GEOTECH
CONSULTANTS, INC.

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April 25, 2023

JN 23101

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Subject: **Geotechnical Report**
Proposed Remodel and Expansion of Existing Residence
9116 S.E. 58th Street
Mercer Island, Washington

Greetings:

This report presents our geotechnical engineering report related to the planned remodel and expansion of your existing home. The scope of our services consisted of assessing the site surface and subsurface conditions, and then developing this summary report.

Plans for the development have been prepared by RF Architecture. Based on these plans, new foundations will be constructed to "bump out" areas of the existing main floor through the central portion of the house. A new second story addition will then be constructed over the central portion of the structure. A deck overlying an outdoor living space will also be created on the east side of the house, in the area of the existing patio. The excavations are expected to be limited in depth to what is necessary to reach suitable bearing soils for the new foundations. No deep below-grade spaces, such as a basement, are anticipated.

The City of Mercer Island GIS indicates that no geologic hazards are mapped on your property on the adjacent lots. There are no steep slopes on, or around, your property.

We visited the subject property on two occasions, the most recent being April 4, 2023. During these site visits, we were able to assess the conditions on and around the property, and to conduct soil explorations in the area of the proposed expansion. The existing house sits centrally on the irregularly-shaped lot. The cul-de-sac for S.E. 58th Street forms the curved western property line. Developed residential lots abut the remaining property lines. The existing residence consists of one story, with a crawl space beneath the main floor. The garage is located on the southern end of the house, with a driveway extending through the south portion of the lot from S.E. 58th Street. A paver patio is located on the eastern side of the house. Grass yard and landscaping cover most of the remainder of the lot, with several mature trees scattered about on the lot. The property is relatively flat, with a slight rise up to the house from S.E. 58th Street, and a slight slope away from the eastern side of the residence. There are no steep slopes on, or near, the site.

There is no history of slope movement in this area. This is confirmed by our review of Mercer Island's GIS, as well as the *Mercer Island Landslide Hazard Assessment* (Troos and Wisher, 2009).

By probing alongside the house in the area of the planned expansion, we were able to determine that the top of the perimeter footing lies 19 to 24 inches below the ground surface. This would result in a bottom-of-footing depth of around 24 to 30 inches.

We are familiar with the native subsurface conditions on the property from review of published geologic maps, explorations that our firm has completed in close proximity to the site, and the conditions exposed in test holes completed around the existing residence in the area of the planned expansion. The locations of these test holes are shown on the attached Site Exploration Plan. Underlying the ground surface, all of the test holes exposed fill soils extending to a depth of 6 to 24 inches. Beneath the fill, native soils consisting of heavily-weathered, gravelly, silty sand were exposed. This heavily-weathered soil was loose to medium-dense and typically extended to a depth of 42 to 45 inches. Below this depth, the explorations encountered dense, gravelly, silty sand that has been glacially-compressed. This dense soil is referred to as glacial till. Geologic maps and our previous experience on nearby projects confirms that glacial till soils are typical for the site vicinity. No groundwater seepage was exposed in the test holes. However, it is relatively common to find at least localized zones of subsurface water perched on top of the impervious glacial till following extended periods of weather.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

THIS SECTION CONTAINS A SUMMARY OF OUR STUDY AND FINDINGS FOR THE PURPOSES OF A GENERAL OVERVIEW ONLY. MORE SPECIFIC RECOMMENDATIONS AND CONCLUSIONS ARE CONTAINED IN THE REMAINDER OF THIS REPORT. ANY PARTY RELYING ON THIS REPORT SHOULD READ THE ENTIRE DOCUMENT.

The site and surrounding area are underlain by competent, glacially-compressed native soils. Based on the results of our test holes and probing, it appears that the existing perimeter house foundations were placed on the heavily-weathered soils, at least one foot above the level of the glacial till. The heavily-weathered soils are suitable to support lightly-loaded foundations for an allowable bearing capacity of up to 2,000 pounds per square foot. If additional load is applied to the perimeter footings, they may undergo a slight amount of settlement as the soil compresses under the new loads. We did not assess conditions supporting the isolated footings within the crawl space. However, these footings, which typically support primarily floor loads, we often not excavated as deep as perimeter foundations. It would be prudent to avoid adding any more load to those interior footings, unless the bearing capacity of their supporting soils were first verified.

New footings should all be excavated to bear on the dense glacial till, which will minimize post-construction settlement. This may require excavation below the planned footing subgrade elevations. Where this overexcavation is necessary, it should be filled using imported clean crushed rock (quarry spalls or railroad ballast rock). Where they abut each other, existing and new footings should be connected by doweling, in order to prevent differential movement.

