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

June 9, 2020 G-4638

Mr. Farzad Ghazvinian
7683 SE 27th St, #178
Mercer Island, WA 98040

Subject: ADDENDUM LETTER 5 – RESPONSE TO PLAN REVIEW COMMENTS
PROPOSED DEVELOPMENT – LOWER BUILDING
4270 EAST MERCER WAY
MERCER ISLAND, WA

Ref: See end of letter

Dear Mr. Ghazvinian:

You have requested that we review the City of Mercer Island plan review comments for the lower building permit and provide responses related to the proposed development at the subject site. In order to complete this work we have reviewed our previous referenced reports for the site, attended a phone conference with the project team, reviewed the submitted plans, performed slope stability analyses, performed calculations and prepared the following letter.

The following letter has been prepared in order to provide further clarification regarding the referenced report and earlier addendums. This letter shall serve as an Addendum to the referenced report.

The plan review comments were provided via notes on a shared pdf of the submitted plan set. Therefore comments are associated with selected sheets of the plan set. We have reproduced the geotechnically related reviewer's comments below along with our response to each comment:

Page 1 - Comment #2:

The Geotechnical Engineer is required to provide a written statement that the project documents have been reviewed for conformance to the geotechnical recommendations.

Page 1 – Comment #2 – GGNW Response:

Due to number and scope of the comments and potential plan revisions GEO Group Northwest will perform plan review and issue such as statement following the plan revisions. A separate letter will be issued.

Page 1 – Comment #5:

Discuss sequence of proposed demolition of existing structure. What will be final grades in this area? Will all existing subgrade walls be removed? How will the existing storm drainage utility be protected during removal of these elements? Or will the utility be rerouted by then?

Page 1 – Comment #5 – GGNW Response:

A phone conference was held with the project team on May 11, 2020. Based upon that conversation and subsequent phone discussions with the project team GEO Group Northwest understands that the following construction sequence is proposed:

1. The existing stormwater sewer will be temporarily routed around the lower building pad construction area;

2. Demolish existing building and excavate temporary excavation slopes;

3. Placement of a portion of building pad rock improvement;

4. Installation of piling for the lower building;

5. Install detention piping and control structure. Backfill detention piping and control structure;

6. Complete building pad rock improvement;

7. Construct building, restrain walls and then backfill the building pad excavation;

8. Install the stormwater sewer utility at the permanent location and complete final grading.

We understand that all existing subgrade walls will be removed. The designer may have additional information and/or response regarding the final grading.

Page 2 – Comment #1:

MICC 19.02.020(J) requires new buildings to be located within building pads established pursuant to MICC 19.09.090. MICC 19.09.090 (A)(1) requires that building pads be located to minimize or prevent impacts as indicated in the following:

a. Removal of trees and vegetation required for retention pursuant to Chapter 19.10 MICC shall be prevented.

b. Disturbance of the existing, natural topography as a result of anticipated development within the building pad shall be minimized.

c. Impacts to critical area buffers shall be minimized, consistent with the provisions of Chapter 19.07 MICC.

d. Access to the building pad shall be consistent with the standards contained in MICC 19.09.040.

Please demonstrate that the building pad addresses tree retention and the minimization of impacts to critical areas.

Page 2 – Comment #1 – GGNW Response:

We are prepared to address the question regarding impacts to critical areas.

The lower building pad has been situated roughly at the existing development location at a mostly level bench. Therefore, it is the opinion of GEO Group Northwest that potential impacts to geologically related critical areas and their buffers is minimized.

Page 10 – Comment #1:

Geotechnical engineer did not provide recommendations for shallow foundations at this structure. Geotechnical engineer to provide recommendations for these foundations or revise structural design to conform with current geotechnical recommendations.

Page 10 – Comment #1 – GGNW Response:

For this call-out on page 10 we recommend designing the pile supported foundations per our previous recommendations.

Page 11 – Comment #5:

Geotechnical engineer shall address whether the soil coefficient of friction is appropriate for a pile supported structure.

Page 11 – Comment #5 – GGNW Response:

In our referenced Addendum Letter from November 4, 2019 we recommend that the building pad is improved by over-excavating and placing a 3-foot thickness of clean crushed rock below the bottom of the building slab elevation (with filter fabric at the base). The building pad improvement should extend at least 3-feet horizontally beyond the perimeter of the concrete grade beams. Accordingly, the proposed concrete grade beams will be constructed on top of the crushed rock and will have crushed rock placed against the sides of these beams. Please also recall that our previous report and addenda with slope stability analyses conclude that the site is stable with a factor of safety equal to 1.5. Therefore, it is our opinion that the recommended coefficient of friction of 0.35 is appropriate for the slabs and concrete grade beams which are in contact with the crushed rock building pad improvement.

