

PARCEL 13936340700


INSIGHT GEOLOGIC, INC.

September 24, 2018

Eric Veloni
3403 Steamboat Island Road NW
PMB 335
Olympia, Washington 98502

Report
Steep Slope/Landslide Hazard Assessment
Veloni Property
5725 Sunrise Beach Road NW
Olympia, Washington
Project No. 1072-001-01

THURSTON COUNTY
RECEIVED
JUN 28 2019
DEVELOPMENT SERVICES

INTRODUCTION

Insight Geologic is pleased to provide our report regarding our evaluation of slope conditions at your property located at 5725 Sunrise Beach Road NW in unincorporated Thurston County, Washington. The location of the site is shown relative to surrounding physical features in the Vicinity Map, Figure 1. We understand that the site is developed with a single-family residence and you are planning on a remodel and possible addition to the structure. This steep slope/landslide hazard assessment was requested due to planned activities that will occur within 100 feet of slopes over 15 percent inclination and with at least 10 feet of elevation gain, as required by Thurston County's Critical Areas Ordinance. A site plan is shown in Figure 2.

SCOPE OF SERVICES

The purpose of our services was to evaluate site conditions with respect to geology, marine bluffs and landslide hazard areas, in general accordance with Thurston County Critical Areas Ordinance (Title 24.35.130). The specific tasks performed were:

1. Evaluated critical slopes on and adjacent to the property relative to the potential for landslide hazard in conformance with the County's Ordinance for Geologically Hazardous Areas, Chapter 24.35.
2. Reviewed pertinent and readily available information regarding the site geology and hydrogeology, as well as mapped landslides in the area.
3. Prepared a geologic assessment letter for review by Thurston County, presenting geological information including geologic conditions, along with our conclusions and opinion regarding critical areas constituting landslide hazards on the property.

REGULATORY DEFINITION

According to the Thurston County 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 15 feet or more, excluding those wholly manmade slopes created under the design and inspection of a geotechnical professional.

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

- A. Any area with a combination of:
 - 1. Slopes of 15 percent or steeper, and
 - 2. Impermeable subsurface material (typically silt and clay), frequently interbedded with granular soils (predominantly sand and gravel), and
 - 3. Springs or seeping groundwater during the wet season;
- B. Slopes of 40 percent or greater;
- C. Any areas located on a landslide feature which has shown movement during the Holocene Epoch (post glacial) or which is underlain by mass wastage debris from that period of time;
- D. Known hazard areas, such as areas of historic failures, including areas of unstable, old and recent landslides.

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 underlain by Vashon age glacial till deposits and advance outwash sands. The glacial till material is described as very dense, poorly-sorted silty, fine to coarse sand, with gravel and occasional boulders. The advanced outwash sands are described as sand and gravel with silt. The sediments were deposited and overridden by glacial ice during the last advance of the most recent glacial period in the Puget Sound and has been glacially consolidated.

The nearest identified landslide activity near the project site has occurred along steep slopes located west of the property, based on our review of DNR maps showing landslide inventories. These landslides are mapped as dormant and indistinct, and of questionable certainty, and were determined based on Lidar data, and not field verified. In general, the slopes at the site are underlain by glacial till, which is generally stable relative to deep-seated landslides. If present, we interpret these failures to be surficial sloughs of the weathered till materials on the slope face. These types of failures are common along waterfront properties underlain by glacial till and usually only affect the surficial 12 to 18 inches of weathered material on the face of waterfront bluffs underlain by glacial till. A geologic cross section is shown in Figure 3.

Site Reconnaissance

We visited the subject site on September 6, 2018 to evaluate the slopes on the property with regard to current and historical slope stability. The property is located at the top of a marine bluff overlooking the waters of Eld Inlet to the south. The property is occupied by a single-family residential structure.

We understand that the building addition would extend to the east of the existing residence and would not encroach further upon the top of the slope. The primary vegetation on the face of the bluff is English ivy with isolated fir and maple trees.

