June 3, 2020

Eric J. Scott, P.E. *Project Manager*
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Subject: **Report of Geotechnical Investigation and Engineering**
Proposed Plat Development
Intersection of HW 9 & SR 531, Arlington, WA
Parcel #31052400302000

MTC Project No.: **20B093**

Dear Mr. Scott:

This letter transmits our Geotechnical Investigation and Engineering Report for the above-referenced project. Materials Testing & Consulting, Inc. (MTC) performed this geotechnical engineering study in accordance with our Proposal for Geotechnical Services, dated February 7, 2020.

We would be pleased to continue our role as your geotechnical engineering consultants during the project planning and construction. We also have a keen interest in providing materials testing and special inspection during construction of this project. We will be pleased to meet with you at your convenience to discuss these services.

We appreciate the opportunity to provide geotechnical engineering services to you for this project. If you have any questions regarding this report, or if we can provide assistance with other aspects of the project, please contact me at (360) 755-1990.

Respectfully Submitted,
MATERIALS TESTING & CONSULTING, INC.

Medhanie Tecle, P.E.
Engineering Manager

Mike Furman, G.I.T.
Project Geologist

Attachment: Geotechnical Investigation and Engineering Report

GEOTECHNICAL
INVESTIGATION AND ENGINEERING REPORT

PROPOSED SINGLE FAMILY RESIDENTIAL REDEVELOPMENT

PARCEL #31052400302000,
ARLINGTON, WA

Prepared for:

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June 3, 2020
MTC Project Number: **20B093**

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1.0 INTRODUCTION

1.1 GENERAL

This report presents the findings and recommendations of Materials Testing & Consulting, Inc.'s (MTC) geotechnical engineering study and infiltration assessment conducted for the design and construction of the proposed residential plat development. The proposed project site is currently undeveloped containing prevalent vegetation. It is located immediately northwest of the intersection of Highway 9 and State Route 531 of Interstate 5 in Arlington. The location, vicinity and an aerial photo overlain with a general site plan of the project site including test locations are shown in Figures 1 and 2 of Appendix A.

In summary, MTC's subsurface investigation found generally infeasible conditions for infiltration. Organic topsoil/subsoils were observed to be about 1.3 to 2.3 feet thick over weathered glacial till. This weathered unit ranged from 0.6 to 2.5 feet thick and consisted of a silty sand to sandy silt that generally exhibited some level of cohesion & orange mottling throughout. Below this unit, at an average of 3.0 feet below present grade (BPG), unweathered glacial till was observed in all locations. This unit was very cohesive and medium dense to very dense. In some areas light seepage was observed at the top or within sandy lenses in this unit.

1.2 PROJECT DESCRIPTION

We understand that the project consists of constructing new single-family residences throughout the site. Site development will include road construction to access 85th Ave NE to the west. Project design has not been provided to MTC at the time of this report. It is assumed that typical perimeter foundations and slab-on-grade construction will be used in design.

The project site is a large undeveloped lot. MTC performed and logged fifteen (15) Test Pit excavations (labeled TP-1 through TP-15) in representative areas throughout the site to characterize subsurface soils.

Topography at the site and vicinity is generally flat with minor undulations. The native soil conditions indicate that traditional shallow preparation and construction methods are infeasible for the proposed development. MTC assumes that the proposed structures will employ continuous/stepped perimeter footings as well as isolated interior spread footings with a slab-on-grade floor.

See Sections 5.0 and 6.0 for design and construction recommendations and requirements. It includes discussion of excavating to reach dense soils and backfilling with appropriately compacted structural fill to slab base grade. Given soil types observed, MTC recommends that all foundation elements be founded on competent medium dense to dense soils or compacted structural fill which should reduce potential settlement. Maximum allowable bearing capacity for the residential foundations is 2,000 psf on medium dense, native glacial till.

MTC should be allowed to review the final plans and specifications for the project to ensure that the recommendations presented herein are appropriate. Recommendations and conclusions presented by this report will need to be re-evaluated in the event that changes to the proposed construction are made.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of our study was to explore surface and subsurface conditions at the site and provide geotechnical engineering and infiltration recommendations for design and construction of the proposed improvements. Geotechnical aspects of residential construction are addressed in general accordance with applicable building codes and industry standard practices. A summary of MTC's findings, interpretations, and recommendations are provided herein for the client's planning and design of on-site infiltration facilities and site development. Our scope of services was consistent with that presented in our Proposal for Geotechnical Engineering Services, dated February 7, 2020.

2.0 SITE EXPLORATION AND LABORATORY TESTING

2.1 SITE EXPLORATION

Test Pit (TP) exploration locations were selected by an MTC project geologist while on site with consideration of providing optimal coverage and minimize disturbance of site areas proposed for development. Site exploration activities conducted on April 30, 2020 involved directing the excavation of and logging fifteen (15) geotechnical test pits spread throughout the site to a maximum depth of approximately 10.0 feet BPG.

On April 30th and May 1st, MTC advanced a total of eight (8) Dynamic Cone Penetrometer (DCP) tests at representative test pit locations. All DCP tests were terminated on dense or hard soil conditions; refusal depths ranged from approximately 3.0 to 6.0 feet BPG. During penetrometer advancement, blow counts were recorded in 10-centimeter increments as a thirty-five-pound weight was dropped a distance of 15 inches. Blow counts were then converted to resistance (kg/cm^2), standard penetration blow counts (N-values), and corresponding soil consistency, with complete results shown on the attached logs.

Appendix A, Figure 2 shows exploration locations. Appendix B contains site photos and Appendix C contains the test pit logs. Laboratory Results can be found in Appendix D.

3.0 EXISTING SITE CONDITIONS

3.1 SURFACE DESCRIPTION

The project site is elongated north to south, with roughly rectangular shaped lots. The northeast corner, and majority of the southern corners are reportedly to be conserved as wetland areas. The project site is currently undeveloped onsite vegetation generally consists of a thick bramble in the south and forest regrowth in the north and east. Provided site documents call for multiple roads to be built for access to the site. Topographically, the site is flat with a small mapped northwestern slope.

3.2 AREA GEOLOGY

The *Geologic Map of the Arlington East quadrangle, Snohomish County, Washington* published by the U.S. Geologic Survey (Minard et al., 1985) indicates that site surface geology is mapped as Vashon Quaternary Glacial Till (Qvt). Qvt is described as an unsorted mix of clay, silt, pebbles, cobbles, and boulders. It typically consists of an upper weathered unit and an underlying unweathered compacted 'hard pan' unit.

The USDA NRCS Web Soil Survey maps the property as *Tokul gravelly medial loam* (0 to 8 percent slopes). It is typically formed on till plains or hillslopes and is derived from volcanic ash and loess over glacial till. A typical soil profile includes 2 inches of organic material over gravelly medial loam to about 33 inches depth, and cemented material to 60+ inches. These soils are considered to be moderately well-drained and have a very low to moderately low capacity to transmit water. Restrictive layers consisting of a cemented horizon is expected between 20 to 39 inches depth. Seasonal high groundwater depth is reportedly 18 to 36 inches.

Soil conditions encountered at the site (below the topsoil/subsoil) typically consisted of loose to medium dense sand or silt overlying a gravel rich consolidated unit at 3 to 4 feet BPG. Observed conditions are consistent with regional geologic and soil map resources with a slight variation in observed depth to restrictive feature(s).

3.3 SOIL CONDITIONS

A general characterization of on-site soil units encountered during our exploration is presented below. The exploration logs in Appendix C present details of soils encountered at each exploration location.