Page 13 – Comment #2:

Geotechnical engineer shall confirm passive pressure has been adjusted to reflect minimum factor of safety.

Page 13 – Comment #2 – GGNW Response:

As noted above the building pad crushed rock improvement should be modified as necessary to extend 3-feet horizontally beyond the perimeter of the concrete grade beams. We understand that the depth of concrete grade beams is 1-foot. Therefore, the ground improvement beyond the building footprint extends three times the footing depth. It is the opinion of GEO Group Northwest that this zone of well-interlocked clean crushed rock at the sides of the grade beams shall be capable of providing an allowable passive pressure equal to 350 pcf (equivalent fluid weight). Please note that this value has a minimum factor of safety equal to 2.

Page 15 – Comment #2:

Include pile size and capacity used in the design of the foundations.

Geotechnical engineer to provide supporting calculations for pile capacity.
Include Factor of Safety in determining the allowable pile capacities.

Page 15 – Comment #2 – GGNW Response:

We recommend that the designer revise the plans as necessary to clarify the pile size and capacity.

Please see the attached **Plate A – Pile Calculation Detail** and **Plate B – Pile Calculation** which illustrate the pile calculations performed by GEO Group Northwest. Note that the factor of safety used for pile capacity is 3.0.

Page 16 – Comment #7:

Provide slope stability analyses of this temporary cut with the existing slope above it. Include condition of 3 foot overexcavation below the slab in the slope stability section.

Page 16 – Comment #7 – GGNW Response:

The temporary cut in question is the proposed building basement excavation at the uphill side of the excavation. The designer provided a revised temporary excavation plan as shown on the attached **Plate C – Lower Bldg Temp Excavation** which we used to develop our cross-section C – C' as shown on the attached **Plate D – Cross-Section C – C'**. The designer's temporary excavation plan includes the 3-feet of over-excavation. GEO Group Northwest has performed slope stability analysis for the cross-section C – C' and the output of that analysis is attached as **Plate E – Slope Stability Output C – C'**. Results from the slope stability analysis indicate that

the temporary excavation slope is sufficiently stable for a temporary construction related excavation having a factor of safety equal to 1.3.

The existing steep slope located above the building pad excavation has an approximate inclination of around 66 percent (max 72 percent) which is less steep than the temporary excavation slopes but consisting of the same or similar soil conditions as those at the 1H:1V temporary excavation. Therefore, the stability factor of safety at the slope above the temporary excavation is higher than the 1.3 value. We previously analyzed the existing slope above the temporary excavation using the cross-section A – A' and discussed in our original geotechnical report, July 13, 2018. The factor of safety with regard to sliding reported for the A – A' cross section is 1.5 (static), which is stable.

Page 17 – Comment #3:

Geotechnical engineer to assess potential impact of new storm installation on existing slope stability. Provide section and stability analyses to support conclusions.

Page 17 – Comment #3 – GGNW Response:

GEO Group Northwest has reviewed the plans by Civil Engineering Solutions which illustrate the installation of a new stormwater utility at the lower building lot, including the sheet C2.0 (2/26/20 & 5/25/20). Based upon that information we understand that a new 12-inch diameter HDPE storm drain pipe is to be installed from the new Type 1 CB with beehive grate to the existing sewer at the SE 42nd Place right-of-way. At the lower building lot this new drain piping will traverse down a slope having inclinations of up to 38 percent from the horizontal. The slope inclination along the trench profile itself will be max 28 percent from the horizontal. Based upon the plans we understand that most of the piping within this trench will be around 3-feet deep. For the purpose of our analysis we have assumed that maximum depth for the new piping will be 3.5-feet.

In our referenced Addendum Letter from Oct. 18, 2019 we provided recommendations for the design and construction for the new stormwater piping traversing the site slopes. One of those recommendations was that trench backfill at slopes which are steeper than 25% consist of clean crushed rock fills. The excavation for temporary excavation slopes for the stormwater utility trench may be performed in accordance with the temporary excavation recommendations in our geotechnical report. In the Addendum Letter (10-18-2019) we also noted that shoring may be used as necessary to maintain trench safety during the period in which the trench is excavated. This shoring may consist of a trench box.

GEO Group Northwest has previously provided slope stability analyses which demonstrate that the existing site slopes have stability equal to or exceeding a factor of safety equal to 1.5. Please see our geotechnical report.

