INSIGHT GEOLOGIC, INC.

September 4, 2018

Chul Kim
454 Southwest 297th Street
Federal Way, Washington 98023

Report
Steep Slope Evaluation
Sunrise Hills Development
Sapp Road SW
Parcel No. 12827330000
Tumwater, Washington
Project No. 843-001-01

INTRODUCTION

Insight Geologic is pleased to provide our report regarding our evaluation of the steep slopes for the proposed Sunrise Hills Development to be located on the property identified as Thurston County Tax Parcel No. 12827330000 in Tumwater, Washington. The location of the site is shown relative to surrounding physical features in the Vicinity Map, Figure 1. The property is approximately 11 acres and contains areas that appear to meet the definition of Landslide Hazard Areas under Tumwater's Critical Areas Ordinance for Geologically Hazardous Areas. A site plan is shown in Figure 2.

SCOPE OF SERVICES

The purpose of our services was to evaluate site conditions as they relate to slope stability on the subject property in the area of the proposed development. We proposed to perform our evaluation in general accordance with the procedures outlined in Tumwater's Ordinance for Geologically Hazardous Areas. The specific tasks performed were:

1. Evaluated critical slopes on the property relative to the potential for landslide hazard in conformance with the City of Tumwater's Ordinance for Geologically Hazardous Areas, Chapter 16.20.
2. Reviewed pertinent and readily available information, including previously generated reports regarding the site geology and hydrogeology, as well as mapped landslides in the area.
3. Provided for the location of subsurface utilities on the property. We conducted this task by notifying the "One Call" utility notification system.
4. Excavated eight (8) exploratory test pits on the site using a small, track-mounted excavator. The test pits were excavated to depths of approximately 8 feet below ground surface, or to bedrock, whichever was encountered first.

5. Logged the soils encountered in the test pits in general accordance with the Unified Soil Classification System (ASTM D2487). Detailed logs of the test pits were completed in the field.
6. Collected representative soil samples from the test pits, as appropriate, for laboratory analyses.
7. Prepared a steep slope evaluation report for review by the City of Tumwater summarizing our activities and presenting our opinion on slope stability at the subject site.

REGULATORY DEFINITION

According to the City of Tumwater Critical Areas Ordinance (CAO), "Landslide Hazard Areas" means those areas which are potentially subject to risk of landslide due to a combination of geologic, topographic, and/or hydrologic factors; and where the vertical height is 10 feet or more.

The following areas, at a minimum, are considered to be subject to landslide hazards:

1. Areas of historic failures such as:
    a. Those areas delineated by the U.S. Department of Agriculture's Natural Resources Conservation Service as having "severe" limitation for building site development;
    b. Those areas mapped by the Department of Ecology (Coastal Zone Atlas) or the Department of Natural Resources (slope stability mapping) as unstable ("U" or class 3), unstable old slides ("UOS" or class 4), or unstable recent slides ("URS" or class 5);
    c. Areas designated as quaternary slump, earthflows, mudflows, lahars, or landslides on maps published by the U.S. Geological Survey or Department of Natural Resources.

2. Areas with all three of the following characteristics:
    a. Slopes steeper than fifteen percent; and
    b. Hillsides that have intersecting geologic contact with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock; and
    c. Springs or ground water seepage.

3. Areas that have shown movement during the Holocene epoch (from ten thousand years ago to present) or that are underlain or covered by mass wastage debris of that epoch.

4. Slopes that are parallel or sub parallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials.

5. Slopes having gradients steeper than eighty percent subject to rock fall during seismic shaking.

6. Areas potentially unstable because of rapid stream incision, stream bank erosion, and undercutting by wave action.

7. Areas located in a canyon or on an active alluvial fan, presently or potentially subject to inundation by debris flows or catastrophic flooding.

8. Any area with a slope of forty percent or steeper and with a vertical relief of ten or more feet, except areas composed of consolidated rock. A slope is delineated by establishing its toe and top and measured by averaging the inclination over at least ten feet of vertical relief.

FINDINGS

Area Geology

We reviewed the Washington State Department of Natural Resources (DNR) Interactive Geologic Map (https://geologyportal.dnr.wa.gov/) to evaluate the geology of the area and landslide potential. Based on our review, the site appears to be predominantly underlain by Vashon age glacial till deposits. The glacial till consists of an unsorted mixture of silt, sands, and gravels that was deposited at the base of the advancing glacier and was subsequently glacially compacted. Deposits of Eocene age basalts of the Crescent Formation are exposed on limited portions of the hillslopes and underlie soils at the site. The southern portion of the site, north of Sapp Road SW is identified as Vashon age glacial recessional outwash deposits. This material is described as recessional sands with minor fines and was deposited in stream channels and along the margins of glacially-formed lakes during the waning stages of the most recent glacial period in the Puget Sound area. These deposits are not glacially consolidated.

No landslide activity has been identified near the project site based on our review of DNR maps showing landslide inventories.

Soil beneath the site is classified as Everett very gravelly sandy loam, Indianola loamy sand and Schneider very gravelly loam, based on the 1986 Soil Conservation Service (SCS) Soil Survey for the Thurston County Area. The Everett and Indianola soils are generally deep, somewhat excessively drained soil formed along terraces and glacial outwash plains. The Schneider soils are generally deep well drained soils formed in colluvium derived from basalt.

Site Reconnaissance

We visited the subject site to evaluate the slopes on the property with regard to current and historical slope stability. The property consists of an undeveloped and wooded south facing slope of Tumwater Hill. The property is roughly rectangular in shape with an extension connecting to Sapp Road SW on the south edge of the property. The property is also accessed by Woodland Drive SW from the north. The parcel encompasses a shallow drainage that drains to the central portion of the site and discharged to the southwest and slopes from an elevation of 325 feet above mean sea level (MSL) along the east parcel boundary, to an elevation of 168 feet MSL near Sapp Road SW. A gravel road accesses the central portion of the property from Sapp Road SW. Three steep slopes were identified as having inclinations greater than 40 percent based on an elevation survey performed by Contour Engineering and provided by the client. The slopes are identified as Steep Slope A, B and C on the site plan. The majority of the remainder of the site has moderate slopes that descend to the south. Two limited areas with slopes less than 15 percent exist along the northeast and south edges of the site. A topographic map with identified steep slopes is shown on the Site Plan, Figure 2.

The proposed development area consists of all but an open tract area on the east portion of the site and a proposed stormwater infiltration pond near the south edge of the site. The southern and northern portions of the site will be accessed by roadways off of Sapp Road SW and Woodland Drive SW, respectively.

We did not observe indications of current or past large-scale slope failure on the property, such as slump blocks, back-tilted slopes, or ponded water on the slope. Geologic contacts with the underlying bedrock were observed in isolated areas along the steepest portions of the site, however no groundwater seeps were observed in these areas.

Subsurface Exploration

We excavated eight test pits in the locations as shown on the Site Plan, Figure 2. The test pits were excavated using a track-mounted excavator owned and operated by Insight Geologic. A geologist from Insight Geologic maintained a log of the conditions encountered. The test pits were generally completed to a depth of between 3 and 6 feet below ground surface (bgs) and were terminated upon reaching the underlying basalt. The test pits were completed along the steep slopes and northern portion of the site. The soils were visually classified in general accordance with the system described in ASTM D2487-06. The exploration logs are contained in Attachment A.

Soil Conditions

Soil conditions encountered in the test pits were highly variable across the site. Approximately 1 foot of organic forest duff was encountered in each of the test pits. Underlying the duff in test pits TP-1 and TP-2, we encountered 2 feet of brown fine to coarse sand with gravel and silt (SP-SM) in a loose and dry condition, overlying 2 to 3 feet of similar material in a very dense and dry condition. Underlying the granular soils at a depth of 5 feet bgs, we encountered weathered basalt in TP-2. Test pit TP-3 consisted of 2 feet of gravel with sand (GP) in a medium dense and dry condition between the duff and basalt. Test pits TP-4 and TP-5 consisted of 2 to 3 feet of silt (ML) with varying levels of gravel in a soft to medium stiff and dry to moist condition between the duff and weathered basalt. Test pits TP-6 and TP-8 consisted of 1 foot of forest duff directly in contact with the underlying weathered basalt. Test pit TP-7 consisted of 3 feet of silty sand with gravel (SM) in a loose and dry condition, overlying 2 feet of sand with gravel (SP) in a very dense and dry condition, before encountering the underlying weathered basalt. The granular soils in a very dense condition encountered at the site were consistent with a thin glacial till horizon.

