Exhibit 5

Geotechnical Engineering Report

1204 Yew Street
Bellingham, WA 98229

Prepared For:

Brad Widman
1615 Old Samish Road
Bellingham, WA, 98229

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April 7, 2022
Project No. 22-0336

Brad and Krista Widman
1204 Yew Street
Bellingham, WA, 98229

CC: **Bryan Jones**
Jones Engineers, Inc.

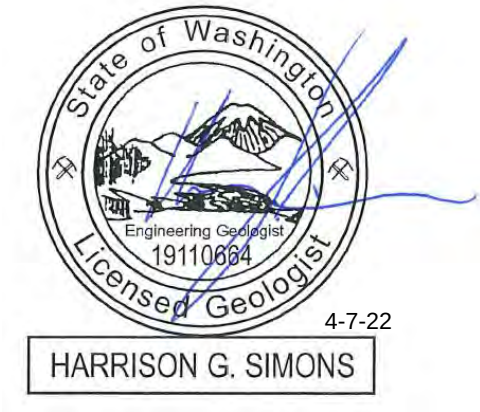
Regarding: **Geotechnical Engineering Report**
1204 Yew Street Development
1204 Yew Street
Bellingham, WA 98229
(Parcel No. 3803330384410000)

Dear Mr. Widman,

As requested, GeoTest Services, Inc. (GeoTest) is pleased to submit the following report summarizing the results of our geotechnical engineering investigation for the property located at 1204 Yew Street in Bellingham, Washington (see *Vicinity Map*, Figure 1). This report has been prepared in general accordance with the terms and conditions established in our services agreement (Proposal No. 22-176G) dated February 28, 2022.

GeoTest appreciates the opportunity to provide geotechnical services on this project and look forward to assisting you in further phases of the development and on any future projects. Should you have any questions regarding the information contained within the report, or if we may be of service in other regards, please contact the undersigned.

Respectfully,
GeoTest Services, Inc.



Harrison Simons, L.E.G.
Geotechnical Project Manager

Enclosure: Geotechnical Engineering Report

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PURPOSE AND SCOPE OF SERVICES

The purpose of this investigation is to establish general surface and subsurface conditions beneath the site from which conclusions and recommendations pertaining to project design can be formulated. Our study also includes a review of the potential geologic hazards that are present on, or adjacent to, the property. Our scope of services includes the following tasks:

- Perform surface reconnaissance of the parcel and sloping terrain within its vicinity.
- Explore soil and groundwater conditions underlying the subject area by advancing 7 test pit explorations with a client provided tracked excavator.
- Perform laboratory testing on representative samples to classify and determine the engineering characteristics of the soils encountered.
- Provide a written report containing a description of surface and subsurface conditions, exploration logs, with findings and recommendations pertaining to site preparation and earthwork, including stripping depths, subgrade preparation below the planned building, reuse of on-site soils, and criteria for selection, placement, and compaction of structural fill.
- Provide recommendations for foundation support of the planned structures including allowable bearing capacity, bearing elevations, frost penetration depth, a discussion of potential foundation settlement (total and differential), floor support and general foundation design.
- Provide recommendations for lateral earth pressures including active and at-rest conditions, allowable passive soil resistance, groundwater considerations, drainage recommendations, and utilities.
- A discussion of the Seismic Site Class considerations based on the 2018 International Building Code (IBC).
- Provide commentary regarding the feasibility of on-site stormwater infiltration based on the 2019 Stormwater Management Manual for Western Washington.
- Discussion of excavation considerations including recommendations for allowable slope inclination for temporary and permanent slopes, classification of soil types per OSHA regulations, geotechnical consulting, and construction monitoring.
- Discussion of geologic hazards and potential mitigation in compliance with Bellingham Municipal Code (BMC).

PROJECT DESCRIPTION

The subject property consists of an irregularly shaped, roughly 2.5-acre parcel (#3803330384410000) that is located to the east of Yew Street in Bellingham, Washington. Although formal plans for development were not available at the time this report was written we understand that the preferred path for development would consist of the parcel's subdivision and the construction of multiple single-family residences across the extent of the property. We expect that the proposed residences will be wood framed and will utilize slab on grade or daylight basement style foundation configurations constructed of reinforced concrete. Thus, we expect that building loading conditions will be light in scale.

SITE CONDITIONS

This section includes a description of the general surface and subsurface conditions observed at the project site during the time of our field investigations. Interpretations of site conditions are based on the results and review of available information, site reconnaissance, subsurface explorations, laboratory testing, and previous experience in the project vicinity. A GeoTest Staff Geologist performed field work on March 10th, 2022.

Photo 1: Overhead view of project site. Photo captured by GeoTest drone. Perspective to the east.

Surface Conditions

The subject site is located along the eastern margin of Yew Street, approximately 900 feet south of the junction on Yew Street and Lakeway Drive in Bellingham, WA. The subject site is surrounded by single-family residences and neighborhoods. The parcel currently contains a single-family residence within its upslope, eastern portion and is accessed by a gravel driveway which enters the property from Yew Street. The project site is generally located within the lower elevation, northern most portion of the Galbraith Mountain highlands and extends from roughly 310 to 370 feet above sea level.

The upslope portion of the site contains an apparently man-made pond along the eastern margin of the parcel. Standing water was observed within this feature and extended across the north to south extent of the subject property. In general, evidence of historic site grading was observed along the margins of the pond and within limited areas of this upland portion of the site. West of the pond the site is generally level for approximately 50-90 feet. The existing residence is constructed near the northern margin of the parcel on this level area of the site. Moving west from the existing residence location, moderate gradients, up to 30 percent, begin to descend towards the lower elevation, gradually sloped portion of the site along Yew Street. Overall, these slopes descend approximately 50 to 60 vertical feet over 250 feet of lateral distance before leveling out at the elevation of Yew Street.

Photos 2 (left) and 3 (right): Photo 2 depicts surface conditions within the upslope, northern portion of the subject property. Note dense vegetation locally steep slopes (just off-site) as well as the generally moderate site topography. Photo 3 illustrates surface conditions within central and western portion of project site.

Slopes appear to briefly exceed 40 percent inclinations in a few localized areas across the site. These areas include the land immediately east of the existing pond location, brief locations adjacent to the access road and most notably, along the northern margin of the project site, to the west / northwest of the existing residence. The majority of these locations only display 40 percent or greater slope inclinations over a few feet of total vertical relief. However, along the northern margin of the project site, the overall relief of steep slopes does increase to a maximum of roughly 12.5 feet of total relief immediately adjacent to the project site.

Vegetation across the site consists predominantly of low-lying species with scattered deciduous and coniferous trees which exhibited predominantly vertical growth positions. The surface investigation of the slope did not reveal evidence of soil creep, tension cracks, scarps groundwater seepage at the surface or other evidence of ongoing slope instability. Other than within the upslope, man-made pond area, surface water was not observed on-site at the time of our visit.

Subsurface Soil Conditions

Subsurface conditions were investigated by advancing seven test pit explorations (TP-1 and TP-7) with a client provided excavator under the direction of a GeoTest Staff Geologist. The explorations were advanced until equipment reach limits were encountered, at depths of 8 to 9 feet below ground surface (BGS). Soil classification followed the guidelines of the American Society for Testing and Materials (ASTM) D2487 and D2488. Approximate locations of the test pit explorations have been plotted on the *Site and Exploration Plan* (Figure 2). A *Soil Classification System and Key* is presented as Figure 6. Detailed logs of the subsurface conditions encountered at the exploration locations are attached as *Appendix A*. Laboratory testing data is attached as *Appendix B*.

Our subsurface explorations encountered similar conditions across the subject site with some moderate variation in grain size distribution and gravel content. In TP-2 through TP-7 a loose, dark brown, moist, organic rich slightly sandy silt with occasional gravel and cobbles and roots throughout. This unit is interpreted as topsoil and extended to a depth of up to 1 foot BGS (below ground surface).

Photo 4 & 5: Subsurface Conditions at TP-1 (left) with roughly 5.5 feet of uncontrolled fill and TP-7(right) depicting native soil conditions as observed across the majority of the project site.

In TP-1 a medium dense to loose, brown, sandy gravelly silt with frequent organic debris as well as concrete and metal debris was encountered at the surface and extended to a depth of 5.5 feet BGS. This is interpreted as reworked native fill, interpreted to have been generated during

historic construction and lot grading activities. Below fill in TP-1 and below topsoil in TP-2 through TP-7 a medium dense, reddish brown, slightly to very silty, gravelly sand was encountered. This material was interpreted as weathered undifferentiated glacial deposits. In general, weathered undifferentiated glacial deposits were more highly oxidized and contained relatively higher quantities of silt and clay when compared to the unweathered materials encountered at depth. Below this material, a generally gray, slightly to very silty, gravelly sand with depth. These materials were interpreted as weathered grading to unweathered undifferentiated glacial deposits and were observed to terminal depth of our explorations. In general, undifferentiated glacial deposits were variable in terms of the specific gravel, silt and sand contents across the project site.

Groundwater

Perched groundwater seepage was encountered at depths of between 2.5 and 8.0 feet BGS within our test pit explorations. Perched groundwater conditions occur above the regional groundwater table in the unsaturated zone and typically occur when loose, more permeable soil is underlain by denser, less permeable soil or bedrock. The vertical movement of water through loose soils is restricted once a dense or less permeable soil is encountered at depth. Perched groundwater conditions typically develop in the wet season (November through April) or after extended periods of rainfall.

The groundwater conditions reported on the exploration logs are for the specific locations and dates indicated, and therefore may not be indicative of other locations and/or times. Groundwater levels are variable and groundwater conditions will fluctuate depending on local subsurface conditions, precipitation, and changes in on-site and off-site use.

General Geologic Conditions

According to the *Geologic Map of Western Whatcom County, Washington* (Easterbrook, 1976) and the *Geologic Map of the Bellingham 1:100,000 Quadrangle, Washington* (Lapen, 2000) general geologic conditions at the project site consist of Undifferentiated Glacial Deposits (unit Qf) and Glacial Deposits, undifferentiated (unit Qgd) by Easterbrook and Lapen, respectively. In addition, the Padden Member of the Chuckanut Formation (unit Ec_{cp}) is mapped just east and to the north of the project site.

According to Easterbrook, Undifferentiated Glacial Deposits consist of glacial till and gravel occurring on the lower slopes of the Cascade foothills. Similarly, Lapen describes Glacial Deposits, undifferentiated (Qgd) as material that may include all glacial deposits described in the general site vicinity.

Chuckanut Formation bedrock is composed of sandstone, conglomerate, shale, and coal. This unit is known to underlie many of the Cascade foothills and in places is known to protrude

through unconsolidated deposits in the lowlands. This unit is thought to have been deposited in an alluvial flood plain type paleogeographic setting and in some places may exceed 10,000 feet in thickness. Specifically, the bedrock at the project site is considered to be the Padden Member (Ec_{cp}) of the Chuckanut Formation. This member is described by Lapen as moderately to well sorted sandstone and conglomerate alternating with mudstone and minor coal. Sandstone ranges from fine to coarse grained, with pebbly to conglomeratic sandstone layers common. Planar cross-bedding, flat-bedding, trough cross-bedding, and ripple lamination are common bedding features.

Based on the conditions encountered within our test pit explorations, it is our opinion that the subsurface conditions present at the subject property are generally in accordance with the mapped geologic units. It should be noted that the published soil and/or rock types are representative of regional conditions and some variation between on-site soils and mapped geologic units should generally be anticipated.

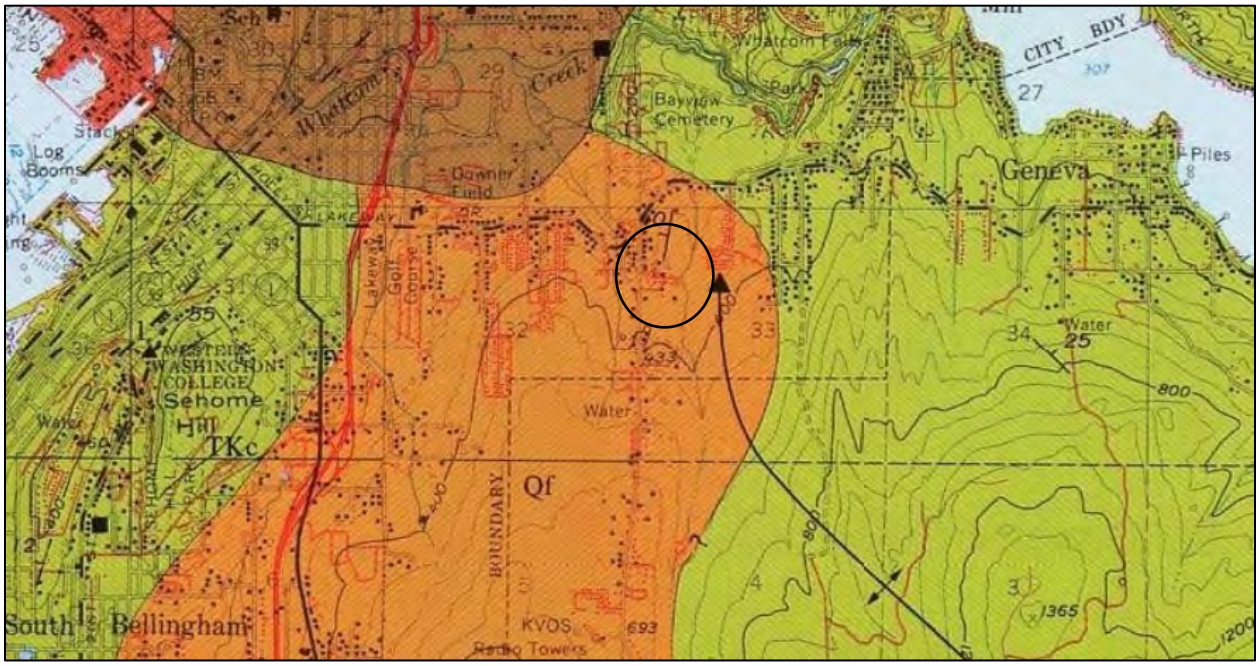

Image 1 – Snip from *Geologic Map of Western Whatcom County, Washington (Easterbrook, 1976).* Subject area shown in black circle.

