



741 Marine Drive
Bellingham, WA 98225

20611-67th Avenue NE
Arlington, WA 98223

PHONE
360 733_7318

TOLL FREE
888 251_5276

FAX
360 733_7418

April 21, 2015
Job No. 15-0191

Monterra Partners
1729 145th Place SE
Mill Creek, Washington, 98082

Attention: Mr. David Martin

**Re: Geotechnical Engineering Evaluation
Haller Avenue Apartments**
Near E. Haller Avenue and Railroad Avenue
Arlington, Washington

Dear Mr. Martin:

As requested, GeoTest Services, Inc. is pleased to submit this report summarizing the results of our geotechnical engineering evaluation for the above-referenced project. The purpose of this evaluation was to establish general subsurface conditions beneath the site from which conclusions and recommendations for project design could be formulated. Specifically, our scope of services included the following tasks:

- Exploration of soil and groundwater conditions underlying the site by observing a total of 2 exploration test pits to evaluate subsurface conditions.
- Laboratory testing on representative samples in order to classify and evaluate the engineering characteristics and infiltration potential of the soils encountered.
- Provide this written report containing a description of subsurface conditions, test pit logs, and findings and recommendations pertaining to seismic design, site preparation and earthwork, fill and compaction, wet weather earthwork, foundation recommendations, concrete slab-on-grade construction, foundation and site drainage, stormwater design recommendations, geotechnical consultation and construction monitoring.

PROJECT DESCRIPTION

The project site is an approximately 0.25 acre previously graded and developed property that contains an existing residential structure and detached shed/garage structure. GTS understands that the existing structures will be torn down and removed from the site and that a new 3-story apartment building will be constructed on the property. The new construction will include a partially buried garage structure that daylight onto E. Haller Avenue. GTS also understands that a rock trench is planned on site for the purposes of infiltrating stormwater. GTS anticipates that the structures will utilize wood-frame construction with shallow conventional foundations. Structural loads are expected to be relatively light.

SITE CONDITIONS

This section discusses the general surface and subsurface conditions observed at the project site at the time of our field investigation. Interpretations of the site conditions are based on the results of our review of available information, site reconnaissance, subsurface explorations, laboratory testing, and our experience in the project vicinity.

Surface Conditions

The site is bordered to the north by E. Haller Avenue, to the south by a parking lot from the adjacent grocery store, to the east by a similar residential structure, and to the west by Centennial Trail and Railroad Avenue. The project site is within an established residential neighborhood and retail area, with typical grass lawns and irrigated landscaping. The site is largely flat, but contains an approximately 6-foot high, steep slope on the north side of the property.

Subsurface Soil Conditions

Subsurface conditions were explored by advancing 2 exploration test pits (TP-1 and TP-2) on April 9, 2015. The explorations were advanced to depths of 13 and 12.5 feet below ground surface (BGS), respectively, using a backhoe provided by the client.

The on-site subsurface soils generally consisted of 1 to 1.5 feet of topsoil over Glacial Outwash, with the upper 1 to 1.5 feet of Glacial Outwash being less dense and weathered to red brown. Glacial Outwash generally consisted of medium dense silty sand to sandy gravel. Additionally, a several foot thick, very sandy, silt layer was encountered in both locations at a depth of approximately 9 feet BGS in TP-1 and 7 feet BGS in TP-2.

Please refer to the attached Site and Exploration Map (Figure 2) and Logs of Test Pits (Figure 5) for more information regarding the subsurface soil conditions that were encountered.

General Geologic Conditions

Geologic information for the project site was obtained from the interactive *Geologic Map of the Arlington East Quadrangle (Minard, 1985)*, published by the U.S. Geological Survey. According to the referenced map, near surface soils in the vicinity of the project site consist of Marysville Sand Member Recessional Glacial Outwash (Qvrn). According to Minard, Marysville Sand Recessional Glacial Outwash generally consists of well-drained, stratified to massive, outwash sand with some pebble gravel with localized areas of silt and clay. Native soils encountered during our subsurface exploration were generally consistent with the mapped Glacial Outwash deposits.

Groundwater

A free groundwater condition was not encountered at the time of our subsurface investigation in April of 2015. Our subsurface explorations indicated the presence of a silt layer at a depth of about 7 and 9 feet below existing site elevations. Surface water will likely have reduced infiltration rates as it passes through this silt layer, however, GTS

did not observe indications of a perched or seasonal groundwater condition as indicated by mottled soil conditions.

The groundwater conditions reported on the exploration logs are for the specific locations and date indicated, and therefore may not necessarily be indicative of other locations and/or times. Groundwater levels are not static and groundwater conditions will vary depending on local subsurface conditions, precipitation, changes in site use, both on and off site, and other factors.

CONCLUSIONS AND RECOMMENDATIONS

Based upon evaluation of the data collected during this investigation, it is our opinion that subsurface conditions at the site are suitable for the proposed construction of the development, provided the recommendations contained herein are incorporated into the project design.

Site Preparation and Earthwork

The portions of the site to be occupied by the proposed building foundations and pavements should be prepared by removing any existing topsoil, fill, relic topsoil and loose/soft, upper portions of the native soil.

Prior to placement of any structural fill, the exposed subgrade under all areas should be recompact to a firm and unyielding condition and proof rolled with a loaded dump truck, large self-propelled vibrating roller, or equivalent piece of equipment applicable to the size of the excavation. The purpose of this effort is to identify possible loose or soft soil deposits and recompact the soil exposed during site excavation activities.

Proof rolling should be carefully observed by qualified geotechnical personnel. Areas exhibiting significant deflection, pumping, or over-saturation that cannot be readily compacted should be overexcavated to firm soil. Overexcavated areas should be backfilled with compacted granular material placed in accordance with subsequent recommendations for structural fill. During periods of wet weather, proof rolling could damage the exposed subgrade. Under these conditions, qualified geotechnical personnel should observe subgrade conditions to determine if proof rolling is feasible.

Fill and Compaction

Structural fill used to obtain final elevations for footings and soil-supported floor slabs must be properly placed and compacted. In general, any suitable, non-organic, predominantly granular soil may be used for fill material provided the material is properly moisture conditioned prior to placement and compaction, and the specified degree of compaction is obtained. Excavated site material containing topsoil, wood, trash, organic material, or construction debris will not be suitable for reuse as structural fill and should be properly disposed offsite or placed in nonstructural areas.

Reuse of Onsite Soil

It is our opinion that non-silty portions of the Glacial Outwash, observed below 2 feet BGS and above 7 feet BGS, can be used in structural fill applications provided it is

moisture conditioned, compacted, and if allowed for use in the project plans and specifications.

We do not recommend that silty portions of the Glacial Outwash, observed generally below 7 feet BGS, be used as structural fill due to its elevated fines and moisture content. Re-use of this soil would likely require a moisture conditioning program. The space and time requirements of such a program, however, is not anticipated to be feasible within the current project scope. We can provide additional guidance and recommendations pertaining to moisture conditioning programs upon request.

Soils containing more than approximately 5 percent fines are considered moisture sensitive, and are very difficult to compact to a firm and unyielding condition when over the optimum moisture content by more than approximately 2 percent. The optimum moisture content is that which allows the greatest dry density to be achieved at a given level of compactive effort.

Imported Structural Fill

We recommend that imported structural fill consist of clean, well-graded sandy gravel, gravelly sand, or other approved naturally occurring granular material (pit run) with at least 30 percent retained on the No. 4 sieve, or a well-graded crushed rock. Structural fill for dry weather construction may contain on the order of 10 percent fines (that portion passing the U.S. No. 200 sieve) based on the portion passing the U.S. No. 4 sieve. Soil containing more than about 5 percent fines cannot consistently be compacted to a dense, non-yielding condition when the water content is greater than optimum. Accordingly, we recommend that imported structural fill with less than 5 percent fines be used during wet weather conditions. Due to wet weather or wet site conditions, soil moisture contents could be high enough that it may be very difficult to compact even "clean" imported select granular fill to a firm and unyielding condition. Soils with over-optimum moisture contents should be either scarified and dried back to more suitable moisture contents during periods of dry weather or removed and replaced with fill soils at a more suitable range of moisture contents.