Groundwater

Groundwater was not encountered in any of the test pits performed by Insight Geologic in August, due to the relatively dry summer. Test pits performed by Bradley Noble in early 2004 encountered significant groundwater in the mid-portion of the site along the existing roadway. In addition, the weathered basalt encountered at the site is moderately fractured which would provide conduits for groundwater flow. It has been our experience on other sites in the basalts that the fractures can be sources for significant quantities of groundwater flow during the winter months. Collection and diversion of the groundwater on individual lots will be required.

OPINION AND RECOMENDATIONS

The property includes three slopes that are designated as Landslide Hazard Areas due to inclinations greater than 40 percent. The three slopes range from approximately 40 to 65 feet in overall height. Cross sections of the landslide hazard areas are presented in Figure 3-A and 3-B. No indications of recent slope failure were observed on the steep slopes at the site. We did not observe ponded water or seeps on the slope. Fir trees do not exhibit evidence of curvature or "pistol butt" growth that would indicate minor shallow soil creep along the slope.

The probability of deep seated failure along these slopes is low. The slopes consist of a thin and poorly developed soil less than 6 feet in thickness over weathered basalts. The anticipated failure mechanism would be sloughing of shallow soil as a fluidized debris flow during a period of intense rain, which is a typical failure mechanism on slopes underlain by till and shallow bedrock.

Based on the City of Tumwater CAO, the required prescriptive buffer for the property would be a 50-foot setback from the edges of the Landslide Hazard Area. However, based on our evaluation and understanding of the project, it is our opinion that the slopes are stable in their current condition and construction activities are unlikely to negatively impact on-site or off-site conditions. Therefore, it is our opinion that the landslide hazard buffer may be reduced to 10 feet from the top and sides of the slopes provided foundations bear on the underlying bedrock.

Based on the anticipated shallow soil failure mechanism, we recommend a landslide hazard buffer of 20 feet from the toe of the slope. It would be possible to further reduce the buffer at the toe of the slope with the use of a properly engineered catchment wall to capture or divert debris flows which may occur on the steep slopes. A qualified professional engineer should be consulted for the design of such catchment walls. We should be contacted during the design phase to review retaining wall plans and provide supplemental recommendations, if needed.

DOCUMENT REVIEW AND CONSTRUCTION OBSERVATION

We recommend that we be retained to review the portions of the plans and specifications that pertain to earthwork construction. We recommend that monitoring, testing and consultation be performed during construction to confirm that the conditions encountered are consistent with our explorations and our stated design assumptions. Insight Geologic would be pleased to provide these services upon request.

LIMITATIONS

We have prepared this steep slope evaluation for the exclusive use of Chul Kim and his authorized agents for the Sunrise Hills Development located on Thurston County Tax Parcel No. 12827330000 at Sapp Road SW in Tumwater, Washington.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, expressed or implied, should be understood.

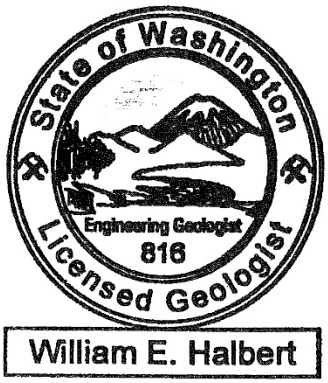
Please refer to Attachment B titled “Report Limitations and Guidelines for Use” for additional information pertaining to use of this report.

We appreciate the opportunity to be of service to you on this project. Please contact us if you have questions or require additional information about the contents of this report.

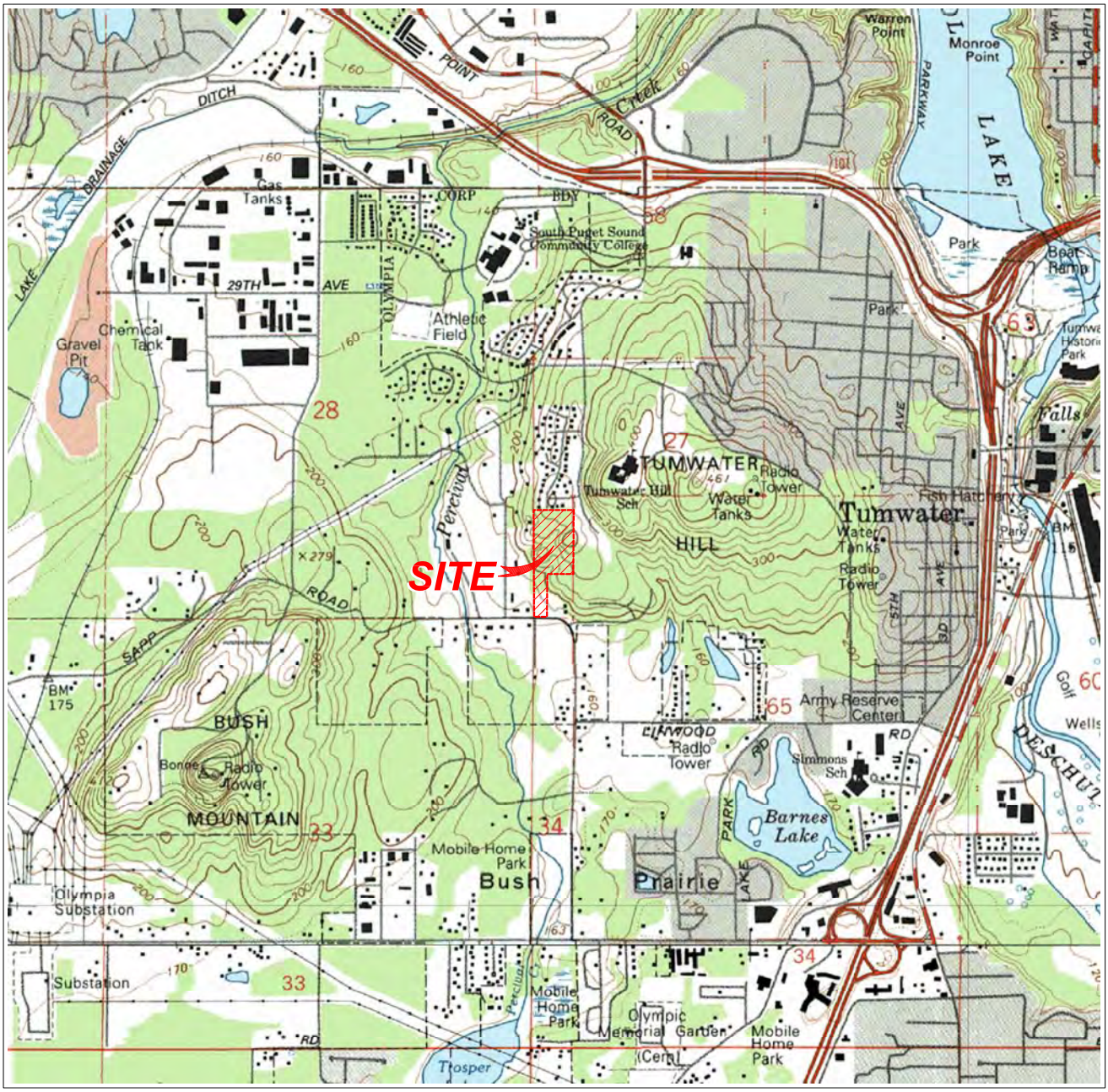
Respectfully Submitted,
INSIGHT GEOLOGIC, INC.

