GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists
& Environmental Specialists

April 22, 2024 G-6047

Elaine Berryman
5222 W Mercer Way
Mercer Island, WA 98040

c/o Toni Santos

Subject: **Geotechnical Engineering Investigation**
Proposed Addition
5222 – West Mercer Way
Mercer Island, Washington 98040

Dear Ms. Berryman:

In accordance with our contract with you dated March 18, 2024, we have investigated the subsurface conditions at the subject property and prepared the following geotechnical report for the proposed addition at the subject property.

SITE AND PROJECT DESCRIPTION

Site Description

The project site (Parcel No. 192405-9311) is located in Mercer Island, Washington as shown on the attached *Plate 1 – Vicinity Map*. The project site is irregular-shaped, with its major axis oriented approximately east-west. The project site is approximately 14,810 square feet (0.34 acres) in size.

The project site slopes downwards towards the west, with a maximum elevation of approximately 246 feet near the site's northeast corner and a minimum elevation of approximately 176 feet near the site's western limit. The project site is currently developed, consisting of an approximately 1,530 square feet large single-family residence constructed in 1980 with an approximately 620 square feet large attached garage. Undeveloped areas of the project site consist of moderately to heavily forested terrain near the northeastern and western perimeter of the project site, and landscaped areas near the center of the project site.

The project site is accessed by a private driveway to the south. The project site is bounded by developed residential lots to the north, east & south, and is bounded by W Mercer Way to the west.

Project Description

Based upon our discussions with the project's architect and our review of the preliminary plan set, it is our understanding that the proposed construction consists of a second story addition above the existing attached garage. Three concrete footings are proposed within the footprint of the existing garage, and no increase to the building footprint is proposed. No earthwork outside of previously developed areas at the site is anticipated.

GEOLOGIC CONDITIONS

The published geologic map (Geologic Map of Mercer Island, Washington, Troost et al., 2006) for the site's vicinity indicates that the project site is underlain by Quaternary-age advance outwash (Qva) and Lawton clay (Qvlc) deposits. Advance outwash deposits typically consist of sands and gravel that were deposited in meltwater streams issuing from the Puget lobe of the cordilleran ice sheet. Lawton clay deposits consist of silt and clay that were deposited before the advance of the Puget lobe during the Vashon glaciation period, which occurred approximately 15 thousand years ago. After deposition, advance outwash and Lawton clay deposits were subsequently overridden by the Puget lobe, which resulted in the deposits over-consolidated condition.

SUBSURFACE INVESTIGATION

Subsurface Investigation

On March 26th, 2024, a geologist with our firm visited the project site to perform a visual reconnaissance of the project site & its vicinity, as well as to investigate the subsurface soil conditions. Two exploratory borings were advanced with hand operated boring equipment. The approximate locations of each boring are illustrated on the attached *Plate 2- Site Plan*.
Soils encountered in boring HA-1 consisted of loose dark brown gravelly sand with silt to a depth of approximately 0.75 feet below ground surface (bgs), underlain by loose dark brown silty sand to a depth of approximately 1.5 feet bgs. Medium dense to dense dark brown silty sand with gravel was encountered at depths below approximately 1.5 feet bgs in boring HA-1. Boring HA-

1 was terminated at approximately 2.5 feet bgs due to refusal on dense material. No groundwater was encountered during the advancement of boring HA-1.

Soils encountered in boring HA-2 consisted of an approximately 0.5 feet thick mulch groundcover underlain by loose dark brown silty sand with gravel to a depth of approximately 2.0 feet bgs. Medium stiff to stiff blueish gray sandy silt was encountered at depths below approximately 2.0 feet bgs in boring HA-2. Boring HA-2 was terminated at approximately 2.5 feet bgs due to refusal on dense material. Perched groundwater was encountered at a depth of approximately 2.0 feet bgs in boring HA-2. For a more detailed description of the soils encountered during our subsurface investigation, please refer to the boring logs on the attached Appendix A – *USCS Soil Classification & Boring Logs*.

We interpret the surficial loose gravelly soil encountered in borings HA-1 as fill soils that were possibly placed during previous construction activity at the site. We interpret the medium stiff to stiff soils encountered below approximately 2.0 feet bgs in boring HA-2 to be a relatively weathered horizon of Lawton clay deposits, consistent with published mapping of the site.

SETTLEMENT INVESTIGATION

On March 26th, 2024, a geologist from our firm visited the project site to evaluate the existing garage's foundation and to quantify the building's settlement. We used a self-leveling laser throughout the interior of the existing garage to evaluate the potential presence of differential settlement. We found that the southeast corner of the garage floor was approximately 0.5 inches lower than the northeast corner, and the southeast corner was approximately 1.0 inch lower than the southwest corner. We did not observe small to medium sized cracks in the visible garage walls and floor surfaces.

Based on our findings, it is our opinion that the garage has not experienced significant differential settlement since its original construction in 1980. The 0.5 to 1.0 inches observed is within an acceptable construction tolerance for garage slabs. Based on our observations and understanding of the proposed addition, it is our opinion that the garage's foundation does not require re-stabilization at this time.

