



**NELSON GEOTECHNICAL
ASSOCIATES, INC.**

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December 17, 2021

Catherine and Edward Moran
Via Email: catherine.b.moran@gmail.com
edmoran82@gmail.com

Critical Areas Study and Geotechnical Plan Review
Moran Residence Development
5000 West Mercer Way
Mercer Island, Washington
NGA File No. 1211520

Dear Catherine and Edward:

This letter documents our Critical Areas Study and geotechnical plan review regarding a planned residence development project located at 5000 West Mercer Way on Mercer Island, Washington.

INTRODUCTION

We previously prepared a revised geotechnical report titled ***“Geotechnical Engineering Evaluation (REV2) – Moran Residence Development – 5000 West Mercer Way – Mercer Island,” dated September 27, 2021.***

Project plans consist of constructing a new residence structure on the property, with retaining walls to support grading plans. Since retaining walls and residential development is proposed within the standard buffers outlined in the Mercer Island Municipal Code, the City of Mercer Island has required a Critical Areas Study. The scope of this study includes geologically hazardous areas only; environmental hazards which may or may not be present at the site would be subject to a separate study, if present and required by the City of Mercer Island.

For our use in preparing this letter, we were provided with the following documents:

- Architectural Plan set titled “Edward & Catherine Moran,” dated November 30, 2021 and prepared by Plan One Fine Home Design, including structural shoring plans by KIA CO.
- Civil Plans titled “Moran Residence,” dated October 1, 2021 and prepared by JMJ Team.
- Arborist Report and Tree Survey Plan Sheet titled “Catherine Moran: 5000 W Mercer Way,” dated September 24, 2021 and prepared by Tree Solutions Inc.
- Topographic and Boundary Survey titled “Moran Residence,” dated August 31, 2020 and prepared by Terrane.

CRITICAL AREAS STUDY

We characterized the geologically hazardous areas present within the site in our revised report dated September 27, 2021. A summary of the geologically hazardous areas is provided hereon to satisfy the provisions of Mercer Island Municipal Code (MIMC) Section 19.07.110. In the following sections, we summarize the results of our geological critical areas study.

Presence of Critical Areas

Geologically Hazardous Areas in Mercer Island are designated in accordance with the Washington Administrative Code (WAC) Section 365-190-120. We identified the presence of Landslide Hazard Areas within the property in our revised geotechnical engineering evaluation for the site dated September 27, 2021. Specifically, there are portions of the site which include slopes exceeding 40 percent in gradient with vertical relief greater than 10 feet (WAC 365-190-120 (6) (i)).

We understand the proposed single-family residence will be situated within the central portion of the site on a gently sloping bench area bound by moderate to steep west-facing slopes to the east and west. The upper steep slopes generally descend from the eastern property line at gradients in the range of 18 to 33 degrees (32.5 to 64.9 percent) down to the upper portion of the gently sloping bench area, while the lower western steep slopes descend from the planned building area at gradients in the range of 20 to 45 degrees (36.4 to 100 percent). The overall vertical relief of the upper eastern steep slopes is approximately 30 to 35 feet while the lower western frontage steep slopes provide approximately 10 to 16 feet of relief. The gently sloping bench and planned development area spans approximately 45 to 65 feet in width from east to west and provides approximately 5 to 10 feet of relief. Existing slope conditions were documented in photographs which are presented as **Appendix A** of this letter.

In accordance with MIMC 19.07.160(C)(2)(b), shallow landslide hazard areas include 25-foot buffers in all directions. The location of the designated Landslide Hazard Area in proximity to the site is shown on the Topographic and Boundary Survey attached in **Appendix B**. The proposed residence will be located as close as 13 feet from the toe and 6 feet from the top of Landslide Hazard Areas within the site and will therefore intersect and overlap the 25-foot Landslide Hazard Area buffers as shown on an excerpt from the Civil Engineering Plan Set in **Appendix C**, which also presents a scale map of the proposed project.

Methodologies for designation of the critical areas and associated buffers are presented on the Topographic and Boundary Survey. Furthermore, land clearing, grading, filling, and foundation work within landslide hazard areas are not permitted between October 1 and April 1. Slope stability concerns controlled effectively with Best Management Practices may waive this prohibition. We review Temporary Erosion and Sediment Control (TESC) plans for the project in the **PLAN REVIEW** subsection of this letter.

Assessment of Probable Effects to Critical Areas and Buffers

The planned project will include the construction of a new single-family residence in the area between steep slopes. To facilitate grading, permanent shoring of cuts consisting of soldier pile shoring walls have been planned along the uphill eastern portion of the disturbance area, below the steep slopes which are designated a Landslide Hazard Area. The soldier pile wall has been designed as a cantilever shoring system incorporating I-beams set in 30-inch diameter boreholes and ranging in exposed height up to 12.0 feet.