William E. Halbert L.HG., L.E.G.
Principal

Attachments



FIGURES



TUMWATER, WASHINGTON
7.5 MINUTE QUADRANGLE
Year 1994

SCALE: 1: 24000

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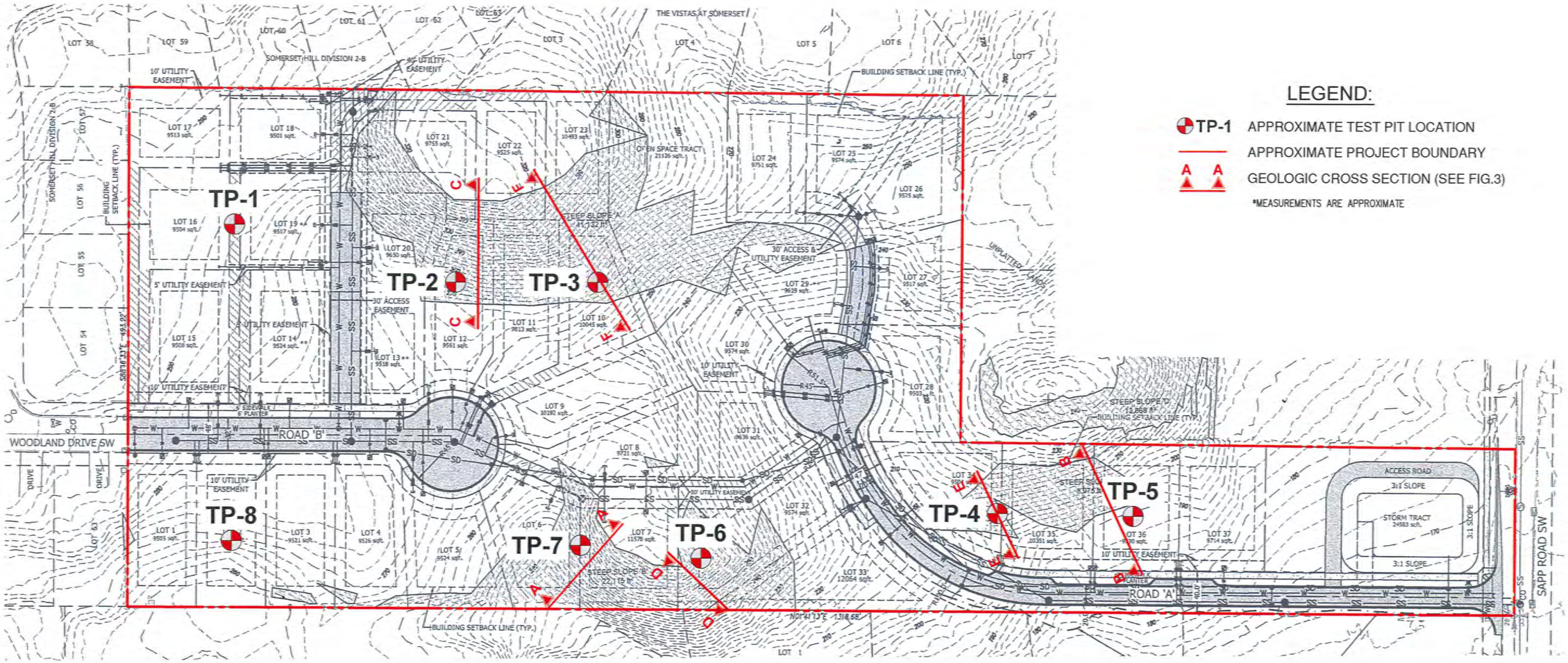
Figure 1
Vicinity Map



LEGEND:

- **TP-1** APPROXIMATE TEST PIT LOCATION
- APPROXIMATE PROJECT BOUNDARY
- A A GEOLOGIC CROSS SECTION (SEE FIG.3)

*MEASUREMENTS ARE APPROXIMATE

SOURCE: CONTOUR ENGINEERING

SCALE: 1" = 100'

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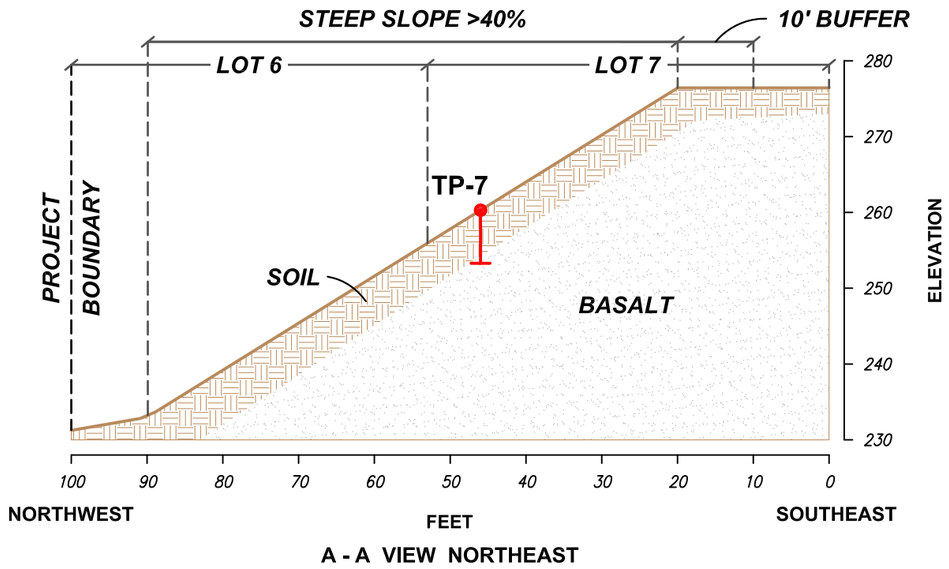
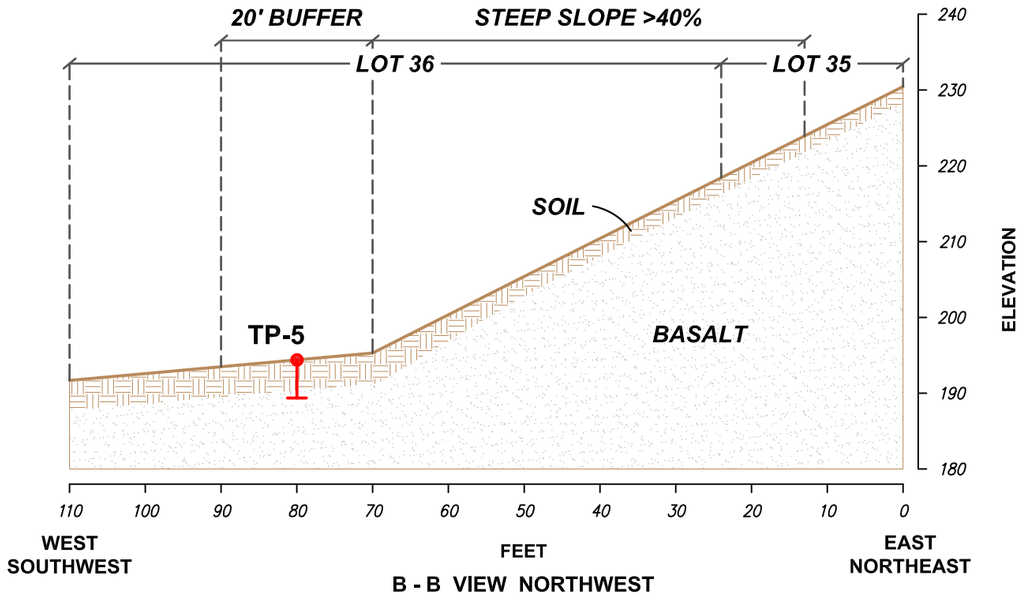
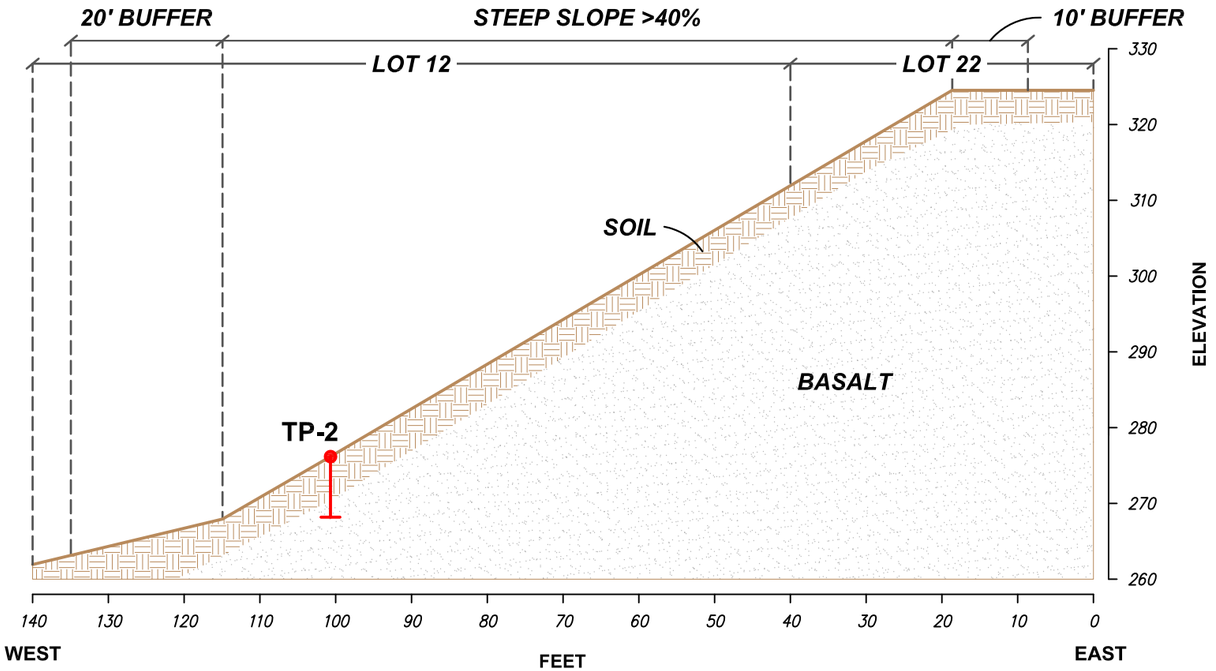
Figure 2
Site Plan