The on-site soils are generally characterized as follows in stratigraphic order by depth:

- **Topsoil – Silty Sand (SM):**
  Topsoil was present in all test pits from the surface to 0.5 to 1.0 feet BPG. Topsoil appeared native and consisted primarily of silty sand with minimal gravel. Topsoil were found to be in loose and moist. Heavy organics including surficial grass and roots, were observed throughout.

- **Subsoil – Silty Sand (SM-ML):**
  Soils interpreted as subsoils were observed underlying topsoil to 2.3 feet BPG max. These units were moist and had a loose or soft consistency. They were similar in grain-size to the topsoil, but contained less organic material and were reddish to light brown in color.

- **Weathered Glacial Till – Sandy Silt to Silty Sand to Silty Gravel (ML-SM-GM):**
  Soils interpreted as native glacial till underlie the subsoil and were consistently observed in all locations. The unit ranged from coarse grained and gravelly to a finer grained sandy silt. This sand unit was moist and generally loose becoming medium dense with depth. In some areas, local seepage was observed within this unit.

- **Unweathered Glacial Till – Silty Gravel to Sandy Gravel to Silty Sand (SM-GP-GM):**
  Soils interpreted as native hard pan glacial till were found at depth in all locations at about 3 to 4 feet BPG. The unit was generally coarse-grained gravel or sand with some variations in fines content. This unit was generally slightly moist with localized instances of seepage from sandy lenses. It was typically dense to very dense with depth with some upper portions medium dense.

3.4 SURFACE WATER AND GROUNDWATER CONDITIONS

MTC observed some standing water in the northeast corner where wetlands are mapped. No major surface water features are within close proximity to the subject site. A small creek is mapped about 1/3rd of a mile to the east, and a residential infiltration pond is mapped 1.4 of a mile to the northwest. No water table or perched ground water conditions were encountered during any explorations. MTC's scope of investigation did not include observation and determination of seasonal variations or conclusive measurement or monitoring of groundwater elevations. A review of local well log data shows static water levels between 144 and 169 feet BPG. Given the timeframe of the explorations during a relatively wet fall season, groundwater conditions were interpreted to be elevated, though below seasonal peak. Orange-mottling was present in all test pits where a textural consistency change was observed. Mottling typically represents oxidation due to seasonal wetting and drying cycles.

4.0 KEY GEOTECHNICAL CONSIDERATIONS

This section discusses geotechnical considerations for project planning and design. This information forms the basis for the geotechnical design recommendations in Section 5.0 and construction recommendations in Section 6.0.

4.1 GENERAL SITE SOIL CONDITIONS

Our investigation observed prevalent native glacial till throughout the project site. Till consisted of an upper loose to medium dense weathered section and a dense to very dense unweathered portion.

Generally, these soil conditions indicate that traditional shallow foundation preparation and construction methods are feasible for the proposed development. The proposed structures are expected to employ continuous perimeter footings as well as isolated interior spread footings with a slab-on-grade floor. Finished grade is assumed to be similar to existing grade; therefore, shallow conditions of the existing site soil are relevant to slab-on-grade construction. The recommendations in the below sections pertain to this understanding for shallow tiered/stepped foundation construction.

4.2 SCOPE OF SITE GRADING

A full grading plan was not available to MTC at the time of this report. Based on discussions with the client, this study assumes existing grade approximates final grade for proposed slab-on-grade construction. Therefore, depths referred to in this report are considered roughly equivalent to final depths near the base of the slab. Foundation depths are also referenced from current grade.

4.3 TEMPORARY EXCAVATION CUT SLOPES, SHORING, AND DEWATERING

Plans for excavation including temporary cut slopes and proposed shoring methods were not available to MTC at the time of report production. Based on the client's project descriptions and soils observed during explorations, general excavations are anticipated to be shallow. If deep excavations are left open and require worker entry, tiered cut slopes and/or shoring will likely be needed due to the non-cohesive nature of the native and fill soils present sitewide. Sections 6.3 to 6.5 provide general recommendations for excavations, trenches, and slopes. MTC can provide further consultation, design, and evaluation services for cut slopes if desired prior to and during construction. If shoring is required beyond typical OSHA standards, MTC can provide geotechnical engineering services for shoring design upon request.

4.4 SEISMIC DESIGN PARAMETERS AND LIQUEFACTION POTENTIAL

According to the *Liquefaction Susceptibility Map of Snohomish County, Washington* (Palmer et al., 2004), the site vicinity is identified as having a *very low* liquefaction susceptibility. Liquefaction is a phenomenon typically associated with a subsurface profile of relatively loose, cohesionless soils saturated by groundwater. Under seismic shaking the pore pressure can exceed the soil's shear resistance and the

soil 'liquefies', which may result in excessive differential settlements that are damaging to structures and disruptive to exterior improvements. The accompanying *Seismic Site Class Map* (Palmer et al., 2004) classifies the project and regional vicinity as *Site Class C.*

The *OSHPD Seismic Design Map Tool* was used to determine site-specific seismic design coefficients and spectral response accelerations for the project site assuming design Site Class D, representing a sensitive subsurface profile including approximately 10 feet or more of soft soils in the upper 100 feet. Parameters in Table 1 were calculated using 2008 USGS hazard data and 2012/2015 International Building Code standards. ASCE 7-10 Standard was referenced for the site Peak Ground Acceleration:

Table 1. Seismic Design Parameters – Site Class C

Mapped Acceleration Parameters (MCE horizontal)	S_S	1.063 g
	S_1	0.413 g
Site Coefficient Values	F_a	1.075
	F_v	1.587
Calculated Peak SRA	S_{MS}	1.142 g
	S_{M1}	0.655 g
Design Peak SRA (*2/3 of peak*)	S_{DS}	0.762 g
	S_{D1}	0.437 g
MCE Peak Ground Acceleration Maximum (PGA_M)		0.458 g
Seismic Design Category – Short Period (0.2 Second) Acceleration		C
Seismic Design Category – 1-Second Period Acceleration		C

Based on the findings of this study, the site is generally considered to have a low risk of liquefaction-induced settlement.

5.0 DESIGN RECOMMENDATIONS

5.1 FOUNDATION FEASIBILITY

Two requirements must be fulfilled in the design of foundations. First, the loads must be limited to the allowable bearing capacity of the foundation to maintain stability. Second, the differential settlement must not exceed an amount that will produce adverse behavior of the structure. Allowable bearing pressure is determined while addressing settlement considerations that include differential settlement. Both shallow and deep soils must be considered because either can cause excessive settlement. This assumes that loads are typical for the type and materials of construction, and that appropriate preparation measures are applied to verify that subgrades are suitable at any given foundation location and grade (See Section 5.2).

Within the assumed building areas, medium dense to dense native glacial till deposits are suitable for foundation placement after proper preparation. Shallow soils overlying this unit consisting of organic-rich topsoil/subsoils, and excessively loose material are not suitable to remain below foundations. We recommend these unsuitable materials be removed prior to footing preparations and construction. MTC recommends that we be contacted to verify that suitable conditions have been meet below footing alignments prior to construction.

We assume the structures will employ a combination of continuous or stepped perimeter footings and interior spread footings with elevated or slab-on-grade interior floors. Foundations and floors are assumed to be founded on medium dense or dense native glacial till with foundations stepped as needed. Therefore, shallow soil conditions are directly relevant to and slab-on-grade construction. In our opinion, these foundation types appear suitable for use given the site conditions encountered and by following the recommendations herein.