Based on our review of the Washington State Department of Natural Resources (DNR) *Geologic Information Portal,* there are no active tectonic faults or landslides mapped within the vicinity of the project site.

Web Soil Survey

According to the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) *Web Soil Survey* website, soils within the subject area are classified as Chuckanut-

Urban land complex, 5 to 20 percent slopes, and Squalicum-Urban land complex, 5-20 percent slopes.

The Chuckanut-Urban land complex soils consist of ashy loam over unweathered bedrock derived from a parent material of volcanic ash and colluvium derived from glacial drift and sandstone bed rock. The Squalicum-Urban land complex soils consist of gravelly ashy loam and are derived from a parent material of volcanic ash, loess, and slope alluvium over glacial drift. These soils are well drained and moderately well drained respectively and are rated as having a moderate to high erosion susceptibility with erosion K factors of 0.37 and 0.24. Values of K range from 0.02 to 0.69, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Table 1, below, summarizes the soil properties that were obtained from the USDA *Web Soil Survey* website.

Table 1
USDA Web Soil Survey Soil Classifications

Map Unit Symbol	29	159
Map Unit Name	Chuckanut-Urban land comples, 5 to 20 percent slopes	Squalicum-Urban land comples, 5 to 20 percent slopes
Soil Description	Ashy loam over unweathered bedrock	Gravelly ashy loam
Landform	Hillslopes	Hillslopes
Parent Material	Volcanic ash and colluvium derived from glacial drift and sandstone bedrock	Volcanic ash, loess, and slope alluvium over glacial drift
Land Capability Classification	3e	3e
Erosion K Factor, Whole Soil	0.37	0.24

Native soils at the project site appeared to be generally consistent with the *Web Soil Survey* description. Further discussion is provided in the *Erosion Hazard Areas* section of this report.

Bare Earth Imagery Review

GeoTest reviewed bare earth imagery, acquired in 2013, of the site vicinity and subject slopes. Based on our review, the site and subject slopes do not display typical indications of ongoing or historic slope instability such as tension cracks, head scarps, or hummocky terrain at the base of the slope.

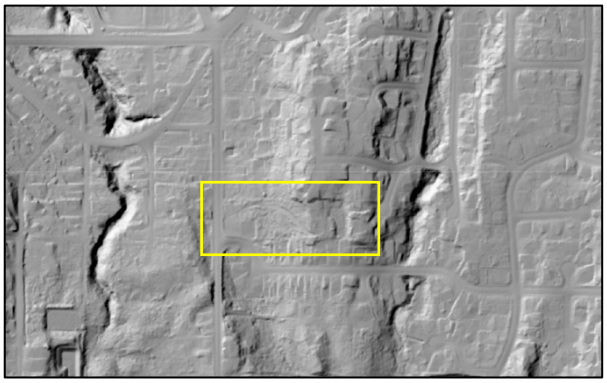

Image 2 – Snip from *Bellingham_2013 LIDAR Digital Terrain Model.* Subject area shown in yellow.

Evidence of residential development and past site grading can be seen on and adjacent to the subject property. The generally north to south oriented, relatively steep marginal slopes of Cemetery and West Cemetery Creeks can be seen to the east and west of the project site, respectively. However, no signs of large scale "global" instability were observed on or in proximity to the subject property in these images.

Please note that not all signs of slope instability can be observed in the bare earth imagery review due to imagery resolution and scale. In addition, any signs of instability on the site slopes that have occurred within the last approximately 9 years, if present, have occurred after original imagery acquisition.

GEOLOGICALLY HAZARDOUS AREAS

According to BMC section 16.55.410, *geologically hazardous areas include areas susceptible to erosion, landslide, rock fall, subsidence, earthquake, or other geological events that pose a threat to the health and safety of citizens when incompatible development is sited in areas of significant hazard*. In this section we present a review of the site and proposed development in accordance with the City of Bellingham Critical Areas Ordinance 16.55.410-16.55.460, specifically as relating to geologic hazards.

Erosion Hazard Areas - BMC 16.55.420A

Bellingham Municipal Code (BMC) 16.55.420A defines Erosion Hazard Areas as, *areas prone to soil erosion. Specifically, these areas include any area where the soil type is predominantly (greater that 50 percent) comprised of sand, clay, silt, and/or organic matter and the slope is greater than 30 percent.*

The soils underlying the project site are greater than 50 percent sand and silt. Additionally, the sloped terrain to the west of the existing residence intermittently exceeds 30 percent grades (See Figure 3 – *Bare Earth Imagery*). **Therefore, the project site is considered to contain limited areas which would be considered Erosion Hazard Areas per Bellingham Municipal Code.** Residential construction will be required to meet the standards outlined in 16.55.440A. Thus, the

development will require an erosion and sediment control, drainage, and mitigation plan prepared in compliance with BMC 15.42.

Long term slope erosion must be mitigated through proper drainage and civil design in conformance with the Stormwater Management Manual for Western Washington, 2019. We recommend the client retain a civil engineer to prepare these plans. Stormwater volumes generated from the proposed impermeable surfaces should be collected and directed to a municipally acceptable location. The following recommendations are intended to prevent excessive erosion from occurring at the site during and following construction:

- All clearing and grading activities for future residence construction will need to incorporate Best Management Practices (BMP's) for erosion control in compliance with current Bellingham Municipal Codes and standards.

- We recommend that appropriate silt fencing be incorporated into the construction plan for erosion control.

- We recommend that on-site BMP's be implemented during construction. Areas of native vegetation should be left in place or may be enhanced by adding additional native plant species and/or other vegetation enhancements.

- Removal of vegetation and trees without proper mitigation may increase the risk of failure for the surficial soils during periods of wet weather. Planting additional native vegetation within the sloped portion of the subject site and in areas disturbed by excavation activities will help maintain near surface slope stability by providing a stable root base within the near surface soils.

- Proper drainage controls have a significant effect on erosion. All surface water and any collected drainage water should not be allowed to be concentrated and discharged down the face of the sloped portions of the subject area. All collected stormwater should be directed to an appropriate collection system.

- All areas disturbed by the construction practices should be vegetated or otherwise protected to limit the potential for erosion as soon as practical during and after construction. Areas requiring immediate protection from the effects of erosion should be covered with either plastic, mulch, or erosion control netting/blankets. Areas requiring permanent stabilizations should be seeded with an approved grass seed mixture, hydroseeded with an approved seed-mulch-fertilizer mixture or landscaped with a suitable planting design.

It should also be noted that the proposed development will be subject to the City of Bellingham Stormwater Mitigation Minimum Requirements that are set forth in BMC section 15.42.060F.

Depending on the final surface area that will be disturbed as a result of site development, various requirements (#1 through #9) may be required by the City of Bellingham, prior to project permitting. In addition, the project's design and construction should implement the recommendations set forth in the subsequent *Geologic Hazard Mitigation* section of this report.

Landslide Hazard Areas - BMC 16.55.420B

BMC 16.55.420B broadly defines Landslide Hazard Areas as, *[areas] prone to landslides and/or subsidence that could include slow to rapid movement of soil, fill materials, rock and other geologic strata resulting in risk of injury or damage to the public and environment. Landslides could result from any combination of soil, slope, topography, underlying geologic structure, hydrology, freeze-thaw, earthquake, and other geologic influences. Specific geologic hazards include slopes with an incline that is equal or greater than 40 percent grade (22 degrees) with a vertical elevation change of at least 10 feet. Slope shall be calculated by identifying slopes that have at least 10 feet of vertical elevation change within a horizontal distance of 25 feet or less.*

Based on on-site observations, our review of digital elevation models and topographic drawings, the project site does not contain the slope does not exceed 40 percent grade with a vertical elevation change of 10 feet. **As such, site slopes are not considered potential Landslide Hazard Areas per Bellingham Municipal Code.** However, off site slopes, immediately adjacent to the project site do exceed 40 percent slope inclinations over approximately 12.5 feet of vertical relief. (northern margin of project site, see *Bare Earth Imagery,* Figure 3). **Thus, this localized area of off-site slopes is considered to be a potential landslide hazard area based on Bellingham Municipal Code criteria.** Although slope inclinations which exceed 40 percent extend into the subject property in this location, they do uninterruptedly extend for greater than 10 feet of vertical relief within the subject property itself. Mitigations to address these off-site slopes are presented within the subsequent *Mitigation of Geologic Hazards* section of this report.

Large scale global instability, consisting of deep-seated rotational failures, can extend down into the subsurface to substantial depths. These failures typically leave geomorphic evidence of their existence on the slope. Typical indicators can consist of recessional and sometimes nested head scarps, tension cracks, sag pongs, seepage zones, hummocky ground surface and slump blocks. Visual indications of large-scale global slope instability, such as those referenced above, were not observed at the subject property.

Overall, it is our opinion that there is a relatively **low risk** of relatively shallow, "skin-slides" occurring within the subject property when the recommendations presented in this report are incorporated into the projects design and construction. Similarly, it is also our professional opinion that there is a **low risk** of large-scale rotational, or translational landslides occurring and impacting the planned development site under static conditions.

Please keep in mind that the Pacific Northwest is seismically active, and it is difficult to predict how the slopes at the property may behave during a large earthquake.

Seismic Hazard Areas - BMC 16.55.420C

Bellingham Municipal Code defines Seismic Hazard Areas as, *areas subject to severe risk of damage as a result of earthquake induced ground shaking, slope failure, settlement, soil liquefaction, lateral spreading, or surface faulting. Specific areas of very high response to seismic shaking include areas depicted as "fill" and "alluvial deposits" within Whatcom County's Map Folio of Geologic Hazards, 1995.*

The subject site is mapped as a very low to low liquefaction susceptibility area (Palmer et al., 2004). However, this map only provides an estimate of the likelihood that soil will liquefy as a result of an earthquake and is meant as a general guide to indicate areas potentially susceptible to liquefaction. The native soils were observed to be medium dense to dense and contained relatively high "fines" contents by mass based on our laboratory testing. In addition, no evidence of the regional groundwater table was observed within our subsurface explorations. Therefore, we agree with the mapped liquefaction susceptibility rating. In our opinion, the project site present very low to low liquefaction susceptibility. **As such, the project site is not considered a seismic hazard area per BMC.**

However, the proposed development is located within the Seismic Design Category D_1, which states that site slopes may be unstable during a seismic event. As such, we recommend that the design team utilize seismic design standards per the International Building Code (IBC) such that the planned structure, including nonstructural components that are permanently attached to building's supports, be designed to resist the effects of earthquake motions. However, GeoTest does not expect that further mitigations will be required to address this potential hazard.

Please keep in mind that the Pacific Northwest is seismically active. Large Cascadia subduction zone earthquakes with possible magnitudes of 8 or 9 could produce ground shaking events with the potential to significantly impact the subject property regardless of the subsurface. Cascadia subduction zone earthquakes have occurred 6 times in the last 3,500 years with the most recent taking place in 1700, approximately 320 years ago. They have been determined to have an average reoccurrence interval of approximately 300 to 700 years. (Atwater and Haley, 1997).

Mine Hazard Areas - BMC 16.55.420D

The BMC defines Mine Hazard Areas as *those areas underlain by or affected by mine workings such as adits, gangways, tunnels, drifts, or airshafts, and those areas of probable sink holes, gas releases, or subsidence due to mine workings.*

Based on Bellingham Geologic Hazards Map (1991), the project site is **not** located within proximity of any mine areas, and therefore does not meet the criteria of a Mine Hazard Area as defined by BMC 16.55.420D. As such, no mitigations for this specific hazard are required.