The soldier pile shoring wall has been designed in accordance with the soil and seismic parameters we recommended based on our explorations within the site, detailed in our revised geotechnical engineering evaluation. Based on our review of project plans detailed in the **PLAN REVIEW** subsection of this letter, it is our opinion that the soldier pile wall is sufficient to permanently protect the proposed residence from landslide hazards associated with the overlying slope while protecting the landslide hazard critical area from impacts associated with grading for site development.

Provided the development on the site is constructed in accordance with the provided plans and our recommendations, any impacts caused by the development proposal and alterations to the subject property should be minimized. Specifically, proper site grading and drainage as well as adequate foundation placement as recommended in this report should help maintain current stability conditions. The design of the soldier pile wall will eliminate impacts to neighboring uphill property if constructed in accordance with the plans, our recommendations, and best practices. Such Best Practices include but are not limited to reducing the area and amount of time unsupported cuts are left open during lagging of the wall and backfilling of the voids behind the wall with clean-draining materials not requiring compaction.

Potential Impacts on downgradient sites may include sedimentation or erosion if TESC plans are not properly employed or continually maintained during construction. While it is our opinion that the TESC measures are sufficient to prevent sedimentation and erosion during construction, we or another CESCL monitor should be retained during construction to observe TESC measure efficacy if work is to be completed during the wet season.

Description of Mitigation Sequencing (MIMC 19.07.100)

The planned residential development incorporates design elements to avoid critical area impacts. The Landslide Hazard Areas within the vicinity of the site will not be altered and adequate retaining wall systems will prevent undermining from occurring at the toe of the steep slopes. Additional embedment on downhill-facing foundation elements will transfer structure loads to deeper, more competent soils and increase the effective setback of those foundation elements from the lower steep slopes.

Accuracy of the Report and Assumptions

The scope of our work does not include services related to construction safety precautions and our recommendations are not intended to direct the contractors' methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. There are possible variations in subsurface conditions between the explorations and also with time. Our report, conclusions, and interpretations should not be construed as a warranty of subsurface conditions. A contingency for unanticipated conditions should be included in the budget and schedule.

All people who own or occupy homes with hills should realize that landslide movements are always a possibility. The landowner should periodically inspect the site slopes, especially after a winter storm. If distress is evident, a geotechnical engineer should be contacted for advice on remedial/preventative measures. The probability that landsliding will occur is substantially reduced by the proper maintenance of drainage control measures at the site (the runoff from the roofs should be led to an approved discharge point). Therefore, the homeowner should take responsibility for performing such maintenance. Consequently, we recommend that a copy of our report be provided to any future homeowners of the property if the home is sold.

PLAN REVIEW

We have reviewed the geotechnical aspects of the provided plans and found the plans to be in general compliance with our recommendations as presented in our previous geotechnical report and supplemental recommendations provided via email communications and discussions with the design team. The soil parameters used in the foundation and retaining wall designs are consistent with the recommendations provided in our previous report. All other recommendations provided in our previous report should be strictly followed.

The proposed residence will be located within the west-central portion of the site and is planned to cover approximately 2,300 square feet. Associated driveways and attached garage will be located on the northern portion of the site. The wall alignment is planned to span the base of the upper slope along the length of the planned residence, located approximately 5-10 feet from the structure and driveway, depending on specific locations. The wall will continue and wrap around to the north side of the driveway, and around to the southeast portion of the residence to protect the proposed structures from potential soil movement with 18-inches of additional 'stick-up' height. Downhill residence foundation lines in proximity to the lower slopes will be additionally embedded a minimum of 12 inches into the competent native soils to provide protection from any potential shallow slope failures. In general, the plans appear to reflect our recommendations, including design values for soils outlined in our revised report.

Drainage: It is critical that stormwater not be allowed to flow uncontrolled over site slopes. Roof downspout drains are shown to be tightlined to a catch basin on the northern side of the property. We generally recommended the installation of footing drains around the perimeter of the structure foundations and behind the soldier pile retaining wall. These subsurface drains are not shown on Sheet C03 of the Civil Engineering Plan Set but are insinuated on the typical drainage detail and Detail 9 (Retaining Wall) on Sheet S3. Weep holes are shown on Detail 1 of Structural Engineering Sheet SH-3 to convey water from behind the soldier pile wall to a French drain system located at the base of the exposed face of the wall. Provided roof downspout drains are not directly connected to perforated foundation footing drains, the plans generally meet our recommendations for stormwater drainage within the site.

Shoring: The soldier pile shoring wall is sufficient to permanently stabilize the cuts associated with planned site grading. Due to the close proximity of the planned temporary excavations and shoring systems to the neighboring properties and structures, we recommend that settlement monitoring survey points be installed on the surrounding slope and/or neighboring structures during construction and monitored at least once a week until it is confirmed that no movement is occurring. We should be retained to discuss surrounding structure monitoring plans as project plans are finalized. Additional photographic and visual pre-existing surveys of the project vicinity and neighboring structures prior to construction activities should also be performed to document existing conditions within the vicinity of the property.