Explorations of this study were limited to test pit excavations and DCP testing, which encountered practical refusal at all locations. Given the anticipated building loads and style of construction and the recessional outwash present to the maximum depth explored, settlement from deeper conditions is *not* considered a tangible risk to the proposed development. The recommendations presented in the remainder of this report pertain to shallow foundation construction and standard earthwork preparations. These recommendations are provided based on the results of site investigation to date and our understanding of the project scope at this time.

5.2 FOUNDATION RECOMMENDATIONS

MTC recommends foundations be founded on suitably medium dense native glacial till soils. Assuming site preparation is completed as described above, we recommend the following:

- **Allowable Soil Bearing Capacity:**
  2,000 psf bearing load capacity for the residential foundations placed on native glacial till (anticipated to occur at 3 to 4 feet BPG). The allowable bearing capacity may be increased by 1/3 for transient loading due to wind and seismic events.

- **Minimum Footing Depth:**
  For a shallow perimeter and spread footing system, all exterior footings shall be embedded a minimum of 18 inches and all interior footings shall be embedded a minimum of 12 inches below the lowest adjacent finished grade, but not less than the depth required by design. *However, all footings must penetrate to the prescribed bearing stratum cited above, and no footing should be founded in or above organic or loose soils or non-verified fills.*

- **Minimum Footing Width:**
  Footings should be proportioned to meet the stated bearing capacity and/or the IBC 2018 (or current) minimum requirements. For a shallow perimeter and spread footing system, continuous strip footings should be a minimum of 16 inches wide and interior or isolated column footings should be a minimum of 24 inches wide.

- **Estimated Settlements:**
  We estimate that the maximum settlements under static loading will be on the order of 1 inch, or less, with a differential settlement of ½ inch, or less, over 50 linear feet. Settlement is anticipated to occur when the load is applied during construction.

- **Lateral Load Resistance:**

  Lateral loads can be resisted by passive pressure against buried portions of the foundation elements and sliding resistance along its base. We recommend an allowable lateral pressure equal to that generated by a fluid with an equivalent unit weight of 150 pcf EFW. This value assumes foundations placed directly medium dense native till or compacted structural fill, backfilled with granular native soils or structural backfill and includes a factor of safety of two. The upper 18 inches of soil should be ignored unless the area is paved or covered with concrete, due to soil softening associated with freeze/thaw.

  Sliding resistance between native till subgrade and the foundation base should be evaluated using an allowable coefficient of friction of 0.25. This value assumes concrete placed directly medium dense glacial till and includes a factor of safety of 1.5.

5.3 SLAB-ON-GRADE FLOOR CONSTRUCTION

MTC understands a slab-on-grade interior floor and exterior elements may be constructed. No details on slab loading conditions were provided at the time of this study. We assume the floor will be subject to typical light loading from foot traffic as well as light residential vehicle traffic within the garage. The

design and construction of the slab should consider the anticipated use. These designs should aim to counteract the potential for cracking if differential settlement is of concern.

MTC recommends the below activities and parameters for slab-on-grade floor construction:

- **Subgrade Modulus and Base Preparations:**
  Assuming slab base grade is at or near existing grade, MTC recommends that any topsoil, locally soft soil, or vegetation, if present, be removed down to medium dense native glacial till deposits. Grade can be reestablished by placing and compacting structural fill following the guidelines outlined in section 6.2.1. Native soil conditions should be verified by visual inspection and recompacted if unsuitably loose or replaced locally with structural fill if unsuitably loose or rich in organics.

  A Subgrade Modulus (k) of 150 pci is recommended for use in design of slab-on-grade floors constructed over structural fill and existing native subgrade. This is assuming the slab will be placed on an angular crushed rock capillary break installed and compacted over suitably firm subgrade conditions.

- **Capillary Break:**
  A capillary break will be helpful to maintain a dry slab floor and reduce the potential for floor damage resulting from shallow water inundation. To provide a capillary moisture break, a 4-inch thick, properly compacted granular mat consisting of open-graded, free-draining angular aggregate is recommended below floor slabs. To provide additional slab structural support, or to substitute for a structural fill base pad where specified, MTC recommends the capillary break should consist of crushed rock all passing the 1-inch sieve and no more than 3 percent (by weight) passing the U.S. No. #4 sieve, compacted in accordance with Section 6.2.2.

- **Vapor Barrier:**
  A vapor retarding membrane such as 10 mil polyethylene film should be placed beneath all floor slabs to prevent transmission of moisture through the slab where floor coverings may be affected. Care should be taken during construction not to puncture or damage the vapor retarding membrane. To protect the membrane, a layer of sand no more than 2 inches thick may be placed over the membrane, if desired.

- **Structural Design Considerations:**
  For slabs proposed for loading due to heavy storage, large industrialized equipment, or vehicle parking/access, we recommend these slabs be designed for increased rigidity and self-support in order to help counteract the increased potential for differential settlement, if applicable. MTC suggests at least a minimum unreinforced concrete structural section of 6.0 inches be employed, or as specified by the project structural engineer or architect. It is generally recommended that floor slabs and annular exterior concrete paving subject to vehicular loading be designed to

incorporate reinforcing to help span localized areas of variable soils and eliminate potential cracking. In addition, these areas may call for new structural fill to be placed beneath rigid pavements, depending on final grades.

We understand design and specifications of slabs and consideration of their loading requirements will be assessed by the project structural engineer. MTC recommends that we be contacted to review specifications for heavily loaded or traffic areas if present, and to provide additional recommendations appropriate to the type and magnitude of loading in conjunction with the location and proposed elevation versus existing grade.

5.4 INFILTRATION RATE DETERMINATION

Gradation Analysis Method & Results

During test pit excavations, MTC collected representative samples of soils among native strata at potential infiltration facility areas and depths. No target depths were prescribed prior to field work. MTC understands that the final locations, sizes, and depths of the infiltration facilities will be refined following the results of this study. Laboratory gradation analyses were completed including sieve and hydrometer tests for general rate determination to supplement field observations. Results of laboratory testing are summarized below.

Laboratory results were interpreted to hydraulic conductivity (Ksat) values in accordance with methods of the Washington State Department of Ecology *Stormwater Management Manual for Western Washington* (SMMWW), *2012/2014*. Standard correction factors were applied as noted in the reference documents. Data and Ksat values are summarized in Table 1.

Gradation results were applied to the Massmann (2003) equation (1) to calculate Ksat representing the initial saturated hydraulic conductivity, as described in the 2012 DOE SMMWW Volume III 3.3.6.3.

(1) $$\log10(Ksat) = -1.57 + 1.90*D10 + 0.015*D60 - 0.013*D90 - 2.08*ff$$

Table 1 reports for each sample the input laboratory values and calculated Ksat. Corrected Ksat values presented below are a product of the initial Ksat and correction factor CFT. For a generalized design situation, we have applied an average site variability factor of CFv = 0.5 along with typical values of CFt = 0.4 (for the Grain Size Method) and CFm = 0.9 (assuming standard influent control).

(2) $$CFT = CFv \times CFt \times CFm = 0.5 \times 0.4 \times 0.9 = 0.18$$

Table 2. Results of Massmann Analysis

TP #	Depth *(BPG)*	USCS	D10	D60	D90	Ff (%)	Ksat *(inches/hour)*	Corrected Ksat (*inches/hour)*
8	**2.0**	SM	0.010	0.425	9.075	36.6	5.34	**0.96**
13	**2.5**	SM	0.023	0.410	26.27	32.4	4.13	**0.74**

Facility Design Discussion and Rates

MTC understands the stormwater system will undergo further design pending the results of this assessment to confirm general site feasibility of infiltration and design rates. Based on subsurface conditions found during this study, on-site stormwater management is anticipated to consist of shallow, decentralized low-demand facilities including bioswale, biocell or rain garden bioretention features dispersed among the site. The limitations of the restrictive conditions consisting of consolidated soils appear to preclude use of larger centralized systems or systems placed at greater depths. Bioretention systems can be viable for use with as little as 1.0 foot separation to limiting conditions, anticipated to be present at 1.5 to 4.0 feet BPG below most areas of the site.