GEOLOGICAL HAZARD AREA INVESTIGATION AND EVALUATION

Geological Hazard Area Investigation

The City of Mercer Island's definitions for geological hazard areas are provided in Mercer Island's City Code Chapter 19.16.010 (MICC 19.16.010). It is our understanding that the existing garage (location of proposed addition) is located in areas mapped by Mercer Island as erosion, and potential landslide geological hazard areas. Areas mapped by Mercer Island as steep slope geologic hazard areas are located within 200 feet of the proposed addition. A map illustrating locations of the mapped geological hazard areas are provided on *Plate 3 – Geologic Hazard Map* (MICC 19.07.160.C).

Erosion Hazard Area

According to the published geologic hazard mapping by Mercer Island, the entire project site is mapped as an erosion hazard area. Areas mapped as an erosion hazard area by Mercer Island extends beyond the project site to the developed properties to the north, east, and south, as well as beyond West Mercer Way to the west. Current mapping of erosion hazard areas is based upon past regional soils mapping by several government agencies and is generalized. For this reason, site specific evaluations are necessary to quantify the actual nature and degree of erosion hazard.

During our visual reconnaissance of the project site, we observed the proposed project area was covered with impervious surfaces (existing garage's roof). Areas at the project site that are outside of the proposed project area, and are undeveloped consist of sloped areas near the site's northeast corner and western limit. Sloped areas near the site's northeast corner were observed to have grades ranging from approximately 35 to 60 percent, and a maximum vertical relief of approximately 45 feet. Sloped areas near the site's western limit were observed to have grades ranging from approximately 25 to 40 percent, and a maximum vertical relief of approximately 15 feet. We observed sloped areas near the site's northeast corner and western limit to be covered with grass, moss, bushes, medium to large trees. Approximately 30 percent of the area mapped as an erosion hazard area at the project site is covered by impervious surfaces (residence, garage, and driveway). We did not observe any evidence of soil erosion during our visual reconnaissance of the project site.

Landslide Hazard Area

According to Mercer Island's geological hazard mapping, the project site is located within an area mapped as a potential landslide geologic hazard area. The mapped potential landslide geologic hazard area extends beyond the project site to the developed properties to the north, east, and south, as well as beyond West Mercer Way to the west. Published mapping of the project site provided by Mercer Island's Landslide Hazard Assessment indicates no recent landslides have occurred on the project site, or within approximately 200 feet of the project site.

During our visual reconnaissance of the project site, we did not observe any evidence of historic landslide activity, recent slope instability, or earth loss at the project site, and its vicinity.

Steep Slope Hazard Area

Two sloped areas located northeast and southeast of the project site are mapped as steep slope geological hazard areas by the City of Mercer Island. The areas mapped by Mercer Island as steep slope hazard areas within approximately 200 feet of the project site consists of sloped areas above approximately 210 feet in elevation approximately 100 feet northeast of the site's northeastern corner, and slopes above approximately 218 feet in elevation approximately 50 feet east of the site's southeastern corner. Sloped areas mapped by Mercer Island as steep slope hazard areas beyond the project site have approximately 50 to 75 feet of vertical relief.

During our visual reconnaissance, we observed sloped areas beyond the limits of the project site that are mapped as steep slope hazard areas by Mercer Island to be undisturbed and moderately to well vegetated with shrubbery and trees. During our visual reconnaissance of the project site and its vicinity, we did not observe any evidence of recent soil movement or slope instability. Based on our review of Mercer Island's mapping, and the plan set for the proposed construction, The proposed project area is not located within the toe of slope buffer of either of the nearby mapped steep slope hazard areas.

Geological Hazard Areas Evaluation

Per MICC 19.07.100, we anticipate overall impacts to the mapped geological hazard areas to be mitigated by the project's proposed measures to reduce impacts to the most critical parts of the geological hazard areas present, including no proposed disturbance to the mapped steep slope hazard areas or their respective buffers, proposed earthwork being limited to within previously

developed areas at the project site, and re-stabilization of disturbed areas within the mapped geological hazard areas to be completed post-construction. The application of appropriate construction methods and Best Management Practices (BMPs) are also anticipated to minimize impacts to the mapped geological hazard areas during the construction of the proposed addition. It is our opinion that the potential for soil erosion at the project site can be mitigated through temporary and permanent erosion control measures and control of surface water runoff. Our recommendations for appropriate construction BMPs and erosion control are provided in the Conclusions and Recommendations section of this report.

Based on our understanding and interpretation of subsurface conditions at the site and our understanding of the proposed construction, it is our opinion that the proposed construction will not increase the potential for slope instability at the project site or adjacent properties. The proposed addition is to be constructed at a previously developed area at the project site, and subsurface soils supporting the proposed addition and existing garage are anticipated to consist of dense, native soils, that, in our opinion, are not susceptible to landslide activity (MICC 19.07.160.B2).

Statement of Risk

Based on our understanding and interpretation of subsurface conditions at the site and our understanding of the proposed construction, the proposed addition has been designed such that the risk to the site and adjacent property is mitigated such that the site is determined to be safe (MICC 19.07.160.B3).

