work within: (a) an erosion hazard area, when 2,000 square feet or more of site disturbance is proposed, and/or (b) a landslide hazard area are not permitted between October 1 and April 1.*

    a. *The code official may grant a waiver to this seasonal development limitation if the applicant provides a critical area study for the site concluding that:*

        i. *Geotechnical slope stability concerns, erosion and sedimentation impacts can be effectively controlled on site consistent with adopted storm water standards, and;*

        ii. *The proposed construction work will not subject people or property, including areas off site, to an increased risk of associated impacts.*

    b. *As a condition of the waiver, the code official may require erosion control measures, restoration plans, an indemnification, a release agreement and/or performance bond.*

    c. *If site activities result in erosion impacts or threaten water quality standards, the city may suspend further work on the site and/or require remedial action.*

    d. *Failure to comply with the conditions of an approved waiver shall subject the applicant to code compliance pursuant to chapter 6.10, code compliance, including but not limited to civil penalties and permit suspension.*

It is the opinion of ESNW that the subject site does not meet the criteria for a liquefaction hazard or landslide hazard based on the presence of glacial till soil observed from the surface of the subject site to the base of the subject slope terminating within the excavation for the neighboring property to the south, coupled with the fact that the slopes under concern have been highly modified resulting in limited amounts of remaining slopes above the cast-in-place retaining walls associated with the new residence on the southern neighboring property. Our evaluation of site-specific subsurface conditions demonstrates that the proposed development is not located in a landslide hazard area or seismic hazard area.

Critical Area Report

As part of this report preparation, ESNW assessed the site for potential critical areas utilizing the City of Mercer Island geologic hazard map available on-line. The subject slopes located south of the proposed development envelope, above the neighboring residence under construction are not proposed to be modified beyond what has occurred as part of the neighboring property re-development, which has essentially removed the previously identified steep slopes and replaced them with a series of cast-in-place retaining walls for the new residence.

ESNW has provided an evaluation of the sloped regions and mapped scarps within this critical areas study in addition to an opinion relating to the seismic hazard delineated for the subject site based on previous fieldwork (December 2021) and additional fieldwork which occurred in August of 2023 where ESNW observed the subsurface conditions within the excavation for the adjacent property foundation elements.

ESNW observed no soil mobilization or visible scarps within the areas where scarps are mapped during site visits in 2021 and 2023.

The City of Mercer Island municipal code requires the following for a critical areas study:

1. *Disclosure of the presence of critical areas, including a delineation and type or category of critical area, on the development proposal site and any mapped or identifiable critical areas on or off site within the distance equal to the largest potential required buffer applicable to the development proposal area on the applicant's property;*

The slopes on the south side of the existing residence are described as possessing an erosion hazard (known or suspected), landslide hazard (known or suspected), slopes 15 percent to 39 percent, and scarps within the sloped regions to the south of the residence. Additionally, a seismic hazard is mapped for the subject site and sites to the west and south of the subject property.

Recently, the site to the south of the subject site has been undergoing re-development with a single-family residence which includes a series of cast-in-place retaining walls cut into the subject slope. This grading activity has essentially removed the majority of the sloped region below the subject site, leaving only a small vertical portion of the slope above the retaining walls. A landslide hazard may not exist following the re-grading of the slopes.

2. *A topographic and boundary survey;*

We have provided a site plan which does not includes topographic information for the subject site but not for the entirety of the now-altered slopes on the neighboring properties designated as geologic critical areas.

3. *A statement specifying the accuracy of the report and all assumptions made and relied upon;*

This report can be relied upon for geotechnical analysis of the critical areas as they relate to the proposed single-family residence in our professional opinion. The report was authored with site-specific information gleaned through subsurface and surface explorations in December of 2021 and as site visit in August of 2023.

4. *A description of the methodologies used to conduct the critical area study, including references;*

ESNW representatives were on-site in December of 2021 to obtain subsurface data through excavation and observation of test pits surrounding the existing residential structure. The test pits were advanced to seven and one-half feet maximum depth, and terminated in dense to very dense native glacial till soil. ESNW observed glacial till within the excavation for the neighboring residence under construction located at the toe of the subject slopes in August of 2023. We also reviewed the geologic maps for the region, and the Web Soil Survey.