The existing residence is located on a topographic bench at an approximate elevation of 42 feet above mean sea level (MSL) and is located 17 feet from the top of the marine bluff, which descends to the south. The height of the slope is approximately 34 feet, based on our review of topographic information provided by the Thurston County Geodata Center and our site reconnaissance. Based on multiple measurements made using a hand-held clinometer, the steepest slopes are located to the south of the residence with inclinations of up to 80 percent. Slopes located east of the residence have an inclination of 35 percent. The upland portion of the parcel is gently sloping with an overall inclination of approximately 17 percent down to the south. A short slope uphill of the driveway has an inclination of 45 percent, however does not reach a height of 10 feet. Soils exposed along the steep slopes were observed to be very dense sandy soils with gravel and silt that are generally consistent with glacial till.

We did not observe indications of current or past large-scale slope failure such as slump blocks, back-tilted slopes, ponded water or seeps on the property. No geologic contacts which would serve as sources of slope failure were observed. Fir and maple trees growing from the side of the steep slope exhibit curvature of the trunk known as a "pistol butt" and the concrete stairway has minor distressing, indicating likely minor shallow soil creep along the slope. Our field reconnaissance observations are shown on Figure 4.

Slope Stability

A slope stability analysis was completed at the site for a proposed addition by Geotechnical Testing Laboratory, which is documented in the Geotechnical Report dated March 20, 2006. This report and associated slope stability analysis were reviewed as part of our Steep Slope/Landslide Hazard Assessment. Geotechnical Testing Laboratory identified the slope as stable relative to deep-seated and shallow failures under static conditions. Under seismic conditions the slopes were susceptible to surficial raveling and not deep-seated failures. Factors of safety were determined using Bishop's, Janbu and Morgenstern-Price methods. Based on our analysis of site conditions and assumptions made, we generally concur with the conclusions.

OPINION

The property includes a marine bluff. The bluff height is approximately 42 feet measured from the top of the slope to the shoreline. The property contains a series of slopes that range from 17 to 80 percent. No indications of recent slope failure were observed on the bluff face. The probability of failure along the bluff is low to moderate, and the predicted failure type would be sloughing of the surficial weathered material along the face of the slope. The recurrence interval for this type of failure is between about 20 to 40 years. A typical rate of erosion for the bluff face in this area is likely in the range of 0.5 to 2 inches per year.

We did not observe indications of deep-seated failure on the property such as slump blocks, back-tilted slopes, ponded water or seeps. Shallow soil creep was noted in the form of isolated fir trees growing from the side of the steep slope having pistol, or butt-bowing.

Based on the Thurston County CAO, the required buffer for the property is a 50-foot setback from the top of the steep slope. The current residence is located approximately 17 feet from top of the slope. Any remodel or planned additions would be within the 50-foot buffer. However, it is our understanding that the planned remodel would not change the footprint of the building and would not significantly increase loading of the soils. In addition, any addition would be founded on glacial till, which have a high bearing capacity and are not prone to deep-seated failure. Further, slope stability analysis completed by others has indicated that the slope is stable to deep-seated landslides. In our opinion, the proposed development in this area is unlikely to increase the risk of slope failure due to planned construction activities.

In our opinion, the site appears to be suitable for its intended use. We provide the following development recommendations to reduce the potential for future failure of the slope face:

- The base of footings for habitable structures should be setback from the top of slope equal to the existing building footprint. No further encroachment towards the top of the waterfront bluff shall occur.
- All stormwater drainage, foundation drainage and road runoff should be routed through tightlines to the base of the slope for discharge or to an engineered stormwater system, if available. Collected drainage and runoff should not be allowed to discharge onto the face of the slope.
- Low growing vegetation should be encouraged within 10 feet of the slope face and on the slope face to reduce erosion and increase soil strength resulting from the root systems.

LIMITATIONS

We have prepared this steep slope/landslide hazard assessment for the exclusive use Eric Veloni and his authorized agents for the property located at 5725 Sunrise Beach Road NW, in unincorporated Thurston County, 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.

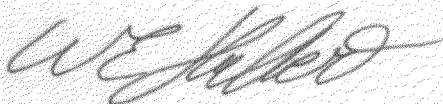
Please refer to Attachment A titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

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Veloni Property
Steep Slope/Landslide Hazard Assessment
September 24, 2018

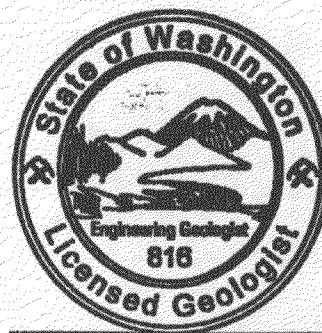
We appreciate the opportunity to be of service to you on this project. Please contact us if you have questions or require additional information about the contents of this report.