SITE SEISMIC DESIGN CLASSIFICATION

Per the procedures specified in ASCE Standard 7-16, the project site can be assigned a seismic design classification as Site Class C (very dense soil profile). This conclusion is based on review of the geologic mapping of the site vicinity, the conditions encountered in the borings excavated on the site, and our understanding and interpretation of deeper subsurface condition at the site. Seismic design parameters applicable for the site are as follows:

$S_S = 1.448g$	$S_{MS} = 1.738g$	$S_{DS} = 1.158g$
$S_1 = 0.503g$	$S_{M1} = 0.753g$	$S_{D1} = 0.502g$

The peak ground acceleration for the site, adjusted for the assigned site class, is 0.744g per current seismic hazard design mapping and calculations conforming to ASCE Standard 7-16.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of our study, it is our professional opinion that the site is geotechnically suitable for the proposed addition without increasing the risk of slope instability or soil erosion at the project site or adjacent properties. Based on the results of our subsurface investigation, the property is underlain with dense, native deposits that are consistent with available geologic mapping of the vicinity. These competent soils are anticipated to be found below approximately 2.0 feet bgs at the project site. Additionally, no groundwater seepage was observed during our subsurface investigation and is not anticipated during construction. Details of our recommendations regarding the geotechnical aspects of the proposed addition's construction are described in the following sections of this report.

Site Preparation and General Earthwork

Minimal earthwork is anticipated outside of previously developed areas at the project site. Earthwork for the project should be restricted to the minimum needed to achieve proposed final grades.

Erosion Control

Prior to the start of construction, temporary erosion and sedimentation controls (TESCs) should be installed to prevent the flow of sediment-laden runoff from the site and to minimize the potential for on-site soil erosion. Temporary erosion and sedimentation controls, such as straw wattles or silt fencing should be installed down-gradient of areas disturbed during construction activity to prevent sediment-laden surface runoff from being discharged off the project site. Stockpiled soils should be covered with plastic sheeting. The temporary erosion and sediment controls should be maintained during the progress of the project until the ground disturbance activities have been completed and the disturbed areas have been stabilized.

Concentrated surface water should not be allowed to flow into footing excavations. Any accumulated surface water should be directed toward settlement or collection points for treatment and discharge, as appropriate for the site conditions, per a construction stormwater management plan. Water should not be allowed to stand in any area where concrete slabs or

footings are to be constructed. During construction, loose surfaces should be sealed at night by compacting the surface to reduce the potential for moisture infiltration into the soils.

For permanent erosion control, disturbed soils that are not covered with impervious surfacing should be landscaped and mulched upon completion of the site work.

Excavations and Slopes

We anticipate that relatively shallow excavations may be made from the existing grade at the existing garage area for proposed interior footings. Based on the findings from our subsurface investigation, water seepage is not anticipated for excavations shallower than approximately 2.5 feet bgs at the property. If water seepage or other adverse conditions are encountered, the geotechnical engineer should observe and evaluate these conditions, and temporary cuts in these soils may need to be made at shallower inclinations when recommended by the geotechnical engineer.

Under no circumstances should temporary excavation slopes be greater than the limits specified in local, state, and national government safety regulations. If groundwater seepage is encountered during excavations for proposed interior footings, temporary excavation slopes should have inclinations no steeper than 2H:1V for the construction time period.

Subgrade Preparation

Soils in areas to receive structural fill or concrete slabs should be prepared to a firm, unyielding condition. The prepared subgrade should be observed and approved by the geotechnical engineer. Any detected soft spots or disturbed areas should be compacted or excavated and replaced with compacted structural fill or crushed rock as directed by the geotechnical engineer.

Structural Fill

All fill material used to achieve design site elevations below concrete footings or slabs should meet the requirements for structural fill. During wet weather conditions, material to be used as structural fill should have the following specifications:

1. Be free draining, granular material containing no more than five (5) percent fines (silts and clay-size particles passing a No. 200 mesh sieve);

2. Be free of organic material and other deleterious substances, such as construction debris and garbage;
3. Have a maximum particle size of three (3) inches in diameter.

All fill material should be placed at or slightly above the optimum moisture content. The optimum moisture content is the water content in soil that enables the soil to be compacted to the greatest dry density for a given compaction effort.

Based upon our subsurface investigation, some of the sites near surface soils consisted of silty soils which are not recommended for use as structural fill due to their fine-grained gradation and anticipated moisture content, both of which will retard compaction efforts. If structural fills are required to achieve design site elevations, then we recommend the use of an imported granular fill material which may provide more uniformity and be easier to compact to the required structural fill specifications, especially during periods of wet weather.

Structural fill underneath concrete slabs or footings, should be compacted to at least ninety-two (92) percent of the material's maximum dry density, as determined by ASTM Test Designation D-1557-91 (Modified Proctor). Structural fill placed within twelve (12) inches of finish grade should be compacted to at least ninety-five (95) percent of the material's maximum dry density.

Structural fill material should be spread and compacted in lifts that are ten (10) inches or less in thickness in an uncompacted state. The compacted fill material should be field tested by using ASTM Designations D2922 and D3017, Nuclear probe method, to verify that the required degree of compaction has been achieved, or be approved by the geotechnical engineer.

We recommend that GEO Group Northwest, Inc. be retained to evaluate the suitability of structural fill material and to monitor the compaction of structural fill material during construction for quality assurance of the earthwork.

Building Support

The proposed addition can be supported by concrete footings supported on the site's native dense, soils, or on a compacted, structural fill underlain with the site's native, dense soils. The concrete footings should bear directly on undisturbed, dense native soils, or compacted structural fill underlain with undisturbed, dense native soils. Our recommended design criteria for concrete

footings constructed on dense native soils or structural fill underlain with native soils are provided below.

