Cobalt Geosciences

Geotechnical Investigation
Proposed Single-Family Residence

Parcel No. 11250240692002
Sunrise Drive NE
Bainbridge Island, Washington

December 9, 2020

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December 9, 2020

1.0 Introduction

In accordance with your authorization, Cobalt Geosciences, LLC (Cobalt) has completed a geotechnical investigation for the proposed single-family residence located along the east side of Sunrise Drive NE in Bainbridge Island, Washington (Figure 1).

The purpose of the geotechnical investigation was to identify subsurface conditions and to provide preliminary geotechnical recommendations for foundation design, concrete retaining walls, earthwork, soil compaction, utilities, general pavement guidelines, drainage, and suitability of the on-site soils for use as fill.

The scope of work for the geotechnical investigation consisted of a site investigation followed by engineering analyses to prepare this report. Recommendations presented herein pertain to various geotechnical aspects of the proposed development, including foundation design, drainage, and earthwork.

2.0 Project Description

The project includes construction of a new multi-story single-family residence with daylight basement and paved access driveway. The residence and driveway will be located in the western and upland portion of the property. We have reviewed a preliminary updated site plan that shows the new location of the residence as of October 2020. This is attached in Figure 2.

We anticipate that foundation loads will be generally light and that site grading will include cuts and fills on the order of 10 feet or less for foundation placement and driveway construction. We should be provided with the final architectural, civil, and structural plans so that we may update our recommendations, if necessary.

3.0 Site Description

The site is located at along the east side of Sunrise Drive NE in Bainbridge Island, Washington (Figure 1). The property consists of one rectangular parcel (No. 11250240692002) with a total area of about 15,682 square feet.

The site is undeveloped and vegetated with grasses, holly, ferns, blackberry vines, ivy, and other herbs/shrubs along with Cedar, Maple, and Fir trees.

The property slopes gently to moderately steeply downward toward the east at magnitudes ranging from 10 to 50 percent. The topographic relief across the site is approximately 40 feet.

The site is bordered to the north, south, and east by single-family residences and to the west by Sunrise Drive NE.

P.O. Box 82243, Kenmore, WA 98028

4.0 Field Investigation

4.1.1 Site Investigation Program

The geotechnical field investigation program was completed on July 7, 2017 and included excavating and sampling three test pits within the property, where accessible.

The soils encountered were logged in the field and are described in accordance with the Unified Soil Classification System (USCS).

A Cobalt Geosciences field representative conducted the explorations, classified the encountered soils, kept a detailed log of each test pit, and observed and recorded pertinent site features.

The results of the test pit explorations are presented in Appendix C.

5.0 Soil and Groundwater Conditions

5.1.1 Area Geology

The site lies within the Puget Lowland. The lowland is part of a regional north-south trending trough that extends from southwestern British Columbia to near Eugene, Oregon. North of Olympia, Washington, this lowland is glacially carved, with a depositional and erosional history including at least four separate glacial advances/retreats. The Puget Lowland is bounded to the west by the Olympic Mountains and to the east by the Cascade Range. The lowland is filled with glacial and non-glacial sediments consisting of interbedded gravel, sand, silt, till, and peat lenses.

The Geologic Map of Bainbridge Island, indicates that the site is located near the contacts between Vashon Glacial Till and Pre-Vashon Deposits.

Vashon Glacial Till is typically characterized by an unsorted, non-stratified mixture of clay, silt, sand, gravel, cobbles and boulders in variable quantities. These materials are typically dense and relatively impermeable. The poor sorting reflects the mixing of the materials as these sediments were overridden and incorporated by the glacial ice.

Pre-Vashon Deposits can include a wide variety of glacial and non-glacial deposits. These deposits are typically dense to very dense and include diamict, fluvial deposits, and outwash-like materials.

Test Pits TP-1 through TP-3

All of the test pits encountered approximately 12 inches of vegetation and topsoil underlain by 2 to 3 feet of loose/soft, silt-fine to medium grained sand with variable amounts of organics and gravel. These materials were underlain by approximately 2 to 3 feet of medium dense/stiff, silty-fine to medium grained sand with variable amounts of gravel. These materials were underlain by dense/very stiff, silty-fine to medium grained sand with variable amounts of gravel (with local areas of somewhat cemented soils), which continued to the termination depths of the test pits.

5.1.2 Groundwater

At the time of our investigation, groundwater was not encountered in any of the test pits. Iron-oxide staining (soil mottling) was observed in all of the test pits between 3 and 5 feet below existing elevations. This indicates that perched groundwater is likely present at these depths during the wet season (typically November through April).

Water table elevations often fluctuate over time. The groundwater level will depend on a variety of factors that may include seasonal precipitation, irrigation, land use, climatic conditions and soil permeability. Water levels at the time of the field investigation may be different from those encountered during the construction phase of the project.