Vegetation Management: We understand that several trees are to be removed upon review of the Arborist's Report. Trees to be removed on the steeply sloping portions of the property should be cut such that the stumps remain at least 2 feet in height above the ground surface. All removed vegetation, cut trees, and resulting debris should not be allowed to impact the slopes during trimming and be removed from the slopes. If stump removal is needed, Best Management Practices should be followed to minimize disturbance to the slopes. If any portion of the site slopes are denuded from groundcover, they should be stabilized by plantings and erosion control measures consisting of heavy-duty jute netting or coconut coir matting staked regularly into the affected sloping areas.

Utility Installation: The Utility Plan on Sheet C-03 shows water and side sewer connections between the residence and West Mercer Way to the west. Resulting temporary excavations for utility connections over the steeply sloping areas should be temporarily shored as necessary. Temporary slopes on the site should be no steeper than 1.5H:1V. The contractor should develop plans to facilitate safe worker access and prevent instability during temporary utility excavations. We are able to provide consultation and review of utility excavation plans during construction, as warranted.

Backfill of utility trenches over steep slopes should be performed in level, benched lifts, and not be completed in sloping lifts. Recommendations for trench backfill are outlined in the revised geotechnical report and should be followed strictly.

Pavement Sections: Concrete pavement sections are detailed on Sheet C-05 and consist of 6 inches of unreinforced concrete underlain by 8 inches of crushed rock atop compacted subgrade. The 1,735-square-foot concrete driveway will be inclined at 17.4 percent grade from the shared driveway to the northwest of the site and will include a relatively level parking and turnaround area next to the garage and retaining wall. Unless heavy machinery is proposed to utilize the driveway, it should be possible to reduce the thickness of the concrete to 4 inches. In any case, rebar reinforcement should be incorporated into the driveway design to reduce concrete cracking potential.

CONCLUSIONS

General

Based on our slope stability modeling, we have determined that it is possible to construct the proposed residential addition development on the site within the proposed footprint without detrimental effects to the slope, neighboring properties, or public infrastructure provided geotechnical considerations are followed during construction. *Complete stabilization* is met for the proposed addition without improvements to the existing, short retaining wall at the top of the slope.

Minimum Risk Statement

In accordance with MIMC 19.07.160 (B) (2), it is our opinion that the alteration of the landslide hazard buffers will not adversely impact other critical areas, will not adversely impact the subject property or adjacent properties, will mitigate impacts to the geologically hazardous area consistent with the best available science to the maximum extent reasonably possible such that the site is determined to be safe; and will include the landscaping of all disturbed areas outside of building footprints and installation of hardscape prior to final inspection.

It is further our professional opinion that 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. (MIMC 19.07.160(B)(3)(c))

CLOSURE

We recommend that NGA be retained to provide construction monitoring, CESCL, and consultation services during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities comply with contract plans and specifications.

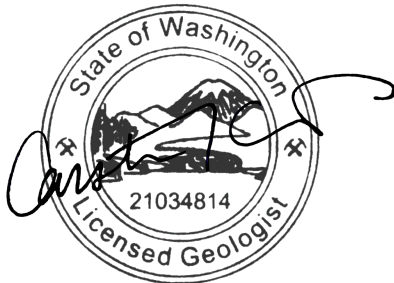
Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering practices in effect in this area at the time this letter was prepared. No other warranty, expressed or implied, is made. Our observations, findings, and opinions are a means to identify and reduce the inherent risks to the owner.

O-O-O

We appreciate the opportunity to provide service to you on this project. If you have any questions or require further information, please call.

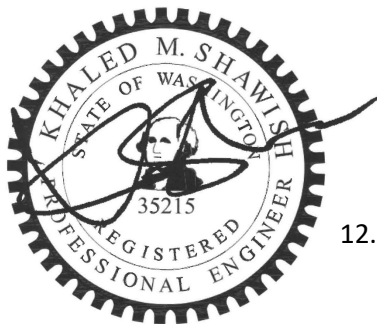
Sincerely,

NELSON GEOTECHNICAL ASSOCIATES, INC.



Carston Thomas Curd

Carston T. Curd, LG
Project Geologist



12.17.2021

Khaled M. Shawish, PE
Principal

CTC:KMS:dy

Three Appendices Attached

cc: William Gottlieb – wmgottlieb@planone.biz

APPENDIX A

Photographic Documentation of Critical Areas

December 12, 2021



Figure 1. Typical slopes on property.



Figure 2. Typical Slopes on property; note moderate understory of ferns.