Concrete Footing Foundations

Concrete spread footings should bear directly on a suitable subgrade, or on a pad of structural fill placed on such a subgrade. Our recommended design criteria for concrete footing foundations are as follows:

- Allowable bearing pressure, including all dead and live loads:
  - Undisturbed, Medium dense native soil = 2,000 psf
  - Structural fill placed on medium dense native soil = 2,000 psf

- Minimum depth to bottom of interior footings below top of floor slab = 12 inches
- Minimum lateral dimension of column footings = 24 inches
- Estimated post-construction settlement = ½ inch
- Estimated post-construction differential settlement across addition width = ½ inch

A one third increase in the above allowable bearing pressures can be used when considering short-term transitory wind or seismic loads. Lateral loads against the building foundations can be resisted by friction between the foundation and the supporting compacted building pad or by passive earth pressure acting on the buried portions of the foundations. For the latter case, the foundations must be poured "neat" against the existing undisturbed soil or be backfilled with compacted structural fill. Our recommended parameters are as follows:

- Passive Earth Pressure (Lateral Resistance)
  350 pcf, equivalent fluid weight, for structural fill or competent undisturbed native soil.

- Coefficient of Friction (Friction Factor)
  0.35 for structural fill or competent undisturbed native soil

We recommend that GEO Group Northwest, Inc. be retained to observe excavations for the addition's footings prior to installation of the footings to verify whether exposed soils will be able to support the design allowable soil bearing capacity, and that construction of the footings conforms with the recommendations presented in this report. Soil bearing verification may also

be required by the governing municipality.

Exterior Concrete Slabs-on-grade

Based on our discussions with the project architect, it is our understanding that an exterior concrete slab-on-grade is being considered near the northern extent of the proposed addition instead of the previously proposed wooden entry deck that is depicted in the project's plan set. Exterior concrete slabs-on-grade should be constructed on a firm, dense, and unyielding subgrade. During preparation of the slab subgrade, any areas of the subgrade that have been disturbed by construction activity should be either re-compacted or excavated and replace with compacted structural fill. We recommend that structural fill placed below slab-on-grade floors conform to the earthwork and grading recommendations provided in this report.

To avoid build-up of moisture on the subgrade, concrete slabs should be placed on a capillary break, which is in turn placed on the prepared subgrade. The capillary break should consist of a layer at least six (6) inches thick, of free-draining crushed rock or gravel containing no more than five (5) percent material passing a No. 4 sieve.

Subsurface Drainage

Roof & Footing Drainage Systems

Water should not be allowed to stand in areas where footings or slabs are to be constructed. Final site grades should provide drainage away from the building structures. During construction, the presence of an existing footing drainage system for the existing garage's footings should be verified. If no footing drainage system is present, we recommend that subsurface drains be installed around the perimeter of the garage's exterior footing.

The footing drains should consist of a four (4) inch minimum diameter perforated rigid drain pipe laid with perforations downwards, at or slightly above the bottom of the footing with a gradient sufficient to generate flow. The drain line should be bedded on, surrounded by, and covered with a free-draining rock; pea gravel, or other free-draining granular material. The drain rock and drain line should each be completely surrounded by a geotextile filter fabric, Mirafi 140N or equivalent. Once the footing drains are installed, the excavation should be backfilled with a compacted fill material. The footing drains should be tight lined to discharge to an approved storm water collection system.

Under no circumstances should roof downspout drain lines be connected to the footing drainage system. All roof downspout drain lines must be separately tight lined to discharge into the approved storm water collection system. We recommend that sufficient cleanouts be installed at strategic locations to allow for periodic maintenance of the footing drains and downspout drains. For footing drain design details, please refer to the attached *Plate 4 - Typical Footing Drain*.

Surface Drainage

We do not anticipate an adverse impact to the site's stormwater drainage will result from the proposed addition. We recommend that storm water drainage from impervious areas continue to be collected into one or more tight-line systems which convey the water to an approved stormwater system. Storm water should not be permitted to develop into concentrated flows on the ground surface, because concentrated flows can lead to increased soil erosion and rutting.

The existing stormwater drainage system should continue to be maintained and mitigate concentrated flows on the ground surface from developing, as these flows can lead to increased soil erosion and rutting. Final site grades should direct surface water away from building foundations

LIMITATIONS

This report has been prepared for the specific application to this site for the exclusive use of Elaine Berryman, and their authorized representatives. Any use of this report by other parties is solely at that party's own risk. We recommend that this report be included in its entirety in the project contract documents for reference during construction.

Our findings and recommendations stated herein are based on field observations, our experience and judgement. The recommendations are our professional opinion derived in a manner consistent with the level of care and skill ordinarily exercised by other members of the profession currently practicing under similar conditions in this area, and within the budget constraint. No warranty is expressed or implied. In the event that soil conditions not anticipated in this report are encountered during site development, GEO Group Northwest, Inc. should be notified and the above recommendations should be re-evaluated.

ADDITIONAL SERVICES

GEO Group Northwest recommends that it be retained to perform a review of the final design and specifications of the proposed addition to verify that our geotechnical recommendations are properly interpreted and incorporated into the design and construction documents and are appropriate for the finalized configuration of the proposed construction.

We also recommend that we be retained to provide geotechnical monitoring and testing services during construction to verify that construction work is completed in compliance with the recommendations in this report and the project plans. As part of these services, we will be available to discuss and recommend design changes, if needed, in the event that unanticipated site conditions are encountered or occur during construction.

CLOSING

We appreciate the opportunity to provide you with geotechnical engineering services for this project. If you have any questions, or if we may be of further service, please do not hesitate to contact us.