City of Bellingham Review Discussion

Geologically hazardous critical area review is often an iterative process. Evaluations typically consist of at least two stages: an "assessment" stage in which the geologic hazards are identified and applicable mitigations are recommended. Stage two typically consists of a "plan review" stage in which the final civil and structural plans are reviewed to assess the incorporation of the recommended mitigations, presented herein, into the project plan sets.

CONCLUSIONS AND RECOMMENDATIONS

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

Although no formal plan was available at the time this report was written, we understand that the development plan will include the construction several new single-family residences across the project site. We expect that the residences will utilize conventional concrete foundations and wood framing. Thus, suitably prepared (and recompacted), medium dense to dense undifferentiated glacial deposits will provide adequate bearing conditions for the planned structures. Further, we generally anticipate that up to 1 foot of stripping will be needed to remove topsoil and to expose undifferentiated glacial deposits suitable for foundation support across the majority of the project site. Within the upslope portion of the site, adjacent to TP-1, roughly 5.5 feet of uncontrolled fill was observed to extend to depth from the surface. Although not currently anticipated, any development proposed within this portion of the project site should be expected to encounter up to 5.5 feet of uncontrolled fill material extending to depth from current surface elevations. This material would need to be removed from foundation footprints or roadways to expose firm native soil prior to the placement of structural fill or foundation formwork.

Where foundations are to be placed within proximity to slopes steeper that 5H:1V, appropriate keying and benching techniques should be utilized. We recommend excavating a keyway into the downslope foundation lines to embed the new structures into the slope and provide added shear force resistance. This keyway should extend a minimum of 18 inches into approved medium dense to dense, undifferentiated glacial deposits.

The near surface native materials underlying the site generally consist of medium dense to dense undifferentiated glacial deposits which commonly contained between 18 and 51 percent fines by

mass within a couple of feet from the surface. Thus, it is our opinion that the site is not suitable for conventional stormwater infiltration.

In addition, potential (off-site) landslide and intermittent erosion hazards as defined by Bellingham Municipal Code are present in the vicinity of the planned improvements. GeoTest recommends that the proposed residences be set back by minimum of 15 horizontal feet from the toe of the potential landslide hazards which are present along the northern (just off-site) margin of the property (*Bare Earth Imagery*, Figure 3). In addition, due to the intermittent erosion hazards which are present within the more steeply sloped portions of the site, the recommendations presented in the *Erosion Hazards* section of this report should be implemented into the design and construction of the proposed residential development. Ultimately, assuming the recommendations presented in this report are implemented into the projects design and construction, it is our opinion that these hazards can be adequately mitigated in conformance with BMC 16.55.450(A).

Mitigation of Geologic Hazards

Based upon an evaluation of the data collected during this investigation, it is our opinion that the construction of the proposed single-family residences and associated infrastructure on the subject property, as discussed, is feasible and can be adequately mitigated with respect to the following requirements per BMC 16.55.450(A). It is our opinion that the proposed development:

- Will not increase the threat of the geological hazard to adjacent properties beyond predevelopment conditions.
- Will not adversely impact other critical areas.
- Is designed so that the hazard to the project is eliminated or mitigated to a level equal to or less than predevelopment conditions; and
- We anticipate the site to be safe as designed under static conditions and normal use.

Furthermore, per BMC 16.55.460(A.2) it is our opinion that the proposed development:

- Will not increase surface water discharge or sedimentation to adjacent properties beyond predevelopment conditions.
- Will not decrease slope stability on adjacent properties; and
- Such alterations will not adversely impact other geologically hazardous areas.

In consideration of 16.55.460 (4 and 5), GeoTest does not anticipate that removal of the limited vegetation or the placement of the planned building footings will have a negative impact on the slopes. However, to prevent excessive erosion from occurring at the site, stormwater must be managed by appropriate civil design in conformance with the Stormwater Management Manual for Western Washington, 2019. Further, we generally recommend that development plans retain

as much native vegetation as possible and revegetate site slopes following construction, as feasible.

We recommend that the design team utilize seismic design standards per the IBC such that the planned structure, including nonstructural components that are permanently attached to the building's supports, be designed to resist the effects of earthquake motions.

It should be noted that no amount of engineering can completely mitigate or prevent slope instability. Mitigation is intended to make the risk posed by the slope that is present on site less and it should not be interpreted that mitigation is representative of eliminating any and all risk that might be present on the site. It is assumed that the property owner is aware of the slope that is present on the site and that she/he has been adequately informed and is accepting of the risks associated with sloped property development.

Geohazard Area Setbacks

In one localized area, steep slopes, and potential landslide hazards (defined as gradients exceeding 40 percent over greater than 10 feet of vertical relief) exist. This location is immediately north of the subject property, to the west / northwest of the existing residence location. This area exhibit slopes which exceed 40 percent inclinations over roughly 12.5 feet of vertical relief. As such, these off-site slopes are designated as potential landslide hazard areas. According to BMC section 16.55.460.A.1 a minimum building setback and a minimum no disturbance buffer area is required for landslide hazard areas. GeoTest recommends that the proposed residences be set back by minimum of 15 horizontal feet from the toe of these steep slopes along the northern (off-site) margin of project site (*Bare Earth Imagery*, Figure 3).

Site Preparation and Earthwork

The portions of the site proposed for concrete footings, slabs-on-grade, pavement and/or sidewalks should be prepared by removing topsoil, fill soils (if present), deleterious material, and significant accumulations of organics from the area to be developed. Additionally, previously disturbed, loose or soft, native undifferentiated glacial deposits which cannot be readily compacted to firm and unyielding condition should be removed from within areas proposed for foundation, slab or road support until firm and unyielding conditions are encountered at the base of the excavation.

Prior to placement of any foundation elements, concrete formwork, CDF, or structural fill the exposed subgrade under all areas to be occupied by concrete slabs-on-grade, spread, or continuous foundations should be recompacted to firm and unyielding condition and verified as suitable. Verification of suitable subgrade should be performed by a GeoTest geotechnical professional. The purpose of this effort is to identify loose or soft soil deposits or other unsuitable subgrade conditions. Proof rolling may not be a feasible means to identify loose or soft soil

deposits or other unsuitable subgrade conditions. As such, we recommend alternate means of verification such as Dynamic Cone Penetrometer (DCP) testing or soil probe methods be employed to verify suitability of field conditions.

Fill and Compaction

Structural fill used to obtain final elevations for soil supported foundations, floor slabs, driveways, sidewalks, and patios must be properly placed and compacted. In most cases, any 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. Material containing topsoil, wood, trash, organics, or construction debris is not suitable for reuse as structural fill and should be properly disposed offsite or placed in nonstructural areas.

Soils containing more than approximately 5 percent fines are considered moisture sensitive and are 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.

Reuse of On-Site Soil

Due to the potentially excessive "fines" component and variability of the native on-site soils, these soils are not recommended for use as structural fill due to the difficulties associated with moisture conditioning. GeoTest generally recommends any reuse of the native soils be limited to landscape and other non-structural areas. However, if placed at or near the optimum moisture content, these materials could be reused as structural fill during generally dry site conditions. If the project team wishes to use native materials for structural fill applications, we generally recommend that the contractor, owner and GeoTest have a meeting to discuss the limitations of that approach.

We do not recommend reuse of topsoil, on-site soils not properly moisture conditioned, material with significant organic content, or deleterious material within structural areas. Any such material should be reused in non-structural areas only or be disposed of off-site.

Imported Structural Fill

GeoTest recommends that structural fill consist of clean, well-graded sandy gravel, gravelly sand, or other approved naturally occurring granular material or a well graded crushed rock. We recommend imported structural fill for dry weather construction be similar to Washington State Department of Transportation (WSDOT) Standard Specification 9-03.14(2) for "Select Borrow" with the added requirement that 100 percent pass a 4-inch-square sieve.

Soil containing more than about 5 percent fines (that portion passing the U.S. No. 200 sieve) cannot consistently be compacted to a dense, non-yielding condition when the water content is greater than optimum. Accordingly, GeoTest recommends that imported structural fill for wet weather construction be similar to WSDOT Standard Specification 9-03.14(1) for "Gravel Borrow" with the added requirement that no more than 5 percent pass the U.S. No. 200 sieve. 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 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.

Based on local availability, the designer may elect to utilize Crushed Surfacing Base Course (CSBC) or Crushed Surfacing Top Course (CSTC) as structural fill. As such, we recommend WSDOT Standard Specification 9-03.9(3) be incorporated into the project plans.

Backfill and Compaction

Structural fill should be placed in horizontal lifts. The structural fill must measure 8 to 10 inches in loose thickness and be 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 D1557. The top of the compacted structural fill should extend outside any structural improvements, including foundation footings, a minimum distance equal to the thickness of the fill. We recommend that compaction be tested after placement of each lift in the fill pad. Where CDF is used as backfill the top of the CDF needs to extend a nominal distance beyond the width of the footing or other structural element.

Keying and Benching

Due to the sloping topography at the project site, grading activities may require keying and benching to accommodate elevation changes. Where foundations are to be placed within proximity to slopes steeper that 5H:1V appropriate keying and benching techniques should be utilized. On reaching firm an unyielding native soil, foundation alignments should be benched flat by mechanical removal. Foundations should be stepped to accommodate the sloping grade on the site. We recommend a maximum step height of 18 inches vertically with a horizontal spacing of at least 5 feet. For structures which will be cited within the sloped portion of the project site, we recommend excavating a keyway into the downslope foundation lines to embed the new structures into the slope and provide added shear strength. This keyway should extend a minimum of 18 inches into approved, medium dense to dense / hard undifferentiated glacial deposits.

Wet Weather Earthwork

Near surface soils are susceptible to degradation during wet weather. As a result, it may be difficult to control the moisture content of site soils during the wet season. If construction takes place during wet weather, GeoTest recommends that structural fill consist of imported, clean, sandy gravel or gravelly sand. If fill is to be placed or earthwork is to be performed in wet conditions, the contractor may reduce soil disturbance by:

- Limiting the size of areas that are stripped and left exposed
- Accomplishing earthwork in small sections
- Limiting construction traffic over unprotected soil
- Sloping excavated surfaces to promote runoff
- Limiting the size and type of construction equipment used
- Providing gravel 'working mats' over areas of prepared subgrade
- Removing wet surficial soil prior to commencing fill placement each day
- Sealing the exposed ground surface by rolling with a smooth drum compactor or rubber-tired roller at the end of each working day
- Providing up-gradient perimeter ditches or low earthen berms and using temporary sumps to collect runoff and prevent water from ponding and damaging exposed subgrades

Seismic Design Considerations

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

For structures designed using the seismic design provisions of the 2018 International Building Code, the dense to very dense / very stiff to hard undifferentiated glacial deposits observed to underlie the site is classified as Site Class D, according to ASCE 7-16. The structural engineer should select the appropriate design response spectrum based on Site Class D and the geographical location of the proposed development.

Foundation Support

Foundation support for the proposed single-family residences can be established via continuous or isolated spread footings founded on firm and unyielding, approved native soils, or on properly compacted structural fill placed directly over approved native soil. GeoTest recommends that qualified geotechnical personnel confirm that suitable bearing conditions have been reached prior to placement of structural fill or foundation formwork. We generally anticipate that up to 1 foot of stripping will be needed to remove near surface topsoil and expose undifferentiated

glacial deposits suitable for foundation support across the majority of the project site. However, additional excavation could be required on sloping terrain. Within the upslope portion of the site, adjacent to TP-1, roughly 5.5 feet of uncontrolled fill was observed. Although not currently anticipated, any development proposed within this portion of the project site should be expected to encounter roughly 5.5 feet of uncontrolled fill materials which extended to depth from current surface elevations. This material would need to be removed from foundation footprints or roadways to expose firm native soil prior to the placement of structural fill or foundation formwork.

To provide proper support, GeoTest recommends that existing topsoil, existing fill, loose upper portions of the native soils be removed from beneath the foundation area(s). If footings or structural fill will be placed atop native, near surface weathered soils, the surface should be compacted to a firm and unyielding condition with a smooth-drum roller, hoe-pack, or a similar piece of construction equipment. Once suitable bearing conditions have been confirmed, then foundations can bear directly on native soils or on properly compacted structural fill as described in the *Fill and Compaction* section of this report.

All continuous and isolated spread footings should be founded a minimum of 18 inches below the lowest adjacent final grade for freeze/thaw protection. The footings should be sized in accordance with the structural engineer's prescribed design criteria and seismic considerations.

Allowable Bearing Capacity

Assuming the above foundation support criteria are satisfied, continuous or isolated spread footings founded directly on remedially compacted, firm, and unyielding, native soils or on compacted structural fill placed directly over these native soils may be proportioned using a net allowable soil bearing capacity of 2,000 pounds per square foot (psf).