6.0 Geologic Hazards

6.1 Steep Slope Hazard

Typical municipal codes designate slopes with magnitudes greater than about 40 percent and vertical relief of at least 10 feet as geologically hazardous (steep slope/landslide hazards). Based on our observations, the central portion of the site consists of a steep slope hazard area. Slopes in this area are up to 50 percent in magnitude with topographic relief of about 20 feet.

During our field assessment, we traversed slope areas within the site, where accessible. As we conducted the traverses, we looked for any signs that would indicate past slope failures or features indicating possible future instability.

Overall, the steep slope areas within the property appear stable at this time with no evidence of severe erosion, exposed soils, hummocky terrain, or other signs of recent landslide activity. We observed slight curvature of some of the trees within the slope area, indicating variable levels of soil creep.

It is our opinion that the overall slope stability is most affected by uncontrolled surface water runoff and groundwater/spring activity.

6.2 Erosion Hazard

The Natural Resources Conservation Services (NRCS) maps for Kitsap County indicate that the site is underlain by Harstine gravelly ashy sandy loam (0 to 6 and 15 to 30 percent slopes). These soils have a "Slight" to "Moderate" erosion potential in a disturbed state.

It is our opinion that soil erosion potential at this project site can be reduced through landscaping and surface water runoff control. Typically erosion of exposed soils will be most noticeable during periods of rainfall and may be controlled by the use of normal temporary erosion control measures, such as silt fences, hay bales, mulching, control ditches and diversion trenches. The typical wet weather season, with regard to site grading, is from October 31st to April 1st. Erosion control measures should be in place before the onset of wet weather.

6.3 Seismic Hazard

The overall subsurface profile corresponds to a Site Class *D* as defined by Table 1613.5.2 of the 2015 International Building Code (2015 IBC). A Site Class *D* applies to an overall profile consisting of dense to very dense soils within the upper 100 feet.

We referenced the U.S. Geological Survey (USGS) Earthquake Hazards Program Website to obtain values for S_S, S_1, F_a, and F_v. The USGS website includes the most updated published data on seismic conditions. The site specific seismic design parameters and adjusted maximum spectral response acceleration parameters are as follows:

PGA (Peak Ground Acceleration, in percent of g)

S_S	133.30% of g
S_1	52.50% of g
F_A	1.00
F_V	1.50

Additional seismic considerations include liquefaction potential and amplification of ground motions by soft/loose soil deposits. The liquefaction potential is highest for loose sand with a high groundwater table. The relatively dense soil deposits that underlie the site have a low potential for liquefaction.

7.0 DISCUSSION

7.1.1 General

The site slopes gently to moderately downward toward the east. Overall, these slopes are stable in their current configuration and we found no evidence of recent or historic movements. Provided proper temporary and permanent erosion control methods/devices are utilized, the proposed construction will not adversely affect slope stability on the property and adjacent areas. We should be provided with the final grading plans to verify that our recommendations have been implement and whether additional considerations for erosion and slope stability are necessary.

It is our opinion that the proposed single-family residence may be supported on a shallow foundation system bearing on medium dense/stiff or firmer native soils. Deeper foundation embedment will likely be required along the east side of the residence. Preliminarily we recommend a minimum effective setback of 8 feet as measured horizontally from the base of the nearest foundation to the adjacent slope face.

The native soils are fine-grained and should be considered highly moisture sensitive. Their use as structural fill is limited. We recommend importing structural fill for use as wall backfill around the new residence.

Infiltration of stormwater runoff is not feasible based on the dense, fine-grained nature of the shallow subsurface soils. Runoff should be tightlined off-site and into an approved stormwater device.

8.0 Recommendations

8.1.1 Site Preparation

Trees, shrubs and other vegetation should be removed prior to stripping of surficial organic-rich soil. Based on observations from the site investigation program, it is anticipated that the stripping depth will range from 12 to 18 inches. Deeper excavations should be expected around and below removed trees and existing stumps.

The excavated material is not suitable as fill material within the proposed building envelope but could be used as fill material in non-settlement sensitive areas such as landscaping regions. In these non-settlement sensitive areas, the fill should be placed in maximum 12 inch thick lifts that should be compacted to at least 90 percent of the modified proctor (ASTM D 1557 Test Method) maximum dry density.

All existing foundation elements and any undocumented fill should be removed and backfilled with suitable structural fill compacted to at least 95 percent of the modified proctor up to planned subgrade elevations.

The native soils below the vegetation and topsoil consist of silty-sand to sandy silt with gravel. These materials may only be considered suitable for use as structural fill if they are within 3 percent of the optimum moisture content. These soils may be suitable for structural fill during the summer months only if they can be dried to optimum moisture levels.