Grain size analysis methods based on *SMMWW* 2012/2014 standard calculation criteria yielded Corrected Ksat values of about 0.96 and 0.74 inches per hour in the shallow soils considered for infiltration. These values correspond respectively to representative samples of the native silty sand below subsoils and above unweathered glacial till. This unit ranged from 0.5 to 2 feet thick and was locally observed to be silt-dominated.

For targeted shallow bioretention facilities, we recommend applying a ***maximum design Ksat value of 0.76 inches/hour.*** This value represents the lower end of the observed conditions and calculated Ksat values from the upper deposit. This value assumes design of systems to maintain at least the minimum separation of 1.0 feet or greater from restrictive conditions as present.

The recommended rate above is meant to provide a general characterization of shallow subsurface transmission potential for the designer's consideration, but is not necessarily intended to be applied as a final infiltration rate for facilities of an undetermined location and depth or for systems of a larger size/volume. The inherent site limitations of depth to restrictive soils must be considered in design. We recommend the design rate be applied conservatively, and systems should maintain as much vertical separation as possible.

Alternatively, a centralized detention pond or facility may be used if small scale bioretention is insufficient for stormwater created by site development.

The facility designer should also review assumed correction factors per reference literature to ensure applicability with the proposed development, level of anticipated controls, and long-term maintenance plan. The designer may make reasonable adjustments to correction factors and resulting design values based on these criteria to ensure design and operational intent is met.

The project may be eligible for an increase in design rate if Pilot Infiltration Testing (PIT) methods are conducted at design locations and depths, which are considered generally more reliable as a confirmation of actual field conditions and therefore can be applied less conservatively. It is our opinion that grain size

analysis methods, when applied conservatively, should be suitable for general design use of the proposed systems at this site, in accordance with DoE SMMWW 2012/2014 requirements. The native soils are not considered to be compacted by prior development (aside from surface fills anticipated to be removed below facilities). At request of the client, MTC can provide additional services for completing PITs to verify the final stormwater design.

Finally, verification of seasonal groundwater conditions is advised to ensure the design depth and location can maintain adequate separation from groundwater in the peak portions of the winter season (typically February to April timeframe). The client should be aware that this may be required by the local jurisdiction. MTC will be pleased to assist with wet-season explorations or installation and monitoring of groundwater piezometers (standpipes) if elected or required.

Treatment Suitability

MTC subcontracted Cation Exchange Coefficient (CEC) and Organic Content (OC) testing of representative samples of the shallow native deposits considered for infiltration facilities. Soil samples yielded CEC values between 9.4 to 8.4 milliequivalents per 100 grams of soil (meq/100g). Organic content testing yielded between 1.6% and 1.9% organic matter by weight. Table 2 below shows the results from the laboratory testing. In our experience with similar soils, these values appear typical for the soil types encountered and their respective fines contents.

Table 3. Results of Cation Exchange Coefficient and Organic Content Analysis

TP #	Depth *(BPG)*	USCS	Organic Content *(% by weight)*	CEC *(meq/100g)*
8	**2.0**	SM	**1.9**	**9.4**
13	**2.5**	SM	**1.6**	**8.4**

The Department of Ecology 2012/2014 SMMWW, Volume III, Section 3.3.7 addresses minimum requirements for treatment soils under Site Suitability Criteria. According to SSC-6, native soils with CEC values of at least 5 meq/100g and >1% organic content by weight are considered suitable as treatment media without modification. The addition of soil amendments or the import of treatment-specific soil media may be used to achieve a higher CEC and produce a soil more suitable for treatment if required for design where native soils are deficient. In the case of this site, organic contents and CEC values are above the target value (1% & 5 meq minimum). Therefore, if treatment is required as part of this design, amendment will be necessary to meet minimum treatment standards. At request of the client, soils at final infiltration facility locations and depths can be retested prior to or during construction to see if requirements are met at a given location and grade.

Minimum depth for treatment-suitable soils is cited as 18 inches per the DoE *SMMWW* (2012/2014). If native soils are amended or imported treatment media is installed, the LTIR of the facility must be adjusted accordingly by the designer if these modifications will negatively affect the infiltration rate provided above.

Therefore, if treatment is required as part of this design, the thickness of the soil unit may require additional amendment to meet minimum treatment standards. At request of the client, soils at final infiltration facility locations and depths can be retested or measured prior to or during construction to see if requirements are met at a given location and grade.

6.0 CONSTRUCTION RECOMMENDATIONS

6.1 EARTHWORK

6.1.1 Excavation

Soil excavations can generally be performed with conventional earthmoving equipment such as bulldozers, scrapers, and excavators.

Where possible, excavations made within about one foot of finished subgrade level should be performed with smooth edged buckets to minimize subgrade disturbance and the potential for soil softening to the greatest extent practical.

6.1.2 Subgrade Evaluation and Preparation

After excavations have been completed to the planned subgrade elevations, but before placing fill or structural elements, the exposed subgrade soils should be evaluated under the full-time observation and guidance of an MTC representative. Where appropriate, the subgrade should be proof-rolled with a minimum of two passes with a fully loaded dump truck, water truck or scraper. In circumstances where this seems unfeasible, an MTC representative may use alternative methods for subgrade evaluation.

Any local surficial loose soil should be recompacted and any placed soil should be compacted to a firm and unyielding condition and at least to 95 percent of the modified Proctor maximum dry density per ASTM D1557. Any areas that are identified as being soft or yielding during subgrade evaluation should be over-excavated to a firm and unyielding condition or to the depth determined by the geotechnical engineer. Where over-excavation is performed below a structure, the over-excavation area should extend beyond the outside of the footing a distance equal to the depth of the over-excavation below the footing. The over-excavated areas should be backfilled with properly compacted structural fill.

6.1.3 Site Preparation, Erosion Control and Wet Weather Construction

The existing native glacial subgrade may be moisture sensitive during heavy rain events. It could become loose or soft and difficult to compact or traverse with construction equipment when wet. During wet weather, the contractor should take measures to protect the exposed building pad and subgrades and limit construction traffic during earthwork activities.

Once the geotechnical engineer has approved a subgrade, further measures should be implemented to prevent degradation or disturbance of the subgrade. These measures could include, but are not limited to, placing a layer of crushed rock or lean concrete on the exposed subgrade, or covering the exposed subgrade with a plastic tarp and keeping construction traffic off the subgrade. Once subgrade has been approved, any disturbance because the subgrade was not protected should be repaired by the contractor at no cost to the owner.

During wet weather, earthen berms or other methods should be used to prevent runoff from draining into excavations. All runoff should be collected and disposed of properly. Measures may also be required to reduce the moisture content of on-site soils in the event of wet weather. These measures can include, but are not limited to, air drying and soil amendment, etc.

Since soils may be difficult to work with during periods of wet weather due to elevated soil moisture content, and frozen soil is not suitable for use as structural fill, we recommend that earthwork activities generally take place in late spring, summer or early fall. In addition, summer may be the most preferable time for major earthwork construction, corresponding to the period of generally lowest perched ground water occurrences and highest potential for reuse of native soils.