For the proposed 12-inch diameter stormwater installation at the lower building lot we have performed slope stability analysis along the trench profile illustrated on the CES plan sheet C2.0. The output of our stability analyses for this profile is shown on the attached **Plate F – Storm**

Trench – Stability. Stability analysis indicates that the backfilled trench is stable having a factor of safety equal to 2.5.

Page 17 – Comment #4:

Geotechnical engineer to provide design and construction recommendations for utility construction across the slope.

Page 17 – Comment #4 – GGNW Response:

In our referenced Addendum Letter from Oct. 18, 2019 we provided recommendations for the design and construction for the new stormwater piping traversing the site slopes.

Page 19 – Comment #12:

The project team should provide construction sequence given that the proposed retaining wall with pile foundation is located 5 feet from a 5 to 7-foot deep excavation.

Page 19 – Comment #12 – GGNW Response:

Based upon our review of the plans it appears that a 1H:1V temporary excavation slope cannot be maintained between the bottom of the proposed retaining wall and the bottom of the anticipated detention tank excavation. Therefore, we recommend that the detention tank is installed prior to the construction of the retaining wall.

Page 19 – Comment #13:

The geotechnical engineer should provide temporary excavation recommendations given the depth of the excavation adjacent to the slope.

Page 19 – Comment #13 – GGNW Response:

GEO Group Northwest has provided temporary excavation recommendations in our referenced geotechnical report (7/13/18). Temporary excavation slopes should be sloped no steeper than 1H:1V in the loose overlying soils absent seepage conditions. If seepage is encountered then these slopes should have inclinations of no steeper than 2H:1V and GEO Group Northwest should be contacted to evaluate.

This particular comment on Sheet C2.0 appears directed at the area near the catchbasin at the edge of the new driveway (catchbasin number 31). At the catchbasin location it appears that the existing elevation is around 73.5', the proposed catchbasin rim elevation appears to be around 74.5' and the existing slope in the area is around 38 percent from the horizontal. Based upon discussions with the designer we understand that the excavation for this particular catchbasin will likely be around 4-feet deep. It appears feasible to grade 1H:1V slopes for the catchbasin excavation.

We appreciate the opportunity to provide geotechnical consulting regarding the proposed development. Please contact us if there are any questions or concerns.

Sincerely,
GEO GROUP NORTHWEST, INC.

Adam Gaston
Project Engineer

William Chang, P.E.
Principal

Attached: Plate A – Pile Calculation Detail
Plate B – Pile Calculation
Plate C – Lower Bldg Temp Excavation
Plate D – Cross-Section C – C'
Plate E – Stability Output C – C'
Plate F – Storm Trench - Stability

REFERENCES

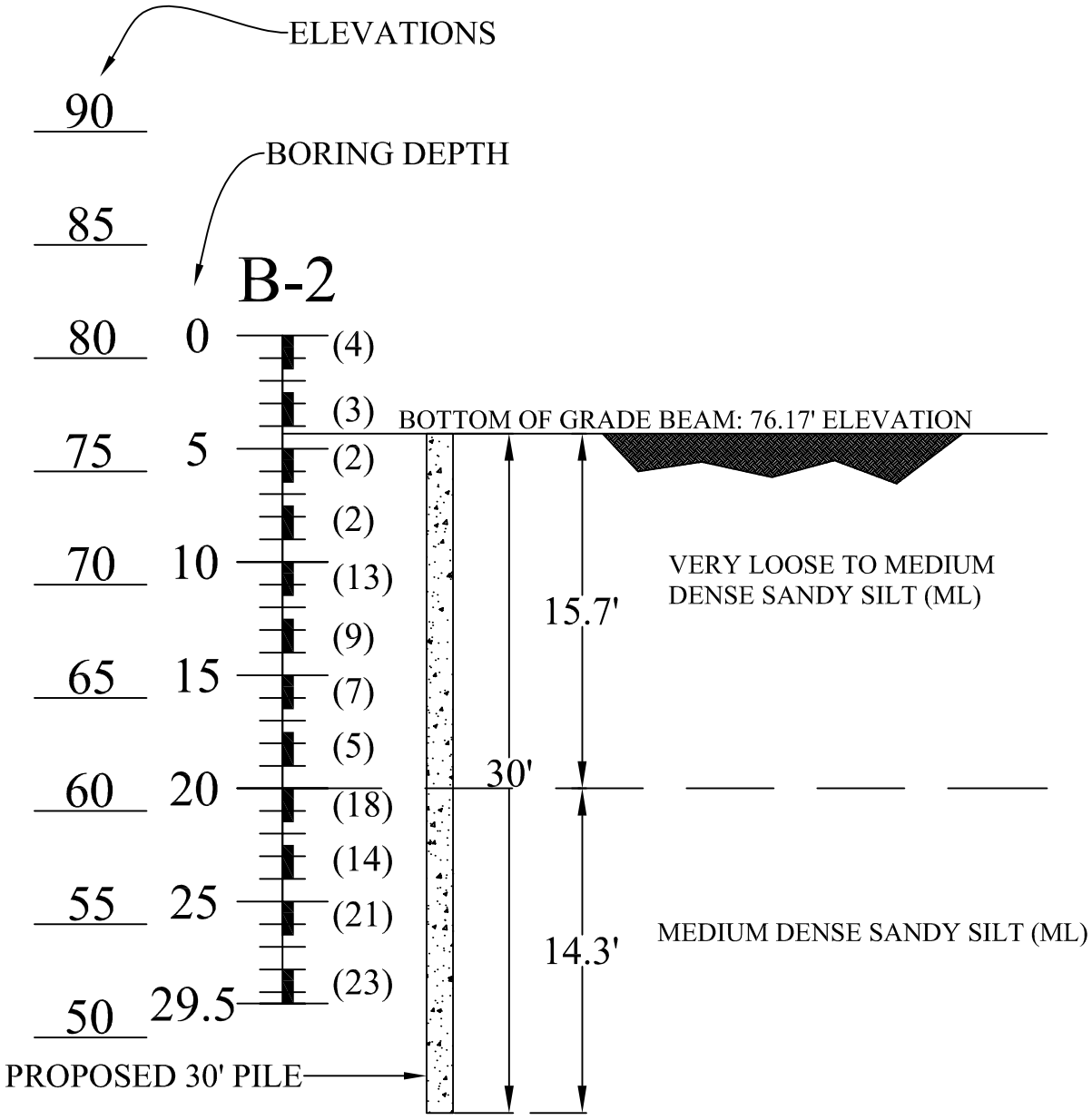
"Addendum Letter #4, Lower Building Development, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, Nov. 4, 2019.