Backfill and Compaction

Structural fill should be placed in horizontal lifts 8 to 10 inches in loose thickness and thoroughly compacted. All structural fill placed under load bearing areas should be compacted to at least 95 percent of the maximum dry density, as determined using test method ASTM D 1557. Structural fill should be placed in horizontal lifts 8 to 10 inches in loose thickness and thoroughly compacted. The top of the compacted structural fill should extend outside all foundations and other structural improvements a minimum distance equal to the thickness of the fill. We recommend that compaction be tested periodically throughout the fill placement.

Temporary and Permanent Slopes

Actual construction slope configurations and maintenance of safe working conditions, including temporary excavation stability, should be the responsibility of the contractor, who is able to monitor the construction activities and has direct control over the means and methods of construction. All applicable local, state, and federal safety codes should be followed. All open cuts should be monitored during and after excavation for any

evidence of instability. If instability is detected, the contractor should flatten the side slopes or install temporary shoring.

Temporary excavations in excess of 4 ft should be shored or sloped in accordance with Safety Standards for Construction Work Part N, WAC 296-155-657.

Temporary unsupported excavations in Glacial Outwash should be classified as a Type C soil according to WAC 296-155-657 and may be sloped as steep as 1.5H:1V (Horizontal: Vertical). All soils encountered are classified as Type C soil in the presence of groundwater seepage. Flatter slopes or temporary shoring may be required in areas where groundwater flow is present and unstable conditions develop.

Temporary slopes and excavations should be protected as soon as possible using appropriate methods to prevent erosion from occurring during periods of wet weather.

We recommend that permanent cut or fill slopes be designed for inclinations of 2H:1V or flatter and all open ponds or water holding features sloped to 3H:1V or flatter. All permanent slopes should be vegetated or otherwise protected to limit the potential for erosion as soon as practical after construction.

Seismic Design Considerations

The Pacific Northwest is seismically active and the site could be subject to ground shaking from a moderate to major earthquake. Consequently, moderate levels of earthquake shaking should be anticipated during the design life of the project, and the proposed structure should be designed to resist earthquake loading using appropriate design methodology.

Site Class Definition

For structures designed using the seismic design provisions of the 2012 International Building Code, the underlying alluvial soils interpreted to underlie the site within the upper 100 feet classifies as Site Class D according to 2010 ASCE -7 Standard – Table 20.3-1, Site Class Definitions. The corresponding values for calculating a design response spectrum for the assumed soil profile type is considered appropriate for the site.

Please use the following values for seismic structural design purposes:

Conterminous 48 States – 2012 International Building Code
Zip Code 98223
Central Latitude = 48.20083, Central Longitude = -122.12584

Short Period (0.2 sec) Spectral Acceleration

Maximum Considered Earthquake (MCE) Value of $S_s = 1.051$ (g)
Site Response Coefficient, $F_a = 1.080$ (Site Class D)
Adjusted spectral response acceleration for Site Class D, $S_{MS} = S_s \times F_a = 1.134$ (g)
Design spectral response acceleration for Site Class D, $S_{DS} = 2/3 \times S_{MS} = 0.756$ (g)

One Second Period (1 sec) Spectral Acceleration

Maximum Considered Earthquake (MCE) Value of $S_1 = 0.408$ (g)

Site Response Coefficient, $F_v = 1.592$ (Site Class D)

Adjusted spectral response acceleration for Site Class D, $S_{M1} = S_1 \times F_v = 0.650$ (g)

Design spectral response acceleration for Site Class D, $S_{D1} = 2/3 \times S_{M1} = 0.433$ (g)

Building Foundation Support and Settlement

We recommend that all topsoil, relic topsoil, and organic portions of the native site soil be removed below footing and slab areas down to native soil. Foundation support for the proposed building may be provided by continuous or isolated spread footings founded on the proof-rolled or recompacted, undisturbed, firm and unyielding Glacial Outwash (Marysville Sand) or on properly compacted structural fill placed directly over prepared subgrades. In areas requiring overexcavation to competent native soil, the limits of the overexcavation should extend laterally beyond the edge of each side of the footing a distance equal to the depth of the fill. If CDF is used to backfill the overexcavation, the limits of the overexcavation need only extend a nominal distance beyond the width of the footing.

All continuous and isolated spread footings should be founded a minimum of 18 inches below the lowest adjacent final grade for freeze/thaw protection.

Allowable Bearing Capacity

Assuming the above foundation support criteria are satisfied, continuous or isolated spread footings founded directly on firm and unyielding Glacial Outwash, compacted structural fill, or CDF placed directly over undisturbed Glacial Outwash, may be proportioned using a maximum net allowable soil bearing pressure of 2,500 pounds per square ft (psf). The term "net allowable bearing pressure" refers to the pressure that can be imposed on the soil at foundation level resulting from the total of all dead plus live loads, exclusive of the weight of the footing or any backfill placed above the footing. The net allowable bearing pressure may be increased by one-third for transient wind or seismic loads.

Foundation Settlement

Settlement of shallow foundations depends on foundation size and bearing pressure, as well as the strength and compressibility characteristics of the underlying soil. Assuming construction is accomplished as previously recommended and for the maximum allowable soil bearing pressure recommended above, we estimate the total settlement of building foundations should be less than about 1 inch and differential settlement between two adjacent load-bearing components supported on competent soil should be less than about one half the total settlement. The soil response to applied stresses caused by building and other loads is expected to be predominantly elastic in nature, with most of the settlement occurring during construction as loads are applied.

Concrete Slabs-on-Grade

Floor slabs may be supported on properly prepared native subgrade or on structural fill placed over properly prepared native soil. New floor slabs should not be founded on

topsoil, existing fill, or loose native soils. Prior to placement of structural fill, the native soil should be proof-rolled as recommended in the *Site Preparation and Earthwork* section of this report.

We recommend that interior concrete slab-on-grade floors be underlain by a minimum of 6 inches of compacted, clean, free-draining gravel with less than 3 percent passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The purpose of this layer is to provide uniform support for the slab, provide a capillary break, and act as a drainage layer. To help reduce the potential for water vapor migration through floor slabs, a continuous 10-mil minimum thickness polyethylene sheet with tape-sealed joints should be installed below the slab to serve as an impermeable vapor barrier. The vapor barrier should be installed and sealed in accordance with the manufactures instructions.

The American Concrete Institute (ACI) guidelines suggest that the slab may either be poured directly on the vapor barrier or on a granular curing layer placed over the vapor barrier depending on conditions anticipated during construction. We recommend that the architect or structural engineer specify if a curing layer should be used. If moisture control within the building is critical, we recommend that the vapor barrier be observed by a representative of GTS to confirm that openings have been properly sealed. Use of a curing layer is generally only recommended during drier months of the year and/or when limited rain is expected during the slab-on-grade construction process. If the slab will be constructed during the wet season, exposed to rain after construction or the site may be potentially wet, we do not recommend the use of curing layer as excessive moisture emissions through the slab may occur.

Exterior concrete slabs-on-grade, such as sidewalks, may be supported directly on undisturbed native or on properly placed and compacted structural fill; however, long-term performance will be enhanced if exterior slabs are placed on a layer of clean, durable, well-draining granular material.