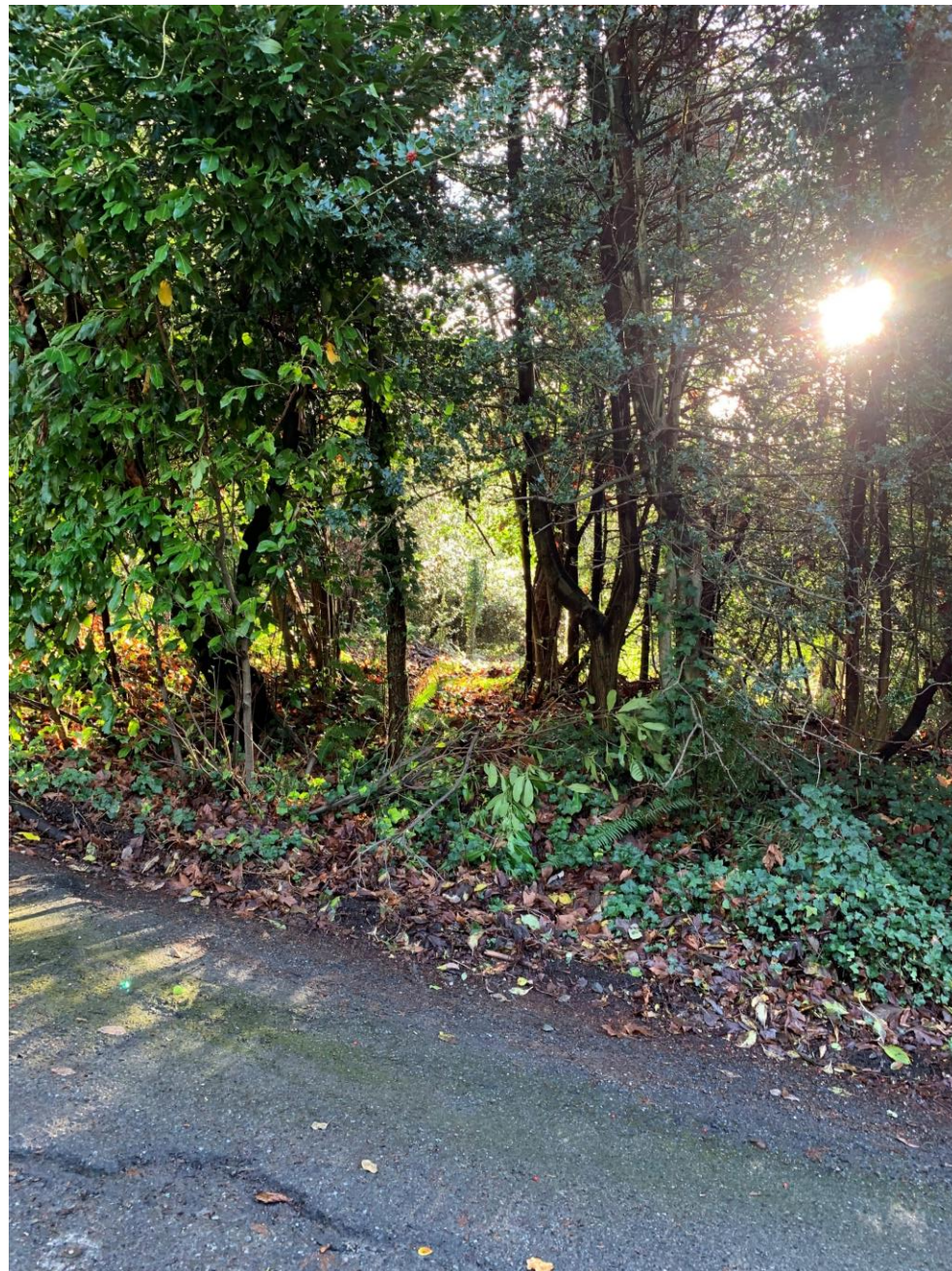


Figure 3. Looking south from driveway on north-central portion of property



Figure 3. Typical slopes on property; note presence of laurel, ferns, and ivy groundcover.



Figure 5. Looking southwest from north central portion of property.



Figure 6. Midslope bench in central portion of site. Looking south.