"Addendum Letter – Response to Sept. 4, 2019 Review, Proposed Development, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, Oct. 18, 2019.

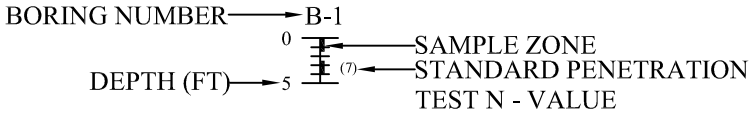
"Addendum Letter – Response to 3rd Party Review, Proposed Development, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, Aug. 16, 2019.

"Addendum Letter, Proposed Development, 4270 East Mercer Way, Mercer Island, WA", GEO Group Northwest, December 27, 2018.

"Geotechnical Report, Proposed Development, 4270 East Mercer Way, Mercer Island, Washington", GEO Group Northwest, July 13, 2018.



LEGEND



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PILE CALCULATION DETAIL

LOWER BUILDING PAD
4270 E. MERCER WAY
MERCER ISLAND, WASHINGTON

SCALE: NTS	DATE: 6-3-20	MADE: AG	JOB NO.: G-4638	PLATE: A

Group Northwest, Inc.
13705 Bel-Red Rd. Bellevue, WA 98005
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SCALE: NTS | DATE: 6-3-20 | MADE: AG | JOB NO.: G-4638 | PLATE: B

PILE CALCULATION

LOWER BUILDING PAD
4270 E. MERCER WAY
MERCER ISLAND, WASHINGTON

G-4638

4270 E Mercer Way Lower Bldg

PILE EMBEDMENT = 10 Feet

TOTAL PILE LENGTH = 30 Feet (min)

Qskin = Pi * Pile Diameter * Embedment * ((Gamma * X) + (Gamma - 62.4) * Y) * Tan Ø

Q skin	Pile Diameter	Depth of Embedment*	Soil Moist Density (pcf)	Pile length mid-point above water	Pile length mid-point below water	Sigma'1	Angle of Friction			Qskin
	D (ft)	L1	Gamma	X	Y		Ø	Tan Ø		
14" Pile:	1.17	**14**	**120**	**22.9**	**0.0**	2742.00	**34**	0.675		**96937**
16" Pile:	1.33	14	120	22.9	0.0	2742.00	34	0.675		**110785**
18" Pile:	1.50	14	120	22.9	0.0	2742.00	34	0.675		**124633**
24" Pile:	2.00	14	120	22.9	0.0	2742.00	34	0.675		**166177**