Imported structural fill should consist of a sand and gravel mixture with a maximum grain size of 3 inches and less than 5 percent fines (material passing the U.S. Standard No. 200 Sieve). Structural fill should be placed in maximum lift thicknesses of 12 inches and should be compacted to a minimum of 95 percent of the modified proctor maximum dry density, as determined by the ASTM D 1557 test method.

8.1.2 Temporary Excavations

Based on our understanding of the project, we anticipate that the grading could include local cuts on the order of approximately 10 feet or less for foundation placement. These excavations should be sloped no steeper than 1H:1V (Horizontal:Vertical) in native soils. If an excavation is subject to heavy vibration or surcharge loads, we recommend that the excavations be sloped no steeper than 1.5H:1V, where room permits.

Temporary cuts should be in accordance with the Washington Administrative Code (WAC) Part N, Excavation, Trenching, and Shoring. Temporary slopes should be visually inspected daily by a qualified person during construction activities and the inspections should be documented in daily reports. The contractor is responsible for maintaining the stability of the temporary cut slopes and reducing slope erosion during construction.

Temporary cut slopes should be covered with visqueen to help reduce erosion during wet weather, and the slopes should be closely monitored until the permanent retaining systems or slope configurations are complete. Materials should not be stored or equipment operated within 10 feet of the top of any temporary cut slope.

Soil conditions may not be completely known from the geotechnical investigation. In the case of temporary cuts, the existing soil conditions may not be completely revealed until the excavation work exposes the soil. Typically, as excavation work progresses the maximum inclination of temporary slopes will need to be re-evaluated by the geotechnical engineer so that supplemental recommendations can be made. Soil and groundwater conditions can be highly variable. Scheduling for soil work will need to be adjustable, to deal with unanticipated conditions, so that the project can proceed and required deadlines can be met.

If any variations or undesirable conditions are encountered during construction, we should be notified so that supplemental recommendations can be made. If room constraints or groundwater conditions do not permit temporary slopes to be cut to the maximum angles allowed by the WAC, temporary shoring systems may be required. The contractor should be responsible for developing temporary shoring systems, if needed. We recommend that Cobalt Geosciences and the project structural engineer review temporary shoring designs prior to installation, to verify the suitability of the proposed systems.

8.1.3 Erosion and Sediment Control

Erosion and sediment control (ESC) is used to reduce the transportation of eroded sediment to wetlands, streams, lakes, drainage systems, and adjacent properties. Erosion and sediment control measures should be implemented and these measures should be in general accordance with local regulations. At a minimum, the following basic recommendations should be incorporated into the design of the erosion and sediment control features for the site:

- Schedule the soil, foundation, utility, and other work requiring excavation or the disturbance of the site soils, to take place during the dry season (generally May through September). However, provided precautions are taken using Best Management Practices (BMP's), grading activities can be completed during the wet season (generally October through April).
- All site work should be completed and stabilized as quickly as possible.
- Additional perimeter erosion and sediment control features may be required to reduce the possibility of sediment entering the surface water. This may include additional silt fences, silt fences with a higher Apparent Opening Size (AOS), construction of a berm, or other filtration systems.
- Any runoff generated by dewatering discharge should be treated through construction of a sediment trap if there is sufficient space. If space is limited other filtration methods will need to be incorporated.

8.1.4 Foundation Design

The proposed single-family residence may be supported on a shallow spread footing foundation system bearing on undisturbed medium dense/stiff or firmer native soils or on properly compacted structural fill placed on the suitable native soils. If structural fill is used to support foundations, then the zone of structural fill should extend beyond the faces of the footing a lateral distance at least equal to the thickness of the structural fill. Any loose soils should be removed to the depth of medium dense/stiff or firmer native soils.

No specific buffer or setback is possible due to the location and presence of steep slopes. We recommend a minimum effective setback for all footings in the eastern portion of the building to be embedded an adequate depth to create a minimum 8 foot effective setback from the adjacent slope face.

For shallow foundation support, we recommend widths of at least 16 and 24 inches, respectively, for continuous wall and isolated column footings supporting the proposed structure. Provided that the footings are supported as recommended above, a net allowable bearing pressure of 2,500 pounds per square foot (psf) may be used for design.

A 1/3 increase in the above value may be used for short duration loads, such as those imposed by wind and seismic events. Structural fill placed on bearing, native subgrade should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Footing excavations should be inspected to verify that the foundations will bear on suitable material.

Exterior footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Interior footings should have a minimum depth of 12 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower.

If constructed as recommended, the total foundation settlement is not expected to exceed 1 inch. Differential settlement, along a 25-foot exterior wall footing, or between adjoining column footings, should be less than ½ inch. This translates to an angular distortion of 0.002. Most settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated. All footing excavations should be observed by a qualified geotechnical consultant.