Dewatering efforts may be required depending on total excavation depth, season of construction, and weather conditions during earthwork. MTC recommends major earthwork activities take place during the dry season if possible to minimize the potential for seasonal or perched high groundwater levels near proposed excavation depth, and to reduce seepage from perched water conditions.

6.2 STRUCTURAL FILL MATERIALS AND COMPACTION

6.2.1 Materials

All material placed below structures or pavement areas shall be free of deleterious material, have a maximum particle size of 6 inches, not contain organic soil or topsoil, and can be compacted to the required compaction level. Deleterious material includes wood, organic waste, coal, charcoal, or any other extraneous or objectionable material.

Structural material used beneath **footings** shall meet WSDOT 9-03.14(1) definition of **Gravel Borrow.** Aggregate for gravel borrow shall consist of granular material, either naturally occurring or processed, and shall meet the gradation requirements of Table 4.

Table 4. WSDOT Definition of Gravel Borrow

Gravel Borrow	
Sieve Size	% Passing by weight
4"	99-100
2"	75-100
No. 4	50-80
No. 40	30 max.
No. 200	7.0 max.
Sand Equivalent	50 min.

WSDOT 9-03.14(1)

Soil used beneath slabs, parking lots, and pavement (if applicable) shall meet WSDOT 9-03.14(3) definition of Common Borrow. Material for common borrow shall consist of granular or nongranular soil and/or aggregate. The material shall meet one of the options in Table 5.

Table 5. WSDOT Definition of Common Borrow

Soil Plasticity Table			
Option	Sieve Size	% Passing by weight	Plasticity Index
1	No. 200	0 – 12	N/A
2	No. 200	12.1 – 35	6 or less
3	No. 200	Above 35	0 (Non-plastic)

WSDOT 9-03.14(3)

Excavated native, soils (excluding topsoil/subsoil) consisting primarily of sand with silt and gravel will likely be unsuitable for re-use as Common Borrow fill due to a variable but moderate fines content. However, conformance to WSDOT specifications should be verified during construction due to the potential for an elevated fines content. Onsite sandy soils, if diligently segregated from the finer- end members, may be eligible for limited reuse, such as for utility trench backfill outside of paved areas, depending on project specifications.

Appropriate imported material can be used as structural fill. Imported structural fill material should conform to Section 9-03.14(1), Gravel Borrow, of the most recent edition (at the time of construction) of the State of Washington Department of Transportation *Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT Standard Specifications)*.

Controlled-density fill (CDF) or lean mix concrete can be used as an alternative to structural fill materials, except in areas where free-draining materials are required or specified.

Frozen soil is not suitable for use as structural fill. Fill material may not be placed on frozen soil.

The contractor should submit samples of each of the required earthwork materials to the geotechnical engineer for evaluation and approval prior to delivery to the site. The samples should be submitted at least 5 days prior to their delivery and sufficiently in advance of the work to allow the contractor to identify alternative sources if the material proves unsatisfactory.

6.2.2 Placement and Compaction

Prior to placement and compaction, structural fill should be moisture conditioned to within 2 percentage points of its optimum moisture content for coarse-grained soils and 3 percentage points of its optimum moisture content for fine-grained and mixed soils. Individual lifts of structural fill shall not exceed 6 inches, in loose state, for compactive efforts using walk-behind or hand operated compaction equipment, 8 inches using light to medium-duty rollers, and 12 inches using heavy-duty compaction equipment.

All structural fill shall be compacted to a dense and unyielding condition and to a minimum percent compaction based on its modified Proctor maximum dry density as determined per ASTM D1557. Structural fill placed beneath each of the following shall be compacted to the indicated percent compaction:

Foundation and Floor Slab Subgrades:	95 Percent
Pavement Subgrades (upper 2 feet):	95 Percent
Pavement Subgrades (below 2 feet):	90 Percent
Utility Trenches (upper 4 feet):	95 Percent
Utility Trenches (below 4 feet):	90 Percent

We recommend that fill placed on slopes steeper than 3:1 (H:V) be 'benched' in accordance with hillside terraces entry of section 2-03.3(14) of the WSDOT Standard Specifications.

We recommend structural fill placement and compaction be observed on a full-time basis by an MTC representative. A sufficient number of tests shall be performed to verify compaction of each lift. The number of tests required will vary depending on the fill material, its moisture condition and the equipment being used. Initially, more frequent tests will be required while the contractor establishes the means and methods required to achieve proper compaction.

6.3 TEMPORARY EXCAVATIONS AND SLOPES

All excavations and slopes must comply with applicable local, state, and federal safety regulations. Construction site safety is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing soil type information solely as a service to our client for planning purposes. Under no circumstances should the information be interpreted to mean that MTC is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

Based on our soil characterization, the near-surface soils at the site classify as OSHA Type C soils. Temporary excavations in the sandy soils should be inclined no steeper than 1.5H:1V, although locally steeper grades may be approvable depending on actual conditions encountered, season of construction, and depth of excavation. Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed near the top of any excavation. Where the stability of adjoining walls or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning may be required to provide structural stability and to protect personnel working within the excavation. Earth retention, bracing, or underpinning required for the project (if any) should be designed by a professional engineer registered in the State of Washington.

Temporary excavations and slopes should be protected from the elements by covering with plastic sheeting or some other similar impermeable material. Sheeting sections should overlap by at least 12 inches and be tightly secured with sandbags, tires, staking, or other means to prevent wind from exposing the soils under the sheeting.

6.4 PERMANENT SLOPES

MTC recommends that new areas of permanent slopes including fill embankments be inclined no greater than 3H:1V. Permanent slopes should be planted with a deep-rooted, rapid-growth vegetative cover as soon as possible after completion of slope construction. Alternatively, the slope should be covered with plastic, straw, etc. until it can be landscaped.

6.5 DRAINAGE CONTROLS

Stormwater from roof downspouts, footing/wall drains, and surface drains if present should be collected and routed to an approved disposal location. This can include an onsite infiltration facility or an existing stormwater utility, if available.

Roof, footing/wall and surface drains as applicable should be tightlined separately from their collection point to an approved outlet or should be gathered in an appropriately sized catch basin structure and routed collectively. If storm drains are incorporated for impervious flatworks (driveways, patios, etc.), collected waters shall also be disposed according to the above recommendations. All drainage tightline pipes shall be composed of appropriately sturdy material (such as rigid PVC), sized adequately according to anticipated volume, and anchored or buried sufficiently for protection. MTC recommends all above-grade slope tightline pipes be inspected by the property owner periodically to look for signs of damage or displacement that could result in leakage or catastrophic failure and subsequent erosion or failure, and be re-anchored or replaced if required.

These recommendations are given from a geotechnical standpoint. In the event that the above conflicts with local jurisdiction guidelines and regulations, MTC recommends that we be contacted for additional consultation to determine a most suitable course of action.