Sincerely,
GEO GROUP NORTHWEST, INC.

Andrew Hoff, G.I.T.
Staff Engineering Geologist

Dated: 4/22/2024
William Chang, P.E.
Principal Engineer

Attachments:

- Plate 1 – *Vicinity Map*
- Plate 2 – *Site Plan*
- Plate 3 – *Geologic Hazard Map*
- Plate 4 – *Typical Footing Drain*
- Appendix A – *USCS Soil Classification & Boring Logs*

Source: King County iMap, 2024

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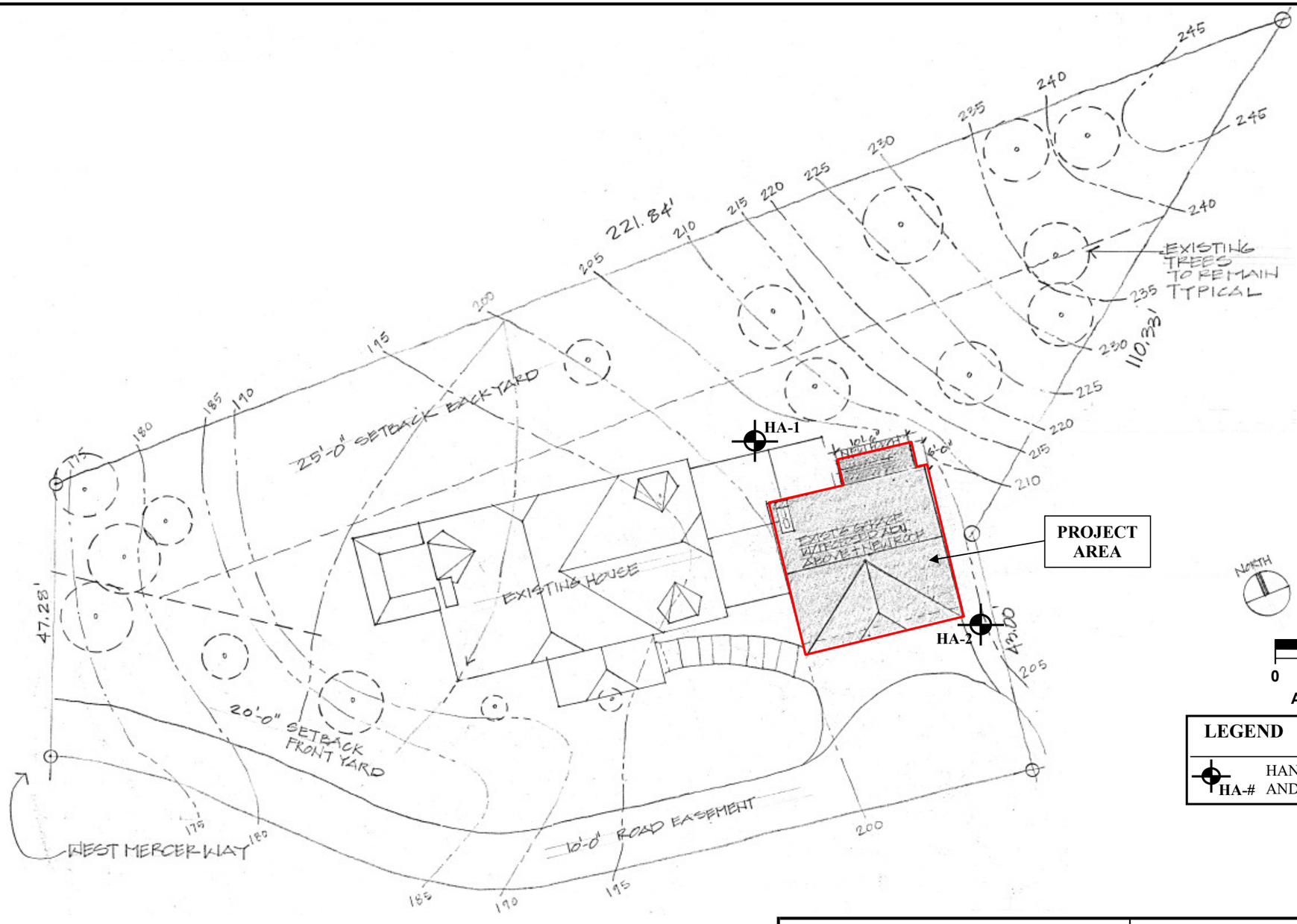
Geotechnical Engineers, Geologists, & Environmental Scientists