Resistance to lateral footing displacement can be determined using an allowable friction factor of 0.35 acting between the base of foundations and the supporting subgrades. Lateral resistance for footings can also be developed using an allowable equivalent fluid passive pressure of 250 pounds per cubic foot (pcf) acting against the appropriate vertical footing faces (neglect the upper 12 inches below grade in exterior areas). The allowable friction factor and allowable equivalent fluid passive pressure values include a factor of safety of 1.5. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance.

Care should be taken to prevent wetting or drying of the bearing materials during construction. Any extremely wet or dry materials, or any loose or disturbed materials at the bottom of the footing excavations, should be removed prior to placing concrete. The potential for wetting or drying of the bearing materials can be reduced by pouring concrete as soon as possible after completing the footing excavation and evaluating the bearing surface by the geotechnical engineer or his representative.

8.1.5 Reinforced Concrete Retaining Walls

The following table, titled **Wall Design Criteria**, presents the recommended soil related design parameters for retaining walls with a level backslope. Contact Cobalt if an alternate retaining wall system is used.

Wall Design Criteria	
"At-rest" Conditions (Lateral Earth Pressure – EFD+)	55 pcf (Equivalent Fluid Density)
"Active" Conditions (Lateral Earth Pressure – EFD+)	35 pcf (Equivalent Fluid Density)
Seismic Increase for "At-rest" Conditions (Lateral Earth Pressure)	22H* (Uniform Distribution)
Seismic Increase for "Active" Conditions (Lateral Earth Pressure)	8H* (Uniform Distribution)
Passive Earth Pressure on Low Side of Wall (Allowable, includes F.S. = 1.5)	Neglect upper 2 feet, then 250 pcf EFD+
Soil-Footing Coefficient of Sliding Friction (Allowable; includes F.S. = 1.5)	0.35

*H is the height of the wall; Increase based on one in 2,500 year seismic event (2 percent probability of being exceeded in 50 years), + EFD – Equivalent Fluid Density

+EFD – Equivalent Fluid Density

The stated lateral earth pressures do not include the effects of hydrostatic pressure generated by water accumulation behind the retaining walls. Uniform horizontal lateral active and at-rest pressures on the retaining walls from vertical surcharges behind the wall may be calculated using active and at-rest lateral earth pressure coefficients of 0.3 and 0.5, respectively (if necessary for the vaults). The soil unit weight of 125 pcf may be used to calculate vertical earth surcharges.

To reduce the potential for the buildup of water pressure against the walls, continuous footing drains (with cleanouts) should be provided at the bases of the walls. The footing drains should consist of a minimum 4-inch diameter perforated pipe, sloped to drain, with perforations placed down and enveloped by a minimum 6 inches of pea gravel in all directions.

The backfill adjacent to and extending a lateral distance behind the walls at least 2 feet should consist of free-draining granular material. All free draining backfill should contain less than 3 percent fines (passing the U.S. Standard No. 200 Sieve) based upon the fraction passing the U.S. Standard No. 4 Sieve with at least 30 percent of the material being retained on the U.S. Standard No. 4 Sieve. The primary purpose of the free-draining material is the reduction of hydrostatic pressure. Some potential for the moisture to contact the back face of the wall may exist, even with treatment, which may require that more extensive waterproofing be specified for walls, which require interior moisture sensitive finishes.

We recommend that the backfill be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. In place density tests should be performed to verify adequate compaction. Soil compactors place transient surcharges on the backfill. Consequently, only light hand operated equipment is recommended within 3 feet of walls so that excessive stress is not imposed on the walls.

8.1.6 Stormwater Runoff

The site soils are not conducive for infiltration systems. All stormwater runoff from impervious surface should be tightlined off-site and into storm utility infrastructure.

If on-site systems are proposed, we should be provided with the plans so that we may provide additional geotechnical recommendations, if necessary.

8.1.7 Slab-on-Grade

We recommend that the upper 12 inches of the existing soils (following fill and topsoil removal) within any proposed slab areas be re-compacted to at least 95 percent of the modified proctor (ASTM D1557 Test Method).

Often, a vapor barrier is considered below concrete slab areas. However, the usage of a vapor barrier could result in curling of the concrete slab at joints. Floor covers sensitive to moisture typically requires the usage of a vapor barrier. A materials or structural engineer should be consulted regarding the detailing of the vapor barrier below concrete slabs. Exterior slabs typically do not utilize vapor barriers.

The American Concrete Institutes ACI 360R-06 Design of Slabs on Grade and ACI 302.1R-04 Guide for Concrete Floor and Slab Construction are recommended references for vapor barrier selection and floor slab detailing.

Slabs on grade may be designed using a coefficient of subgrade reaction of 180 pounds per cubic inch (pci) assuming the slab-on-grade base course is underlain by structural fill placed and compacted as outlined in Section 8.1.