The "net allowable bearing capacity" refers to the pressure that can be imposed on the soil at foundation level. This pressure includes all dead loads, live loads, the weight of the footing, and 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. If construction is accomplished as recommended and at the maximum allowable soil bearing pressure, GeoTest estimates the total settlement of building foundations to be less than one inch. Differential settlement between two adjacent load-bearing components supported on competent soil is estimated to be less than one half the total settlement.

Floor Support

Conventional slab-on-grade floor construction is feasible for the planned site improvements. Floor slabs should be supported by properly placed and compacted structural fill placed over suitable native subgrade. We recommend that stripping include all fill soils, topsoil and loose or disturbed portion of native soils from within floor slab areas.

GeoTest recommends that interior concrete slab-on-grade floors be underlain with at least 6 inches of clean, compacted, free-draining crushed gravel to serve as a capillary break. This material should be clear, crushed, ¾ inch rock with no fines or similar. The purpose of this gravel layer is to provide uniform support for the slab, provide a capillary break, and act as a drainage layer. Structural fill material installed below the capillary break, if needed, should be placed, and compacted in accordance with the recommendations presented in the *Fill and Compaction* section of this report. To help reduce the potential for water vapor migration through floor slabs, a continuous 10 to 15-mil minimum thick 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 manufacturer's instructions. American Concrete Institute (ACI) guidelines suggest that the slab may be poured directly on the vapor barrier.

A modulus of subgrade reaction of 200 pounds per cubic inch (pci) for structural fill over medium dense undifferentiated glacial deposits should be appropriate for use in design. This value is assuming site preparations prior to slab installation follow the minimum preparation measures recommended above, including the removal of topsoil and any existing fill soils, if present.

Exterior concrete slabs-on-grade, such as sidewalks or drive lanes, may be supported directly on approved native soil 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

Positive surface gradients should be provided adjacent to the proposed building to direct surface water away from the building 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 similar municipality-approved outlet. Pavement and sidewalk areas, if present, should be sloped and drainage gradients should be maintained to carry surface water away from the building towards an approved 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.

To reduce the potential for groundwater and surface water to seep into interior spaces, GeoTest recommends that an exterior footing drain system be constructed around the perimeter of new building foundations as shown in the *Conceptual Footing and Wall Drain Section* (Figures 5a and 5b) of this report. The drain should consist of a perforated pipe measuring 4 inches in diameter at minimum, surrounded by at least 12 inches of filtering media. The pipe should be sloped to carry water to an approved collection system.

The filtering media should consist of open-graded drain rock wrapped in a nonwoven geotextile fabric such as Tencate® Mirafi® 140N or industry equivalent. For foundations supporting retaining walls, drainage backfill should be carried up the back of the wall and be at least 12 inches wide. The drainage backfill should extend from the foundation drain to within approximately 1 foot of the finished grade and consist of open-graded drain rock containing less than 3 percent fines 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 be contained. This process prevents water from seeping through walls or floor slabs. The drain system should include cleanouts to allow for periodic maintenance and inspection.

Please understand that the above recommendations are intended to assist the design engineer in development of foundation and site drainage parameters and are based on our experience with similar projects in the area. The final foundation and site drainage plan that will be incorporated into project details is to be determined by the project team. GeoTest may provide additional consultation and plan review for site drainage if requested by the client.

Resistance to Lateral Loads

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 comprises the active soil pressure. When a wall is restrained against lateral movement or tilting (a nonyielding wall), the soil pressure exerted comprises 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.

GeoTest recommends that yielding walls under drained conditions be designed for an equivalent fluid density of 35 pounds per cubic foot (pcf) for structural fill in active soil conditions. Nonyielding walls under drained conditions should be designed for an equivalent fluid density of 55 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.

For structures designed using the seismic provisions of the 2018 International Building Code, GeoTest recommends that retaining walls include a surcharge of approximately 8H (where H is the height of the wall in feet) be used for design purposes. The seismic surcharge should be modeled as a rectangular distribution with the resultant applied at the midpoint of the wall. The surcharge assumes that the wall is allowed to rotate or yield. If the wall is restrained, GeoTest should be contacted so that we can provide a revised seismic surcharge pressure.

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 is equivalent to a fluid with a density of 300 pounds per cubic foot. The recommended value includes a safety factor of about 1.5. The passive resistance values assume that the ground surface adjacent to the structure is level and the representative soil unit extends 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.

Allowable coefficient of base friction value of 0.30 may be used for foundations founded directly on competent undifferentiated glacial deposits. 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. A safety factor of about 1.5 is included in the base friction design value. GeoTest does not recommend increasing the coefficient of friction to resist seismic or wind loads.

Temporary and Permanent Slopes

The contractor is responsible for construction slope configurations and maintaining safe working conditions, including temporary excavation stability. 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 feet should be shored or sloped in accordance with Safety Standards for Construction Work Part N, WAC 296-155-66403. The native undifferentiated glacial deposits encountered were granular in most locations across the project site. As such, these soils are classified as a Type C soil according to WAC 296-155-66401. Thus, temporary, unsupported excavations founded in this soil unit may be sloped as steep as 1.5:1 (Horizontal: Vertical). Flatter slopes or temporary shoring may be required in areas where groundwater flow is present and unstable conditions develop. Notably, all soils are classified as Type C soils in the presence of groundwater seepage.

Temporary slopes and excavations should be protected as soon as possible using appropriate methods to prevent erosion from occurring during periods of wet weather. GeoTest recommends that permanent cut or fill slopes be designed for inclinations of 2H:1V or flatter. All permanent slopes should be vegetated or otherwise protected to limit the potential for erosion as soon as practical after construction.

Utilities

Utility trenches must be properly backfilled and compacted to reduce cracking or localized loss of foundation or slab support. Excavations for new shallow underground utilities are expected to be placed within medium dense glacial outwash deposits or near bedrock.

Trench backfill in improved areas (beneath structures, driveways, sidewalks, etc.) should consist of structural fill as defined in the *Fill and Compaction* section of this report. Outside of improved areas, trench backfill may consist of reused weathered or unweathered native material provided the backfill 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 activity and traffic may cause caving of the trench walls.

The contractor is responsible for trench configurations. 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, soil within the trench zone may be prone to caving, channeling, and running. Trench widths may be substantially wider if not properly dewatered, as opposed to under dewatered conditions.

Stormwater Infiltration Potential

Standing surface water was observed in the pond within the upslope portion of the project site. In addition, perched groundwater seepage and soil mottling was generally encountered across the site at depths ranging from 2.5 to 8 feet below ground surface. Moreover, the near surface native materials underlying the site generally consist of medium dense to dense or stiff undifferentiated glacial deposits which commonly contained between 18 and 51 percent fines by mass within a couple of feet from the surface. The presence of this material, in our opinion, supports the presence of a "restrictive layer", as defined by the 2019 Stormwater Management Manual for Western Washington. Maintaining a minimum separation from the base of traditional stormwater infiltration systems to this restrictive layer does not appear feasible across most of the project site. Thus, it is our opinion that the site is not suitable for conventional stormwater infiltration.

Stormwater Considerations

Site stormwater must be managed through appropriate civil design. With adequate engineering and/or proper stormwater design based on the current Stormwater Manual, GeoTest does not anticipate that the proposed improvements will negatively impact the generally moderate site slopes any more than the existing site conditions do. Existing cutoff drains and/or foundation drain systems, if present, should be inspected to evaluate their functionality and determine how these systems might be incorporated or connected to the proposed stormwater system.

We recommend that the designer consider the use of dispersion within the western most portion of the project site, where intermittent erosion hazards are not present, and slope inclinations are generally low.

The stormwater collection system should be considered a routine maintenance item and should be regularly checked for proper working order. Typically, the stormwater system is checked at least twice a year and after any major storm event.

Geotechnical Consultation and Construction Monitoring

GeoTest recommends that we be involved in the project design review process. The purpose of the review is to verify that the recommendations presented in this report are understood and incorporated in the design and specifications.

We also recommend that geotechnical construction monitoring services be provided. These services should include observation by GeoTest personnel during structural fill placement, compaction activities and subgrade preparation operations to confirm that design subgrade conditions are obtained beneath the proposed building. Periodic field density testing should be performed to verify that the appropriate degree of compaction is obtained. The purpose of these

services is to observe compliance with the design concepts, specifications, and recommendations of this report. In the event that subsurface conditions differ from those anticipated before the start of construction, GeoTest Services would be pleased to provide revised recommendations appropriate to the conditions revealed during construction.

GeoTest is available to provide a full range of materials testing and special inspection during building 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, wood framing and structural steel. These services are supported by our fully accredited materials testing laboratory.

USE OF THIS REPORT

GeoTest Services, Inc. has prepared this report for the exclusive use of Brad Widman and his design consultants for specific application to the design of the proposed residence at 1204 Yew Street in Bellingham, Washington. Use of this report by others is at the user's sole risk. This report is not applicable to other site locations. Our services are conducted in accordance with accepted practices of the geotechnical engineering profession; no other warranty, 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 these conditions are representative of conditions at other locations and times. The analyses and conclusions contained in this report are based on site conditions to the limited depth and time of our explorations, a geological reconnaissance of the area, and a review of previously published geological information for the site. If variations in subsurface conditions are encountered during future construction that differ from those contained within this report, GeoTest should be allowed to review our report and, if necessary, make revisions. 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 contained herein.

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

Attachments:	Figure 1	Vicinity Map
	Figure 2	Site and Exploration Plan
	Figure 3	Bare Earth Imagery
	Figure 4	Cross Section A-A’
	Figure 5a & 5b	Conceptual Footing and Wall Drain Section
	Figure 6	Soil Classification System and Key
	Appendix A	Test Pit Logs
	Appendix B	Laboratory Test Results
	Attachment	Report Limitations and Guidelines for Its Use (4 Pages) (2) 11” x 17” Site Plans for COB Review (2 Pages)