We expect that the floors of the new additions will be framed over a crawl space. It is not necessary to remove the loose soils in crawl space areas.

The onsite soils will not be suitable for reuse as compacted fill, due to their very high silt and moisture contents. Any compacted fill placed in structural areas, or where post-construction settlement is undesirable (patios, porches, stoops, etc.) should consist of imported granular material that can be properly compacted.

The underlying glacially-compressed soils beneath the site are not susceptible to seismic liquefaction.

The site does not meet the City of Mercer Island's criteria for an Erosion Hazard Area. Even so, it is prudent to install appropriate temporary erosion control measures during the site development, in order to avoid adverse erosion impacts to the surrounding properties. The temporary erosion control measures needed during the site development will depend heavily on the weather conditions that are encountered during the site work. One of the most important considerations, particularly during wet weather, is to immediately cover any bare soil areas to prevent accumulated water or runoff from the work area from becoming silty in the first place. A wire-backed silt fence bedded in compost, not native soil or sand, should be erected as close as possible to the planned work area, and the existing vegetation between the silt fence and the top of the steep slope be left in place. Rocked construction access and staging areas should be established wherever trucks will have to drive off of pavement, in order reduce the amount of soil or mud carried off the property by trucks and equipment. Covering the base of the excavation with a layer of clean gravel or rock is also prudent to reduce the amount of mud and silty water generated. Cut slopes and soil stockpiles should be covered with plastic during wet weather. Soil stockpiles should be minimized. Following rough grading, it may be necessary to mulch or hydroseed bare areas that will not be immediately covered with landscaping or an impervious surface.

Even shallow crawl spaces may collect subsurface water perched on top of the dense soil. Providing perimeter footing drains, and well as installing perforated drains in a layer of gravel under the vapor barrier/retarder in the crawl space, would be prudent. A typical footing drain detail is attached.

The glacial till soil is impervious, and seasonal perched groundwater is relatively common in these conditions. On-site infiltration of concentrated runoff from impervious surfaces is infeasible, due to the impervious barrier against downward percolation resulting from the glacial till.

We recommend including this report, in its entirety, in the project contract documents. This report should also be provided to any future property owners so they will be aware of our findings and recommendations.

SEISMIC CONSIDERATIONS

In accordance with the International Building Code (IBC), the site class within 100 feet of the ground surface is best represented by Site Class Type D (Stiff Soil).

The IBC and ASCE 7 require that the potential for liquefaction (soil strength loss) during an earthquake be evaluated for the peak ground acceleration of the Maximum Considered Earthquake (MCE), which has a probability of occurring once in 2,475 years (2 percent probability of occurring in a 50-year period). The dense soils beneath the site are not susceptible to seismic liquefaction under the ground motions of the MCE because of the absence of near-surface groundwater.

CONVENTIONAL FOUNDATIONS

We recommend that continuous and individual spread footings have minimum widths of 12 and 16 inches, respectively. Exterior footings should also be bottomed at least 18 inches below the lowest adjacent finish ground surface for protection against frost and erosion. The local building codes should be reviewed to determine if different footing widths or embedment depths are required.

Footing subgrades must be cleaned of loose or disturbed soil prior to pouring concrete. Depending upon site and equipment constraints, this may require removing the disturbed soil by hand. In wet conditions, the prepared footing subgrades should be protected with several inches of clean crushed rock, in order to prevent softening or disturbance during the placement of forms and rebar.

Depending on the final site grades, overexcavation may be required below the footings to expose competent native soil. Unless lean concrete is used to fill an overexcavated hole, the overexcavation must be at least as wide at the bottom as the sum of the depth of the overexcavation and the footing width. For example, an overexcavation extending 2 feet below the bottom of a 2-foot-wide footing must be at least 4 feet wide at the base of the excavation. If lean concrete is used, the overexcavation need only extend 6 inches beyond the edges of the footing.

An allowable bearing pressure of 2,500 pounds per square foot (psf) is appropriate for new footings supported on competent native soil. A one-third increase in this design bearing pressure can be used when considering short-term wind or seismic loads. For the above design criteria, it is anticipated that the total post-construction settlement of footings founded on competent native soil, or compacted rock structural fill up to 5 feet in thickness will be less than one inch, with differential settlements on the order of one-quarter-inch in a distance of 25 feet along a continuous footing with a uniform load.