6.6 STANDARD EROSION PROTECTION

Erosion is one of the most common driving forces leading to slope instability. In addition to the above commentary, the following general recommendations should be implemented in general to reduce long-term erosion potential at the project site:

1. The ground surface adjacent to the house should be sloped to drain away at a 5% minimum to prevent ponding of water adjacent to the house. Footing drains and surface gradients should be incorporated as needed for the building and site design to help maintain a dry building area.
2. Minimize the volume and velocity of water that travels toward and down the slope face (via proper choice of site development features including stormwater controls discussed herein).
3. Avoid further accelerating slope erosion and mass wasting due to human activity such as:
    a. Adding side-cast debris to the slopes during or after construction
    b. Using heavy construction equipment on or near steep slopes

c. Excavating on or near adjacent slope face outside of approved locations
d. Placing additional tailings or soils near the slope crest or on the face

4. Construction equipment, construction materials, and native and imported soils should not be placed behind the erosion control devices. Suitable temporary erosion and sediment control measures should be implemented and maintained as needed at the construction site during and immediately after any ground disturbance occurs. Temporary areas bare of vegetation should be protected from erosion via a blanket of straw or rolled erosion control product (RECP) during prolonged breaks in site work and prior to reseeding or revegetation.
5. At the end of the project, all disturbed vegetation should be repaired and maintained until it is established. Concentrated surface water should not be allowed to traverse the slope during or after the construction phase of the project. Recommendations for long-term site drainage controls should be followed as discussed above. Footing drains should be routed into closed pipes and tightlined to the base of the slope to outlet in a drain course or ditch, tightlined to a pre-existing catch basin for disposal, or as directed by local regulations. Outlets for these pipes should be protected from erosion through the use of rip-rap or some other energy dissipating device.
6. Clearing of existing vegetation outside the proposed building area near to and on the slope should be avoided except as approved by a qualified professional. This provides additional stability to loose top soils and minimizes the effects of down-slope water movement. This is excepting removal of dead or dying trees if posing a direct hazard to site installations or adjacent roadways.
7. Grading or excavation of soils during construction should be accompanied by grass reseeding and re-vegetation as the project is completed. According to "Vegetation Management: A Guide for Puget Sound Bluff Property Owners" (Manashe, 1993) the following types of vegetation provide good to excellent erosion control:

Common Name	*Botanical Name*	*Deciduous/Evergreen*	*Mature Height (ft)*
Vine Maple	Acer cricinatum	Deciduous	10+
Oceanspray	Holodiscus discolor	Deciduous	10+
Willow	Salix spp.	Deciduous	10+
Snowberry	Symphoricarpos albus	Deciduous	3+
Rose	Rose spp.	Deciduous	2-10
Salmonberry	Rubus spectabilis	Deciduous	To 12
Salal	Gaultheria shallon	Evergreen	To 4
Oregon grape	Mahonia spp.	Evergreen	To 6
Red huckleberry	Vaccinium parvifolium	Deciduous	To 12
Evergreen	Vaccinium ovatum	Evergreen	To 8
Serviceberry	Amelanchier alnifolia	Deciduous	12+
Bigleaf maple	Acer macrophyllum	Deciduous	60
Pacific madrone	Arbutus menziesii	Evergreen	70
Douglas-fir	Pseudotsuga menziesii	Evergreen	200+

6.7 UTILITY TRENCHES AND EXCAVATIONS

The contractor shall be responsible for the safety of personnel working in utility trenches. Given that steep excavations in soils on site may be prone to caving, we recommend all utility trenches, but particularly those greater than 4 feet in depth, be supported in accordance with state and federal safety regulations including trench-shield or shoring as appropriate.

Pipe bedding material should conform to the manufacturer's recommendations and be worked around the pipe to provide uniform support. Cobbles exposed in the bottom of utility excavations should be covered with pipe bedding or removed to avoid inducing concentrated stresses on the pipe.

Trench backfill should be placed and compacted as structural fill as recommended in Section 6.2. Particular care should be taken to ensure bedding or fill material is properly compacted to provide adequate support to the pipe. Jetting or flooding is not a substitute for mechanical compaction and should not be allowed.

7.0 ADDITIONAL RECOMMENDED SERVICES

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during construction to verify compliance with these recommendations. Testing and observations performed during construction should include, but not necessarily be limited to, the following:

- Geotechnical plan review and engineering consultation as needed prior to construction phase,
- Observations and testing during site preparation, earthwork, structural fill, and pavement section placement,
- Consultation on temporary excavation cut slopes and shoring if needed,
- Testing and inspection of any concrete or masonry included in the final construction plans, and
- Consultation as may be required during construction.

We strongly recommend that MTC be retained for the construction of this project to provide these and other services. Our knowledge of the project site and the design recommendations contained herein will be of benefit in the event that difficulties arise and either modifications or additional geotechnical engineering recommendations are required or desired. We can also, in a timely fashion, observe the actual soil conditions encountered during construction, evaluate the applicability of the recommendations presented in this report to the soil conditions encountered, and recommend appropriate changes in design or construction procedures if conditions differ from those described herein.

We further recommend that project plans and specifications be reviewed by us to verify compatibility with our conclusions and recommendations.

Also, MTC retains fully accredited, WABO-certified laboratory and inspection personnel, and is available for this project's testing, observation and inspection needs. Information concerning the scope and cost for these services can be obtained from our office.

8.0 LIMITATIONS

Recommendations contained in this report are based on our understanding of the proposed development and construction activities, our field observations and explorations, and our laboratory test results. It is possible that soil and groundwater conditions could vary and differ between or beyond the points explored. If soil or groundwater conditions are encountered during construction that vary or differ from those described herein, we should be notified immediately in order to review and provide supplemental recommendations. If the scope of the proposed construction, including the proposed loads or structural locations, changes from that described in this report, we should be notified to review and provide supplemental recommendations.

We have prepared this report in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our study. No warranty, expressed or implied, is made. The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be conducted by MTC during the construction phase in order to evaluate compliance with our recommendations.

This report may be used only by the Client and their design consultants and only for the purposes stated within a reasonable time from its issuance, but in no event later than 18 months from the date of the report. It is the Client's responsibility to ensure that the Designer, Contractor, Subcontractors, etc. are made aware of this report in its entirety. Note that if another firm assumes Geotechnical Engineer of Record responsibilities they need to review this report and either concur with the findings, conclusions, and recommendations or provide alternate findings, conclusions and recommendation under the guidance of a professional engineer registered in the State of Washington.

Land or facility use, on- and off-site conditions, regulations, or other factors may change over time, and additional work may be required. Based on the intended use of the report, MTC may recommend that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Client or anyone else will release MTC from any liability resulting from the use of this report. The Client, the design consultants, and any unauthorized party, agree to defend, indemnify, and hold harmless MTC from any claim or liability associated with such unauthorized use or non-compliance. We recommend that MTC be given the opportunity to review the final project plans and specifications to evaluate if our recommendations have been properly interpreted. We assume no responsibility for misinterpretation of our recommendations.