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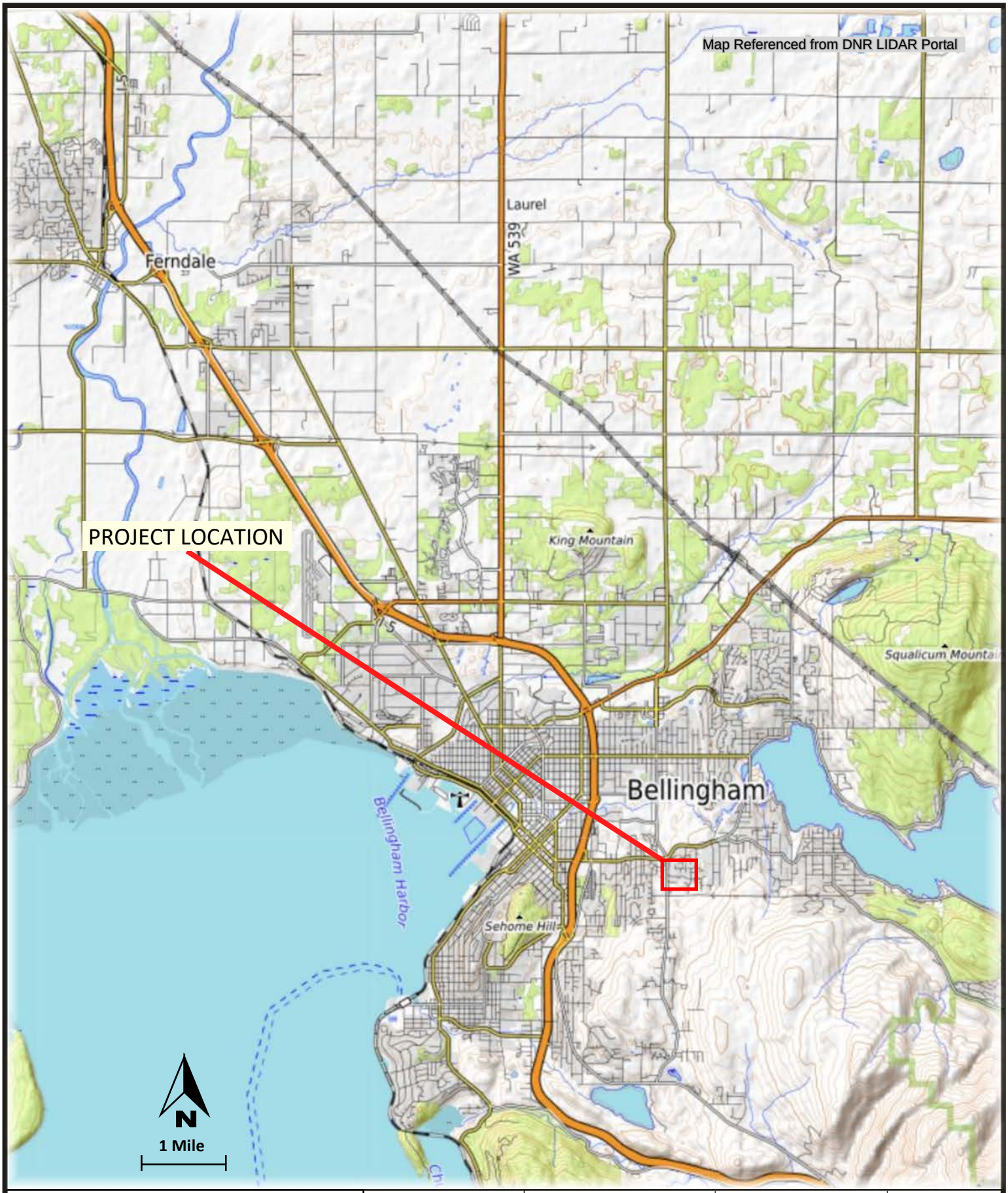
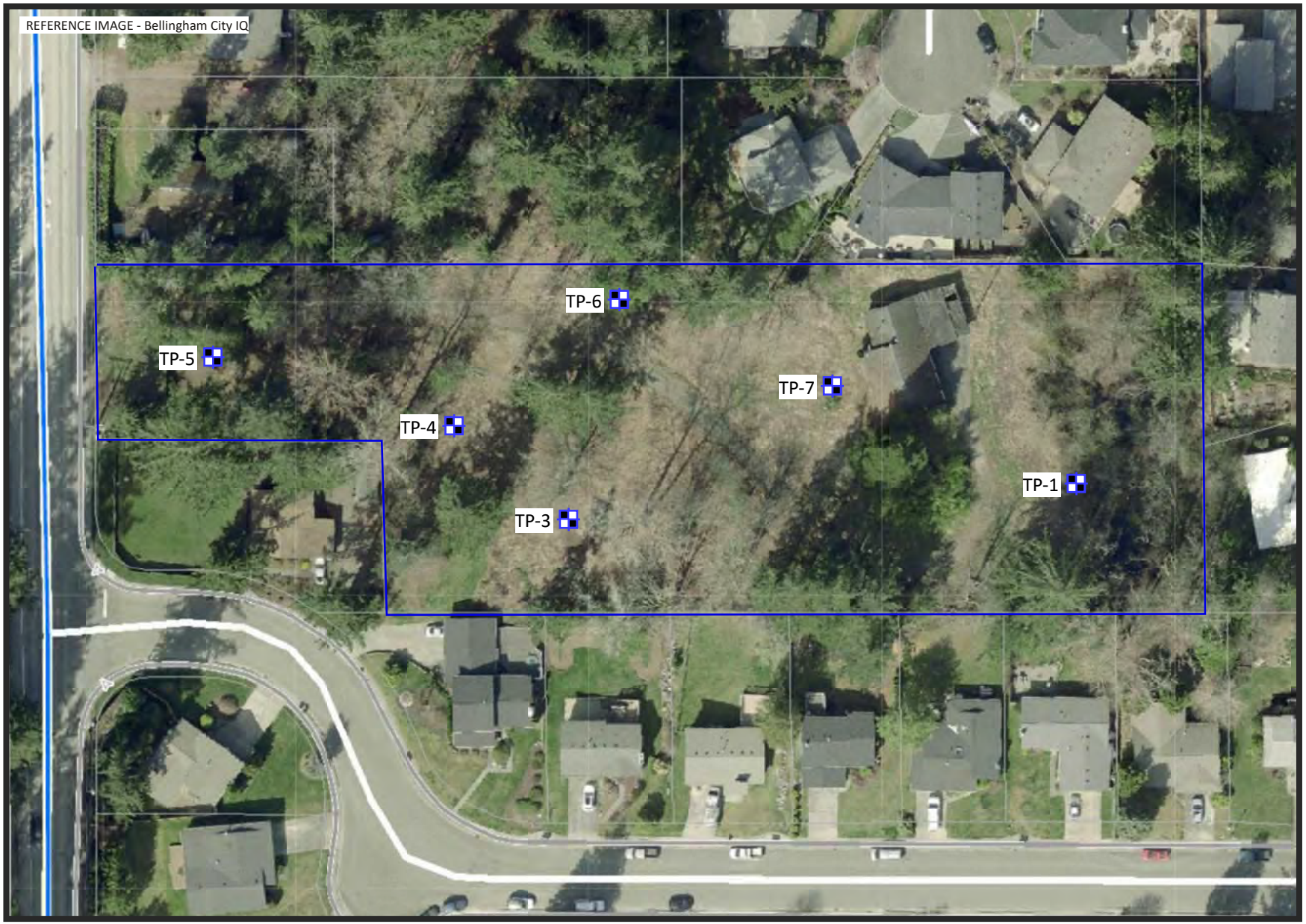


Date: 3-14-22	By: DK	Scale: As Shown	Project 22-0336

VICINITY MAP
1204 YEW STREET DEVELOPMENT
1204 YEW STREET
BELLINGHAM, WASHINGTON

Figure 1



N

60 FEET

TP-# = Test Pit Location

GEOTEST

Date: 4-4-22	By: HS	Scale: NTS	Project 22-0336

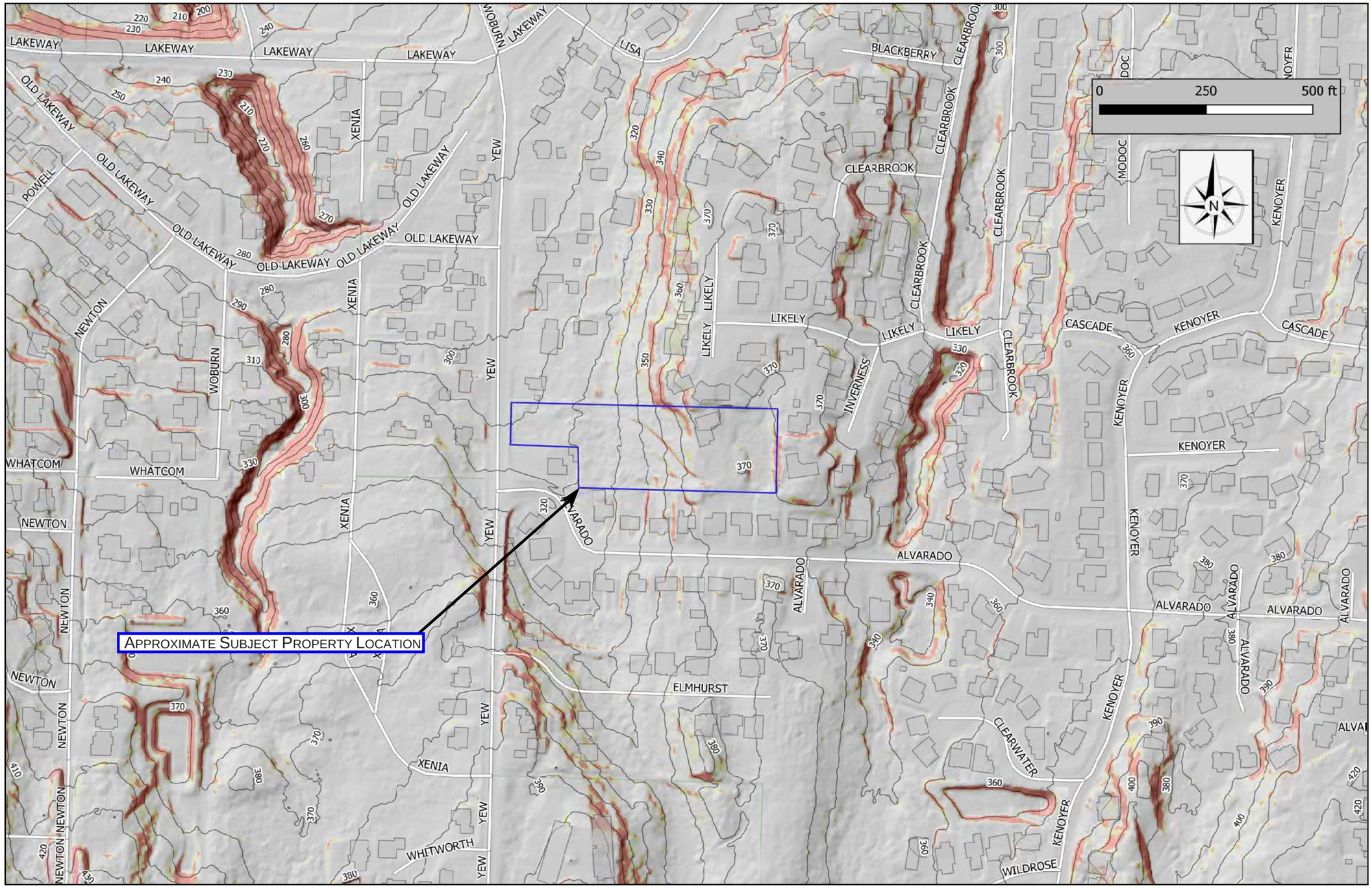
SITE AND EXPLORATION PLAN

1204 YEW STREET DEVELOPMENT

1204 YEW STREET

BELLINGHAM, WASHINGTON

Figure 2



NOTES:
1) SLOPES IN EXCESS OF 40 PERCENT ARE SHOWN IN RED (POTENTIAL LANDSLIDE HAZARDS)
2) SLOPES IN EXCESS OF 30 PERCENT ARE SHOWN IN YELLOW (POTENTIAL EROSION HAZARDS)

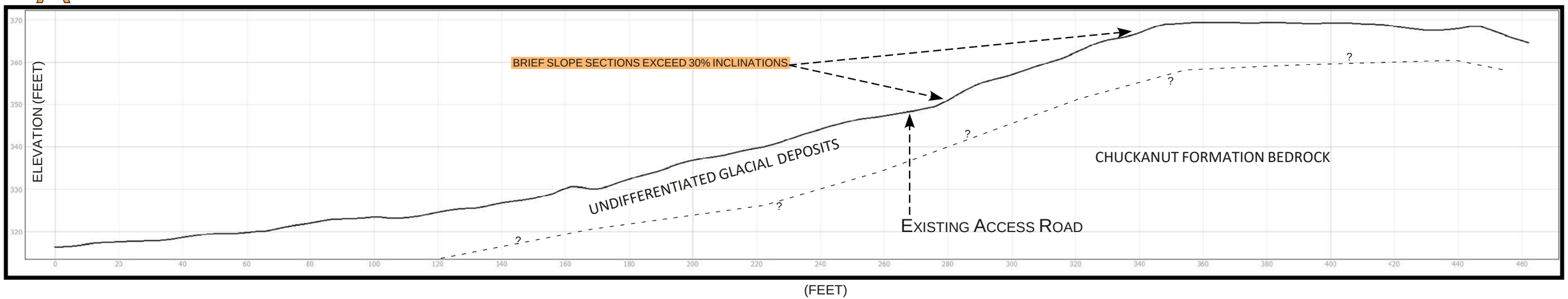
DATA SOURCE(S):	DATE: 3-31-22	BY: HS	SCALE: AS SHOWN	PROJECT
PARCELS, STRUCTURES, ROADWAYS : COB GIS DATA ELEVATION, SLOPE, AND HILLSHADE: DERIVED FROM BELLINGHAM_2013 LIDAR SURVEY BY WSI APPLIED REMOTE SENSING AND ANALYSIS MAPPED LANDSLIDE AND ALLUVIAL FAN DEPOSITS: WA DNR GIS OPEN DATA	**BARE EARTH IMAGERY** **1204 YEW STREET DEVELOPMENT** **1204 YEW STREET** **BELLINGHAM, WASHINGTON**			**22-0336** FIGURE **3**

WEST

A

EAST

A'



NOTES:

1) CROSS SECTION GENERATED USING PUBLIC LIGHT DETECTION AND RANGING DATA (LIDAR) BELLINGHAM, 2013.