VICINITY MAP

PROPOSED ADDITION
5222 W MERCER WAY
MERCER ISLAND, WA 98040

SCALE	DATE	MADE	CHKD	JOB NO.	PLATE
NONE	4/22/2024	AH	WC	G-6047	1



Source: Adapted From Site Plan by Toni Santos, 2024

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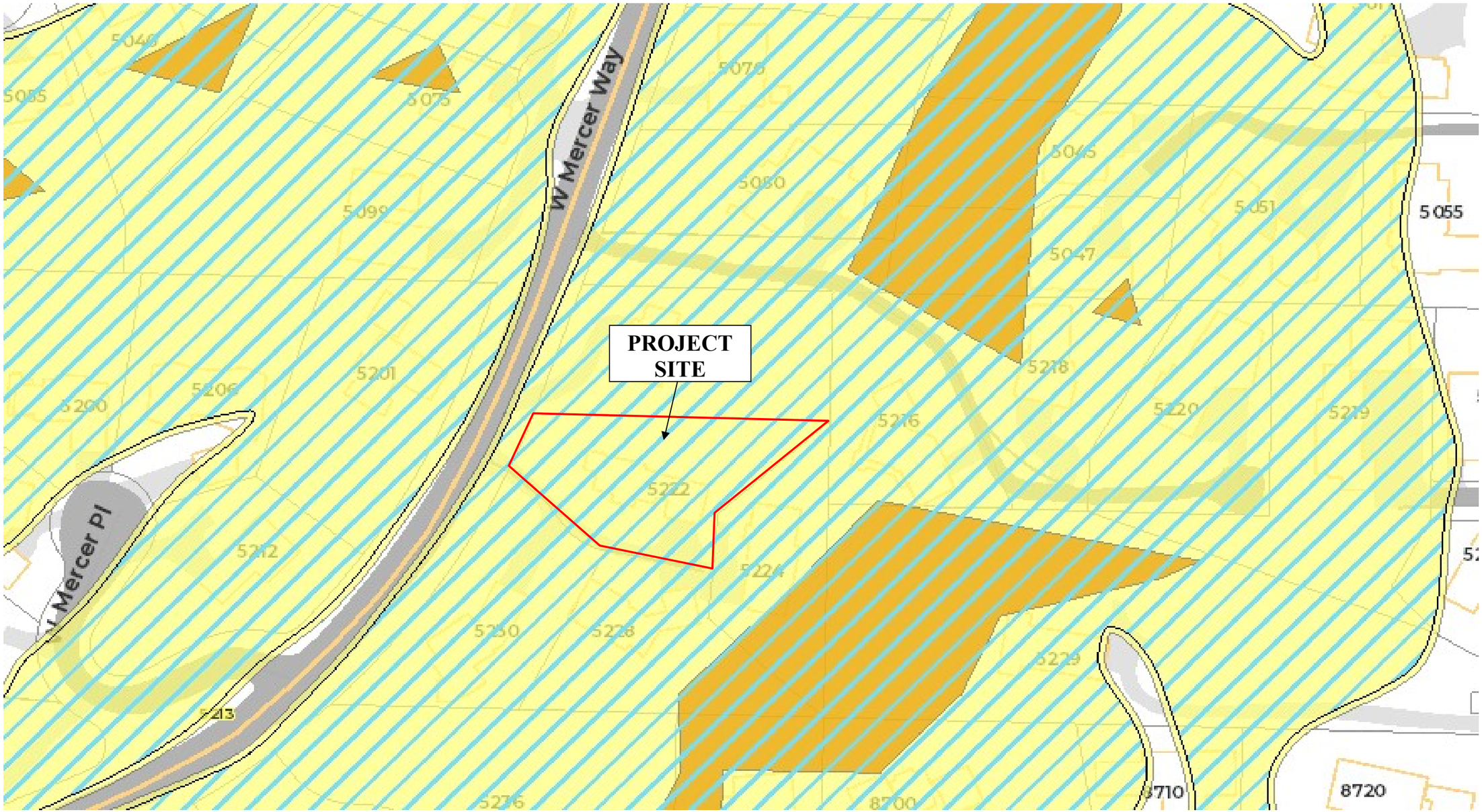
Geotechnical Engineers, Geologists, & Environmental Scientists

SITE PLAN
PROPOSED ADDITION
5222 W MERCER WAY
MERCER ISLAND, WA 98040

SCALE	DATE	MADE	CHKD	JOB NO.	PLATE
As Shown	4/22/24	AH	WC	G-6047	2



N

0 75' 150'

Approx. Scale: 1 inch = 75'