A perimeter drainage system is recommended unless interior slab areas are elevated a minimum of 12 inches above adjacent exterior grades. If installed, a perimeter drainage system should consist of a 4 inch diameter perforated drain pipe surrounded by a minimum 6 inches of drain rock wrapped in a non-woven geosynthetic filter fabric to reduce migration of soil particles into the drainage system. The perimeter drainage system should discharge by gravity flow to a suitable stormwater system.

Exterior grades surrounding buildings should be sloped at a minimum of one percent to facilitate surface water flow away from these buildings and preferably with a relatively impermeable surface cover immediately adjacent to the buildings.

8.1.8 Utilities

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards, by a contractor experienced in such work. The contractor is responsible for the safety of open trenches. Traffic and vibration adjacent to trench walls should be reduced; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

In general, silty and sandy soils were encountered at shallow depths in the explorations at this site. These soils have low cohesion and have a tendency to cave or slough in excavations. Shoring or sloping back trench sidewalls is required within these soils.

All utility trench backfill should consist of imported structural fill or suitable on site soils. Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. The upper 5 feet of utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Below 5 feet, utility trench backfill in pavement areas should be compacted to at least 90 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with the pipe manufacturer's recommendations.

The contractor is responsible for removing all water-sensitive soils from the trenches regardless of the backfill location and compaction requirements. Depending on the depth and location of the proposed utilities, we anticipate the need to re-compact existing fill soils below the utility structures and pipes. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction procedures.

8.1.9 Groundwater Influence on Construction

Groundwater was not encountered during our field investigation. Mottled soils were observed within the upper 5 feet which indicate that perched groundwater may be present during the wetter months of the year. We can provide de-watering recommendations upon request.

8.1.10 Pavement Recommendations

The near surface subgrade soils generally consist of silty sand and sandy silt with variable amounts of gravel. These soils are rated as fair to good for pavement subgrade material (depending on silt content and moisture conditions). We estimate that the subgrade will have a California Bearing Ratio (CBR) value of 8 and a modulus of subgrade reaction value of k = 180 pci, provided the subgrade is prepared in general accordance with our recommendations.

We recommend that, at a minimum, 18 inches of the existing subgrade material be moisture conditioned (as necessary) and re-compacted to prepare for the construction of pavement sections. Deeper levels of recompaction or overexcavation and replacement may be necessary in areas where fill and/or loose soils are present.

The subgrade should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. In place density tests should be performed to verify proper moisture content and adequate compaction. However, if the subgrade soil consists of firm and unyielding native glacial soils a proof roll of the pavement subgrade soil may be performed in lieu of compaction tests.

The recommended flexible and rigid pavement sections are based on design CBR and modulus of subgrade reaction (k) values that are achieved, only following proper subgrade preparation. It should be noted that subgrade soils that have relatively high silt contents will likely be highly sensitive to moisture conditions. The subgrade strength and performance characteristics of a silty subgrade material may be dramatically reduced if this material becomes wet.

Based on our knowledge of the proposed project, we expect the traffic to range from light duty (passenger automobiles) to heavy duty (delivery trucks). The following tables show the recommended pavement sections for light duty and heavy duty use. In general, a residential driveway is considered 'Light Duty'; however, the heavy duty section may be utilized for greater pavement lifespan.

ASPHALTIC CONCRETE (FLEXIBLE) PAVEMENT

LIGHT DUTY

Asphaltic Concrete	Aggregate Base*	Compacted Subgrade* **
2.5 in.	6.0 in.	12.0 in.

** 95% compaction based on ASTM Test Method D1557*
*** A proof roll may be performed in lieu of in place density tests*

HEAVY DUTY

Asphaltic Concrete	Aggregate Base*	Compacted Subgrade* **
3.5 in.	6.0 in.	12.0 in.

** 95% compaction based on ASTM Test Method D1557*
*** A proof roll may be performed in lieu of in place density tests*

PORTLAND CEMENT CONCRETE (RIGID) PAVEMENT

Min. PCC Depth	Aggregate Base*	Compacted Subgrade* **
6.0 in.	6.0 in.	12.0 in.

** 95% compaction based on ASTM Test Method D1557*
*** A proof roll may be performed in lieu of in place density tests*

The asphaltic concrete depth in the flexible pavement tables should be a surface course type asphalt, such as Washington Department of Transportation (WSDOT) ½ inch HMA. The rigid pavement design is based on a Portland Cement Concrete (PCC) mix that has a 28 day compressive strength of 4,000 pounds per square inch (psi). The design is also based on a concrete flexural strength or modulus of rupture of 550 psi.

9.0 Construction Field Reviews

Cobalt Geosciences should be retained to provide part time field review during construction in order to verify that the soil conditions encountered are consistent with our design assumptions and that the intent of our recommendations is being met. This will require field and engineering review to:

- Monitor and test structural fill placement and soil compaction
- Verify the soil bearing at foundation locations for the buildings
- Verify slab subgrade and capillary break material below slab-on-grade
- Observe footing drainage placement

- Test wall backfill compaction
- Observe proof rolls of roadway subgrade prior to asphalt placement

Geotechnical design services should also be anticipated during the subsequent final design phase to support the structural design and address specific issues arising during this phase. Field and engineering review services will also be required during the construction phase in order to provide a Final Letter for the project.