5. *A scale map of the development proposal site;*

We have provided a site plan. The subject slopes are located on the south and west sides of the existing residence depicted on Plate 2.

6. *Photographic records of the site before the proposed alteration occurs;*

We have provided as an attachment.

7. *An assessment of the probable effects to critical areas and associated buffers, including impacts caused by the development proposal and associated alterations to the subject property and impacts to other properties and any critical areas or buffers located on them resulting from the development of the site and the proposed development;*

We have analyzed the proposed site re-development from a slope stability standpoint. The new residence will not likely increase instability on and around the subject site as there are no planned alterations for the slopes designated as steep, the presence of glacial till extending from the surface to below the toe-of-slope on the neighboring property, and recommendations for foundations to be sited to where a minimum of ten feet laterally is maintained to the face-of-remaining slope. Additionally, ESNW assumes the buffers from the top-of-slope on the subject site will remain similar in many respects which will not result in any alteration in the stability characteristics of the slopes on and off-site.

In regards to the seismic hazard delineated for the site and site to the south, in our opinion a liquefication hazard does not exist on the site. The site and slopes are underlain by glacial till which is shown to demonstrate a very stable condition during seismic events. In our opinion, site susceptibility to liquefaction may be considered negligible. The absence of a shallow groundwater table and the dense to very dense characteristics of the native glacial till soil were the primary bases for this opinion.

The densified cemented qualities of glacial till present a very low erosion hazard from a geological standpoint. In this respect, ESNW opines there is a negligible risk of erosion on the subject site within the unweathered glacial till and slopes located off-site to the south of the existing residence and subsequent building envelope. There is a risk of erosion within the weathered zone of glacial till and topsoil where they are exposed during construction. Best management practices should be utilized for protection of these areas where exposed during and after construction in order to lessen the risk of erosion. Covering exposed soil with plastic sheeting and directing surface water away from exposed soil must be considered for the subject site. Furthermore, stormwater must not be allowed to sheet towards sloped regions. ESNW can consult with the client if desired to provide stormwater management services relating to erosion control upon request.

ESNW representatives observed no soil mobilization or scarps within areas described as possessing scarps in 2021 or 2023.

8. *A description of mitigation sequencing implementation described in section 19.07.100 including steps taken to avoid and minimize critical areas impacts to the greatest extent feasible;*

In our opinion, provided best management practices (BMP) are utilized during and after construction for stormwater management and erosion control measures, there will be no impacts to the critical areas on the site. Erosion control BMP include silt fencing, swales/interceptor trenches to collect and divert stormwater away from slopes, and other common erosion control measures typical of the industry practices.

9. *Detailed studies, as required by this chapter, for individual critical area types in order to ensure critical area protection;*

We have evaluated the slopes on the subject site and based on our observations, the slopes are stable in their current condition and configuration. The primary basis for this opinion is the fact that there are no planned alterations for the slopes dictated as possessing an erosion and landslide hazard, and the underlying site geology. The subject development will be occurring outside of the sloped regions, and the site and slopes are underlain by dense to very dense glacial till which presents a very stable condition. As such there will be no net-gain in surcharge conditions on the subject slopes if the recommended ten-foot foundation setback from face-of-slope is adhered to.

10. *Assessment of potential impacts that may occur on adjacent sites, such as sedimentation or erosion, where applicable, and;*

We have evaluated the currently available plan, and there will be no change in the sedimentation or erosion risks on adjacent sites given BMP are employed during and after construction. This should consist of grading the site such that there is no net increase in the volume of water running towards the south and west sides of the site. This can be achieved through grading and installation of stormwater control features that collect and vector surface water to approved discharge points.

11. *A post-design memorandum prepared by a qualified professional confirming that the proposed improvements comply with the design recommendations.*

ESNW can provide upon request.