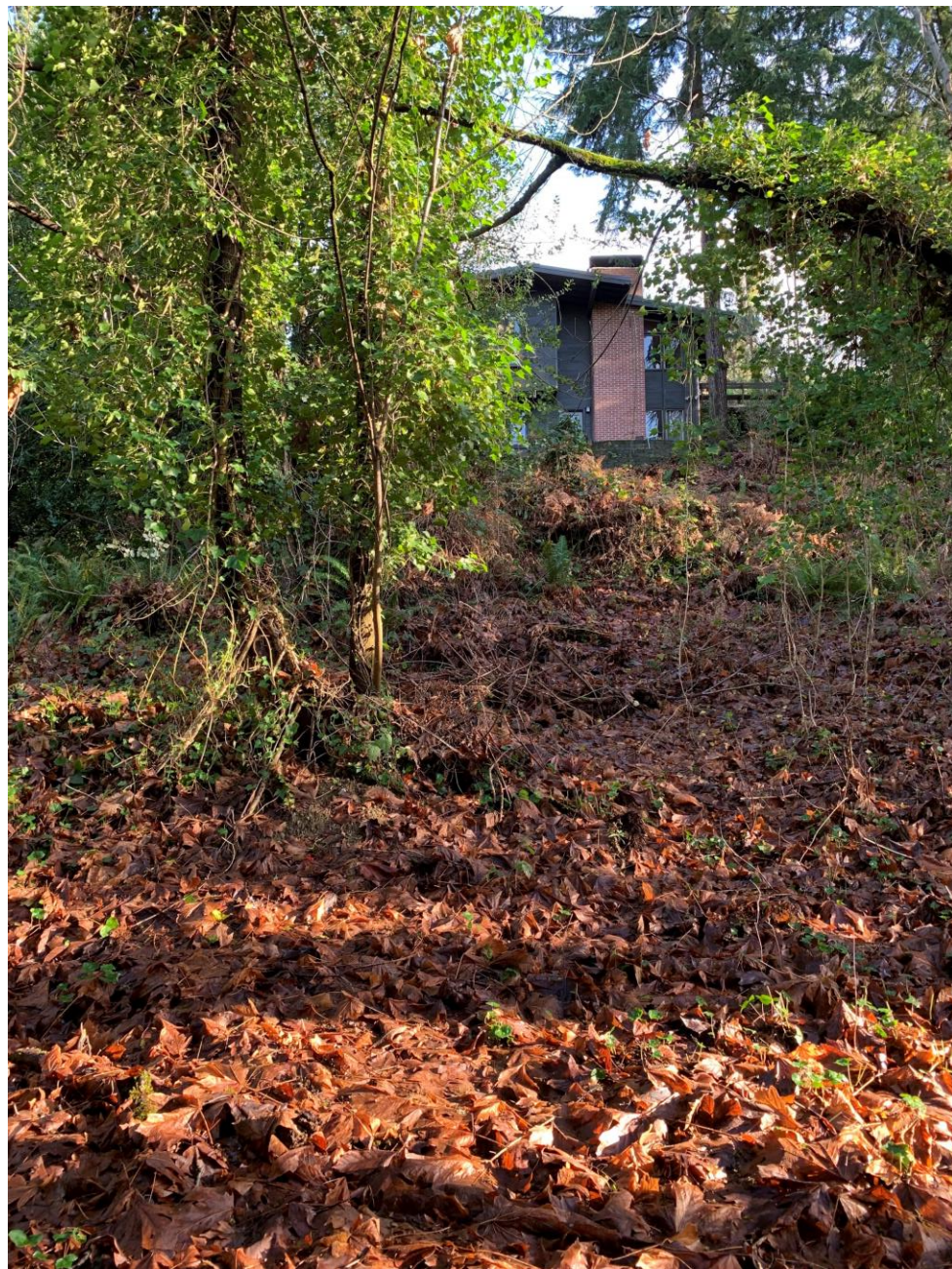


Figure 7. Looking southeast from mid-slope bench toward southeastern Landslide Hazard Area.

APPENDIX B

Topographic and Boundary Survey

August 27, 2020 – Terrane, Inc.

LEGAL DESCRIPTION

THAT PORTION OF THE SOUTH HALF OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF SECTION 19, TOWNSHIP 24 NORTH, RANGE 5 EAST, W.M., DESCRIBED AS FOLLOWS:

BEGINNING ON THE EAST LINE OF SAID SUBDIVISION, DISTANT NORTH 00°02'18" EAST 300 FEET FROM THE SOUTHEAST CORNER THEREOF; THENCE NORTH 89°24'27" WEST TO THE EASTERLY LINE OF WEST MERCER WAY AND THE TRUE POINT OF BEGINNING; THENCE SOUTH 89°24'27" EAST 115 FEET; THENCE NORTH 00°35'33" EAST 150 FEET; THENCE NORTH 89°24'27" WEST 107.15 FEET, MORE OR LESS, TO SAID EAST LINE OF WEST MERCER WAY; THENCE SOUTHERLY ALONG SAID LINE 150 FEET, MORE OR LESS, TO THE TRUE POINT OF BEGINNING. SITUATE IN THE COUNTY OF KING, STATE OF WASHINGTON.

BASIS OF BEARINGS

THE CENTERLINE OF WEST MERCER WAY BEARING = NORTH 19°47'48" EAST PER R1.

REFERENCES

- R1. RECORD OF SURVEY, REC. NO. 20121120900002.
- R2. WEST MERCER ESTATES, VOL.104, PG.19, RECORDS OF KING COUNTY, WASHINGTON.

VERTICAL DATUM

NAVD88, PER GPS OBSERVATIONS.