Lateral loads due to wind or seismic forces may be resisted by friction between the foundation and the bearing soil, or by passive earth pressure acting on the vertical, embedded portions of the foundation. For the latter condition, the foundation must be either poured directly against relatively level, undisturbed soil or be surrounded by level, well-compacted fill. We recommend using the following ultimate values for the foundation's resistance to lateral loading:

PARAMETER	ULTIMATE VALUE
Coefficient of Friction	0.40
Passive Earth Pressure	300 pcf

Where: pcf is Pounds per Cubic Foot, and Passive Earth Pressure is computed using the Equivalent Fluid Density.

The above ultimate values for passive earth pressure and coefficient of friction do not include a safety factor.

LIMITATIONS

This report has been prepared for the exclusive use of Jeremy Raquepau and Angela Gribble, and their representatives, for specific application to this project and site. Our conclusions and recommendations are professional opinions derived in accordance with our understanding of current local standards of practice, and within the scope of our services. No warranty is expressed or implied. The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. Our services also do not include assessing or minimizing the potential for biological hazards, such as mold, bacteria, mildew and fungi in either the existing or proposed site development.

ADDITIONAL SERVICES

Geotech Consultants, Inc. should be retained to provide geotechnical consultation, testing, and observation services during construction. This is to confirm that subsurface conditions are consistent with those indicated by our exploration, to evaluate whether earthwork and foundation construction activities comply with the general intent of the recommendations presented in this report, and to provide suggestions for design changes in the event subsurface conditions differ from those anticipated prior to the start of construction. However, our work would not include the supervision or direction of the actual work of the contractor and its employees or agents. Also, job and site safety, and dimensional measurements, will be the responsibility of the contractor.

During the construction phase, we will provide geotechnical observation and testing services when requested by you or your representatives. Please be aware that we can only document site work we actually observe. It is still the responsibility of your contractor or on-site construction team to verify that our recommendations are being followed, whether we are present at the site or not.

We appreciate the opportunity to be of service on this project. Please contact us if you have any questions, or if we can be of further assistance.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

4/25/2023

Marc R. McGinnis, P.E.
Principal

Attachments: Vicinity Map, Site Exploration Plan, Test Pit Logs, Footing Drain Detail

cc: **RF Architecture** – Richard Flake
via email: richard@rfarchitecture.com

MRM:kg

(Source: King County iMap)

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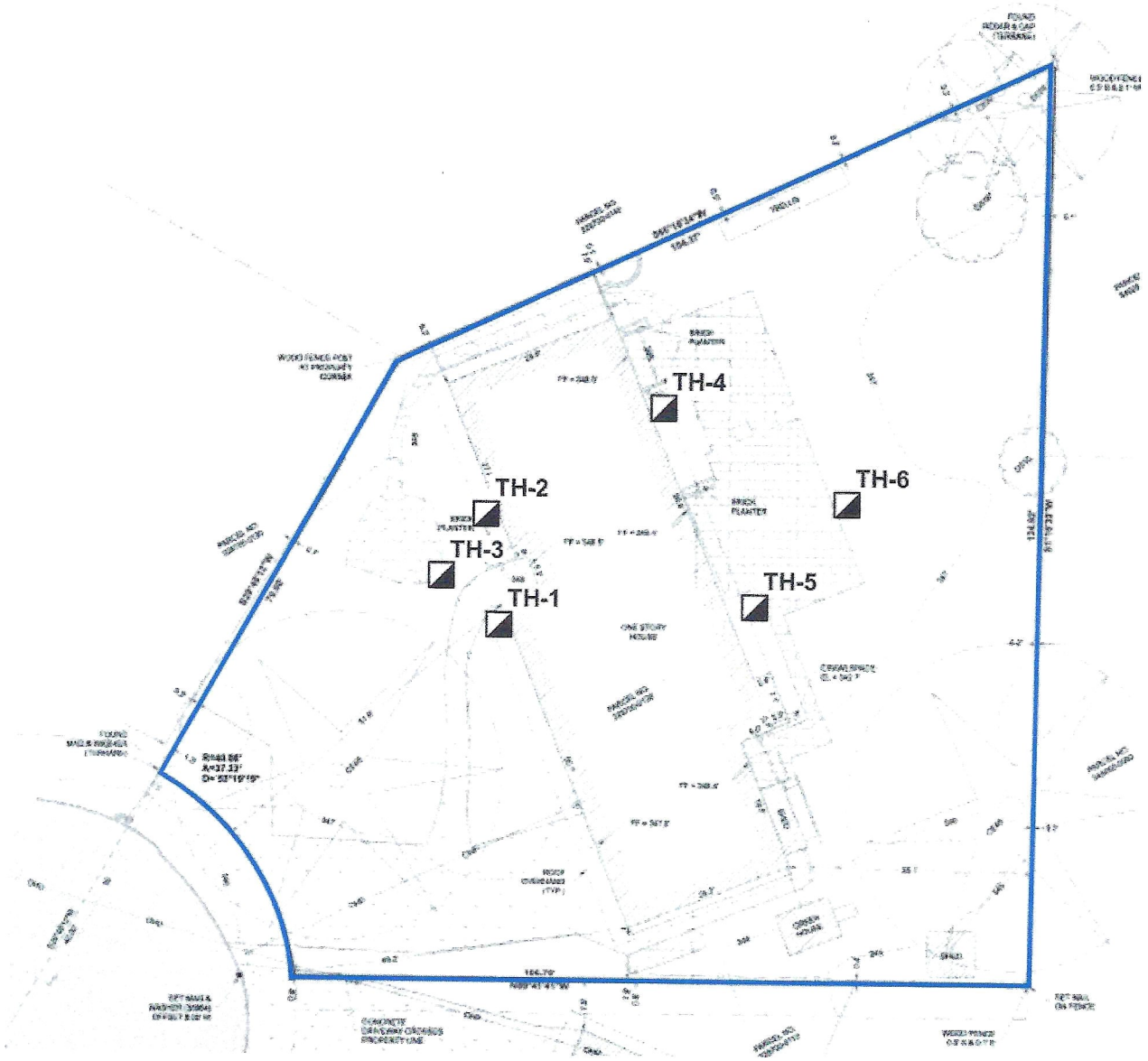
VICINITY MAP