Foundation and Site Drainage

To reduce the potential for groundwater and surface water to seep into interior spaces we recommend that an exterior footing drain system be constructed around the perimeter of new building foundations as shown in the Typical Footing and Wall Drain Section, Figure 3. The drain should consist of a minimum 4-inch diameter perforated PVC pipe, surrounded by a minimum 12 inches of filtering media with the discharge sloped to carry water to a suitable collection system. The filtering media may consist of open-graded drain rock wrapped by a nonwoven geotextile fabric (such as Mirafi 140N or equivalent) or a graded sand and gravel filter. The drainage backfill should be carried up the back of the wall and contain less than 3 percent by weight passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The invert of the footing drain pipe should be placed at approximately the same elevation as the bottom of the footing or 12 inches below the adjacent floor slab grade, whichever is deeper, so that water will not seep through walls or floor slabs. The footing drain should discharge to an approved drain system and include cleanouts to allow periodic maintenance and inspection.

Positive surface gradients should be provided adjacent to the proposed structures to direct surface water away from foundation areas and toward suitable drainage facilities. Roof drainage should not be introduced into the perimeter footing drains, but should be separately discharged directly to the stormwater collection system or other appropriate outlet. Pavement and sidewalk areas should be sloped and drainage gradients should be maintained to carry all surface water away from above-ground structures towards the local stormwater collection system. Surface water should not be allowed to pond and soak into the ground surface near buildings or paved areas during or after construction. Construction excavations should be sloped to drain to sumps where water from seepage, rainfall, and runoff can be collected and pumped to a suitable discharge facility.

Resistance to Lateral Loads

Current apartment designs include a partially buried parking garage that daylight to E Haller Avenue to the north. The south, east and west walls of this garage are anticipated to consist of cast in place retaining walls. The lateral earth pressures that develop against retaining walls will depend on the method of backfill placement, degree of compaction, slope of backfill, type of backfill material, provisions for drainage, magnitude and location of any adjacent surcharge loads, and the degree to which the wall can yield laterally during or after placement of backfill. If the wall is allowed to rotate or yield so the top of the wall moves an amount equal to or greater than about 0.001 to 0.002 times its height (a yielding wall), the soil pressure exerted will be the active soil pressure. When a wall is restrained against lateral movement or tilting (a nonyielding wall), the soil pressure exerted is the at-rest soil pressure. Wall restraint may develop if a rigid structural network is constructed prior to backfilling or if the wall is inherently stiff.

We recommend that yielding walls under drained conditions be designed for an equivalent fluid density of 35 pounds per cubic ft (pcf) for structural fill in active soil conditions. Nonyielding walls under drained conditions should be designed for an equivalent fluid density of 50 pcf for structural fill in at-rest conditions. Design of walls should include appropriate lateral pressures caused by surcharge loads located within a horizontal distance equal to or less than the height of the wall. For uniform surcharge pressures, a uniformly distributed lateral pressure equal to 35 percent and 50 percent of the vertical surcharge pressure should be added to the lateral soil pressures for yielding and nonyielding walls, respectively. GTS assumes that retaining walls or below-grade structures will not extend below the groundwater table. If walls or structures extend below the water table, GTS should be contacted so that we may provide lateral earth pressures for submerged conditions.

Passive earth pressures developed against the sides of building foundations, in conjunction with friction developed between the base of the footings and the supporting subgrade, will resist lateral loads transmitted from the structure to its foundation. For design purposes, the passive resistance of well-compacted fill placed against the sides of foundations may be considered equivalent to a fluid with a density of 300 pounds per cubic ft. The recommended value includes a safety factor of about 1.5 and is based on the assumption that the ground surface adjacent to the structure is level in the direction of movement for a distance equal to or greater than twice the embedment depth. The recommended value also assumes drained conditions that will prevent the buildup of hydrostatic pressure in the compacted fill. Retaining walls should include a drain system constructed in general accordance with the recommendations presented in the

Foundation and Site Drainage section of this report. In design computations, the upper 12 inches of passive resistance should be neglected if the soil is not covered by floor slabs or pavement. If future plans call for the removal of the soil providing resistance, the passive resistance should not be considered.

An allowable coefficient of base friction of 0.35, applied to vertical dead loads only, may be used between the underlying native soils or imported granular structural fill and the base of the footing. If passive and frictional resistance are considered together, one half the recommended passive soil resistance value should be used since larger strains are required to mobilize the passive soil resistance as compared to frictional resistance. We do not recommend increasing the coefficient of friction to resist seismic or wind loads.

Pavement Subgrade Preparation

Selection of a pavement section is typically a compromise between higher initial cost and lower maintenance versus lower initial cost, with more frequent maintenance (such as reduced time before overlay, crack sealing and/or pothole repair may become necessary). For this reason, we recommend that the owner participate in the selection of a pavement section for the site. Site grading plans should include provisions for sloping of the subgrade soils in proposed pavement areas, so that passive drainage of the pavement section(s) can proceed uninterrupted during the life of the project.

GTS does not recommend placing new pavements on existing pavements, topsoil, existing fill, or loose native soils. New pavement sections should be installed over stripped, compacted, and/or otherwise firm and unyielding subgrades. Near surface native soils can be susceptible to degradation during wet weather due to their elevated fines contents. To protect against degradation that would otherwise require over-excavation of loose or yielding soils, we recommend "working mats" of structural fill be placed over prepared native grades in areas of anticipated construction traffic. We recommend other areas be left un-stripped and unprepared as long as feasible.

Utilities

It is important that utility trenches be properly backfilled and compacted to reduce cracking or localized loss of foundation, slab, or pavement support. It is anticipated that excavations for new shallow underground utilities will be in silty sand to very sandy, gravel (Glacial Outwash). Deeper utilities may encounter silt below 7 feet BGS.

Trench backfill in improved areas (beneath structures, pavements, sidewalks, etc.) should consist of structural fill as defined earlier in this report. Outside of improved areas, trench backfill may consist of re-used native fill provided it can be compacted to the project specifications. Trench backfill should be placed and compacted in general accordance with the recommendations presented in the *Fill and Compaction* section of this report.

Surcharge loads on trench support systems due to construction equipment, stockpiled material, and vehicle traffic should be included in the design of any anticipated shoring system. The contractor should implement measures to prevent surface water runoff from entering trenches and excavations. In addition, vibration as a result of construction activities and traffic may cause caving of the trench walls.

Actual trench configurations are the responsibility of the contractor. All applicable local, state, and federal safety codes should be followed. All open cuts should be monitored by the contractor during excavation for any evidence of instability. If instability is detected, the contractor should flatten the side slopes or install temporary shoring. If groundwater or groundwater seepage is present, and the trench is not properly dewatered, the soil within the trench zone may be prone to caving, channeling, and running. Trench widths may be substantially wider than under dewatered conditions.

Stormwater Design Recommendations

From the explorations excavated at the site, five representative soil samples were selected and mechanically tested for grain size distribution and interpretation according to the United States Department of Agriculture (USDA) soil textural classification. Subsurface infiltration rates corresponding to the United States Department of Agriculture (USDA) soil textural classification were obtained from the 2005 Washington State Department of Ecology *Stormwater Management Manual for Western Washington*, Table 3.7 and are reproduced in Table 1 below.

TABLE 1 Test Pit Soil Sample Infiltration Rates Based On The 2005 DOE Stormwater Management Manual Table 3.7				
Exploration	Sample Depth (ft)	Unit	Classification (USDA)	Infiltration Rate (Inches/Hour)
TP-1	6.0	Glacial Outwash	Sand	2.0
TP-1	9.5	Glacial Outwash	Loam	0.13
TP-2	2.0	Weathered Glacial Outwash	Sand	2.0
TP-2	8.0	Glacial Outwash	Loam	0.13
TP-2	11.0	Glacial Outwash	Sand	2.0
Note: Listed infiltration rates are long term (design) rates as stated in Table 3.7.				