A - A VIEW NORTHEAST



B - B VIEW NORTHWEST



C - C VIEW NORTH

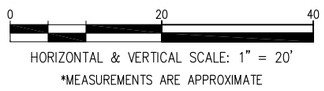


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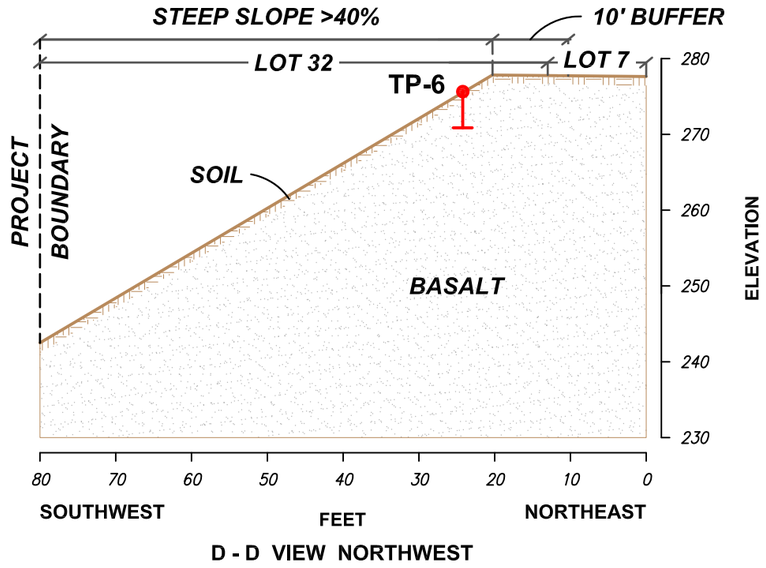
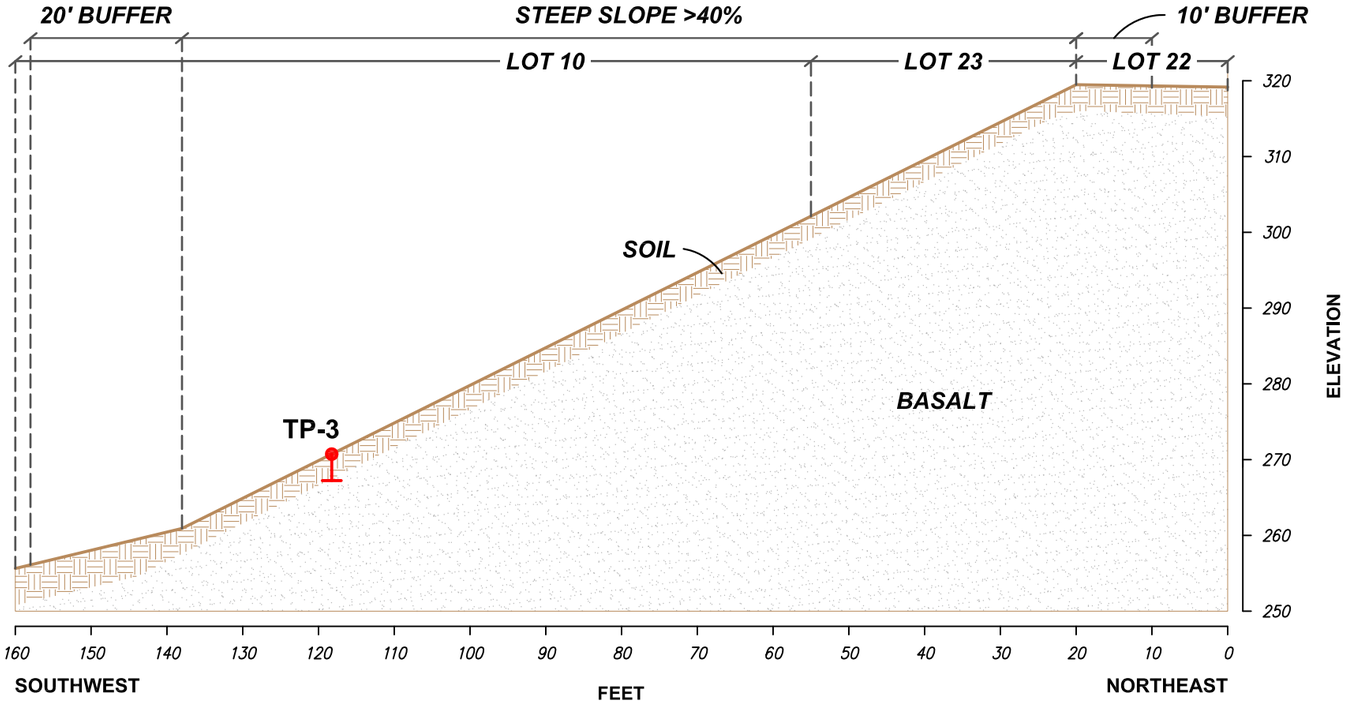
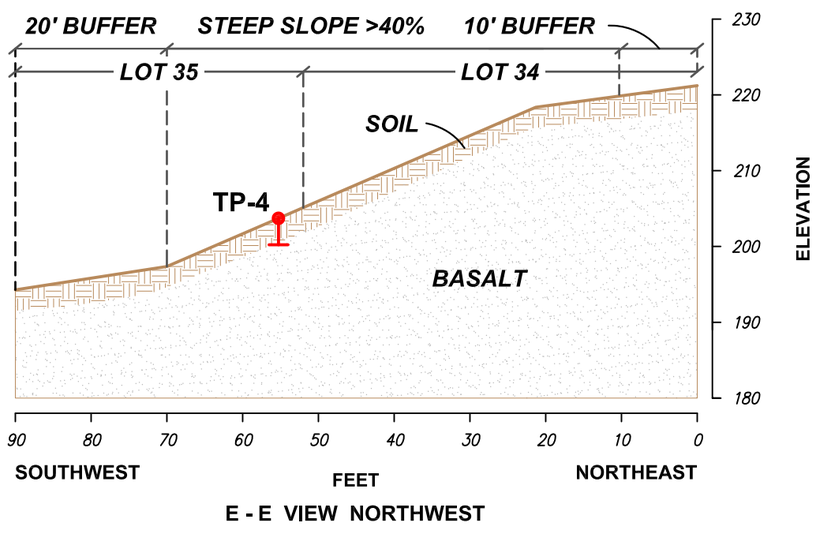
Figure 3-A
Cross Section