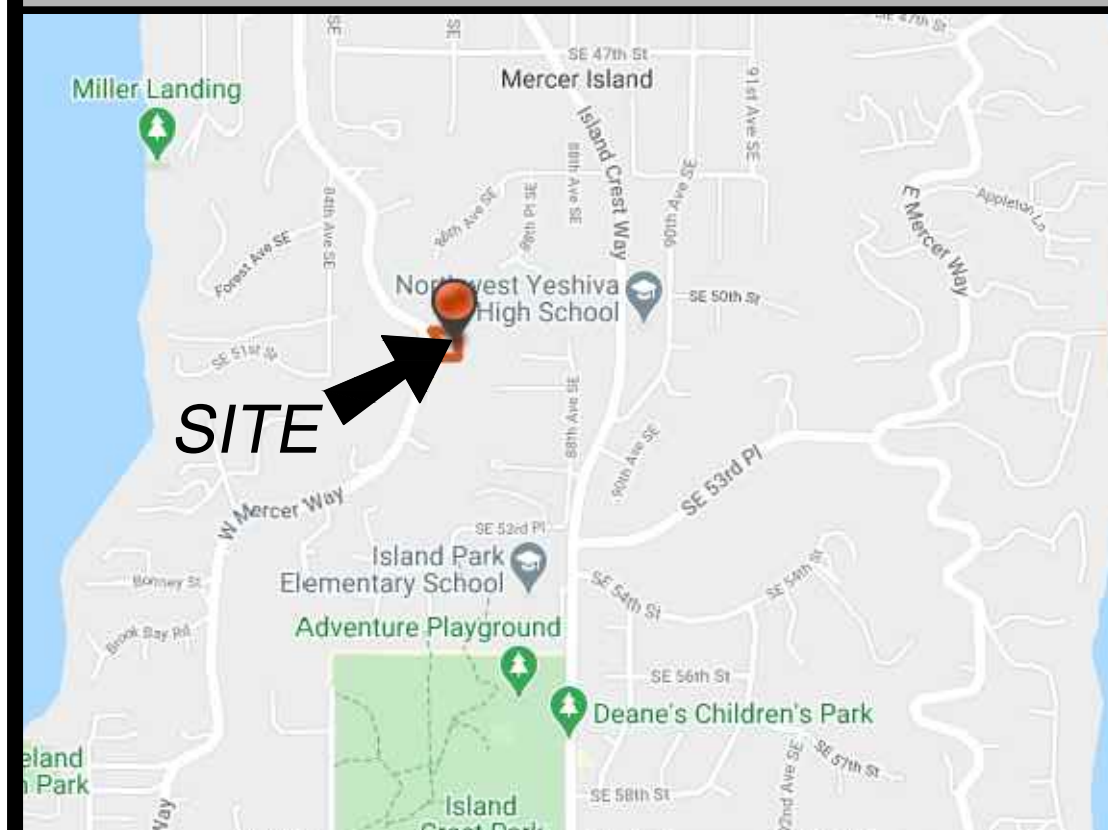
SURVEYOR'S NOTES

1. THE TOPOGRAPHIC SURVEY SHOWN HEREON WAS PERFORMED IN AUGUST OF 2020. THE FIELD DATA WAS COLLECTED AND RECORDED ON MAGNETIC MEDIA THROUGH AN ELECTRONIC THEODOLITE. THE DATA FILE IS ARCHIVED ON DISC OR CD. WRITTEN FIELD NOTES MAY NOT EXIST. CONTOURS ARE SHOWN FOR CONVENIENCE ONLY. DESIGN SHOULD RELY ON SPOT ELEVATIONS.
2. ALL MONUMENTS SHOWN HEREON WERE LOCATED DURING THE COURSE OF THIS SURVEY UNLESS OTHERWISE NOTED.
3. THE TYPES AND LOCATIONS OF ANY UTILITIES SHOWN ON THIS DRAWING ARE BASED ON INFORMATION PROVIDED TO US, BY OTHERS OR GENERAL INFORMATION READILY AVAILABLE IN THE PUBLIC DOMAIN INCLUDING, AS APPLICABLE, IDENTIFYING MARKINGS PLACED BY UTILITY LOCATE SERVICES AND OBSERVED BY TERRANE IN THE FIELD. AS SUCH, THE UTILITY INFORMATION SHOWN ON THESE DRAWINGS ARE FOR INFORMATIONAL PURPOSES ONLY AND SHOULD NOT BE RELIED ON FOR DESIGN OR CONSTRUCTION PURPOSES; TERRANE IS NOT RESPONSIBLE OR LIABLE FOR THE ACCURACY OR COMPLETENESS OF THIS UTILITY INFORMATION. FOR THE ACCURATE LOCATION AND TYPE OF UTILITIES NECESSARY FOR DESIGN AND CONSTRUCTION, PLEASE CONTACT THE SITE OWNER AND THE LOCAL UTILITY LOCATE SERVICE (800-424-5555).
4. SUBJECT PROPERTY TAX PARCEL NO.(S) 1924059244
5. SUBJECT PROPERTY AREA PER THIS SURVEY IS 18,025 S.F. (0.41 ACRES)
6. THE PROPERTY DESCRIBED HEREON IS THE SAME AS THE PROPERTY DESCRIBED IN CHICAGO TITLE INSURANCE COMPANY, CERTIFICATE NO. 0186958-ETU, WITH AN EFFECTIVE DATE OF AUGUST 14, 2020 AND THAT ALL EASEMENTS, COVENANTS AND RESTRICTIONS REFERENCED IN SAID TITLE COMMITMENT OR APPARENT FROM A PHYSICAL INSPECTION OF THE PROPERTY OR OTHERWISE KNOWN TO ME HAVE BEEN PLOTTED HEREON OR OTHERWISE NOTED AS TO THEIR EFFECT ON THE PROPERTY.
7. FIELD DATA FOR THIS SURVEY WAS OBTAINED BY DIRECT FIELD MEASUREMENTS WITH A CALIBRATED ELECTRONIC 5-SECOND TOTAL STATION AND/OR SURVEY GRADE GPS OBSERVATIONS. ALL ANGULAR AND LINEAR RELATIONSHIPS ARE ACCURATE AND MEET THE STANDARDS SET BY WAC 332-130-090.