Respectfully Submitted,
INSIGHT GEOLOGIC, INC.



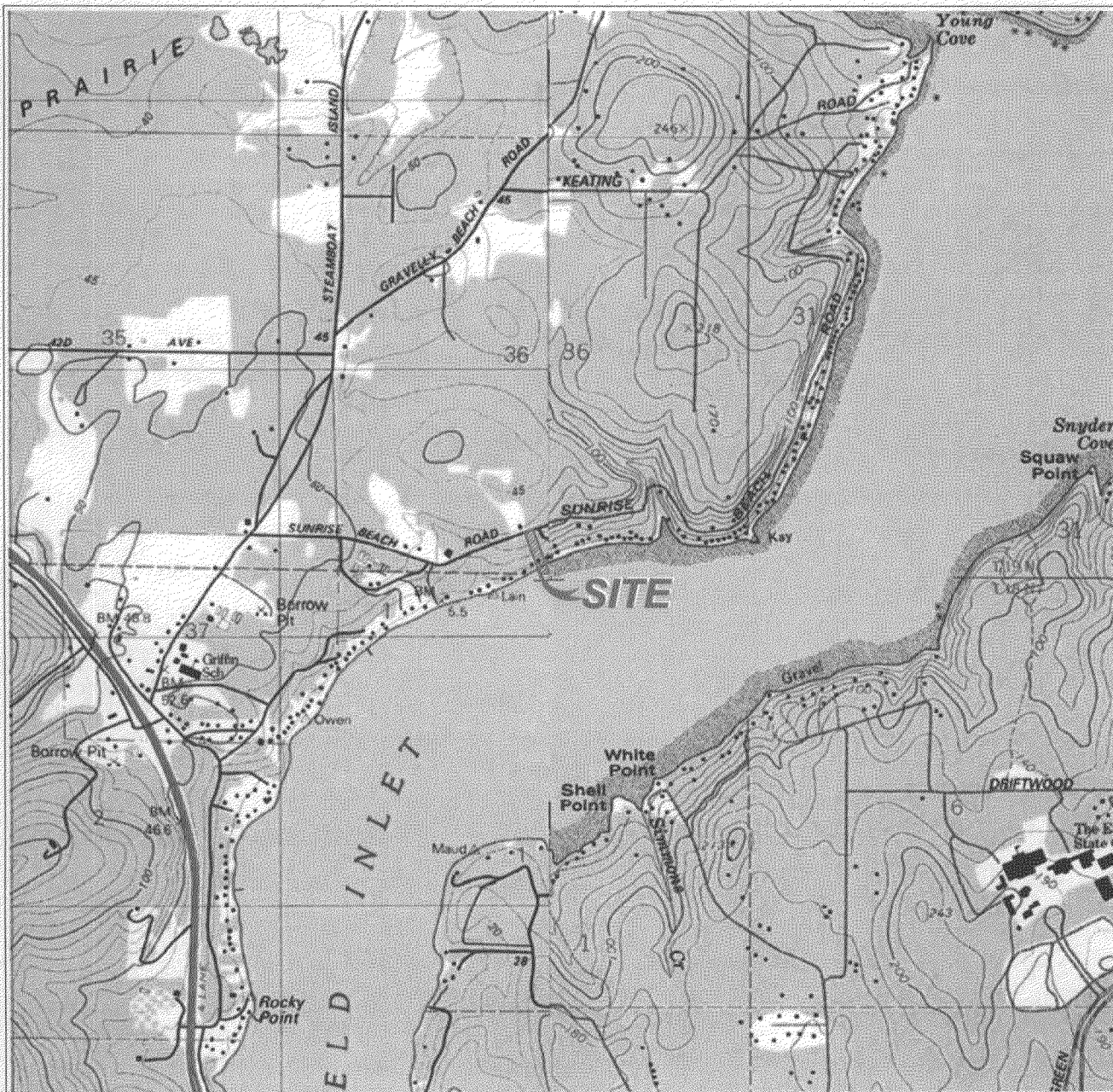
William E. Halbert L.H.G., L.E.G.
Principal

Attachments



William E. Halbert

FIGURES



Source: Terrain Navigator

TUMWATER, WASHINGTON
7.5 MINUTE QUADRANGLE
 Year 1994

SCALE: 1:24000

VELONI PROPERTY
 THURSTON COUNTY, WASHINGTON

INSIGHT GEOLOGIC, INC.