D - D VIEW NORTHWEST



F - F VIEW NORTHWEST



E - E VIEW NORTHWEST

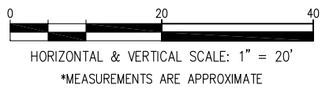


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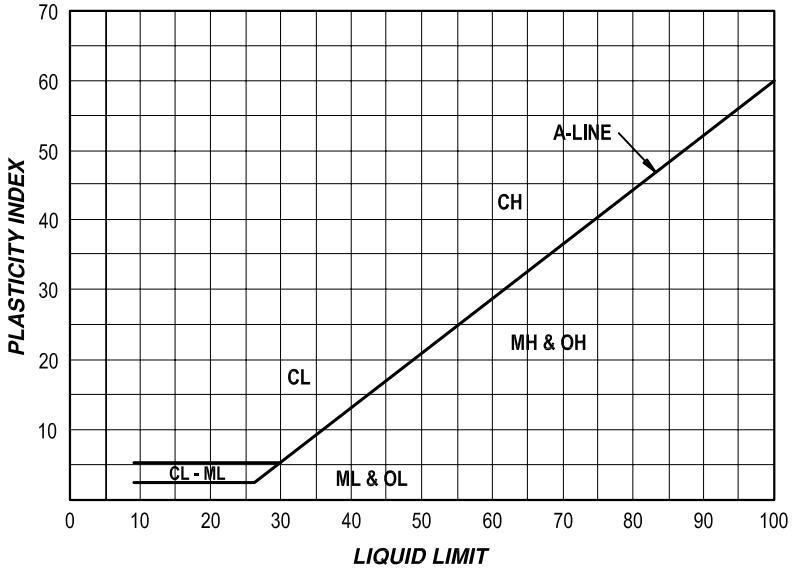
Figure 3-B

Cross Section

ATTACHMENT A
EXPLORATION LOGS

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS	GROUP NAME
COARSE GRAINED SOILS (MORE THAN 50% RETAINED ON NO. 200 SIEVE)	GRAVEL AND GRAVELLY SOILS (MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE)	CLEAN GRAVEL <5% FINES	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY GRADED GRAVEL
		GRAVEL WITH FINES >12% FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND AND SANDY SOILS (MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE)	CLEAN SAND <5% FINES	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY GRADED SAND
		SAND WITH FINES >12% FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS (MORE THAN 50% PASSING NO. 200 SIEVE)	SILTS AND CLAYS (LIQUID LIMIT LESS THAN 50)	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILTS AND CLAYS (LIQUID LIMIT 50 OR MORE)	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT



SOIL MOISTURE MODIFIERS:
DRY - ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST - DAMP, BUT NO VISIBLE WATER
WET - VISIBLE FREE WATER OR SATURATED, USUALLY SOIL IS OBTAINED BELOW WATER TABLE

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS	TYPICAL DESCRIPTION
CC	CEMENT CONCRETE
AC	ASPHALT CONCRETE
CR	CRUSHED ROCK / QUARRY SPALLS
TS	TOPSOIL/SOD/DUFF

GROUNDWATER EXPLORATION SYMBOLS

- MEASURED GROUNDWATER LEVEL IN EXPLORATION, WELL, OR PIEZOMETER
- GROUNDWATER OBSERVED AT TIME OF EXPLORATION
- PERCHED WATER OBSERVED AT TIME OF EXPLORATION
- MEASURED FREE PRODUCT IN WELL OR PIEZOMETER

STRATIGRAPHIC CONTACT

- APPROXIMATE CONTACT BETWEEN SOIL STRATA OR GEOLOGIC UNIT
- APPROXIMATE LOCATION OF SOIL STRATA CHANGE WITHIN GEOLOGIC SOIL UNIT
- APPROXIMATE GRADUAL CHANGE BETWEEN SOIL STRATA OR GEOLOGIC SOIL UNIT
- APPROXIMATE GRADUAL CHANGE OF SOIL STRATA WITHIN GEOLOGIC SOIL UNIT

LABORATORY / FIELD TEST CLASSIFICATIONS

- **%F** PERECENT FINES
- **AL** ATTERBERG LIMITS
- **CA** CHEMICAL ANALYSIS
- **CP** LABORATORY COMPACTION TEST
- **CS** CONSOLIDATION TEST
- **DS** DIRECT SHEAR
- **HA** HYDROMETER ANALYSIS
- **MC** MOISTURE CONTENT
- **MD** MOISTURE CONTENT AND DRY DENSITY
- **OC** ORGANIC COMPOUND
- **PM** PERMEABILITY OR HYDRAULIC CONDUCTIVITY
- **PP** POCKET PENETROMETER
- **SA** SIEVE ANALYSIS
- **TX** TRIAXIAL COMPRESSION
- **UC** UNCONFINED COMPRESSION
- **VS** VANE SHEAR