LEGEND

- POTENTIAL SLIDE AREA
- EROSION HAZARD AREA
- STEEP SLOPE AREA

Source: City of Mercer Island GIS, 2024

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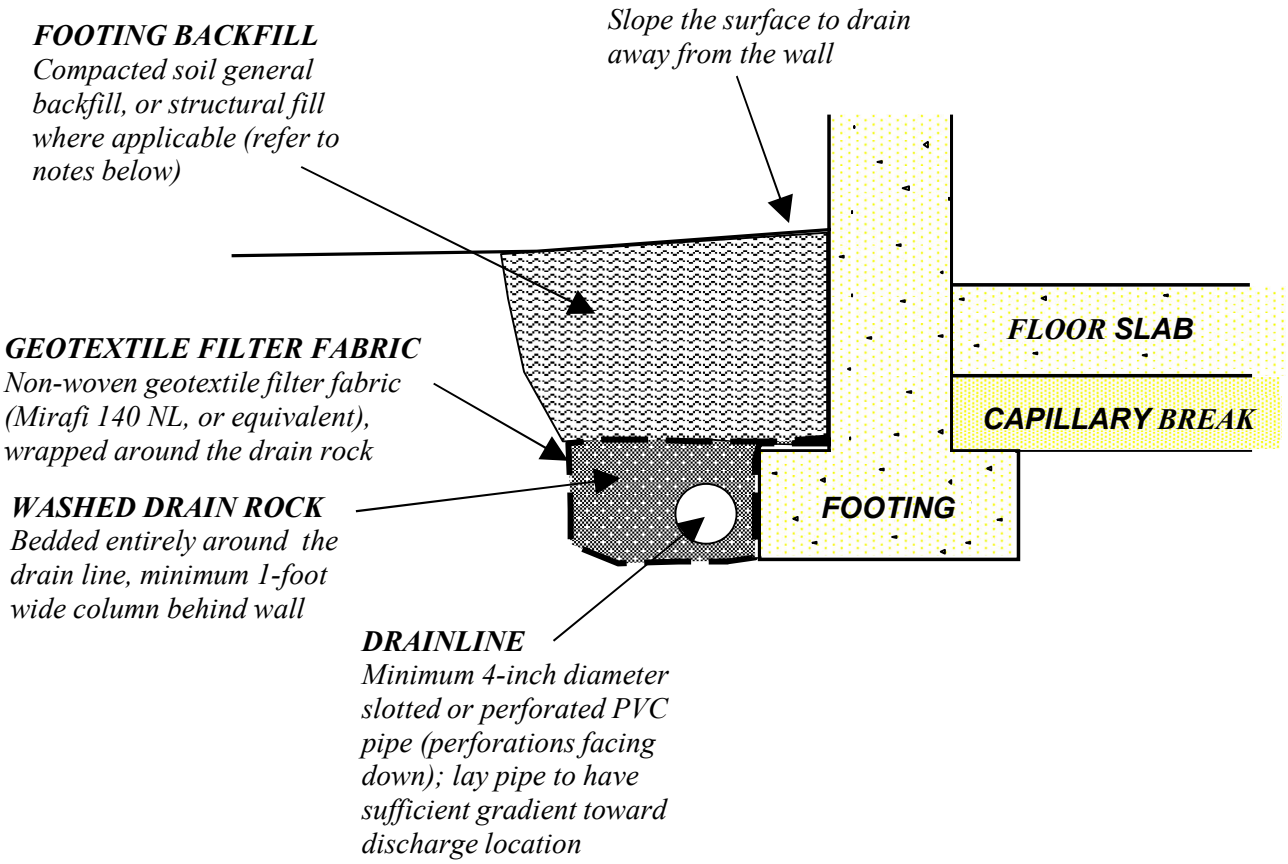
GEOLOGIC HAZARD MAP
PROPOSED ADDITION
5222 W MERCER WAY
MERCER ISLAND, WA 98040

SCALE	DATE	MADE	CHKD	JOB NO.	PLATE
As Shown	4/22/24	AH	WC	G-6047	3

FOOTING DRAIN DETAIL



NOT TO SCALE

NOTES:

1.) Perforated or slotted rigid PVC pipe should be tight jointed and laid with perforations or slots down, and with positive gradient toward discharge location(s). The pipe should be placed at or slightly above the elevation of the bottom of the footing. Do not replace rigid PVC pipe with flexible corrugated plastic pipe.

2.) Do not connect other drainage lines to the footing drain lines. Drain line cleanouts should be installed at appropriate locations to allow inspection and maintenance of the lines after construction.

3.) If the backfill will support sidewalks, driveways, patios, or other structures, it should be compacted to at least 90% of its maximum dry density based on the Modified Proctor test method, except that the top 12 inches of the backfill should be compacted to at least 95% of the maximum dry density.

4.) The geotextile filter fabric should be placed around the drain rock as shown, and not wrapped

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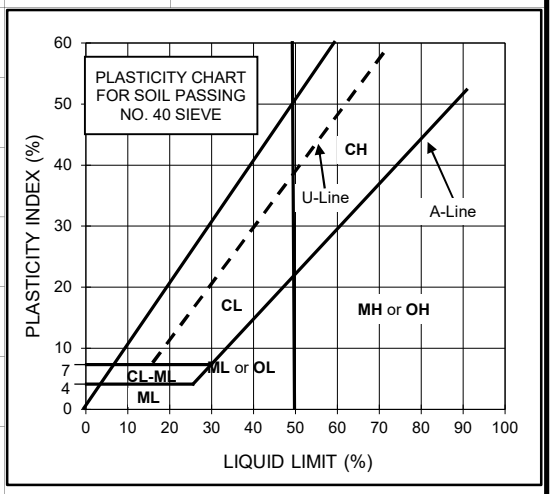
FOOTING DRAIN DETAIL
PROPOSED ADDITION
5222 W MERCER WAY
MERCER ISLAND, WA 98040