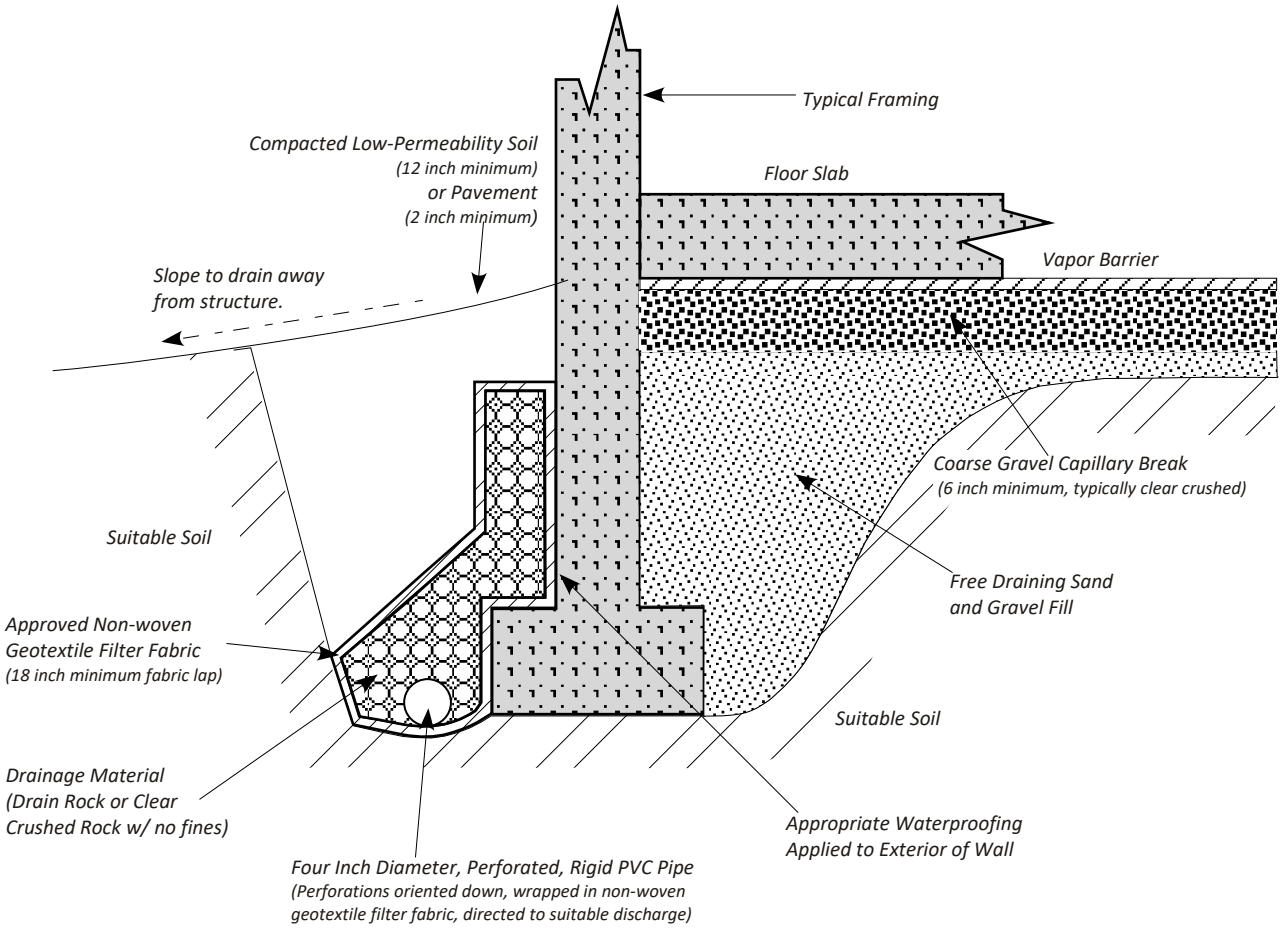
3) CONTACT BETWEEN UNDIFFERENTIATED GLACIAL DEPOSITS AND CHUCKANUT FORMATION BEDROCK IS SHOWN AS DASHED LINE DUE TO INFERRED CONTACT AT DEPTH. CHUCKANUT FORMATION BEDROCK WAS NOT ENCOUNTERED IN OUR SUBSURFACE EXPLORATIONS.

3) SITE PHOTOGRAPHY REFERENCE: BELLINGHAM CITY IQ.

GEOTEST

DATE: 2-26-20	BY: HS	SCALE: AS SHOWN	PROJECT
CROSS SECTION A - A' **1204 YEW STREET DEVELOPMENT** **1204 YEW STREET** **BELLINGHAM, WASHINGTON**			**22-0336**
			FIGURE 4

CONCEPTUAL FOOTINGS WITH INTERIOR SLAB-ON-GRADE



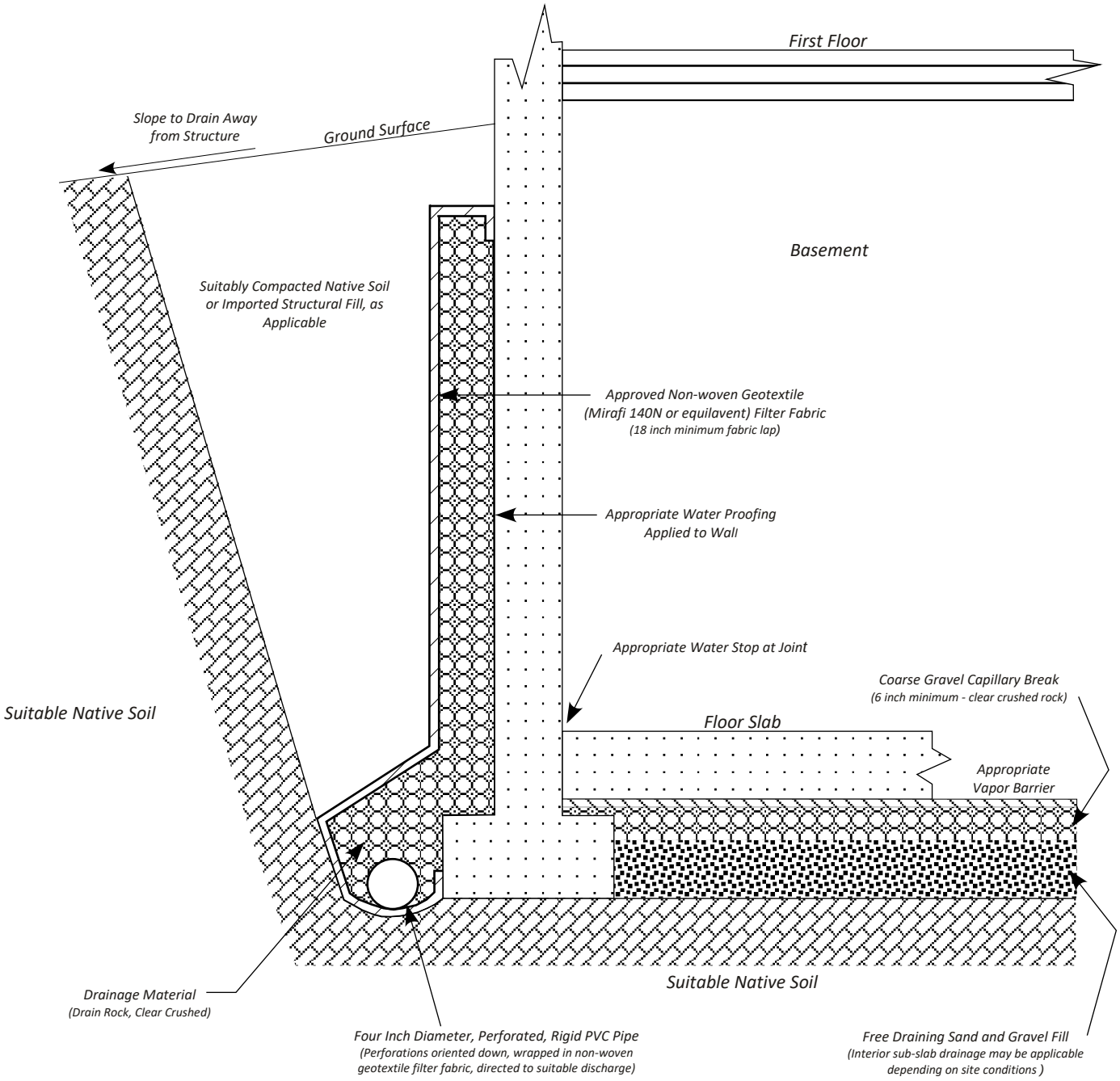
Notes:

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).

This figure is not intended to be representative of a design. This figure is intended to present concepts that can be incorporated into a functional foundation drain designed by a Civil Engineer. In all cases, refer to the Civil plan sheet for drain details and elevations.

GEOTEST	Date: 4-1-22	By: HS	Scale: None	Project 22-0336
	CONCEPTUAL FOOTING & WALL DRAIN SECTION 1204 YEW STREET DEVELOPMENT 1204 YEW STREET BELLINGHAM, WASHINGTON			Figure 5a

CONCEPTUAL 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).

This figure is not intended to be representative of a design. This figure is intended to present concepts that can be incorporated into the design. In all cases, refer to the Civil plan sheet for drain details and elevations.

GEOTEST	Date: 4-1-22	By: HS	Scale: Shown

CONCEPTUAL FOOTING & WALL DRAIN SECTION
1204 YEW STREET DEVELOPMENT
1204 YES STREET
BELLINGHAM, WASHINGTON

Project **22-0336**

Figure **5b**

Soil Classification System

MAJOR DIVISIONS			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
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	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
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of 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

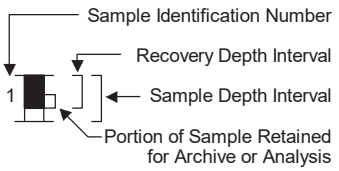
OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

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

SAMPLE NUMBER & INTERVAL



SAMPLER TYPE

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

Groundwater

▽ ATD — Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

Field and Lab Test Data

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

GEOTEST

1204 Yew St. Development
1204 Yew Street
Bellingham, Washington

Soil Classification System and Key

Figure 6

Appendix A:

Test Pit Logs

TEST PIT LOG

Test Pit No. TP-1

PROJECT: 1204 Yew Street Development **PROJECT NO.:** 22-0336
LOCATION: 1204 Yew Street, Bellingham, Washington 98229 **DATE:** 3-10-2022
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** ND
CONTRACTOR/DRILLER: Client **LOGGED BY:** DK
DEPTH TO WATER TABLE: ▽ ND **PERCHED WATER:** ▽ 7.0 **CAVING** C 2.0

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
	SAMPLE & TEST DATA				
0				ML	Medium stiff, medium brown to brown, damp, sandy, gravelly, SILT, rootlets and medium roots to 2.4' BGS, frequent organic and woody debris, concrete and metal debris throughout. (Uncontrolled Fill)
1	1	d			
2				C	Caving at 2.0 feet BGS
3					
4					
5					
6	2	d	W = 12.4 GS	SM	Loose, gray to olive gray, mottled, moist, silty SAND with occasional fine gravel. Density estimated with 5lb hammer and #4 rebar. (Undifferentiated Glacial Deposit)
7				▽	Rapid water seepage at 7.0 feet BGS
8					Grades to blue gray and blocky at 8.0 feet BGS
9	3	d	W = 16.2 GS		
					Test Pit Terminated at Planned Depth

Reference 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 an explanation of the graphics/symbols used.

Test Pit TP-1 was terminated at 9.0 ft below site grades on 3-10-2022

Figure: A-1

Notes: See Figure 2 for Test Pit Location
ND = Not Determined

TEST PIT LOG

Test Pit No. TP-2

PROJECT: 1204 Yew Street Development | **PROJECT NO.:** 22-0336
LOCATION: 1204 Yew Street, Bellingham, Washington 98229 | **DATE:** 3-10-2022
EXPLORATION METHOD: Tracked Excavator | **ELEVATION:** ND
CONTRACTOR/DRILLER: Client | **LOGGED BY:** DK
DEPTH TO WATER TABLE: ▽ ND | **PERCHED WATER:** ▽ 3.3 | **CAVING** ⊂ ND

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
	SAMPLE & TEST DATA				
0				OL	Soft, dark brown, moist, organic rich slightly sandy, SILT with gravel and cobbles, large to small roots throughout. (Topsoil)
1	4	d		SM	Medium dense, tan to gray and mottled, dry to damp, very silty, gravelly SAND, occasional organic debris, sparce rootlets, occasional silt pockets. Density estimated with 5lb hammer and #4 rebar. (Undifferentiated Glacial Deposit)
2	5	d	W = 16.4 GS		
3					Grades to dense and slow seepage at 3.3 feet BGS
4					
5					Grades to olive gray and very dense at 5.0 feet BGS
6	6	d			
7					
8					
9					Test Pit Terminated at Planned Depth

Reference 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 an explanation of the graphics/symbols used.

Test Pit TP-2 was terminated at 9.0 ft below site grades on 3-10-2022

Figure: A-2

Notes: See Figure 2 for Test Pit Location
ND = Not Determined

TEST PIT LOG

Test Pit No. TP-3

PROJECT: 1204 Yew Street Development | **PROJECT NO.:** 22-0336
LOCATION: 1204 Yew Street, Bellingham, Washington 98229 | **DATE:** 3-10-2022
EXPLORATION METHOD: Tracked Excavator | **ELEVATION:** ND
CONTRACTOR/DRILLER: Client | **LOGGED BY:** DK
DEPTH TO WATER TABLE: ▽ ND | **PERCHED WATER:** ▽ 6.0 | **CAVING** ⊂ ND

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
	SAMPLE & TEST DATA				
0				OL	Soft, dark brown, damp, organic rich slightly sandy, SILT with trace gravel, roots throughout, occasional cobbles. (Topsoil)
1	7	d		SM	Loose, reddish brown, damp, silty, gravelly, SAND. Density estimated with 5lb hammer and #4 rebar. (Weathered Undifferentiated Glacial Deposit)
2	8	d	W = 14 GS		Medium dense, gray, moist, slightly silty, gravelly, SAND. (Undifferentiated Glacial Deposit)
3	9	d			
4					
5					Relative silt, sand, and gravel content was variable throughout.
6					Rapid seepage at 6.0 feet BGS
7					
8	10	d			Test Pit Terminated at Planned Depth

Reference 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 an explanation of the graphics/symbols used.