10.0 Closure

This report was prepared for the exclusive use of Harish Bharti and his appointed consultants. Any use of this report or the material contained herein by third parties, or for other than the intended purpose, should first be approved in writing by Cobalt Geosciences, LLC.

The recommendations contained in this report are based on assumed continuity of soils with those of our test holes, and assumed structural loads. Cobalt Geosciences should be provided with final architectural and civil drawings when they become available in order that we may review our design recommendations and advise of any revisions, if necessary.

Use of this report is subject to the Statement of General Conditions provided in Appendix A. It is the responsibility of Harish Bharti who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Cobalt Geosciences should any of these not be satisfied.

Respectfully submitted,

Cobalt Geosciences, LLC
Original signed by:

Phil Haberman, PE, LG, LEG 12/9/2020
Principal

PH/sc

APPENDIX A
Statement of General Conditions

Statement of General Conditions

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Cobalt Geosciences and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Cobalt Geosciences present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Cobalt Geosciences is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

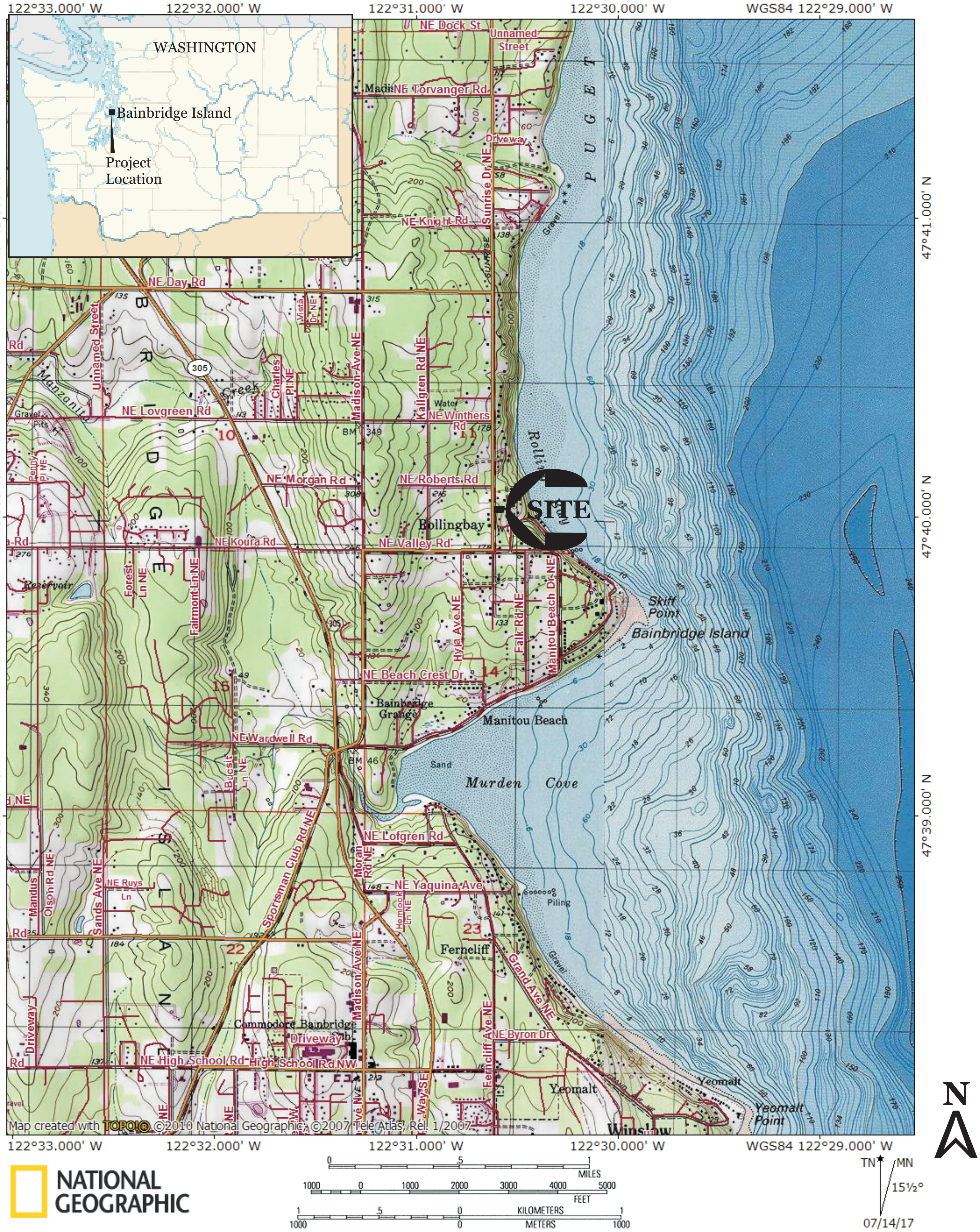
STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Cobalt Geosciences at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