Based on the grain size distribution of the collected samples, the silt layer encountered at depth throughout the site classifies as Loam per USDA classification and a long term design infiltration rate of 0.13 in/hr per the 2005 DOE Stormwater Management Manual. The Glacial Outwash above and below this silt lens classifies as Sand per USDA classification and a long term design infiltration rate of 2.0 in/hr.

GTS did not encounter a regional groundwater table within our explorations that would directly impact planned stormwater infiltration systems. Based on the site plan provided to us by the client, stormwater is to be managed by a seven foot deep rock trench infiltration facility along the south side of the property. The current design places the infiltration facility just above a restrictive silt layer (encountered between 7 and 9 feet BGS in exploration TP-2). We recommend this silt layer be removed from below the

proposed infiltration facility so that the higher long term design infiltration rate of 2.0 in/hr can be utilized. If the silt layer is not removed from below the proposed facility, we recommend a long term design infiltration rate of 0.13 in/hr can be utilized in design.

CATION EXCHANGE CAPACITY AND OTHER TESTING

GTS submitted a total of 3 samples for determination of Cation Exchange Capacity (CEC), pH, and Organic Content in accordance SSC-6, "Soil Physical and Chemical Suitability for Treatment" within the 2005 DOE Stormwater Management Manual. GTS has provided a copy of the laboratory test results attached at the end of this letter. Table 2, listed below, presents a summary of the laboratory results:

Table 2 Testing of Treatment Capacity Parameters					
Test Pit Number	Sample Depth (Feet)	Unit	pH (unitless)	CEC (meq/100g)	Organic Content (percent)
TP-2	2.0	Weathered Glacial Outwash	6.5	13.6	5.15
TP-2	8.0	Glacial Outwash	6.6	5.8	1.41
TP-2	11.0	Glacial Outwash	6.8	2.4	1.01

Recommendations for the Treatment of Stormwater

The Department of Ecology *Stormwater Management Manual for Western Washington* (Ecology) states that the cation exchange capacity (CEC) of the treatment soil must be greater than or equal to 5 milliequivalents CEC/100g dry soil. The manual also recommends a minimum organic content of 1 percent of the dry weight. As indicated in the above-referenced laboratory data, the samples of the Weathered Outwash met the Ecology-recommended cation exchange capacity and organic content. The Glacial Outwash below the silt layer (sample at 11 feet BGS in TP-2) did not achieve the Ecology-recommended cation exchange capacity of at least 5 milliequivalents.

Based on the laboratory results, it is our opinion that the unweathered, non-silty native Glacial Outwash, encountered both above and below the silt layer, is not suitable for the treatment of stormwater without being amended or replaced with soils that have the soil properties recommended by Ecology. Though the silt layer does achieve the Ecology-recommended cation exchange capacity of at least 5 milliequivalents, we do not anticipate it will be utilized for infiltration due to its very low design infiltration rate.

GTS anticipates that amendment may include placement of the near surface red brown Weathered Glacial Outwash soils, cut from other areas of the site, at the base of infiltration facilities.

Amendment may also include the addition of mulch or other admixtures to elevate the cation exchange capacity and/or organic content of the native soil. It should be noted

that it has been historically difficult to obtain a uniformly blended amended soil by using conventional construction equipment to mix on-site soils and imported materials. On-site amended soil would also require additional testing of the amended soil to confirm compliance with Ecology-recommended soil properties. GTS is available to perform additional laboratory testing as part of an expanded scope of services if the soil is to be amended. Alternatively, the Owner may elect to import amended soils with the desired properties for the planned infiltration facility.

Geotechnical Consultation and Construction Monitoring

We recommend that geotechnical construction monitoring services be provided. These services should include observation by geotechnical personnel during fill placement/compaction activities and subgrade preparation operations to verify that design subgrade conditions are obtained beneath the proposed building. We also recommend that periodic field density testing be performed to verify that the appropriate degree of compaction is obtained. The purpose of these services would be to observe compliance with the design concepts, specifications, and recommendations of this report, and in the event subsurface conditions differ from those anticipated before the start of construction, provide revised recommendations appropriate to the conditions revealed during construction. GeoTest Services would be pleased to provide these services for you.

GeoTest Services is also available to provide a full range of materials testing and special inspection during construction as required by the local building department and the International Building Code. This may include specific construction inspections on materials such as reinforced concrete, reinforced masonry, and structural steel. These services are supported by our fully accredited materials testing laboratory.

USE OF THIS REPORT

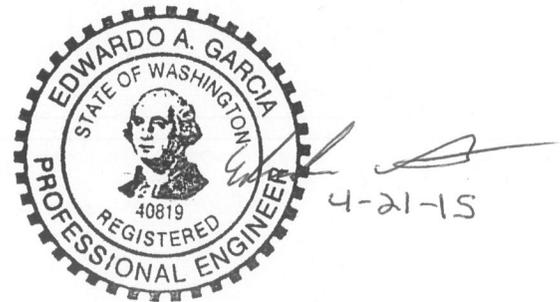
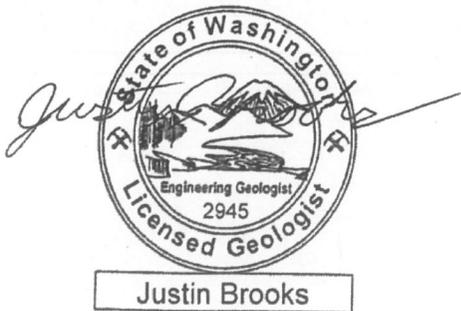
GeoTest Services has prepared this report for the exclusive use of Monterra Partners and their design consultants for specific application to the design of the proposed Haller Street Apartments to be located in Arlington, Washington. Use of this report by others or for another project is at the user's sole risk. Within the limitations of scope, schedule, and budget, our services have been conducted in accordance with generally accepted practices of the geotechnical engineering profession; no other warranty, either express or implied, is made as to the professional advice included in this report.

Our site explorations indicate subsurface conditions at the dates and locations indicated. It is not warranted that they are representative of subsurface conditions at other locations and times. The analyses, conclusions, and recommendations contained in this report are based on site conditions to the limited depth of our explorations at the time of our exploration program, a brief geological reconnaissance of the area, and review of published geological information for the site. We assume that the explorations are representative of the subsurface conditions throughout the site during the preparation of our recommendations. If variations in subsurface conditions are encountered during construction, we should be notified for review of the recommendations of this report, and revision of such if necessary. If there is a substantial lapse of time between submission of this report and the start of construction, or if conditions change due to construction operations at or adjacent to the project site, we recommend that we review this report to determine the applicability of the conclusions and recommendations contained herein.

The earthwork contractor is responsible to perform all work in conformance with all applicable WISHA/OSHA regulations. GeoTest Services, Inc. should not be assumed to be responsible for job site safety on this project, and this responsibility is specifically disclaimed.

We appreciate the opportunity to provide geotechnical services on this project and look forward to assisting you during the construction phase. If you have any questions or comments regarding the information contained in this report, or if we may be of further service, please call.

Respectfully Submitted,
GeoTest Services, Inc.