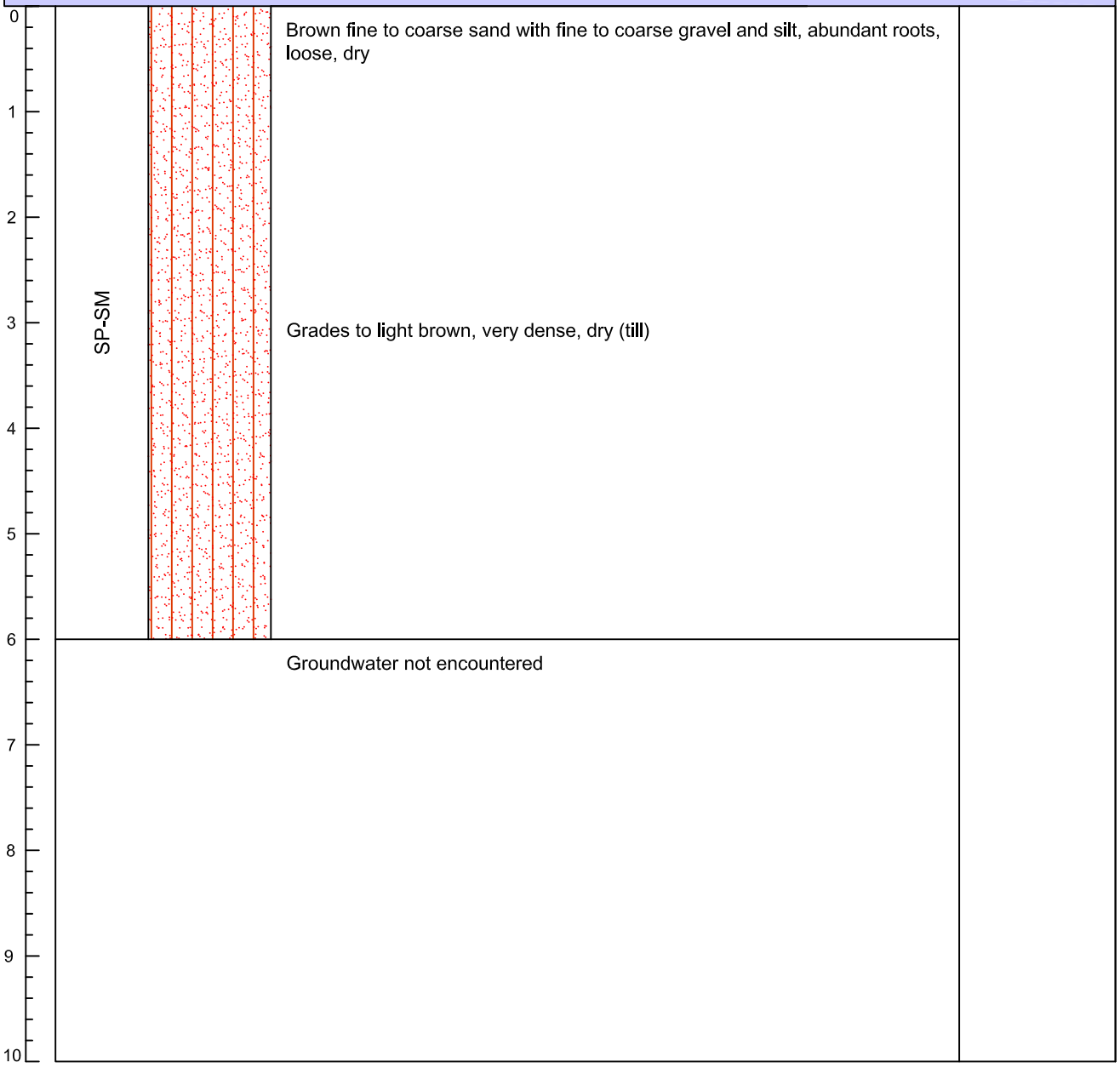
SAMPLER SYMBOLS

- 2.4 INCH I.D. SPLIT BARREL
- DIRECT-PUSH
- STANDARD PENETRATION TEST
- SHELBY TUBE
- PISTON
- BULK OR GRAB

SHEEN CLASSIFICATIONS

- **NS** NO VISIBLE SHEEN
- **SS** SLIGHT SHEEN
- **MS** MODERATE SHEEN
- **HS** HEAVY SHEEN
- **NT** NOT TESTED

TP-1



LEGEND:

PROJECT NO.: 843-001-01
DATE: AUGUST 20, 2018
TOTAL DEPTH: 6 FEET
DRILLING EQUIPMENT: EXCAVATOR
LOGGED BY: KEVIN VANDEHEY

SUNRISE HILLS

TUMWATER, WASHINGTON

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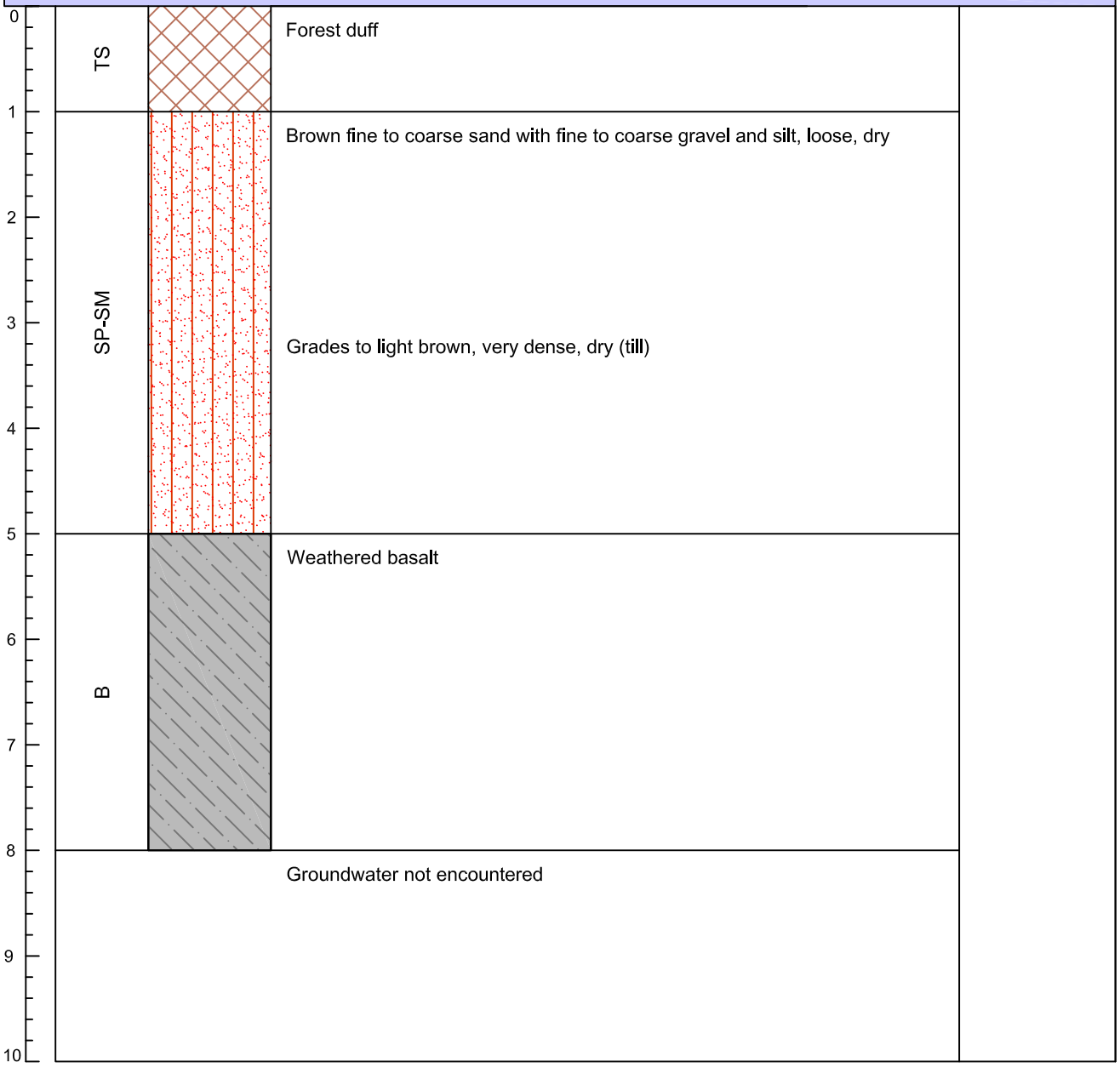
Exploration Log TP-1

TP-2



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PROJECT NO.: 843-001-01
DATE: AUGUST 20, 2018
TOTAL DEPTH: 8 FEET
DRILLING EQUIPMENT: EXCAVATOR
LOGGED BY: KEVIN VANDEHEY

SUNRISE HILLS

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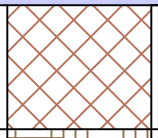
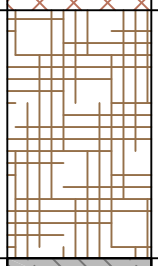
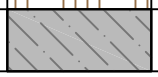
Exploration Log TP-2

TP-3

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND LABORATORY TEST RESULTS
0	TS		Forest duff	
1	GP		Brown fine to coarse gravel with fine to coarse sand, medium dense, dry	
3	B		Basalt	
			Groundwater not encountered	
10				

LEGEND:

PROJECT NO.: 843-001-01
DATE: AUGUST 20, 2018
TOTAL DEPTH: 3.5 FEET
DRILLING EQUIPMENT: EXCAVATOR
LOGGED BY: KEVIN VANDEHEY

SUNRISE HILLS
TUMWATER, WASHINGTON

INSIGHT GEOLOGIC, INC.