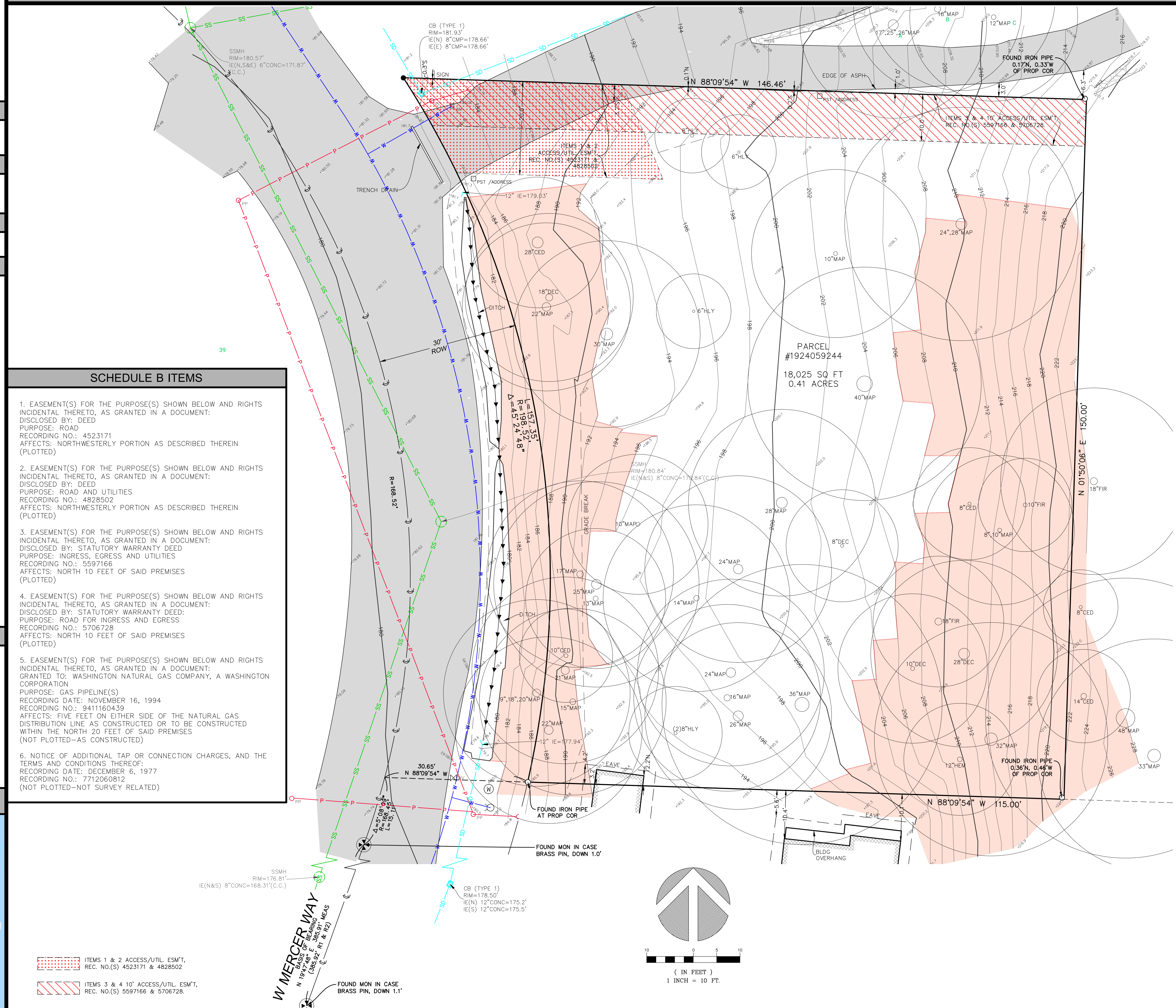
LEGEND

- ASPHALT SURFACE
- BUILDING
- CENTERLINE ROW
- CULVERT PIPE
- DITCH (FLOWLINE)
- FIRE HYDRANT
- GUY ANCHOR
- CATCH BASIN (TYPE 1)
- MONUMENT IN CASE (FOUND)
- PST □ POST
- POWER (OVERHEAD)
- POWER POLE
- IRON PIPE (FOUND)
- REBAR & CAP (SET)
- ROCKERY
- SEWER LINE
- SEWER MANHOLE
- STORM DRAIN LINE
- SIZE TYPE ○ TREE (AS NOTED)
- W (W) WATER MH
- WM □ WATER LINE
- WM □ WATER METER
- WM □ WATER VALVE
- SS (SS) STEEP SLOPE AREA

VICINITY MAP
N.T.S.



TOPOGRAPHIC & BOUNDARY SURVEY



SCHEDULE B ITEMS

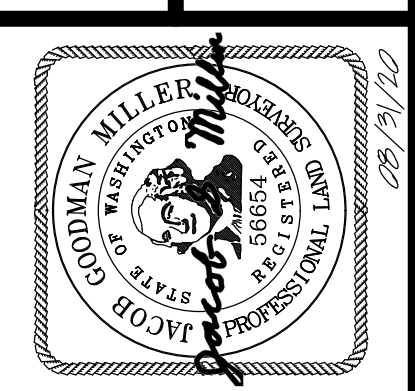
1. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT:
DISCLOSED BY: DEED
PURPOSE: ROAD
RECORDING NO.: 4523171
AFFECTS: NORTHWESTERLY PORTION AS DESCRIBED THEREIN (PLOTTED)
2. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT:
DISCLOSED BY: DEED
PURPOSE: ROAD AND UTILITIES
RECORDING NO.: 4828502
AFFECTS: NORTHWESTERLY PORTION AS DESCRIBED THEREIN (PLOTTED)
3. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT:
DISCLOSED BY: STATUTORY WARRANTY DEED
PURPOSE: INGRESS, EGRESS AND UTILITIES
RECORDING NO.: 5597166
AFFECTS: NORTH 10 FEET OF SAID PREMISES (PLOTTED)
4. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT:
DISCLOSED BY: STATUTORY WARRANTY DEED
PURPOSE: ROAD FOR INGRESS AND EGRESS
RECORDING NO.: 5706728