The scope of work for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

9.0 REFERENCES CITED

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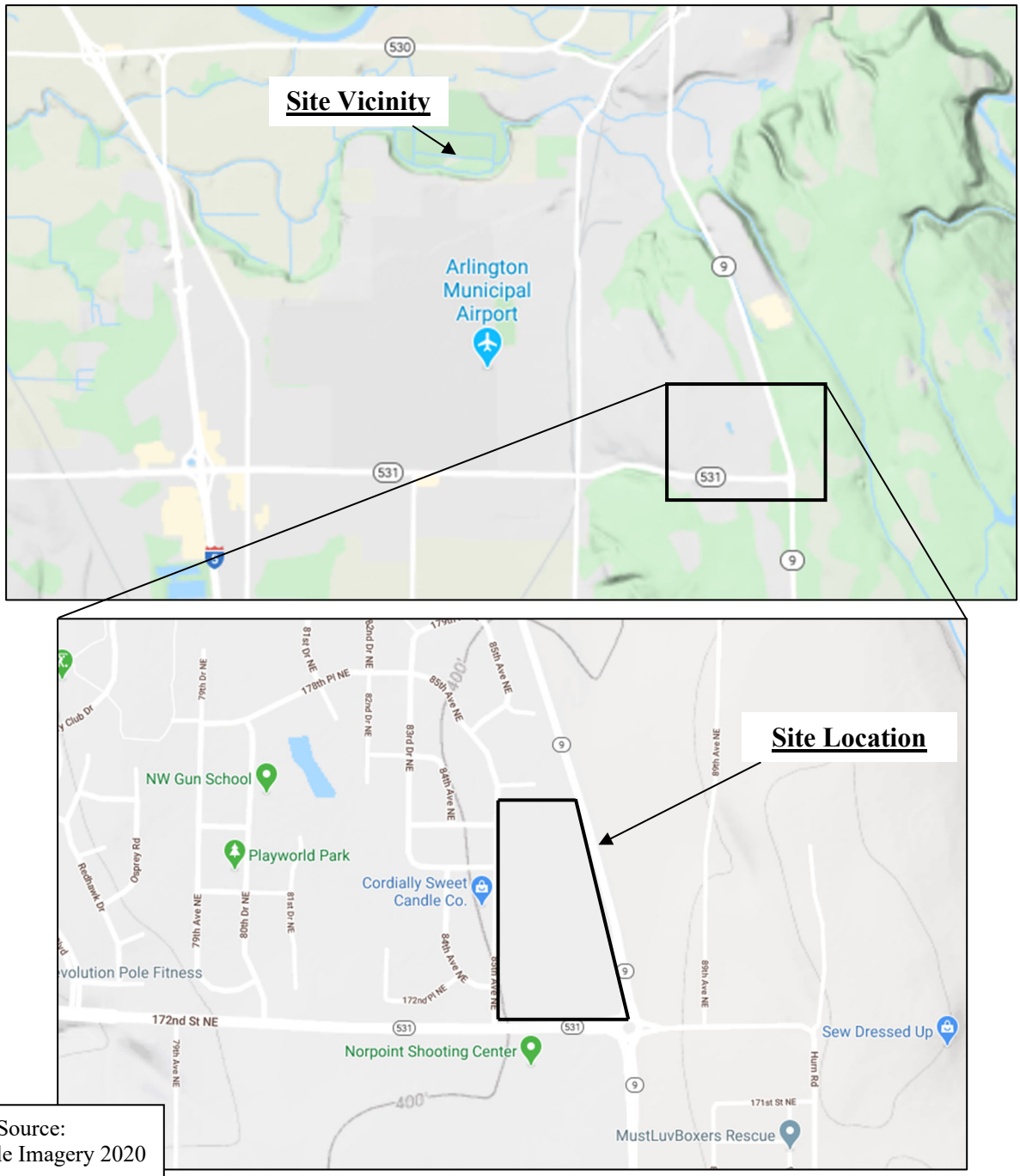
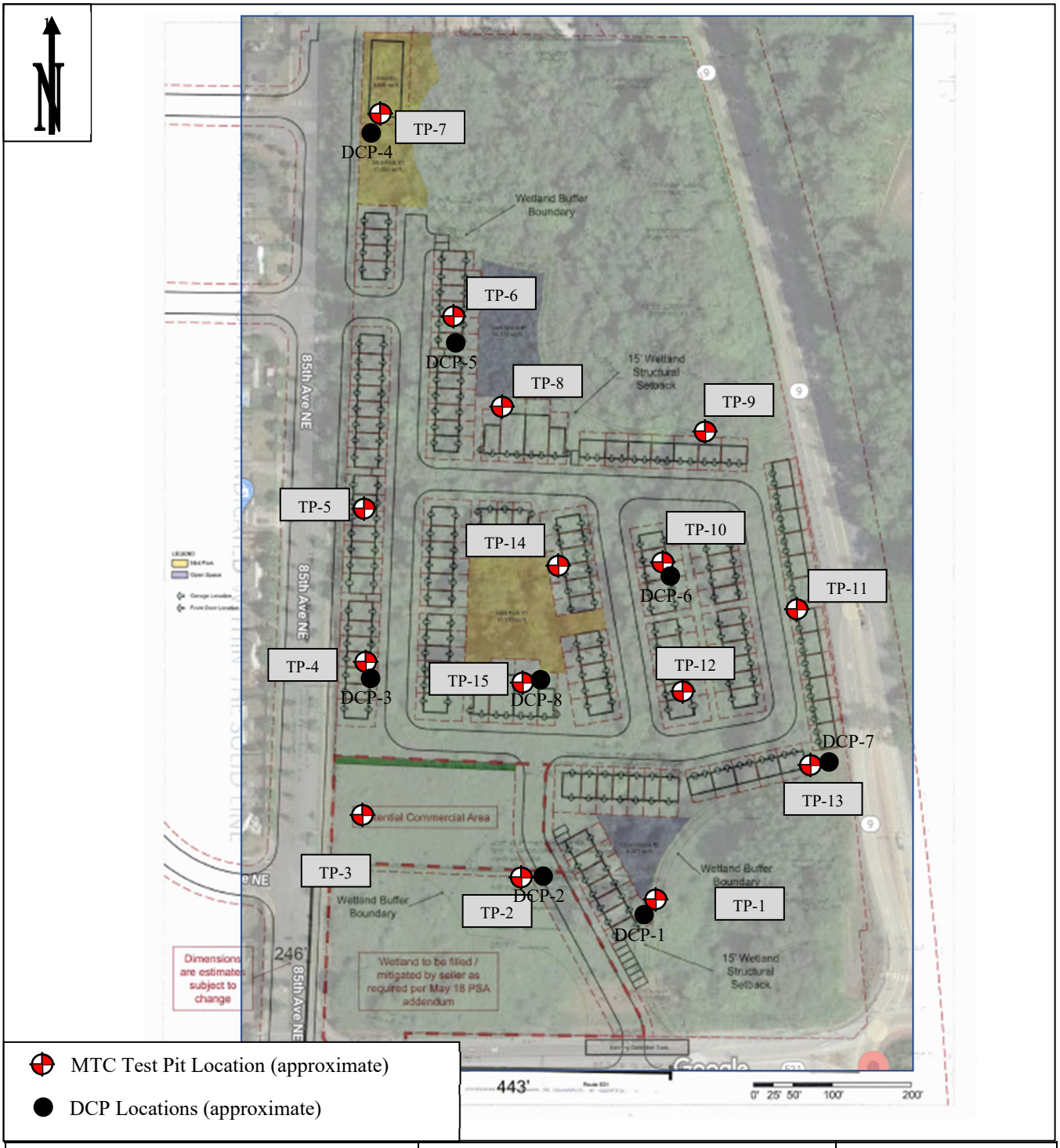
Appendix A1. Location and Vicinity Map



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Site Location & Vicinity** Eagle Peak Geo Parcel #31052400302000 Arlington, WA	**FIGURE** **1**

Appendix A2. Site Plan with Test Locations



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Site Location & Vicinity** Eagle Peak Geo Parcel #31052400302000 Arlington, WA	**FIGURE** **2**

Appendix B. Photos of Site Exploration

Photo A: Overview of project site, looking east from the central-southern end of proposed improvement area. Test Pit 1 in background, and DCP-2 in progress.

Photo B: Representative photo of vegetation in northern portion of site

Photo C: Test Pit TP-14 excavated. Note consolidated gray unit at about 2.5 feet BPG.

Photo D: Representative image of small-scale sand lenses observed locally within the Glacial Till.