Qend = Nq * ((Gamma * L2) + (Gamma - 62.4) * L3) * Pile End Area

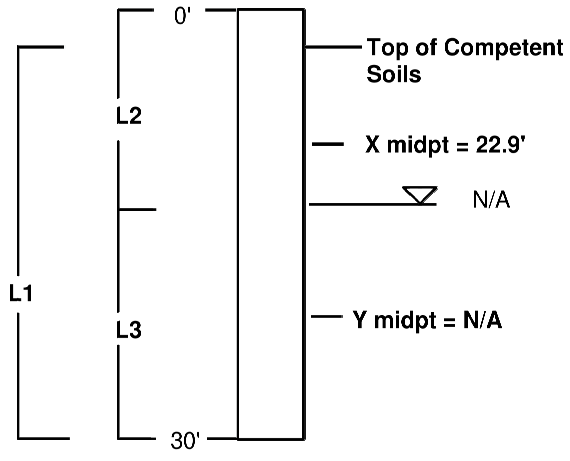
Q end	Pile Diameter	From Table	Pile	Dry Pile Length	Wet Pile Length	Sigma'2	Pile End Area	Cnc		Q end
	D (ft)	Nq	Dia (ft)	L2	L3		Pi D^2/4 (ft)			
14" Pile:	1.17	**70**	1.17	**30.0**	**0.0**	3600	1.069			**269392**
16" Pile:	1.33	70	1.33	30.0	0.0	3600	1.396			**351858**
18" Pile:	1.50	70	1.50	30.0	0.0	3600	1.767			**445321**
24" Pile:	2.00	70	2.00	30.0	0.0	3600	3.142			**791681**

Q ult	Q skin	+	Qend	=	Q ult
14" Pile:	96937		269392		**366328**
16" Pile:	110785		351858		**462643**
18" Pile:	124633		445321		**569953**
24" Pile:	166177		791681		**957858**

Q allow	Q ult		Q allow (Tons) SF=2		Q allow (Tons) SF=3
14" Pile:	366328		**91.6**		61.1
16" Pile:	462643		**115.7**		77.1
18" Pile:	569953		**142.5**		95.0
24" Pile:	957858		**239.5**		159.6

NOTE: * Embedment is into the competent underlying med. dense to dene soils.

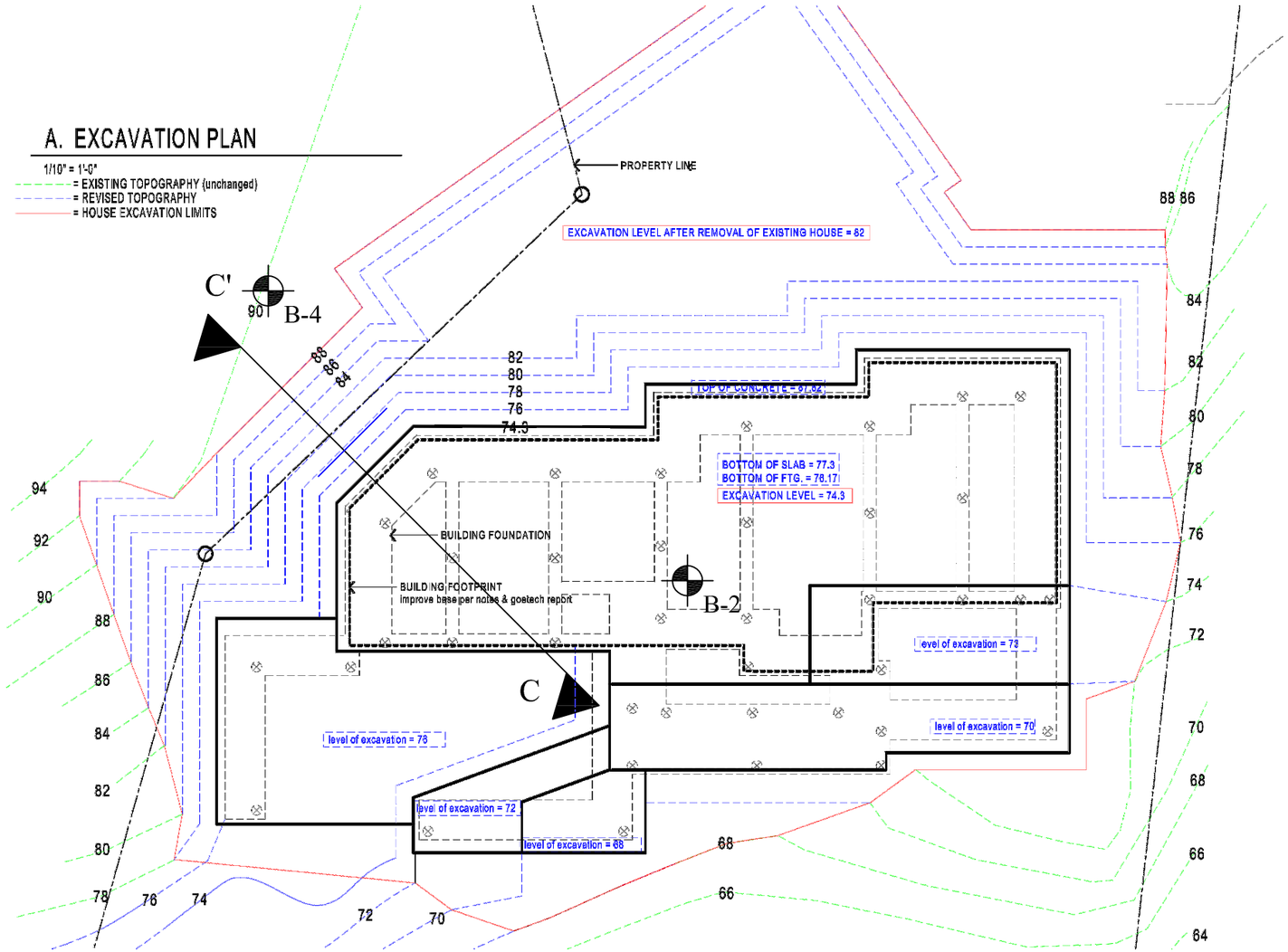
Pile Cap Elev. = 76.17'