Justin Brooks, L.E.G.
Engineering Geologist

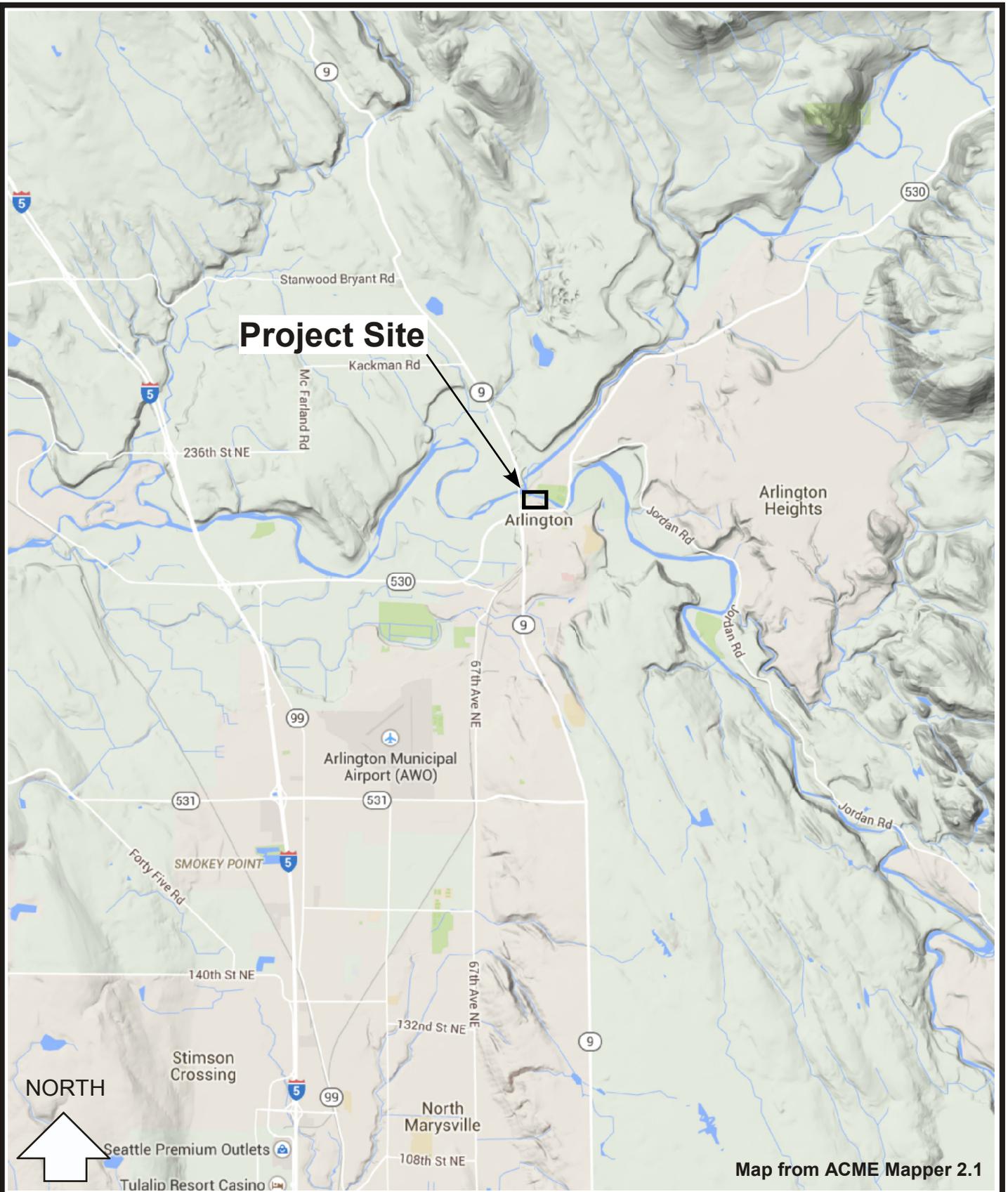
Edwardo Garcia, P.E.
Project Geotechnical Engineer

Attachments:	Figure 1	Vicinity Map
	Figure 2	Site and Exploration Plan
	Figure 3	Typical Footing and Wall Drain Section
	Figure 4	Soil Classification System and Key
	Figure 5	Exploration Logs
	Figure 6	Grain Size Test Data
	Attached	Northwest Agricultural Consultants Test Results (1 page)
	Attached	Report Limitations and Guidelines for Its Use (3 pages)

REFERENCES

Minard, J.P., 1985, Geologic map of the Marysville quadrangle, Snohomish County, Washington: U.S. Geological Survey Miscellaneous Field Studies Map MF-1743

Washington State Department of Ecology Water Quality Program. February 2005. *Stormwater Management Manual for Western Washington*.



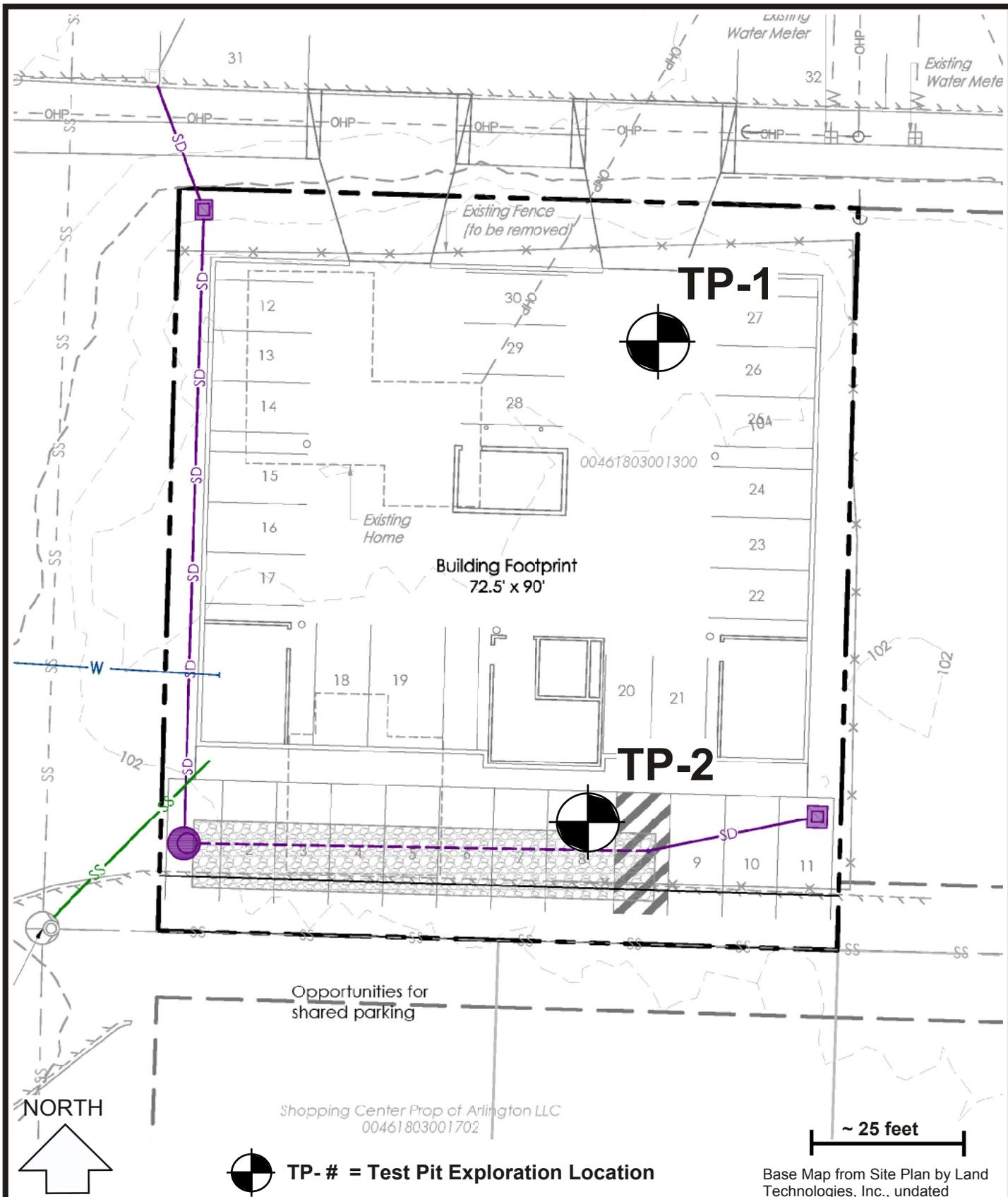
Map from ACME Mapper 2.1

GEOTEST SERVICES, INC.
 741 Marine Drive
 Bellingham, WA 98225
 phone: (360) 733-7318
 fax: (360) 733-7418