We trust this letter meets your current needs. Should you have any questions regarding the content herein, or require additional information, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

KYLE R. CAMPBELL
STATE OF WASHINGTON
27674
REGISTERED
PROFESSIONAL ENGINEER

09/13/2023

Stephen H. Avril
Project Manager

Kyle R. Campbell, P.E.
Senior Principal Engineer

Attachments: Site Photos
Plate 2 – Test Pit Location Plan

Reference:

- Geotechnical Engineering Study – Lorenzini Short Plat, prepared by ESNW, ES-8009.01, dated February 1, 2022


SE 47th St
SE 47th St
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86th Ave SE
86th Ave SE
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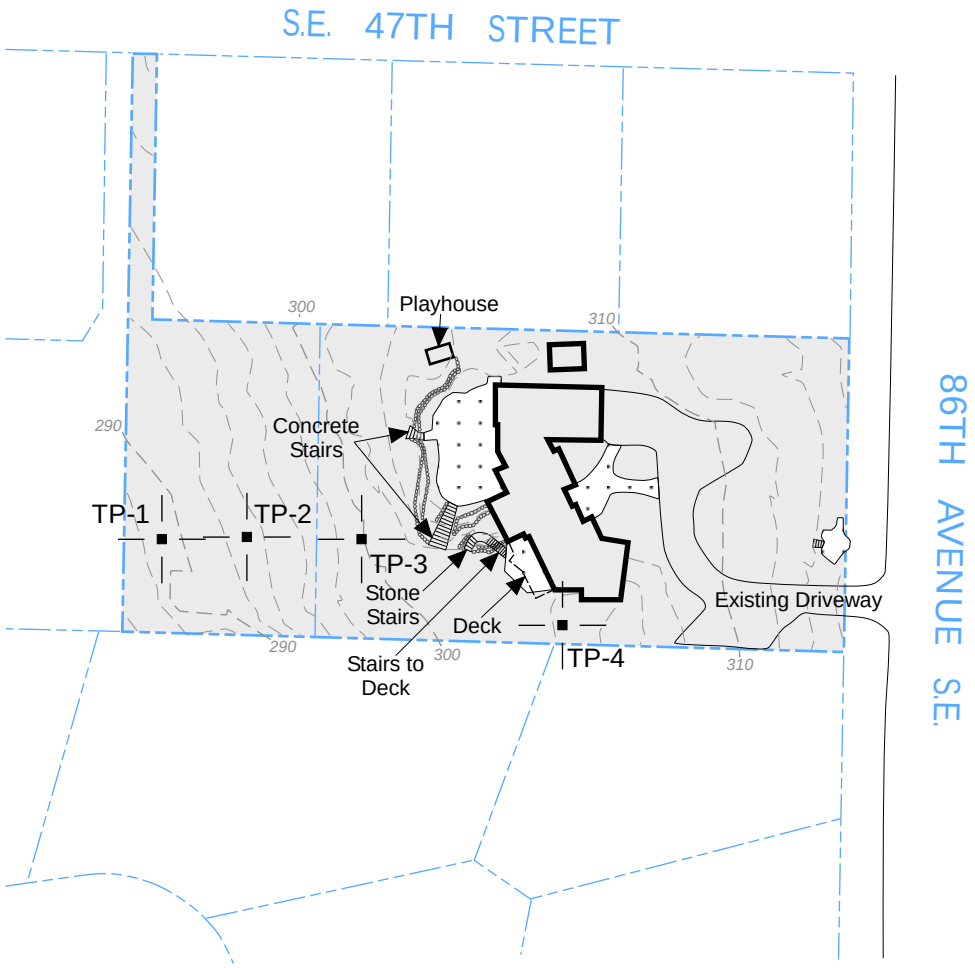

LEGEND

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-8009.01, Dec. 2021

Subject Site

Existing Building

Concrete

Rockery

NORTH

1"=80' 0 40 80 160 Scale in Feet

NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Test Pit Location Plan
Lorenzini Short Plat
Mercer Island, Washington

Drwn. CAM	Date 01/12/2022	Proj. No. 8009.01
Checked BCS	Date Jan. 2022	Plate 2