Exploration Log TP-3

TP-4

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND LABORATORY TEST RESULTS
0	TS		Forest duff	
1	ML		Brown silt, occasional fine gravel, abundant roots, soft, dry	
2				
3	B		Basalt	
			Groundwater not encountered	
4				
5				
6				
7				
8				
9				
10				

LEGEND:

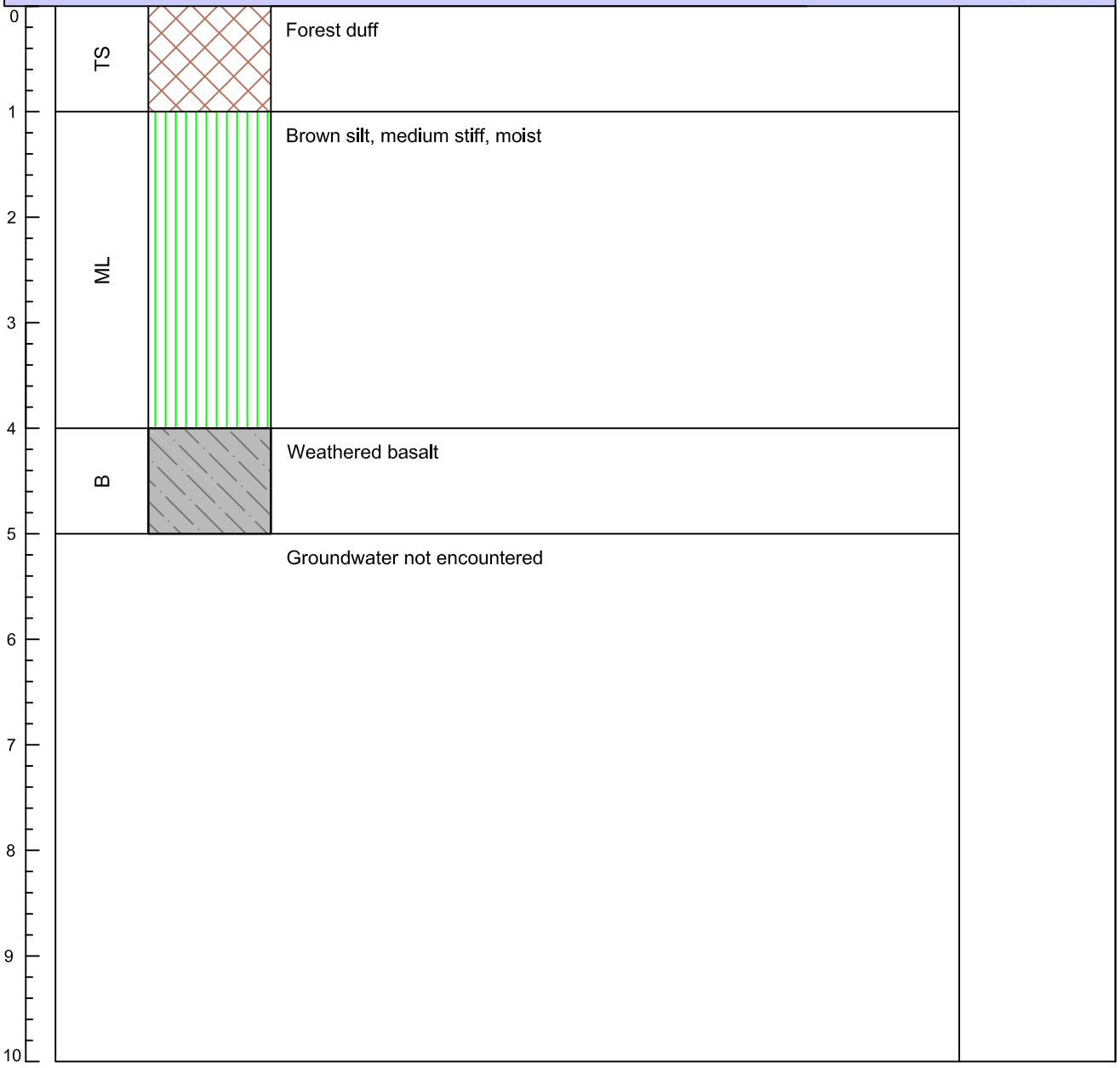
PROJECT NO.: 843-001-01
DATE: AUGUST 20, 2018
TOTAL DEPTH: 3.5 FEET
DRILLING EQUIPMENT: EXCAVATOR
LOGGED BY: KEVIN VANDEHEY

SUNRISE HILLS
TUMWATER, WASHINGTON

INSIGHT GEOLOGIC, INC.

Exploration Log TP-4

TP-5



LEGEND:

PROJECT NO.: 843-001-01
DATE: AUGUST 20, 2018
TOTAL DEPTH: 5 FEET
DRILLING EQUIPMENT: EXCAVATOR
LOGGED BY: KEVIN VANDEHEY

SUNRISE HILLS

TUMWATER, WASHINGTON

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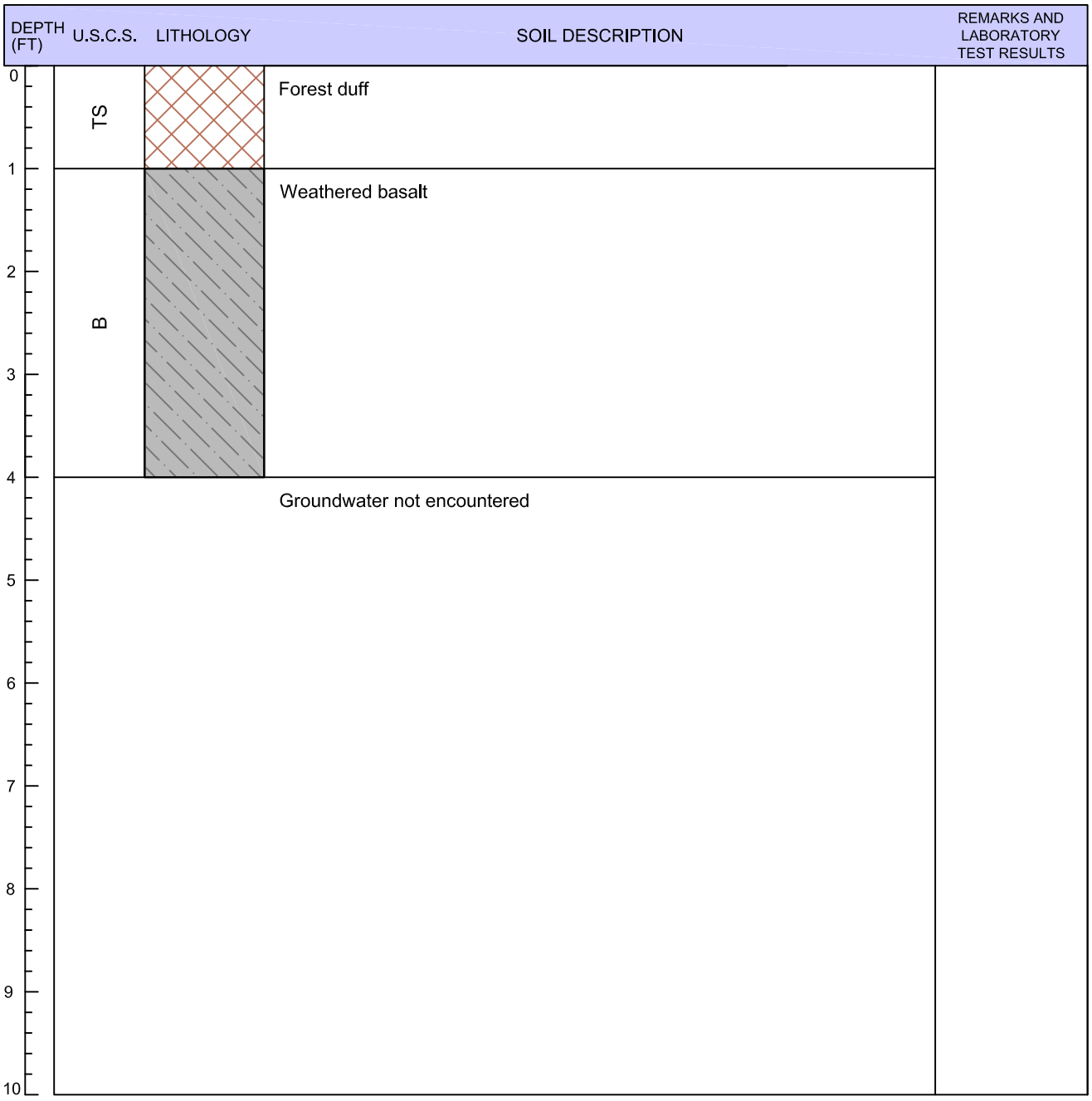
Exploration Log TP-5

TP-6



LEGEND:

PROJECT NO.: 843-001-01
DATE: AUGUST 20, 2018
TOTAL DEPTH: 4 FEET
DRILLING EQUIPMENT: EXCAVATOR
LOGGED BY: KEVIN VANDEHEY