Date: 4-9-15 By: JB Scale: none

VICINITY MAP
HALLER AVENUE APARTMENTS
EAST HALLER AVENUE
ARLINGTON, WASHINGTON

Project
15-0191
 Figure
1



TP- # = Test Pit Exploration Location

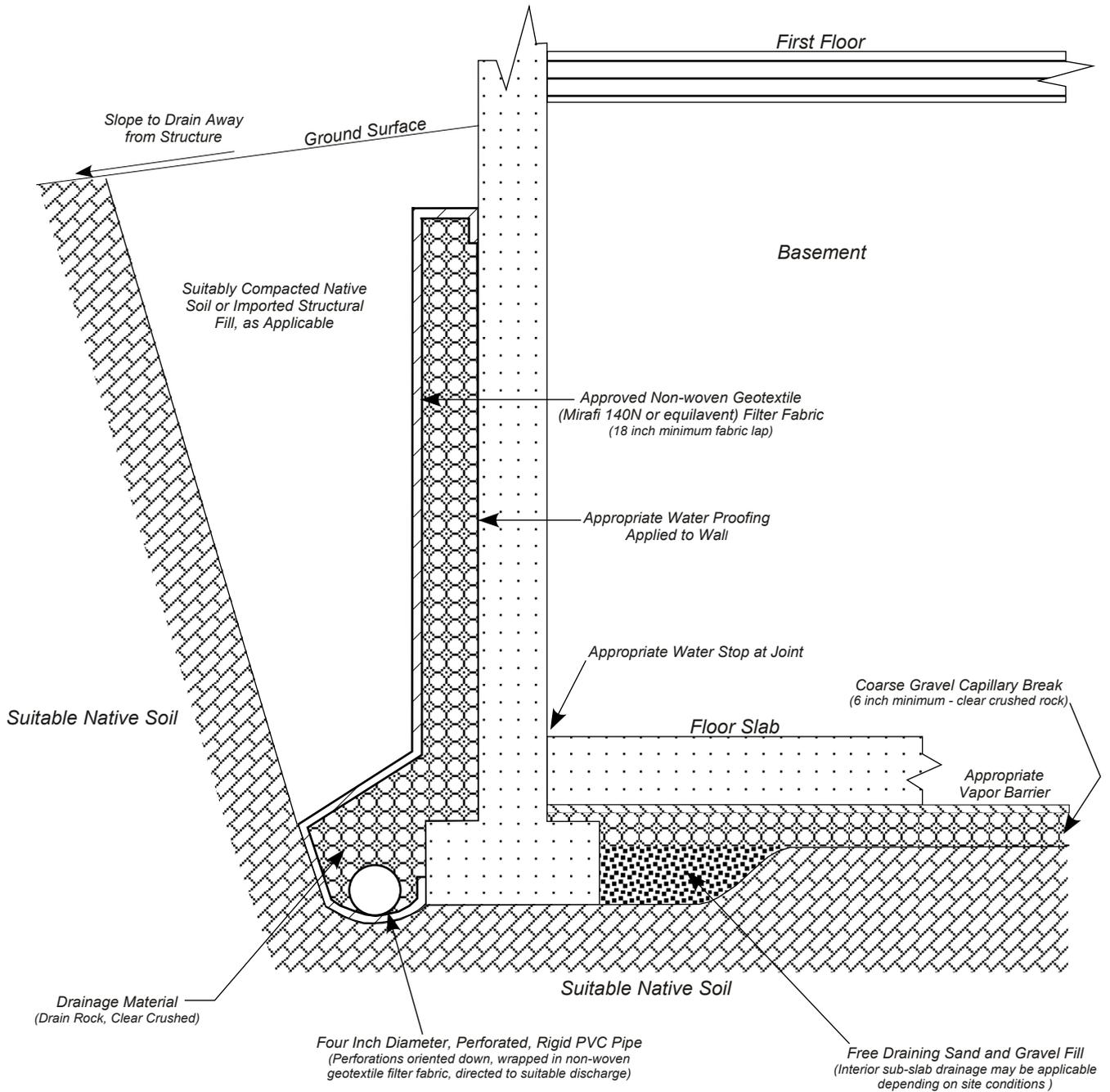
Base Map from Site Plan by Land Technologies, Inc., undated

GEOTEST SERVICES, INC.
 741 Marine Drive
 Bellingham, WA 98225
 phone: (360) 733-7318
 fax: (360) 733-7418

Date: 4-9-15 By: JB Scale: As Shown
SITE AND EXPLORATION PLAN
HALLER AVENUE APARTMENTS
EAST HALLER AVENUE
ARLINGTON, WASHINGTON

Project
15-0191
 Figure
2

BASEMENT WITH INTERIOR SLAB-ON-GRADE



Notes:

Footings should be properly buried for frost protection in accordance with International Building Code or local building codes (Typically 18 inches below exterior finished grades)

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 741 Marine Drive
 Bellingham, WA 98225
 phone: (360) 733-7318
 fax: (360) 733-7418

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TYPICAL FOOTING & WALL DRAIN SECTION
HALLER AVENUE APARTMENTS
EAST HALLER AVENUE
ARLINGTON, WASHINGTON

Project
15-0191
 Figure
3

Soil Classification System

	MAJOR DIVISIONS	CLEAN GRAVEL (Little or no fines)	GRAPHIC SYMBOL	USCS LETTER SYMBOL	TYPICAL DESCRIPTIONS ⁽¹⁾⁽²⁾
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SP	Poorly graded sand; gravelly sand; little or no fines
				SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)		ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity	
			CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay	
			OL	Organic silt; organic, silty clay of low plasticity	
	SILT AND CLAY (Liquid limit greater than 50)		MH	Inorganic silt; micaceous or diatomaceous fine sand	
			CH	Inorganic clay of high plasticity; fat clay	
			OH	Organic clay of medium to high plasticity; organic silt	
	HIGHLY ORGANIC SOIL		PT	Peat; humus; swamp soil with high organic content	

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

- Notes: 1. Soil descriptions are based on the general approach presented in the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*, as outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the *Standard Test Method for Classification of Soils for Engineering Purposes*, as outlined in ASTM D 2487.
2. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

- Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
- Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
- > 12% and ≤ 30% - "gravelly," "sandy," "silty," etc.
- Additional Constituents: > 5% and ≤ 12% - "slightly gravelly," "slightly sandy," "slightly silty," etc.
- ≤ 5% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