AFFECTS: NORTH 10 FEET OF SAID PREMISES (PLOTTED)
5. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT:
GRANTED TO: WASHINGTON NATURAL GAS COMPANY, A WASHINGTON CORPORATION
PURPOSE: GAS PIPELINE(S)
RECORDING DATE: NOVEMBER 16, 1994
RECORDING NO.: 941160439
AFFECTS: FIVE FEET ON EITHER SIDE OF THE NATURAL GAS DISTRIBUTION LINE AS CONSTRUCTED OR TO BE CONSTRUCTED WITHIN THE NORTH 20 FEET OF SAID PREMISES (NOT PLOTTED-AS CONSTRUCTED)
6. NOTICE OF ADDITIONAL TAP OR CONNECTION CHARGES, AND THE TERMS AND CONDITIONS THEREOF:
RECORDING DATE: DECEMBER 6, 1977
RECORDING NO.: 7712060812
(NOT PLOTTED-NOT SURVEY RELATED)

- ITEMS 1 & 2 ACCESS/UTIL. ESM'T, REC. NO.(S) 4523171 & 4828502
- ITEMS 3 & 4 10' ACCESS/UTIL. ESM'T, REC. NO.(S) 5597166 & 5706728.

measure success

TOPOGRAPHIC & BOUNDARY SURVEY
NW 1/4 OF NW 1/4 SEC 19, TWP. 24N., RGE 05E., W.M.
PARCEL NO. 1924059244

MORAN RESIDENCE
5000 W MERCER WAY
MERCER ISLAND, WA 98040



Terrane
10801 Main Street, Suite 102, Bellevue, WA 98004
phone 425.458.4498 support@terrane.net
www.terrane.net

JOB NUMBER:	201386
DATE:	08/27/20
DRAFTED BY:	TGC
CHECKED BY:	JGM
SCALE:	1" = 10'
REVISION HISTORY	
08/31/20	STEEP SLOPE AREA
SHEET NUMBER	
1 OF 1	

APPENDIX C

Landslide Hazard Area Buffer and Proposed Development

October 1, 2021 (Civil Engineering Plan Set Sheet C-03) – JMJ Team