SUNRISE HILLS

TUMWATER, WASHINGTON

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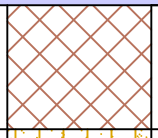
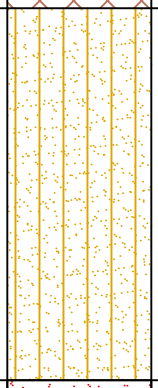
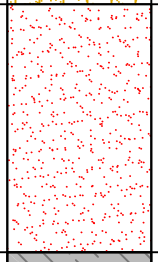
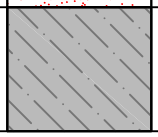
Exploration Log TP-6

TP-7

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND LABORATORY TEST RESULTS
0 – 1	TS		Forest duff	
1 – 4	SM		Brown silty fine to coarse sand with fine to coarse gravel, abundant roots, loose, dry	
4 – 6	SP		Light brown fine to coarse sand with fine to coarse gravel, dense, dry (till)	
6 – 7	B		Weathered basalt	
7 – 10			Groundwater not encountered	

LEGEND:

PROJECT NO.: 843-001-01
DATE: AUGUST 20, 2018
TOTAL DEPTH: 7 FEET
DRILLING EQUIPMENT: EXCAVATOR
LOGGED BY: KEVIN VANDEHEY

SUNRISE HILLS
TUMWATER, WASHINGTON

INSIGHT GEOLOGIC, INC.

Exploration Log TP-7

TP-8

DEPTH (FT)	U.S.C.S.	LITHOLOGY	SOIL DESCRIPTION	REMARKS AND LABORATORY TEST RESULTS
0	TS		Forest duff	
1	B		Weathered basalt	
2				
3			Groundwater not encountered	
4				
5				
6				
7				
8				
9				
10				

LEGEND:

PROJECT NO.: 843-001-01
DATE: AUGUST 20, 2018
TOTAL DEPTH: 3 FEET
DRILLING EQUIPMENT: EXCAVATOR
LOGGED BY: KEVIN VANDEHEY

SUNRISE HILLS
TUMWATER, WASHINGTON

INSIGHT GEOLOGIC, INC.

Exploration Log TP-8

ATTACHMENT B
REPORT LIMITATIONS AND GUIDELINES FOR USE

ATTACHMENT B

REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This attachment provides information to help you manage your risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report has been prepared for the exclusive use of Chul Kim (Client) and his authorized agents. This report may be made available to regulatory agencies for review. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

Insight Geologic Inc. structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. Our report is prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. This report should not be applied for any purpose or project except the one originally contemplated.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

Insight Geologic, Inc. considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless Insight Geologic specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

If important changes are made after the date of this report, Insight Geologic should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

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[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org .

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or ground water fluctuations. Always contact Insight Geologic before applying a report to determine if it remains applicable.

MOST GEOTECHNICAL AND GEOLOGIC FINDINGS ARE PROFESSIONAL OPINIONS

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Insight Geologic reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

GEOTECHNICAL ENGINEERING REPORT RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from Insight Geologic's professional judgment and opinion. Insight Geologic's recommendations can be finalized only by observing actual subsurface conditions revealed during construction. Insight Geologic cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient monitoring, testing and consultation by Insight Geologic should be provided 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 are completed in accordance with our recommendations. Retaining Insight Geologic for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT COULD BE SUBJECT TO MISINTERPRETATION

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having Insight Geologic confer with appropriate members of the design team after submitting the report. Also retain Insight Geologic to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having Insight Geologic participate in pre-bid and pre-construction conferences, and by providing construction observation.

DO NOT REDRAW THE EXPLORATION LOGS

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a

geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

GIVE CONTRACTORS A COMPLETE REPORT AND GUIDANCE

Some owners and design professionals believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with Insight Geologic and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might an owner be in a position to give contractors the best information available, while requiring them to at least share the financial responsibilities stemming from unanticipated conditions. Further, a contingency for unanticipated conditions should be included in your project budget and schedule.

CONTRACTORS ARE RESPONSIBLE FOR SITE SAFETY ON THEIR OWN CONSTRUCTION PROJECTS

Our geotechnical recommendations are not intended to direct the contractor’s procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties.

READ THESE PROVISIONS CLOSELY

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. Insight Geologic includes these explanatory “limitations” provisions in our reports to help reduce such risks. Please confer with Insight Geologic if you are unclear how these “Report Limitations and Guidelines for Use” apply to your project or site.

GEOTECHNICAL, GEOLOGIC AND ENVIRONMENTAL REPORTS SHOULD NOT BE INTERCHANGED

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

EXHIBIT 11

From: Bill Halbert
To: Chris Carlson
Cc: "Chul Kim"
Subject: Proposed Sunrise Hills Development - Steep Slope Critical Area
Date: Friday, June 7, 2019 3:37:31 PM

Chris,

Thank you for meeting with Dr. Kim and myself a week or so ago. As we discussed, the proposed development site has critical slopes which designate as Landslide Hazard Areas based solely on their slope angle (greater than 40 percent). The site geology consists of a thin layer (3 feet or so) of weathered material (glacial basal till or ablation till) overlying competent marine basalts of the Crescent Formation. There was no evidence of past soil failures on these slopes and no evidence of soil creep such as bowed trees, cracks or sags in the soil. Exclusion of designated Critical Areas by the City in the overall density calculations for the development results in the loss of 5 building lots. Given the cost of grading and earthworks in an area underlain by dense basalt, the loss of these lots then renders the project fiscally unfeasible.

A question I posed at the end of our conversation was “When does a Critical Area cease being a Critical Area?” That is, if the slope can be engineered in a way that it no longer poses a threat to homes constructed at the top or at the toe of the slope, does it remain a “Critical Area”. For an exaggerated example, if we were to strip all the overlying soil off the bedrock so that there is nothing left to fail but bare rock (assuming no rockfall hazard), does this slope remain a CAO Landslide Hazard? There would be nothing left on the slope to fail and therefore the homes built at the base would be protected from the (now eliminated) hazard. Of course, we are not proposing to log those slopes and remove the soil, but you get the idea.

Along this same line of thinking, if we designed a highly engineered retention system for the slope consisting of rock bolts and a steel mesh so that the upper soil zone would be securely anchored to the slope and would not fail, and the homes below were thereby protected, does this engineered slope remain a hazard under the CAO simply due to slope? I would say that it does not.

Of course the first option is undesirable from both an aesthetic and cost standpoint and the second option would be costly as well, but the homes at the base of the slope would be protected from the potential hazard through either of these engineering measures.

To mitigate the potential hazard, we are proposing the installation of a continuous barrier or diversion wall along the base of the slope. This would not be a “retaining wall” per se, as it would not support the soil mass subject to potential failure on the slope. It would, however provide protection from “runout” at the base of the slope resulting from the likely mechanism of failure which would be mobilization of the thin soil layer as a debris flow. This mechanism involves loosening of the upper soil layer through over-saturation, resulting in increased weight of the soil and lowering of the soil strength. The mobilized soil then comes down the slope as a muddy, fluidized mass of relatively low volume. The engineered wall at the base of the slope would be designed to withstand the impact of the initial surge, and then retention and diversion of the remainder of the flow. There would be space between the wall and the slope sufficient to retain the debris flow and to allow cleanout of the mud by construction equipment. The houses and occupants at the base of the slope would therefore be protected through the implementation of engineered measures.

As with all the examples presented, the goal is protection of life and property through engineering means. We believe that our proposed engineered barrier negates the threat to houses and persons from a potential soil failure on the slope above. Therefore, the potential hazard has been mitigated and the slope should no longer be considered as “critical”. If this is the case, then the previously designated critical areas would then be deemed non-critical. As non-critical areas, they should be allowed to be included in the density calculations for the proposed development.

I appreciate your thoughtful review of our argument for this development. Please feel free to contact me if you have questions or require additional information.

Respectfully,

William Halbert

William Halbert, L.E.G., L.HG.
Principal

INSIGHT GEOLOGIC, INC.

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