9116 Southeast 58th Street
Mercer Island, Washington

Job	Date:		Plate:
23101	April 2023		1

NORTH



Legend:

Test Hole Location

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SITE EXPLORATION PLAN

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Mercer Island, Washington

Job	Date:		Plate:
23101	April 2023	No Scale	2

TEST HOLE 1

Depth (inches)	Soil Description
0.0 – 24	Landscape bark over dark brown, gravelly, silty SAND, fine-grained, very moist, loose **[FILL]**
24 – 45	Brown mottled orange, slightly gravelly, silty SAND, fine-grained, very moist, loose to medium-dense (heavily weathered)
45	Dense, slightly gravelly, silty SAND, fine-grained, moist, dense

Test Hole was terminated at 45 inches on April 4, 2023.
No groundwater seepage was encountered in the test hole.

TEST HOLE 2

Depth (inches)	Soil Description
0.0 – 12	Landscape bark over dark brown, gravelly, silty SAND, fine-grained, very moist, loose **[FILL]**
12 – 45	Brown mottled orange, slightly gravelly, silty SAND, fine-grained, very-moist, medium-dense (heavily weathered)
45	Dense, slightly gravelly, silty SAND, fine-grained, moist, dense

Test Hole was terminated at 45 inches on April 4, 2023.
No groundwater seepage was encountered in the test hole.

TEST HOLE 3

Depth (inches)	Soil Description
0.0 – 6	Grass over dark brown silty SAND, fine-grained, very moist, loose **[FILL]**
6 – 32	Gray-brown mottled orange, gravelly, silty SAND, fine-grained, moist, medium-dense (weathered) - at 24", becomes dense with more silt, sand, and rust seams
32 – 40	Gray, very silty SAND, fine-grained, very moist, dense - 36", becomes gravelly

Test Hole was terminated at 40 inches on April 4, 2023.
No groundwater seepage was encountered in the test hole.

TEST HOLE 4

Depth (inches)	Soil Description
0 – 6	Topsoil over brown slightly silty, slightly gravelly SAND, fine-grained, moist, loose **[FILL]**
6 – 45	Brown mottled orange, slightly gravelly, silty SAND, fine-grained, very moist, medium-dense (heavily weathered)
45	Dense, slightly gravelly, silty SAND, fine-grained, moist, dense

Test Hole was terminated at 45 inches on April 4, 2023.
No groundwater seepage was encountered in the test hole.

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TEST HOLE LOG

9116 Southeast 58th Street
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Job	*Date:*	*Logged by:*	*Plate:*
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TEST HOLE 5

