

November 22, 2021

JN 21455

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via email: pavel_sterba@hotmail.com

Subject: **Foundation Considerations and Critical Area Report**
Proposed Addition to Existing Residence
9811 S.E. 40th Street
Mercer Island, Washington

Greetings:

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

Based on the provided architectural drawings prepared by TAM Design, and our discussions with you, we understand that a two-story addition will be constructed on the north side of the house. This addition will extend across the western half of the house and will reach up to approximately 15.5 feet north of the north wall of the existing residence. An elevated deck currently located in the planned footprint of the addition will be removed. A new front entry will be included in the addition. No significant excavation, other than the minimal amount necessary for the foundations, will be needed for the planned project.

The City of Mercer Island GIS maps your entire lot as a Potential Landslide Hazard, Erosion Hazard, and Seismic Hazard. There are no Steep Slopes mapped on, or near, your property.

We visited the subject property on November 4, 2021 to observe the existing site conditions, and to assess the subsurface conditions exposed in two test holes excavated in the footprint of the addition. The existing residence has one story overlying a north-facing basement. The garage is located in the eastern half of the basement level, and is accessed via a paved driveway sloping upward from S.E. 40th Street. The house sits centrally on the lot. The ground surface on the lot, and in the vicinity, generally slopes downward toward the north. There is a short, moderately-sloped area along the north edge of the property, becoming gently-sloped through the area of the proposed addition. The ground again slopes up moderately along the west and east sides of the house to the rear, southern yard, which is relatively flat. From the edge of the yard, the ground again slopes upward to the south to the adjacent southern residence (9787 S.E. 41st Street). None of the slopes on, or around, the site are steeper than 40 percent, and even the moderately-sloped areas are less than 10 feet in height. It appears that the moderate slopes in the north, central, and southern portions of the lot were created by grading associated with both S.E. 40th Street, and with the development of your property. We saw no indications of recent slope movement during our visit to the property.

During our November 4, 2021 site visit, we completed test holes near the northeast and northwest corners of the planned addition. These test holes encountered 18 to 24 inches of fill overlying old

topsoil. Below this was loose, weathered silt extending to the 5-foot depth of the test holes. Geologic maps of the area show the near-surface geologic unit to be glacial till, a glacially-compressed mixture of gravel, silt and fine-grained sand. We have been involved with several projects in the site vicinity, all of which encountered glacial till soils. The closest project was a geotechnical study conducted for the property immediately to the south of the site (9787 S.E. 41st Street) as a part of a subdivision. As a part of this study, we conducted a boring immediately to the south of your lot, at the top of the moderately-inclined slope rising from the rear yard. The log of this boring is attached to the end of this report. This boring encountered dense, glacially-compressed silty sand consistent with glacial till. No disturbed soils or landslide deposits were encountered.

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.

Your property is underlain by competent, glacially-compressed soils. However, the near-surface soils in the area of the addition are not suitable to support the new addition without excessive post-construction settlement. Considering the limited access, and the desire to minimize site disturbance, we recommend that the loads from the new addition be supported on 2- or 3-inch-diameter pipe piles driven to refusal in the dense, native silty sand. The 2-inch piles can be installed using hand-held jackhammers, but the 3-inch piles can carry substantially higher loads. The floors of the addition should be supported on the piles also.

Seismic Hazard: The underlying glacially-compressed soils beneath the site are not susceptible to seismic liquefaction. The pipe piles for the new foundations will be driven through the fill and any loose upper soils and will be embedded into this dense, non-liquefiable native soil layer.

Potential Landslide Hazard: The glacially-compressed soils underlying the site are not susceptible to instability on the gentle to moderate slopes, even under the ground motions of the design earthquake (probability of once in 500 years). No buffer or other mitigation measures are required to address the Potential Landslide Hazard mapping of the site.

Erosion Hazard: The site disturbance for the proposed development will be limited. The mapped Erosion Hazard can be mitigated by implementing proper temporary erosion control measures that will depend heavily on the weather conditions that are encountered. We anticipate that a silt fence will be needed around the downslope sides of any work areas. Existing ground cover and landscaping should be left in place wherever possible to minimize the amount of exposed soil. Small soil stockpiles should be covered with plastic during wet weather. Soil and mud should not be tracked onto the adjoining streets, and silty water must be prevented from traveling off the site. It should be possible to complete the planned addition during the wet season without adverse impacts to the site and neighboring lots. On most construction projects, it is necessary to periodically maintain or modify temporary erosion control measures to address specific site and weather conditions.

We provide the following “statement of risk” to satisfy City of Mercer Island conditions:

“It is our professional opinion that the development practices proposed in this report for the new development would render the development as safe as if it were not located in a geologic hazard area.”

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 that will support the foundations are not susceptible to seismic liquefaction under the ground motions of the MCE.

PIPE PILES

A 2-inch-diameter pipe pile driven with a minimum 90-pound jackhammer or a 140-pound Rhino hammer to a final penetration rate of 1-inch or less for one minute of continuous driving may be assigned an allowable compressive load of 3 tons. Extra-strong steel pipe should be used.

Three-inch-diameter pipe piles driven with a 850- or 1,100- or 2,000-pound hydraulic jackhammer to the following final penetration rates may be assigned the following compressive capacity.

INSIDE PILE DIAMETER	FINAL DRIVING RATE (850-pound hammer)	FINAL DRIVING RATE (1,100-pound hammer)	FINAL DRIVING RATE (2,000-pound hammer)	ALLOWABLE COMPRESSIVE CAPACITY
3 inches	10 sec/inch	6 sec/inch	2 sec/inch	6 tons

Schedule 40 pipe should be used for 3-inch-diameter pipe piles.

Load tests are not necessary to verify these recommended allowable capacities when the piles are installed in accordance with our recommendations.

The site soils are not highly organic, and are not located near salt water. As a result, they do not have an elevated corrosion potential. Considering this, it is our opinion that standard “black” pipe can be used, and corrosion protection, such as galvanizing, is not necessary for the pipe piles. Subsequent pipe sections should be connected together using threaded or slip couplers, or by welding. If slip couplers are used, they must fit snugly into the ends of the pipes. This can require that shims or beads of welding flux be applied to the couplers.

Pile caps and grade beams should be used to transmit loads to the piles. In general, a minimum of two piles should be used in isolated pile caps, in order to prevent eccentric loading on individual piles.

Lateral loads may be resisted by passive earth pressure acting on the vertical, embedded portions of the foundation. For this condition, the foundation must be either poured directly against relatively level, undisturbed soil or surrounded by level structural fill. We recommend using an ultimate (no safety factor included) passive earth pressure of 250 pounds per cubic foot (pcf) for this resistance. If the ground in front of a foundation is loose or sloping, the passive earth pressure given above will not be appropriate. Due to their small diameter, the lateral capacity of vertical pipe piles is negligible.

LIMITATIONS

This report has been prepared for the exclusive use of Pavel Sterba, and his 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

In addition to reviewing the final plans, 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.



11/22/2021

Marc R. McGinnis, P.E.
Principal

Attachment – Previous Boring Log

MRM:kg