SCALE: NONE	DATE: 4/22/2024	MADE: AH	CHKD: WC	JOB NO. G-6047	PLATE 4

SOIL CLASSIFICATION & PENETRATION TEST DATA EXPLANATION

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
COARSE-GRAINED SOILS	GRAVELS (More Than Half Coarse Fraction is Larger Than No. 4 Sieve)	CLEAN GRAVELS (little or no fines)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURE, LITTLE OR NO FINES	CONTENT OF FINES BELOW 5%	Cu = (D60 / D10) greater than 4 Cc = $(D30)^2$ / (D10 * D60) between 1 and 3
			GP	POORLY GRADED GRAVELS, AND GRAVEL-SAND MIXTURES LITTLE OR NO FINES		CLEAN GRAVELS NOT MEETING ABOVE REQUIREMENTS
		DIRTY GRAVELS (with some fines)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	GM: ATTERBERG LIMITS BELOW "A" LINE. or P.I. LESS THAN 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES		GC: ATTERBERG LIMITS ABOVE "A" LINE. or P.I. MORE THAN 7
More Than Half by Weight Larger Than No. 200 Sieve	SANDS (More Than Half Coarse Fraction is Smaller Than No. 4 Sieve)	CLEAN SANDS (little or no fines)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	CONTENT OF FINES BELOW 5%	Cu = (D60 / D10) greater than 6 Cc = $(D30)^2$ / (D10 * D60) between 1 and 3
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES		CLEAN SANDS NOT MEETING ABOVE REQUIREMENTS
		DIRTY SANDS (with some fines)	SM	SILTY SANDS, SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW "A" LINE with P.I. LESS THAN 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE "A" LINE with P.I. MORE THAN 7
FINE-GRAINED SOILS	SILTS (Below A-Line on Plasticity Chart, Negligible Organics)	Liquid Limit < 50%	ML	INORGANIC SILTS, ROCK FLOUR, SANDY SILTS OF SLIGHT PLASTICITY		
		Liquid Limit > 50%	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOIL		
	CLAYS (Above A-Line on Plasticity Chart, Negligible Organics)	Liquid Limit < 50%	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, CLEAN CLAYS		
		Liquid Limit > 50%	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS		
Less Than Half by Weight Larger Than No. 200 Sieve	ORGANIC SILTS & CLAYS (Below A-Line on Plasticity Chart)	Liquid Limit < 50%	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		
		Liquid Limit > 50%	OH	ORGANIC CLAYS OF HIGH PLASTICITY		
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS		



SOIL PARTICLE SIZE

FRACTION	U.S. STANDARD SIEVE			
	Passing		Retained	
	Sieve	Size (mm)	Sieve	Size (mm)
SILT / CLAY	#200	0.075		
SAND				
FINE	#40	0.425	#200	0.075
MEDIUM	#10	2.00	#40	0.425
COARSE	#4	4.75	#10	2.00
GRAVEL				
FINE	0.75"	19	#4	4.75
COARSE	3"	76	0.75"	19
COBBLES	76 mm to 203 mm			
BOULDERS	> 203 mm			
ROCK FRAGMENTS	> 76 mm			
ROCK	>0.76 cubic meter in volume			

GENERAL GUIDANCE FOR ENGINEERING PROPERTIES OF SOILS, BASED ON STANDARD PENETRATION TEST (SPT) DATA

SANDY SOILS				SILTY & CLAYEY SOILS		
Blow Counts N	Relative Density, %	Friction Angle ϕ, degrees	Description	Blow Counts N	Unconfined Strength q_u, tsf	Description
0 - 4	0 -15		Very Loose	< 2	< 0.25	Very soft
4 - 10	15 - 35	26 - 30	Loose	2 - 4	0.25 - 0.50	Soft
10 - 30	35 - 65	28 - 35	Medium Dense	4 - 8	0.50 - 1.00	Medium Stiff
30 - 50	65 - 85	35 - 42	Dense	8 - 15	1.00 - 2.00	Stiff
> 50	85 - 100	38 - 46	Very Dense	15 - 30	2.00 - 4.00	Very Stiff
				> 30	> 4.00	Hard

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PLATE A1

BORING LOG HA-1

Completed By: AH Date Drilled: 3/26/2024 Surface Elev. Approx. 202 ft

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	Probing Rod Penet. (in.)	Water Content %	Other Tests/ Comments
		SM	- Dark brown GRAVELLY SAND WITH SILT, sand is fine to medium grained, rounded gravel is fine, loose, damp; brick and wood fragments, small roots present.			7"		
					S1	12"		
1		SM	- Dark brown SILTY SAND, sand is very fine to fine grained loose, damp; occasional small roots.					
						6"		
		SM	- Dark brown SILTY SAND WITH GRAVEL, sand is very fine to fine, subrounded gravel is fine, medium dense to dense, damp; stiff silt clasts present.			3"		
2					S2	0-2"		
			- same as above, increased silt content.			0-2"		
						<1"		
			Total depth = 2.5', dense material encountered. No groundwater seepage encountered.					
3								
4								
5								

LEGEND:

⌶ Sample Location (Approximate)

▽ Groundwater level noted during drilling

GEO Group Northwest, Inc.

Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

PROPOSED ADDITION
5222 W MERCER WAY
MERCER ISLAND, WA 98040

JOB NO. G-6047 **DATE** 4/22/2024 **PLATE** A2

BORING LOG HA-2

Completed By: AH Date Drilled: 3/26/2024 Surface Elev. Approx. 206 ft

Depth ft.	Elevation	USCS Code	Description	Sample Loc.	Sample No.	Probing Rod Penet. (in.)	Water Content %	Other Tests/ Comments
			- Mulch groundcover			24"		
		SM	- Dark brown to blueish gray SILTY SAND WITH GRAVEL, sand is fine grained, subrounded gravel is fine to coarse, loose moist; small roots present.		S1	9"		
1						5"		
						6"		
2	▽		- same as above, perched groundwater seepage encountered			3"		
		ML-SM	- Dark gray to blueish gray SANDY SILT to SILTY SAND sand is fine to medium grained, medium stiff to stiff, moist to saturated; poor recovery.		S2	0-3"		
			Total depth = 2.5', dense material encountered. Groundwater seepage encountered at 2.0 feet bgs.					
3								
4								
5								

LEGEND:
⌶ Sample Location (Approximate)
▽ Groundwater level noted during drilling

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

BORING LOG

PROPOSED ADDITION
5222 W MERCER WAY
MERCER ISLAND, WA 98040

JOB NO. G-6047 **DATE** 4/22/2024 **PLATE** A3