A. EXCAVATION PLAN

1/10" = 1'-0"

= EXISTING TOPOGRAPHY (unchanged)
= REVISED TOPOGRAPHY
= HOUSE EXCAVATION LIMITS



BASED UPON THE LATEST UNDATED EXCAVATION PLAN BY CENTERLINE DESIGN, RECEIVED IN EMAIL 5-7-20.

LEGEND

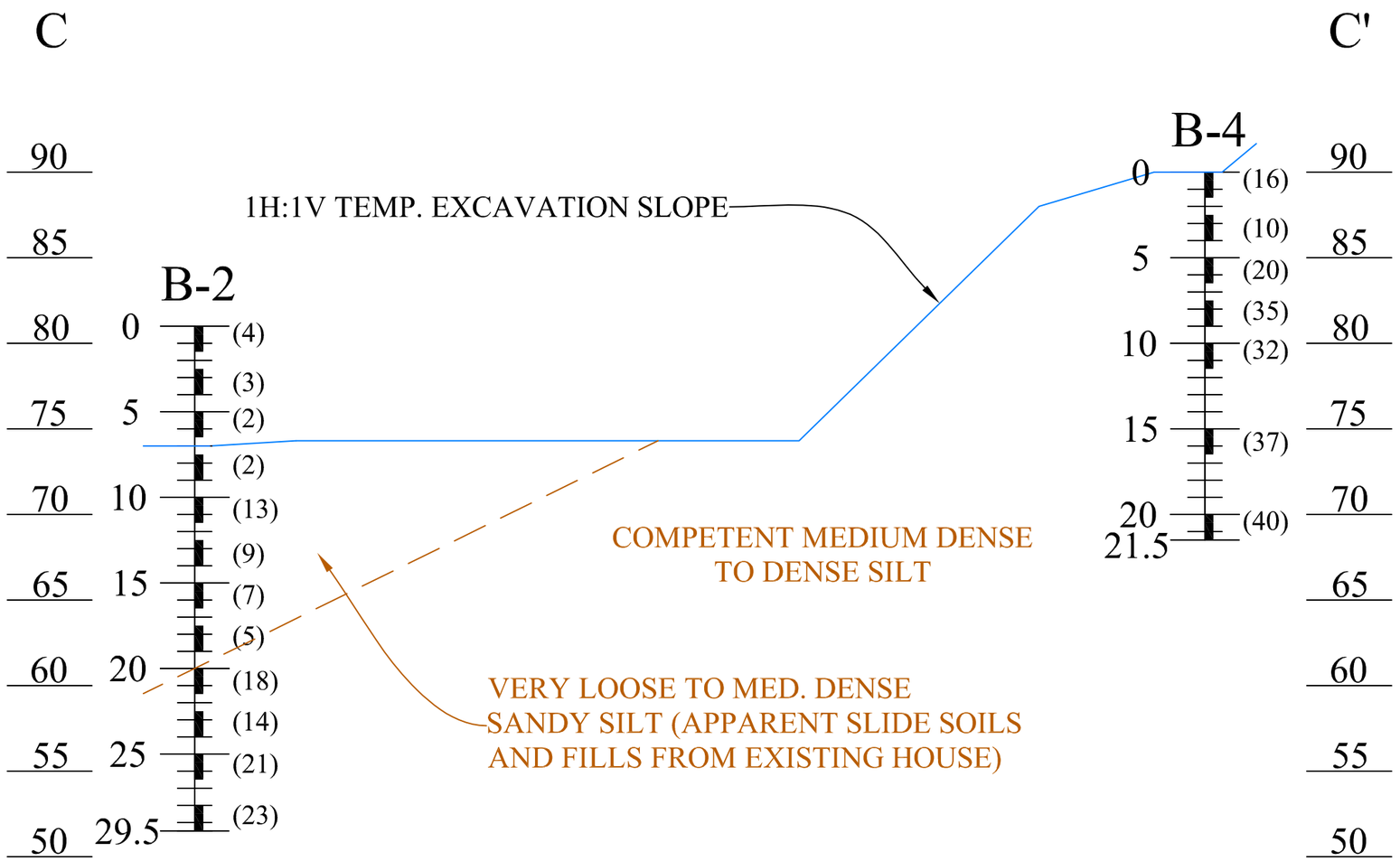
B-1 = BORING NUMBER AND APPROXIMATE LOCATION