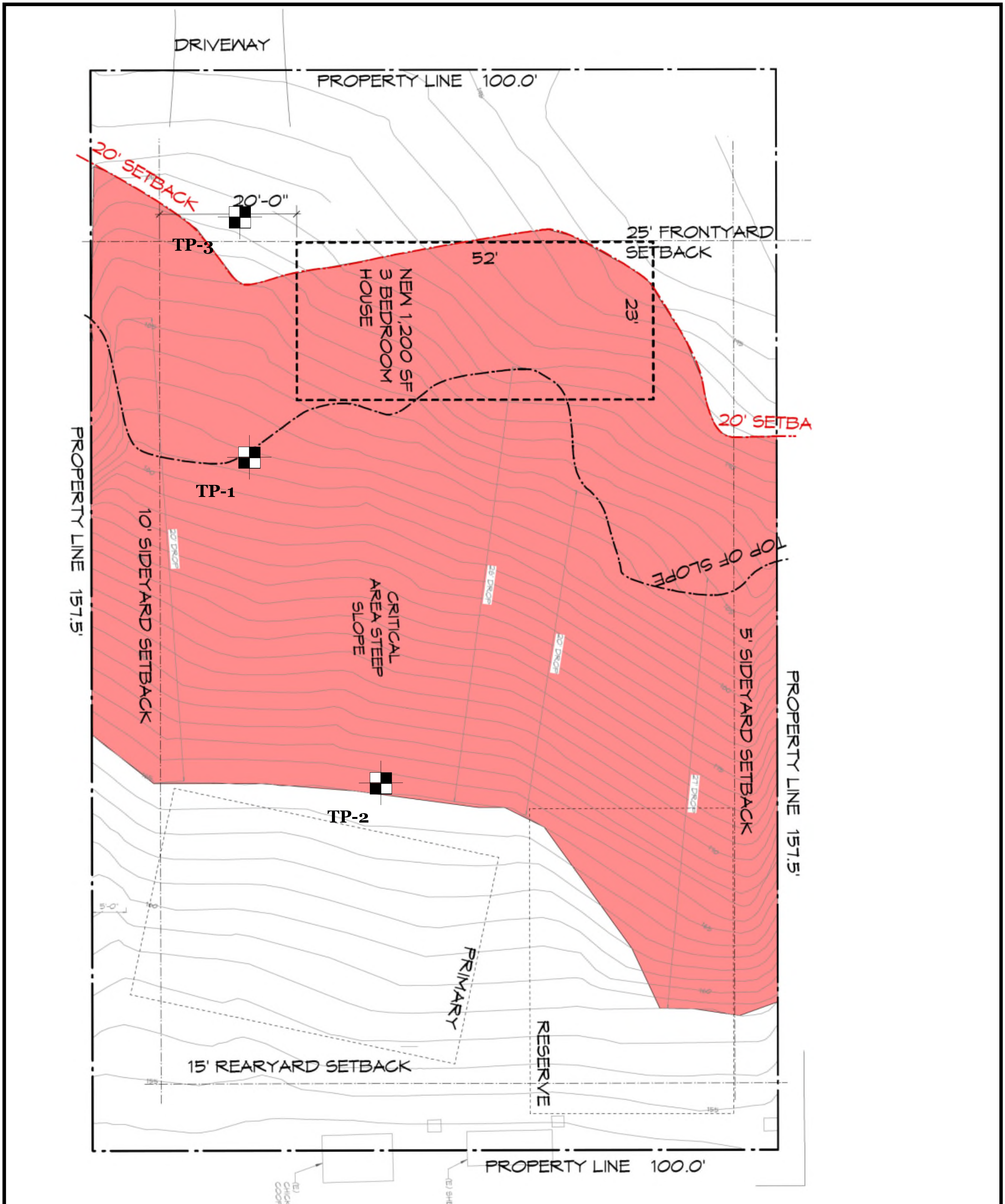
VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Cobalt Geosciences must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Cobalt Geosciences will not be responsible to any party for damages incurred as a result of failing to notify Cobalt Geosciences that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Cobalt Geosciences, sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Cobalt Geosciences cannot be responsible for site work carried out without being present.