Test Pit TP-3 was terminated at 8.7 ft below site grades on 3-10-2022

Figure: A-3

Notes: See Figure 2 for Test Pit Location
ND = Not Determined

TEST PIT LOG

Test Pit No. TP-4

PROJECT: 1204 Yew Street Development | **PROJECT NO.:** 22-0336
LOCATION: 1204 Yew Street, Bellingham, Washington 98229 | **DATE:** 3-10-2022
EXPLORATION METHOD: Tracked Excavator | **ELEVATION:** ND
CONTRACTOR/DRILLER: Client | **LOGGED BY:** DK
DEPTH TO WATER TABLE: ND | **PERCHED WATER:** 2.5 | **CAVING** ND

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
	SAMPLE & TEST DATA				
0				OL	Soft, dark brown, moist, organic rich slightly sandy, SILT, roots throughout, occasional cobbles. (Topsoil)
1	11	d		SM	Medium dense, reddish brown, damp, very silty, gravelly SAND. Density estimated with 5lb hammer and #4 rebar.(Weathered Undifferentiated Glacial Deposit)
2	12	d			
	13	d	W = 18.5 GS	ML	Stiff, gray with orange mottling, very sandy, slightly gravelly, SILT. (Undifferentated Glacial Deposit)
3					Slow seepage at 2.5 feet BGS
4					
5					
6					Grade to dense with slow seepage at 6.0 feet BGS
7					
8					Test Pit Terminated at Planned Depth

Reference 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 an explanation of the graphics/symbols used.

Test Pit TP-4 was terminated at 8.5 ft below site grades on 3-10-2022

Figure: A-4

Notes: See Figure 2 for Test Pit Location
ND = Not Determined

TEST PIT LOG

Test Pit No. TP-5

PROJECT: 1204 Yew Street Development | **PROJECT NO.:** 22-0336
LOCATION: 1204 Yew Street, Bellingham, Washington 98229 | **DATE:** 3-10-2022
EXPLORATION METHOD: Tracked Excavator | **ELEVATION:** ND
CONTRACTOR/DRILLER: Client | **LOGGED BY:** DK
DEPTH TO WATER TABLE: ND | **PERCHED WATER:** 4.0 | **CAVING** ND

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
	SAMPLE & TEST DATA				
0				OL	Soft, dark brown, damp, very organic, slightly sandy SILT, roots throughout. (Topsoil)
1	14	d		SM	Medium dense, reddish brown, damp, very silty, gravelly SAND, Density estimated with 5lb hammer and #4 rebar. (Undifferentiated Glacial Deposit)
2					Grades to very gravelly, silty SAND, frequent coarse gravel, pockets of organic material, pockets of silt and occasional boulders.
3	15	d			
4					Moderate seepage at 4.0 feet BGS
5					
6					
7					
8					Grades to dense, blue gray, damp, silty SAND.
9	16	d	W = 13.9 GS		Test Pit Terminated at Planned Depth

Reference 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 an explanation of the graphics/symbols used.

Test Pit TP-5 was terminated at 9.0 ft below site grades on 3-10-2022

Notes: See Figure 2 for Test Pit Location
ND = Not Determined

Figure:

A-5

TEST PIT LOG

Test Pit No. TP-6

PROJECT: 1204 Yew Street Development | **PROJECT NO.:** 22-0336
LOCATION: 1204 Yew Street, Bellingham, Washington 98229 | **DATE:** 3-10-2022
EXPLORATION METHOD: Tracked Excavator | **ELEVATION:** ND
CONTRACTOR/DRILLER: Client | **LOGGED BY:** DK
DEPTH TO WATER TABLE: ▽ ND | **PERCHED WATER:** ▼ 8.0 | **CAVING** ⊂ ND

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
	SAMPLE & TEST DATA				
0				OL	Loose, dark brown, damp, organic rich, slightly sandy, SILT, occasional boulders, large to small roots throughtout. (Topsoil)
1	17	d		SM	Loose to medium dense, reddish brown, damp, very silty, gravelly, SAND, Density estimated with 5lb hammer and #4 rebar.(Weathered Undifferentiated Glacial Deposit)
2				GP	Grades to medium dense, brown to tan, damp, very sandy GRAVEL with trace silt. (Undifferentated Glacial Deposit)
3	18	d	W = 2.8 GS		
4					
5					
6					
7					
8				SM	Medium dense, gray blue, damp, silty SAND, occasional boulders. (Undifferentiated Glacial Deposit) Moderate seepage at 8.0 feet BGS
9	19	d			Test Pit Terminated at Planned Depth

Reference 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 an explanation of the graphics/symbols used.

Test Pit TP-6 was terminated at 9.0 ft below site grades on 3-10-2022

Figure: A-6

Notes: See Figure 2 for Test Pit Location
ND = Not Determined

TEST PIT LOG

Test Pit No. TP-7

PROJECT: 1204 Yew Street Development | **PROJECT NO.:** 22-0336
LOCATION: 1204 Yew Street, Bellingham, Washington 98229 | **DATE:** 3-10-2022
EXPLORATION METHOD: Tracked Excavator | **ELEVATION:** ND
CONTRACTOR/DRILLER: Client | **LOGGED BY:** DK
DEPTH TO WATER TABLE: ND | **PERCHED WATER:** ND | **CAVING** ND

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA			SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
0				OL	Soft, medium to dark brown, damp, moderately organic slightly sandy, gravelly SILT, minor roots. (Topsoil)
1	20	d		SM	Loose, tan to gray, highly mottled, moist, slightly gravelly, very silty SAND, occasional mottling. Density estimated with 5lb hammer and #4 rebar. (Undifferentiated Glacial Deposit)
2	21	d			
3					
4					
5					Grade to dense, gray to tan, dry, moderately mottled, very silty, gravelly SAND, occasional boulders.
6					
7					Grades to very dense at 6.5 feet BGS
8	22	d	W = 14.3 GS		
					Test Pit Terminated at Planned Depth

Reference 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 an explanation of the graphics/symbols used.

Test Pit TP-7 was terminated at 8.5 ft below site grades on 3-10-2022

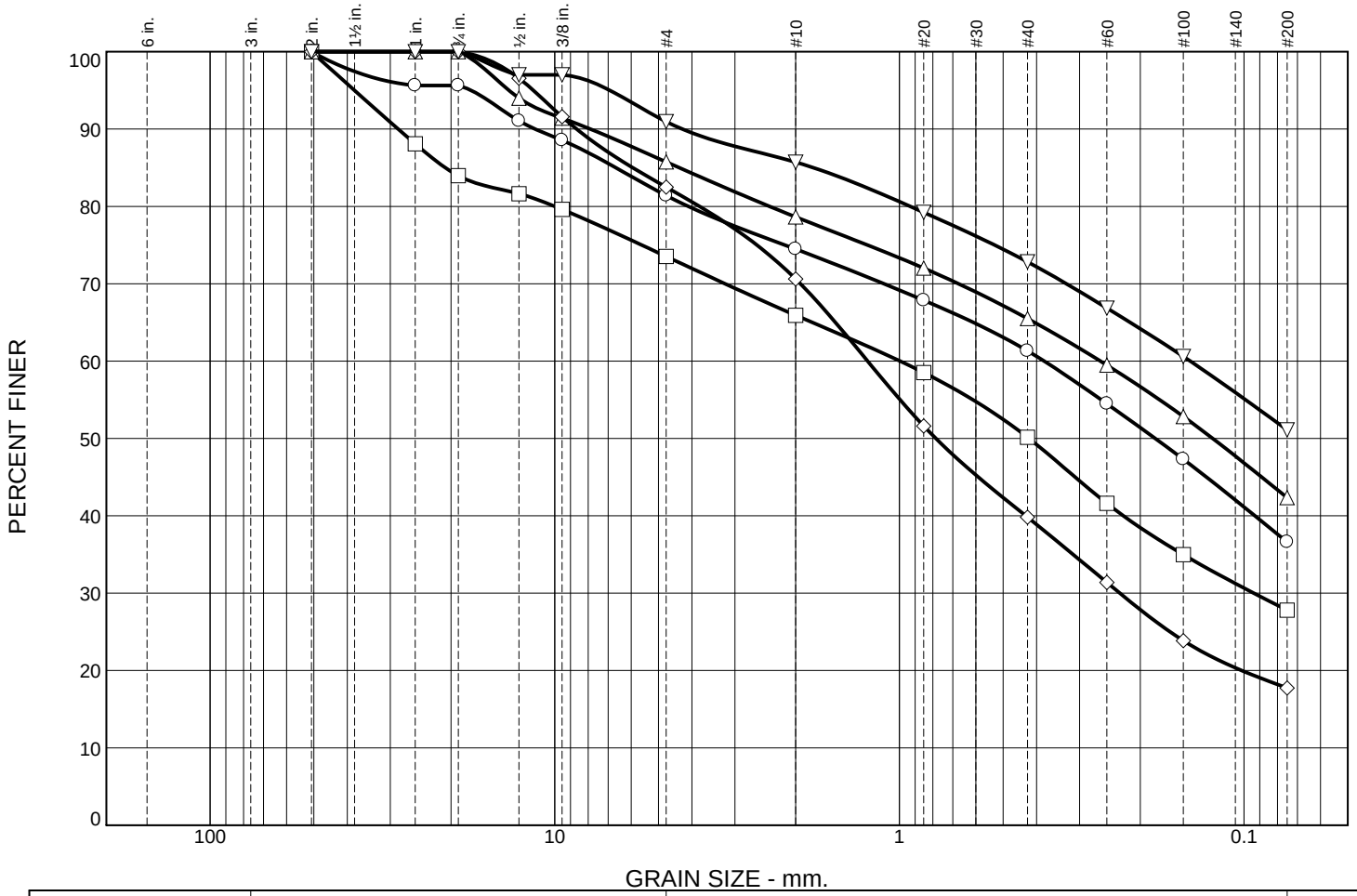
Figure: A-7

Notes: See Figure 2 for Test Pit Location
ND = Not Determined

Appendix B:

Laboratory Test Results

Grain Size Test Data



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	Silt
○	0	4	15	7	13	24	37
□	0	16	10	8	16	22	28
△	0	0	14	7	14	23	42
◇	0	0	18	11	31	22	18
▽	0	0	9	5	13	22	51

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP-1	2	6.0	Very silty, gravelly, SAND	SM
□	TP-1	3	8.5	Silty, gravelly, SAND	SM
△	TP-2	5	2.0	Very silty, gravelly, SAND	SM
◇	TP-3	8	1.4	Silty, gravelly, SAND	SM
▽	TP-4	13	2.5	Very sandy, slightly gravelly, SILT	ML

GEOTEST
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Bellingham | Arlington | Oak Harbor
www.geotest-inc.com