Drilling and Sampling Key	Field and Lab Test Data																																										
<p>SAMPLE NUMBER & INTERVAL SAMPLER TYPE</p> <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 20px;"> </div> <table border="0"> <thead> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr><td>a</td><td>3.25-inch O.D., 2.42-inch I.D. Split Spoon</td></tr> <tr><td>b</td><td>2.00-inch O.D., 1.50-inch I.D. Split Spoon</td></tr> <tr><td>c</td><td>Shelby Tube</td></tr> <tr><td>d</td><td>Grab Sample</td></tr> <tr><td>e</td><td>Other - See text if applicable</td></tr> <tr><td>1</td><td>300-lb Hammer, 30-inch Drop</td></tr> <tr><td>2</td><td>140-lb Hammer, 30-inch Drop</td></tr> <tr><td>3</td><td>Pushed</td></tr> <tr><td>4</td><td>Other - See text if applicable</td></tr> </tbody> </table> </div>	Code	Description	a	3.25-inch O.D., 2.42-inch I.D. Split Spoon	b	2.00-inch O.D., 1.50-inch I.D. Split Spoon	c	Shelby Tube	d	Grab Sample	e	Other - See text if applicable	1	300-lb Hammer, 30-inch Drop	2	140-lb Hammer, 30-inch Drop	3	Pushed	4	Other - See text if applicable	<table border="0"> <thead> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr><td>PP = 1.0</td><td>Pocket Penetrometer, tsf</td></tr> <tr><td>TV = 0.5</td><td>Torvane, tsf</td></tr> <tr><td>PID = 100</td><td>Photoionization Detector VOC screening, ppm</td></tr> <tr><td>W = 10</td><td>Moisture Content, %</td></tr> <tr><td>D = 120</td><td>Dry Density, pcf</td></tr> <tr><td>-200 = 60</td><td>Material smaller than No. 200 sieve, %</td></tr> <tr><td>GS</td><td>Grain Size - See separate figure for data</td></tr> <tr><td>AL</td><td>Atterberg Limits - See separate figure for data</td></tr> <tr><td>GT</td><td>Other Geotechnical Testing</td></tr> <tr><td>CA</td><td>Chemical Analysis</td></tr> </tbody> </table>	Code	Description	PP = 1.0	Pocket Penetrometer, tsf	TV = 0.5	Torvane, tsf	PID = 100	Photoionization Detector VOC screening, ppm	W = 10	Moisture Content, %	D = 120	Dry Density, pcf	-200 = 60	Material smaller than No. 200 sieve, %	GS	Grain Size - See separate figure for data	AL	Atterberg Limits - See separate figure for data	GT	Other Geotechnical Testing	CA	Chemical Analysis
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<p>Groundwater</p> <p> Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.</p>																																											

15-0191 4/13/15 C:\USERS\JUSTIN\DESKTOP\JOB FILES\15-0191 - HALLER ST APTS\15-0191 - HALLER ST APTS.GPJ TEST PIT LOG

TP-1

SAMPLE DATA			SOIL PROFILE			GROUNDWATER	
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol		
Excavation Method: <u>Tracked Excavator</u>							
Ground Elevation (ft): <u>~105</u>							
0	1	d	W = 5 GS W = 20 GS pp=3.5		SM/OL	Groundwater not encountered.	
1	2	d			SM		Loose, dark brown, moist, organic, very silty, SAND (Topsoil)
2	3	d			SP-SM		Loose, red brown, moist, slightly gravelly, silty, SAND (Weathered Glacial Outwash)
3	4	d			GP/SP		Medium dense, tan to grey, damp, slightly silty, gravelly, SAND (Glacial Outwash) with scattered cobbles
4	5	d			GP/SP		Medium dense, tan, damp, very sandy, GRAVEL to very gravelly, fine to coarse SAND (Glacial Outwash) with slight to moderate caving and scattered cobbles
5	6	d			ML		Very stiff to hard, grey, moist, very sandy, SILT (Glacial Outwash)
6	7	d			SP-SM		Medium dense, grey, damp, slightly silty, fine to medium SAND (Glacial Outwash)
7							
Test Pit Completed 04/09/15 Total Depth of Test Pit = 13.0 ft.							

TP-2

SAMPLE DATA			SOIL PROFILE			GROUNDWATER	
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol		
Excavation Method: <u>Tracked Excavator</u>							
Ground Elevation (ft): <u>~102</u>							
0	8	d	W = 21 GS pp=4 W = 23 GS W = 12 GS		SM/OL	Groundwater not encountered.	
1	9	d			SM		Loose, dark brown, moist, organic, very silty, SAND (Topsoil)
2	10	d			GP/SP		Loose, red brown, moist, slightly gravelly, silty, fine to medium SAND (Weathered Glacial Outwash)
3	11	d			GP/SP		Medium dense, grey, damp, very sandy, GRAVEL to very gravelly, SAND (Glacial Outwash) with slight to moderate caving and scattered cobbles
4	12	d			ML		Very stiff to hard, tan grey, moist, very sandy, SILT (Glacial Outwash)
5	13	d		SM	Medium dense, grey, damp, silty, fine SAND (Glacial Outwash)		
6							
Test Pit Completed 04/09/15 Total Depth of Test Pit = 12.5 ft.							

- Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
 2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
 3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

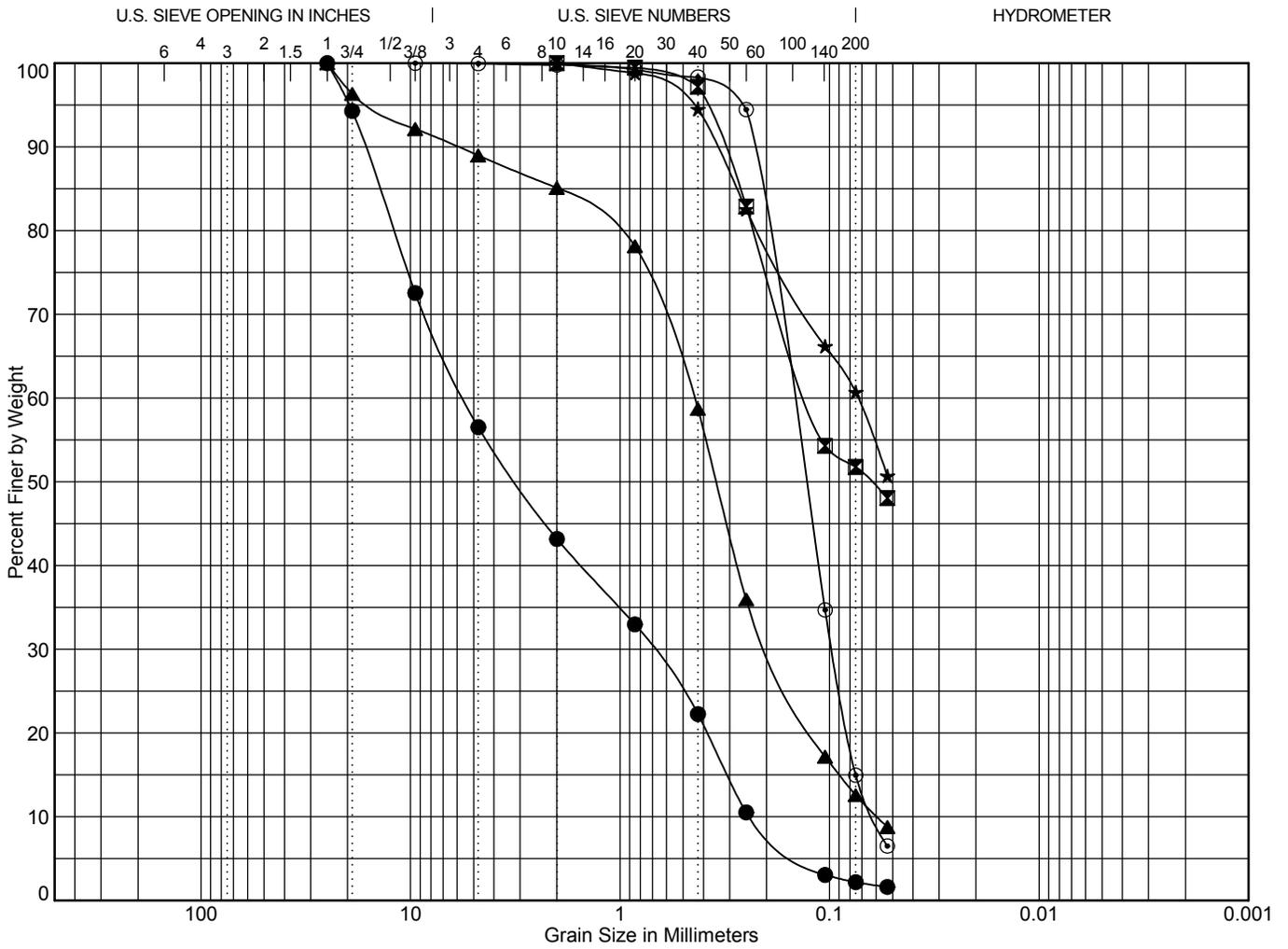


Haller Avenue Apartments
 East Haller Avenue
 Arlington, Washington

Log of Test Pits

Figure
5

15-0191 4/13/15 C:\USERS\JUSTIN\DESKTOP\JOB FILES\15-0191 - HALLER ST APTS\15-0191 - HALLER ST APTS.GPJ GRAIN SIZE W\STATS