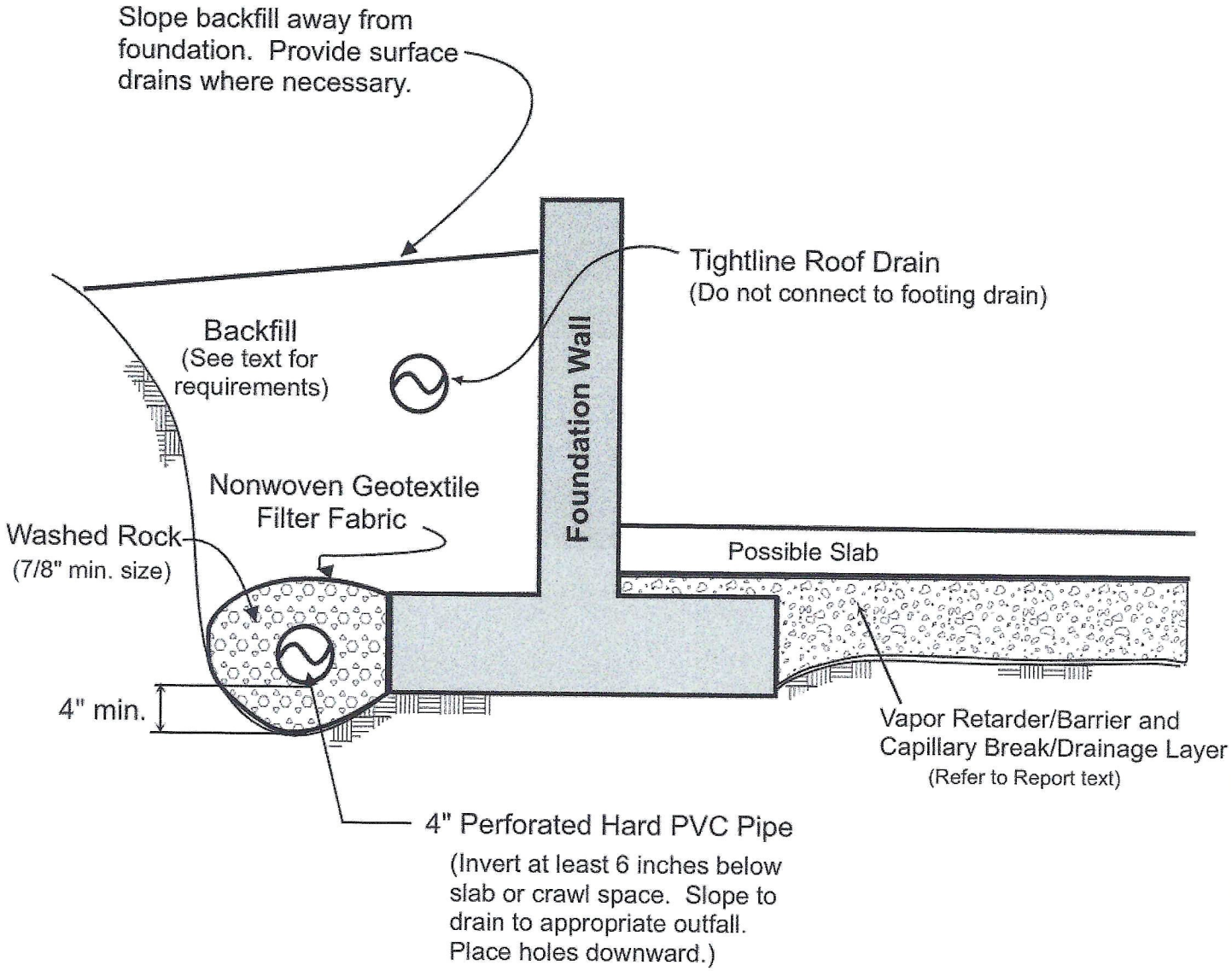
Depth (inches)	Soil Description
0 – 6	Topsoil **[FILL]**
6 – 30	Gray-brown, mottled, silty SAND, fine to medium-grained, very moist, loose
30 - 42	Orange-brown, silty SAND, fine to medium-grained, moist, medium-dense - at 42" becomes dense

Test Hole was terminated at 42 inches on April 4, 2023.
No groundwater seepage was encountered in the test hole.

TEST HOLE 6

Depth (inches)	Soil Description
0.0 – 15	Grass over dark brown slightly silty, slightly gravelly SAND, fine-grained, moist, loose **[FILL]**
15 – 20	Gray, slightly silty SAND, fine-grained, moist, medium-dense **[FILL]**
20 – 26	Dark brown- black, slightly silty SAND, fine-grained, very moist, medium-dense
26 – 45	Orange-brown, slightly silty SAND, fine to medium-grained, very moist, medium-dense
45	Dense, slightly gravelly, silty SAND, fine-grained, moist, dense

Test Hole was terminated at 45 inches on April 4, 2023.
No groundwater seepage was encountered in the test hole.



NOTES:

(1) In crawl spaces, provide an outlet drain to prevent buildup of water that bypasses the perimeter footing drains.

(2) Refer to report text for additional drainage, waterproofing, and slab considerations.

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FOOTING DRAIN DETAIL

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