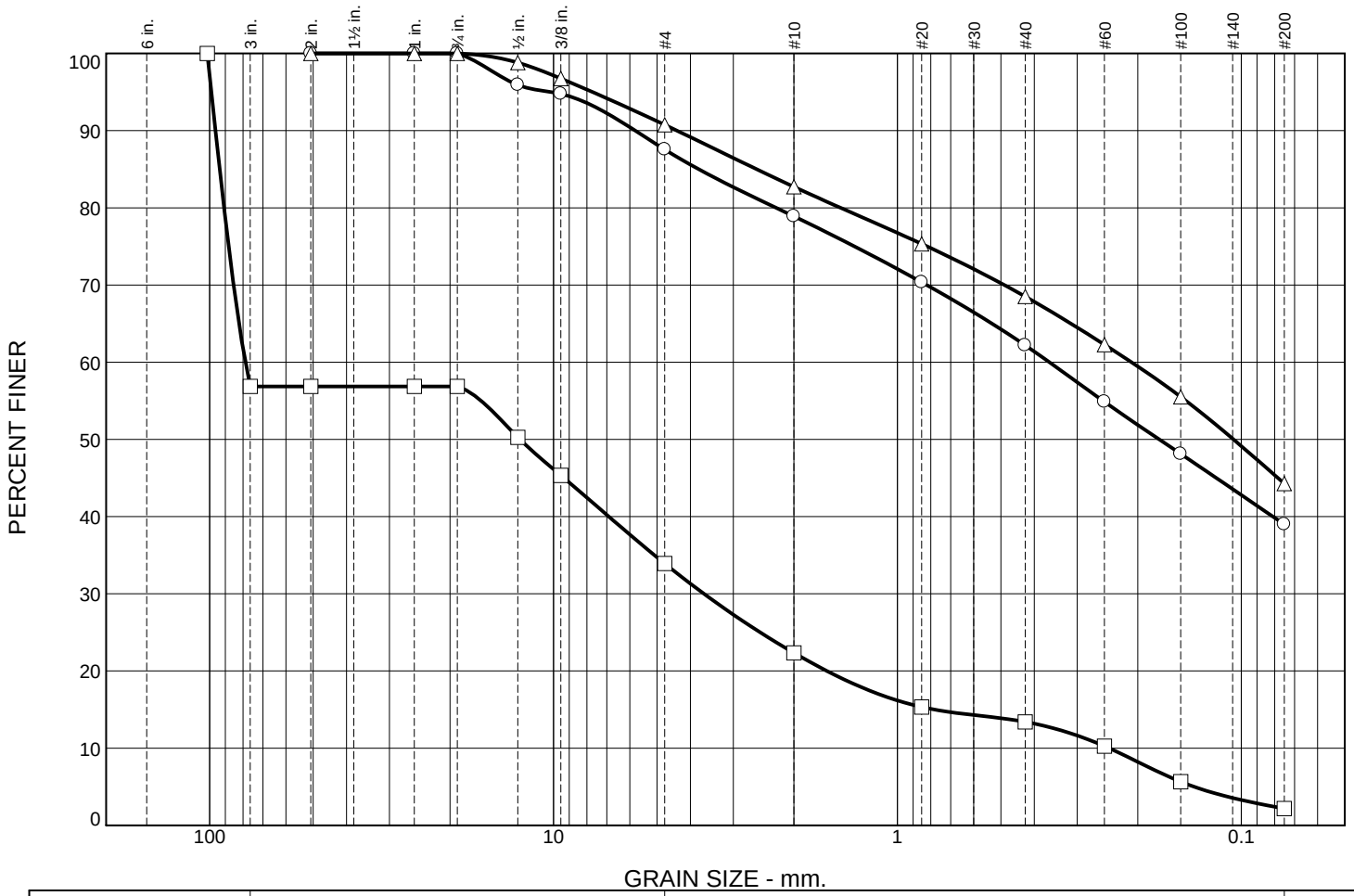
Client: Widman, Brad

Project: 1204 Yew Street Development

Project No.: 22-0336 **Figure** B-1

Tested By: ○ TA □ TA △ TA ◇ TA ▽ RB

Grain Size Test Data



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	Silt
○	0	0	12	9	17	23	39
□	43	0	23	12	9	11	2
△	0	0	9	8	14	25	44

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP-5	16	8.5	Very silty, slightly gravelly, SAND	SM
□	TP-6	18	3.0	Sandy, poorly-graded GRAVEL	GP
△	TP-7	22	7.0	Very silty, slightly gravely, SAND	SM

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Client: Widman, Brad

Project: 1204 Yew Street Development

Project No.: 22-0336 **Figure** B-2

Tested By: RB

REPORT LIMITATIONS AND GUIDELINES FOR ITS USE[1]

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.

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

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.

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.

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

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 GeoTest and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might 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.

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

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.

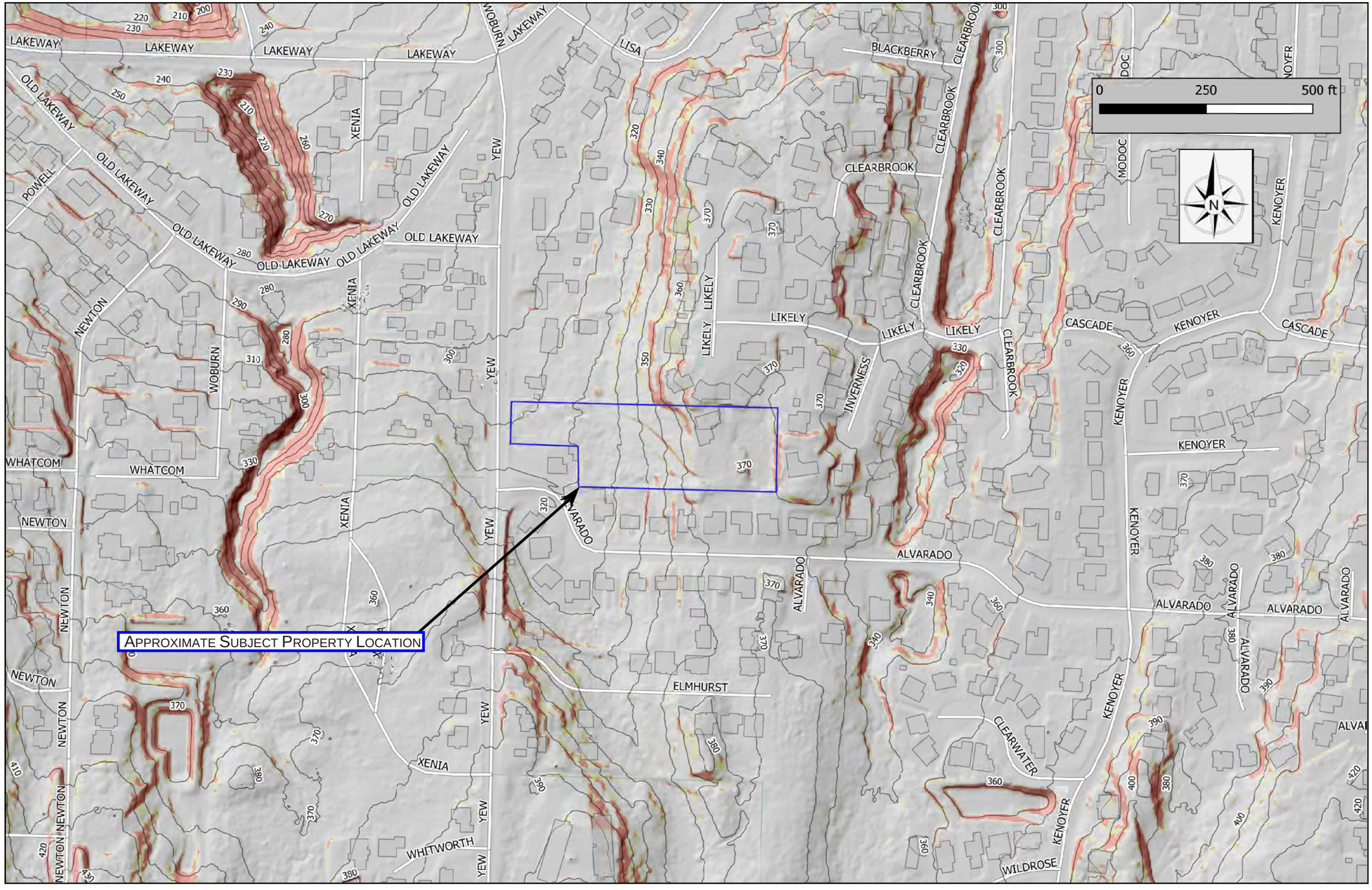
Environmental Concerns Are Not Covered in this Geotechnical or Geologic Report

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

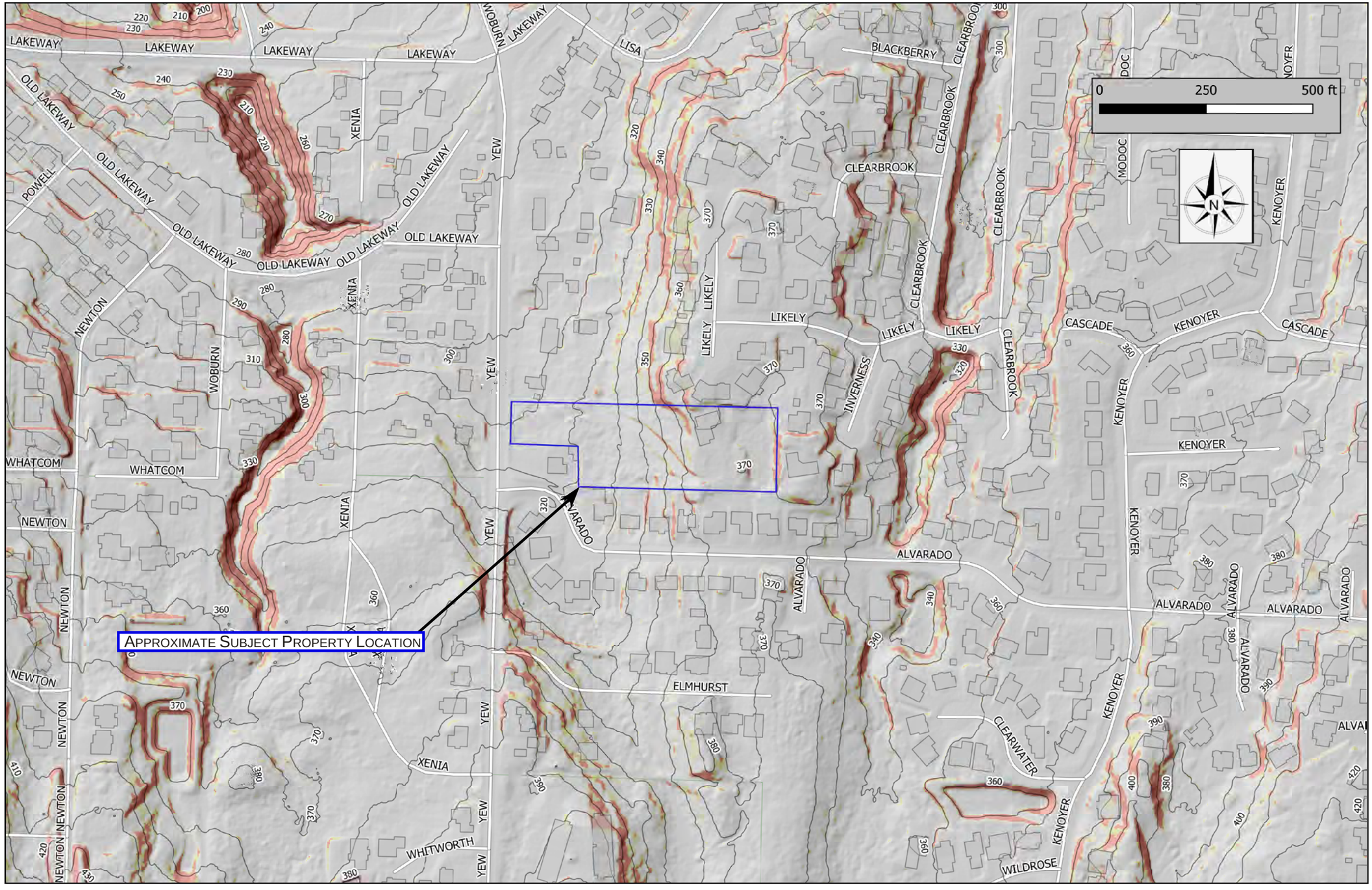
Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts biological pollutants from growing on indoor surfaces. Biological pollutants includes but is not limited to molds, fungi, spores, bacteria and viruses. To be effective, all 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 preformed in connection with this geotechnical engineering or geological study were designed or conducted for the purpose of preventing biological infestations.

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



NOTES:
1) SLOPES IN EXCESS OF 40 PERCENT ARE SHOWN IN RED (POTENTIAL LANDSLIDE HAZARDS)
2) SLOPES IN EXCESS OF 30 PERCENT ARE SHOWN IN YELLOW (POTENTIAL EROSION HAZARDS)

DATA SOURCE(S):		DATE: 3-31-22	BY: HS	SCALE: AS SHOWN	PROJECT
PARCELS, STRUCTURES, ROADWAYS : COB GIS DATA ELEVATION, SLOPE, AND HILLSHADE: DERIVED FROM BELLINGHAM_2013 LIDAR SURVEY BY WSI APPLIED REMOTE SENSING AND ANALYSIS MAPPED LANDSLIDE AND ALLUVIAL FAN DEPOSITS: WA DNR GIS OPEN DATA	GEOTEST	**BARE EARTH IMAGERY** **1204 YEW STREET DEVELOPMENT** **1204 YEW STREET** **BELLINGHAM, WASHINGTON**			**22-0336** FIGURE **3**



NOTES:
1) SLOPES IN EXCESS OF 40 PERCENT ARE SHOWN IN RED (POTENTIAL LANDSLIDE HAZARDS)
2) SLOPES IN EXCESS OF 30 PERCENT ARE SHOWN IN YELLOW (POTENTIAL EROSION HAZARDS)

DATA SOURCE(S):		DATE: 3-31-22	BY: HS	SCALE: AS SHOWN	PROJECT
PARCELS, STRUCTURES, ROADWAYS : COB GIS DATA ELEVATION, SLOPE, AND HILLSHADE: DERIVED FROM BELLINGHAM_2013 LIDAR SURVEY BY WSI APPLIED REMOTE SENSING AND ANALYSIS MAPPED LANDSLIDE AND ALLUVIAL FAN DEPOSITS: WA DNR GIS OPEN DATA	GEOTEST	**BARE EARTH IMAGERY** **1204 YEW STREET DEVELOPMENT** **1204 YEW STREET** **BELLINGHAM, WASHINGTON**			**22-0336** FIGURE **3**