GEO Group Northwest, Inc.
13705 Bel-Red Rd, Bellevue, WA 98005
Phone 425/649-8757 FAX 425/649-8758
Email info@geogroupnw.com

LOWER BLDG TEMP EXCAVATION
PROPOSED DEVELOPMENT
4270 E. MERCER WAY
MERCER ISLAND, WASHINGTON

PROJECT #:	G-4638
DATE:	6-8-20
DRAWN:	AG
CHECKED:	WC
SCALE:	~ 1" = 16'

PLATE: C



LEGEND

BORING NUMBER → B-1

DEPTH (FT) → 0 / 5

(7) → SAMPLE ZONE
STANDARD PENETRATION
TEST N - VALUE

Group Northwest, Inc.
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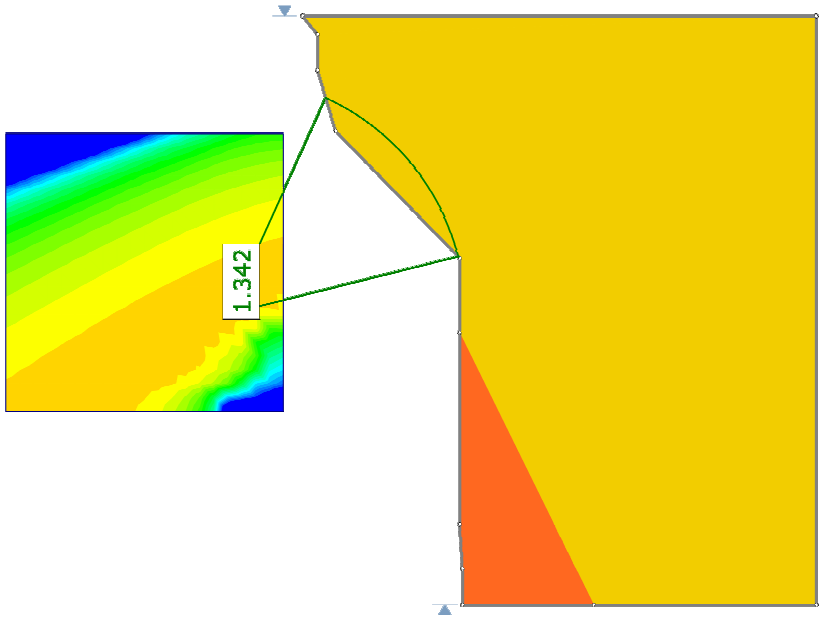
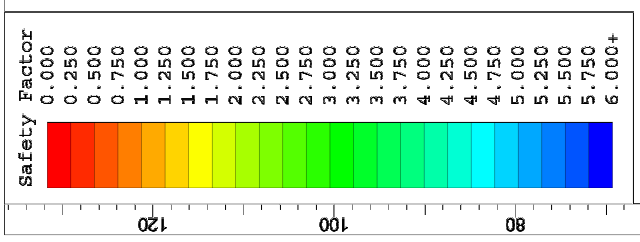
CROSS-SECTION C - C'
LOWER BUILDING PAD
4270 E. MERCER WAY
MERCER ISLAND, WASHINGTON

PROJECT #:	G-4638
DATE:	6-8-20
DRAWN:	AG
CHECKED:	WC
SCALE:	1" = 8'