APPENDIX B
Figures: Vicinity Map, Site Plan



Geotechnical Investigation Sunrise Drive NE Bainbridge Island, Washington	Vicinity Map Figure 1	Cobalt Geosciences P.O. Box 82243 Kenmore, WA 98028 (206) 331-1097 cobaltgeo@gmail.com



Geotechnical Investigation Sunrise Drive NE Bainbridge Island, Washington	Site Plan Figure 2	Cobalt Geosciences P.O. Box 82243 Kenmore, WA 98028 (206) 331-1097 cobaltgeo@gmail.com

APPENDIX C
Test Pit Logs

PROJECT: **Bharti Residence** LOCATION: **Sunrise Drive NE, Bainbridge Island, WA** PROJECT NUMBER:	Test Pit No: **TP-1** PAGE 1 OF 1
DRILLING / INSTALLATION: STARTED **7/7/17** COMPLETED: **7/7/17** DRILLING COMPANY: **Steffen** DRILLING EQUIPMENT: **Excavator** DRILLING METHOD: SAMPLING EQUIPMENT: **Grab**	NORTHING (ft): EASTING (ft): LAT: LONG: GROUND ELEV (ft): TOC ELEV (ft): INITIAL DTW (ft): **Not Encountered** WELL DEPTH (ft): **---** STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **10.0** WELL CASING DIA. (in): **---** BOREHOLE DIA. (in): LOGGED BY: **PH** CHECKED BY: **SC**

Depth (feet)	Graphic Log	USCS	Description	Sample	Sample ID Time	Recov. (feet)	Blow Count	Headspace PID (ppm)	Depth (feet)
			Topsoil/Vegetation						
		ML	ML; Medium stiff to stiff, silt with fine to medium grained sand trace gravel, yellowish brown, dry to moist.						
		ML	ML; Stiff to very stiff, silt with fine to medium grained sand trace gravel, mottled grayish brown, moist. Local cemented pieces.						
5.0									5
10.0									10
			Test pit terminated at 10 feet.						

PROJECT: **Bharti Residence** LOCATION: **Sunrise Drive NE, Bainbridge Island, WA** PROJECT NUMBER:	Test Pit No: **TP-2** PAGE 1 OF 1
DRILLING / INSTALLATION: STARTED **7/7/17** COMPLETED: **7/7/17** DRILLING COMPANY: **Steffen** DRILLING EQUIPMENT: **Excavator** DRILLING METHOD: SAMPLING EQUIPMENT: **Grab**	NORTHING (ft): EASTING (ft): LAT: LONG: GROUND ELEV (ft): TOC ELEV (ft): INITIAL DTW (ft): **Not Encountered** WELL DEPTH (ft): **---** STATIC DTW (ft): **Not Encountered** BOREHOLE DEPTH (ft): **8.0** WELL CASING DIA. (in): **---** BOREHOLE DIA. (in): LOGGED BY: **PH** CHECKED BY: **SC**

Depth (feet)	Graphic Log	USCS	Description	Sample	Sample ID Time	Recov. (feet)	Blow Count	Headspace PID (ppm)	Depth (feet)
			Topsoil/Vegetation						
		ML	ML; Medium stiff to stiff, silt with fine to medium grained sand trace gravel, yellowish brown, dry to moist.						
		ML	ML; Stiff to very stiff, silt with fine to medium grained sand, mottled yellowish brown to grayish brown, moist.						
5.0									5
		ML	ML; Very stiff to hard, silt with fine to medium grained sand trace gravel, grayish brown, moist.						
			Test pit terminated at 8 feet.						
10.0									10

PROJECT: **Bharti Residence**
LOCATION: **Sunrise Drive NE, Bainbridge Island, WA**
PROJECT NUMBER:

Test Pit No: **TP-3** PAGE 1 OF 1

DRILLING / INSTALLATION:	NORTHING (ft):
STARTED **7/7/17** COMPLETED: **7/7/17**	EASTING (ft):
DRILLING COMPANY: **Steffen**	LAT:
DRILLING EQUIPMENT: **Excavator**	LONG:
DRILLING METHOD:	GROUND ELEV (ft):
SAMPLING EQUIPMENT: **Grab**	TOC ELEV (ft):
	INITIAL DTW (ft): **Not Encountered**
	WELL DEPTH (ft): **---**
	STATIC DTW (ft): **Not Encountered**
	BOREHOLE DEPTH (ft): **8.0**
	WELL CASING DIA. (in): **---**
	BOREHOLE DIA. (in):
	LOGGED BY: **PH**
	CHECKED BY: **SC**

Depth (feet)	Graphic Log	USCS	Description	Sample	Sample ID Time	Recov. (feet)	Blow Count	Headspace PID (ppm)	Depth (feet)
			Topsoil/Vegetation						
		ML	ML; Medium stiff to stiff, silt with fine to medium grained sand trace gravel, yellowish brown, dry to moist.						
		ML	ML; Stiff to very stiff, silt with fine to medium grained sand trace gravel, mottled grayish brown, moist. Local cemented pieces.						
5.0									5
			Test pit terminated at 8 feet.						
10.0									10