Figure 1
Vicinity Map



Source: Google Earth

LEGEND:



APPROXIMATE PROJECT LOCATION

CROSS SECTION (SEE FIGURE 3)

*MEASUREMENTS ARE APPROXIMATE



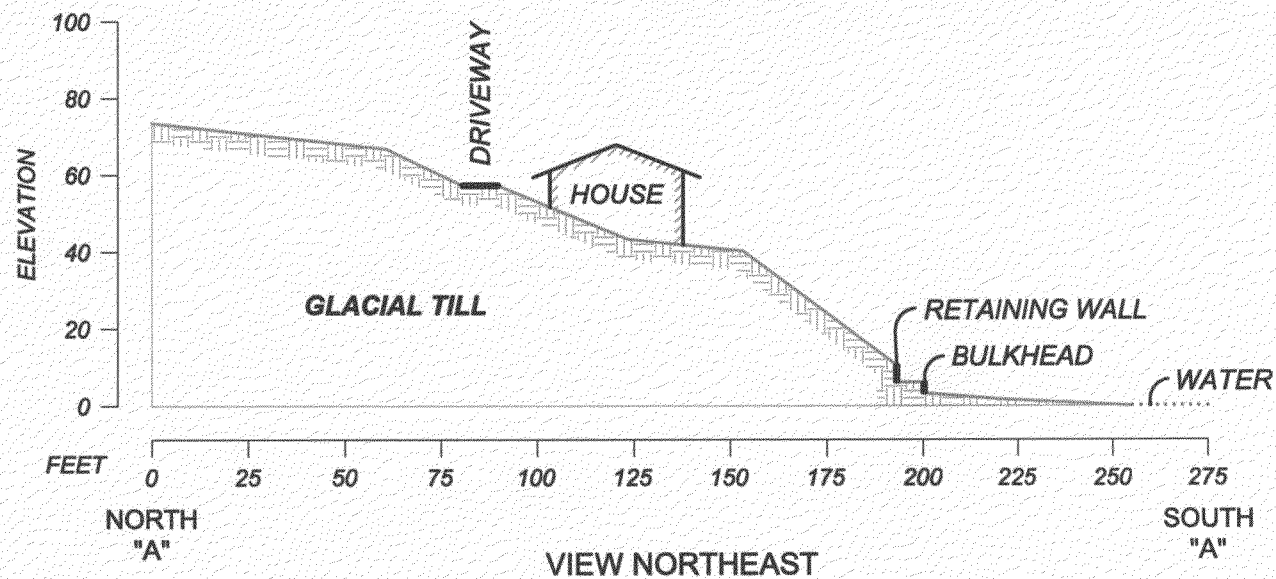
SCALE: 1"=100'

VELONI PROPERTY

THURSTON COUNTY, WASHINGTON



Figure 2
Site Plan



0 25 50
VERTICAL & HORIZONTAL
SCALE: 1" = 50'

INSIGHT GEOLOGIC, INC.

VELONI PROPERTY
THURSTON COUNTY, WASHINGTON

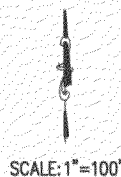
Figure 3
Cross Section



Source: Google Earth

LEGEND:

- APPROXIMATE PROJECT LOCATION
 80% APPROXIMATE SLOPE PERCENT



VELONI PROPERTY
 THURSTON COUNTY, WASHINGTON



Figure 4
Field Reconnaissance

ATTACHMENT A
REPORT LIMITATIONS AND GUIDELINES FOR USE

ATTACHMENT A

REPORT LIMITATIONS AND GUIDELINES FOR USE¹

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 Eric Veloni (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.

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.