PLATE: D

Property			v. loose to med dense sandy SILT-2
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	125	125	125
Cohesion [psf]	85	85	85
Friction Angle [deg]	34	27	27
Water Surface	None	None	None
Ru Value	0	0	0





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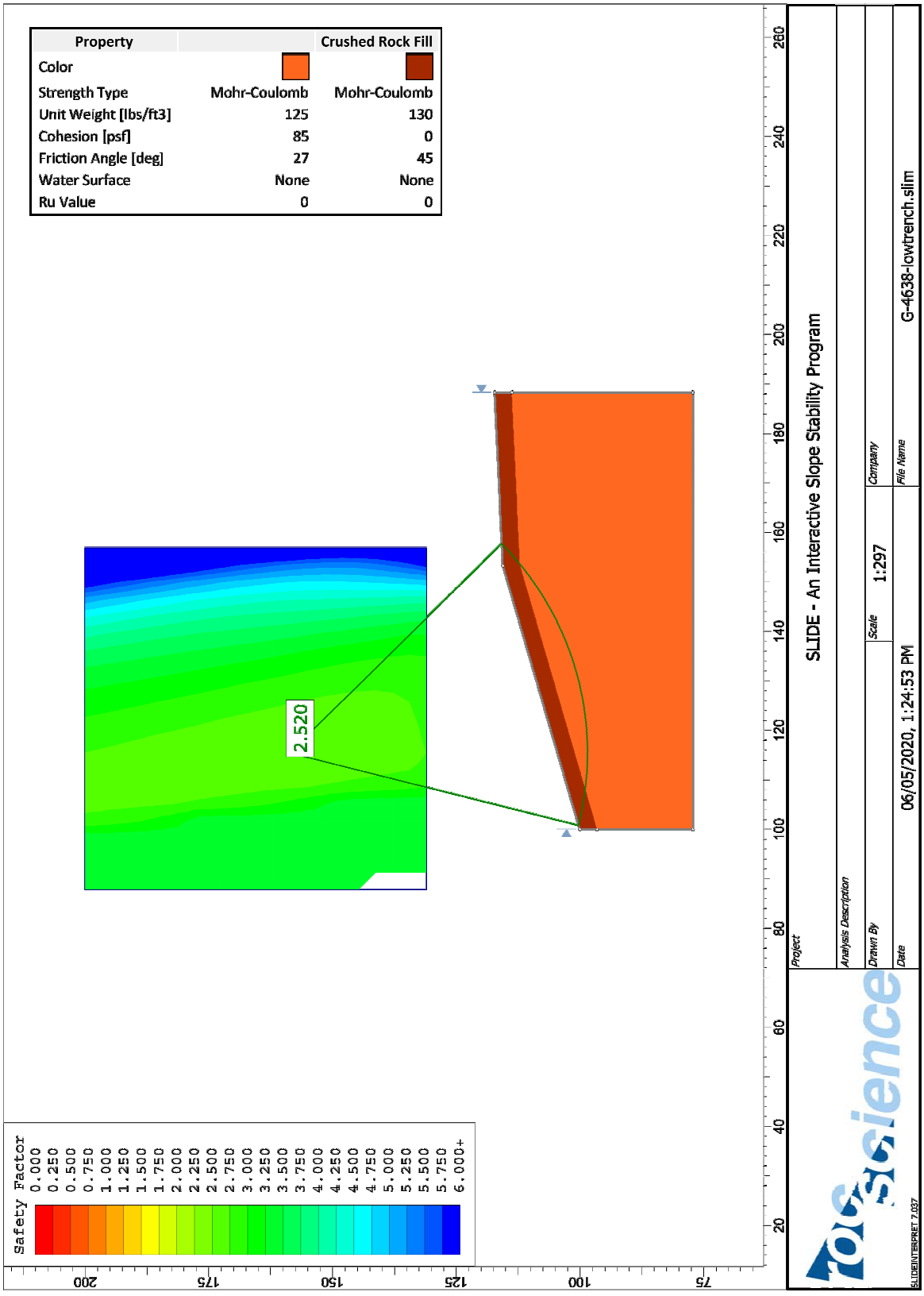
STABILITY OUTPUT C - C'

4270 E. MERCER WAY
MERCER ISLAND, WASHINGTON

SCALE: NTS	DATE: 6-8-20	MADE: AG	JOB NO.: G-4638	PLATE: E



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STORM TRENCH - STABILITY

4270 E. MERCER WAY
MERCER ISLAND, WASHINGTON

SCALE: NTS	DATE: 6-8-20	MADE: AG	JOB NO.: G-4638	PLATE: F