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Point	Depth	Classification	LL	PL	PI	C _c	C _u
●	TP-1 6.0	Very gravely, fine to coarse SAND (USDA Sand) (SP)				0.38	23.41
■	TP-1 9.5	Very sandy, SILT (USDA Loam) (ML)					
▲	TP-2 2.0	Slightly gravely, silty, fine to medium SAND (USDA Sand) (SM)				1.37	7.50
★	TP-2 8.0	Very sandy, SILT (USDA Loam) (ML)					
○	TP-2 11.0	Silty, fine SAND (USDA Sand) (SM)				1.01	2.48

Point	Depth	D ₁₀₀	D ₆₀	D ₅₀	D ₃₀	D ₁₀	% Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
●	TP-1 6.0	25	5.521	3.113	0.701	0.236	5.7	37.8	13.4	20.9	20.1	2.2
■	TP-1 9.5	2	0.125	0.064			0.0	0.0	0.0	2.8	45.4	51.8
▲	TP-2 2.0	25	0.445	0.347	0.19	0.059	3.7	7.3	3.9	26.4	46.1	12.6
★	TP-2 8.0	2	0.073				0.0	0.0	0.0	5.5	33.8	60.7
○	TP-2 11.0	9.5	0.152	0.131	0.097	0.061	0.0	0.0	0.2	1.4	83.4	14.9

$C_c = D_{30}^2 / (D_{60} * D_{10})$ To be well graded: $1 < C_c < 3$ and
 $C_u = D_{60} / D_{10}$ $C_u > 4$ for GW or $C_u > 6$ for SW



Haller Avenue Apartments
 East Haller Avenue
 Arlington, Washington

Grain Size Test Data

Figure
6



Northwest Agricultural Consultants
2545 West Falls
Kennewick, WA 99336
(509) 783-7450 Fax: (509) 783-5305



GEOTEST SERVICES INC
741 MARINE DR
BELLINGHAM, WA 98225

SOIL
Client No.: 9678 Date Received: 04-10-2015
Report No.: 34937 Page: 1 of 1
a6be5b-83814

Grower Sampler Field No. Field Name
Job #: 15-0191 Crop Year Crop Yield Goal

Depth (ft.)	Available Inches	NO3-N lbs/acre	NH4-N lbs/acre	Sulfur ppm	pH	Soluble Salts (mmhos/cm)	Organic Matter Percent	P(bic) ppm	K(bic) ppm	P(ace) ppm	K(ace) ppm	Calcium (meq. per 100 grams)	Magnesium (meq. per 100 grams)	Sodium (meq. per 100 grams)	Eff.	Boron ppm	Zinc ppm	Manganese ppm	Iron ppm	Copper ppm	CEC (meq. per 100 grams)	% Base Sat.	Chloride lbs. per. acre	Bray 1P ppm	Total Bases (meq. per 100 grams)	Sample D
1					6.5		5.15														13.6					
2					6.6		1.41														5.8					
3					6.8		1.01														2.4					
Total	0.00																									

Estimated Nitrogen Release from Organic Matter

Estimated Total Nitrogen Available to Crop

Last Year's Crop

Fertilizer

Comments

Sample ID	pH	LOI Organic Matter	Cation Exchange Capacity
TP2-2	6.5	5.15%	13.6 meq/100g
TP2-8	6.6	1.41%	5.8 meq/100g
TP2-11	6.8	1.01%	2.4 meq/100g

CEC Method: EPA 9081

Organic Matter Method: Loss on Ignition

REPORT LIMITATIONS AND GUIDELINES FOR ITS USE¹

Subsurface issues may cause construction delays, cost overruns, claims, and disputes. While you cannot eliminate all such risks, you can manage them. The following information is provided to help:

Geotechnical Services are Performed for Specific Purposes, Persons, and Projects

At GeoTest our geotechnical engineers and geologists structure their services to meet specific needs of our clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of an owner, a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. No one except you should rely on your geotechnical engineer who prepared it. And no one – not even you – should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report is Based on a Unique Set of Project-Specific Factors

GeoTest's geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the clients goals, objectives, and risk management preferences; the general nature of the structure involved its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless GeoTest, who conducted the study specifically states otherwise, do not rely on a geotechnical engineering report that 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.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed, for example, from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed construction,
- alterations in drainage designs; or
- composition of the design team; the passage of time; man-made alterations and construction whether on or adjacent to the site; or by natural alterations and events, such as floods, earthquakes or groundwater fluctuations; or project ownership.

Always inform GeoTest's geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

¹Information in this document is based upon material developed by ASFE, Professional Firms Practicing in the Geosciences(asfe.org)

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. Do not rely on the findings and conclusions of this report, whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. Always contact GeoTest before applying the report to determine if it is still relevant. A minor amount of additional testing or analysis will help determine if the report remains applicable.

Most Geotechnical and Geologic Findings are Professional Opinions

Our site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoTest's engineers and geologists review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ – sometimes significantly – from those indicated in your report. Retaining GeoTest who developed this report to provide construction observation is the most effective method of managing the risks associated with anticipated or unanticipated conditions.

A Report's Recommendations are *Not* Final

Do not over-rely on the construction recommendations included in this report. Those recommendations are not final, because geotechnical engineers or geologists develop them principally from judgment and opinion. GeoTest's geotechnical engineers or geologists can finalize their recommendations only by observing actual subsurface conditions revealed during construction. GeoTest cannot assume responsibility or liability for the report's recommendations if our firm does not perform the construction observation.

A Geotechnical Engineering or Geologic Report may be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. Lower that risk by having GeoTest confer with appropriate members of the design team after submitting the report. Also, we suggest retaining GeoTest to review pertinent elements of the design teams plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having GeoTest participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do not Redraw the Exploration Logs

Our geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors of omissions, the logs included in this report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable; but recognizes that separating logs from the report can elevate risk.

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly 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 report, but preface it with a clearly written letter of transmittal. In that letter, consider advising the 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 the GeoTest and/or to conduct

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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 you be in a position to give contractors the best information available, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. In addition, it is recommended that a contingency for unanticipated conditions be included in your project budget and schedule.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering or geology is far less exact than other engineering disciplines. This lack of understanding can create unrealistic expectations that can lead to disappointments, claims, and disputes. To help reduce risk, GeoTest includes an explanatory limitations section in our reports. Read these provisions closely. Ask questions and we encourage our clients or their representative to contact our office if you are unclear as to how these provisions apply to your project.

Environmental Concerns Are Not Covered in this Geotechnical or Geologic Report

The equipment, techniques, and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study. 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 containments, etc. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk management guidance. Do not rely on environmental report prepared for some one else.

Obtain Professional Assistance to Deal with Biological Pollutants

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts biological pollutants from growing on indoor surfaces. Biological pollutants includes but is not limited to molds, fungi, spores, bacteria and viruses. To be effective, all such strategies should be devised for the express purpose of prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional biological pollutant prevention consultant. Because just a small amount of water or moisture can lead to the development of severe biological infestations, a number of prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of this study, the geotechnical engineer or geologist in charge of this project is not a biological pollutant prevention consultant; none of the services performed in connection with this geotechnical engineering or geological study were designed or conducted for the purpose of preventing biological infestations.

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