Appendix C. Exploration Logs

UNIFIED SOIL CLASSIFICATION SYSTEM - USCS

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than half of material is larger than the #200 sieve Silt and / or Clay content as specified	GRAVEL Gravel > Sand (More than half of coarse fraction is larger than #4 sieve)	CLEAN GRAVEL WITH LESS THAN 5% FINES	GW	WELL-GRADED GRAVEL <5% FINES
			GP	POORLY-GRADED GRAVEL <5% FINES
		GRAVEL WITH OVER 12% FINES	GM	SILTY GRAVEL >12% FINES (SILT>CLAY)
			GC	CLAYEY GRAVEL >12% FINES (CLAY>SILT)
	SAND Sand > Gravel (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SAND WITH LESS THAN 5% FINES	SW	WELL-GRADED SAND <5% FINES
			SP	POORLY-GRADED SAND <5% FINES
		SAND WITH OVER 12% FINES	SM	SILTY SAND >12% FINES (SILT>CLAY)
			SC	CLAYEY SAND >12% FINES (CLAY>SILT)
FINE GRAINED SOILS More than half of material is fines (smaller than the #200 sieve) Sand and / or Gravel content as specified in log	SILT AND CLAY Lean, low to medium plasticity (Liquid limit less than 50)		ML	INORGANIC SILT; LEAN, LOW PLASTICITY SILT.
			CL	INORGANIC CLAY; LEAN, LOW PLASTICITY CLAY
			OL	ORGANIC SILT & ORGANIC CLAY, LEAN, LOW PLASTICITY, RETAINS VERY HIGH MOISTURE
	SILT AND CLAY Fat, high plasticity (Liquid limit greater than 50)		MH	INORGANIC SILT, HIGH PLASTICITY, FAT SILT, MAY BE MICACEOUS
			CH	INORGANIC CLAY, HIGH PLASTICITY, FAT CLAY
			OH	ORGANIC CLAY & ORGANIC SILT FAT, HIGH PLASTICITY, RETAINS VERY HIGH MOISTURE
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS, PREDOMINANTLY ORGANIC CONTENT

LOG SYMBOLS

SAMPLES
- SPT Standard Penetration Test
- Grab or bulk
- California or D&M (3.0"OD)
- Shelby Tube

WATER TABLE
- Groundwater Level (where first encountered)
- Groundwater Level (measured after completion)
- Perched Groundwater Level (during exploration)

DENSITY: COARSE-GRAINED SOIL

APPARENT DENSITY	SPT Blows / foot
Very Loose	< 5
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

DENSITY: FINE-GRAINED SOIL

APPARENT DENSITY	SPT Blows / foot
Very Soft	< 3
Soft	3 - 4
Medium Stiff	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	> 30

NOTES

USCS evaluated by field observations. Laboratory analyses used when conducted.
Poorly-Graded (GP or SP) indicate not an equal content of every grain size subgroup. Calculated using 10%, 30%, and 60% grain size.
Combination names (e.g. SP-SM Poorly-Graded SAND with silt, represent fines content between 5% and 12%. Fines content is dominantly either clay (c) or silt (m).
A soil description of "with sand" or "with gravel" represents greater than 15% coarse material, and dominant coarse soil is the one specified.

STRATIGRAPHIC CONTACT
(approximated by field identification)
- Distinct stratigraphic contact between soil strata
- Gradual change between soil strata
- Approximate location of stratigraphic change

MODIFIERS (see USCS and Notes)

DESCRIPTION	%
Trace	< 5%
With Clay, With Silt	5 - 12% Fines
Clayey, Silty	> 12% Fines
With Sand, With Gravel	15 - 30% Coarse
Sandy, Gravelly	> 30% Coarse

DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	GRAIN SIZE (inch)	GRAIN SIZE (metric)
Boulder	> 12 in.	> 305 mm
Cobbles	3 in. to 12 in.	75 mm to 305 mm
Gravel	3 in. to # 4 sieve	75 mm to 4.75 mm
Coarse Gravel	3 in. to 3/4 in.	75 mm to 19 mm
Fine Gravel	3/4 in. to # 4	19 mm to 4.75 mm
Sand	# 4 to # 200	4.75 mm to 0.075 mm
Coarse	# 4 to # 10	4.75 mm to 2 mm
Medium	# 10 to # 40	2 mm to 0.425 mm
Fine	# 40 to #200	0.425 mm to 0.075 mm
Fines (Silt or Clay)	< #200 sieve	< 0.075 mm

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Exploration Log Key** Eagle Peak Geotech Study Parcel#31052400302000 Arlington, WA	**FIGURE** **3**

Log of Test Pit TP-1

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : SE central area (See Map)
Logged By : MF/JC

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown, soft, moist. Moderate organic content **Subsoil**				
2	SM		SILTY SAND with some CLAY and GRAVEL, light brown to gray, medium dense, moist. **Weathered Glacial Till / Glacial Outwash**				
3	SM		SILTY SAND with GRAVEL, gray, dense to very dense, slightly moist to moist. Gravel is subrounded and up to 2" Unit is consolidated. **Glacial Till**				
4							
5							
6			Light seepage observed from a sandy lens at 6' and 7.2' BPG				
7					☒	35.9%	14.7%
8							
9			Test Pit terminated at 10.0 feet at planned depth. Light seepage observed at 6' and 7.2' BPG in a sandy lens.				
10							

Log of Test Pit TP-2

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : S central area (See Map)
Logged By : MF/JC

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown, soft, moist. Moderate organic content **Subsoil**				
2	ML		SANDY SILT with some CLAY and GRAVEL, light brown, medium dense, moist. **Weathered Glacial Till**				
3	GP-GM		SANDY GRAVEL with some SILT, gray, dense to very dense, slightly moist to moist. Gravel is subrounded and up to 8" Unit is consolidated. **Glacial Till**				
4							
5							
6			Light seepage observed at upper contact at 2.0' and a sandy lens at 7.2' BPG.				
7							
8							
9							
10			Test Pit terminated at 10.0 feet at planned depth. Light seepage observed at 2' and 7.2' BPG.				

Log of Test Pit TP-3

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : SW area (See Map)
Logged By : MF/JC

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown, soft, moist. Moderate organic content **Subsoil**				
2	ML		SANDY SILT with some CLAY and GRAVEL, light brown to gray, soft to medium stiff, moist. **Weathered Glacial Till**				
3	GP-SM		SILTY GRAVEL with SAND to SILTY SAND WITH GRAVEL, gray, dense to very dense, slightly moist to moist. Gravel is subrounded and up to 2" Unit is consolidated. **Glacial Till**				
4							
5							
6			Light seepage observed at upper contact at 2.3' BPG				
7							
8							
9			Test Pit terminated at 8.0 feet at planned depth. Light seepage observed at 2.3' BPG.				
10							

Log of Test Pit TP-4

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : SW side (See Map)
Logged By : MF/JC

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown, soft, moist. Moderate organic content **Subsoil**				
2	SM		SILTY SAND WITH GRAVEL and some CLAY, light brown, loose to medium dense, moist. Orange mottling throughout Gravel is subrounded 2-4" dia on average and up to 8" clasts observed. **Weathered Glacial Till**				
3							
4	GP-SM		SILTY GRAVEL with SAND to SILTY SAND WITH GRAVEL, gray, dense to very dense, slightly moist to moist. Gravel is subrounded and up to 2" Unit is consolidated. **Glacial Till**				
5							
6			Light seepage observed at upper contact at 2.3' BPG		☒	34.8%	10.7%
7			Test Pit terminated at 6.5 feet at planned depth. Light seepage observed at 3.0, and 3.6' BPG.				
8							
9							
10							

Log of Test Pit TP-5

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : W Central side (See Map)
Logged By : MF/JC

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	SP-SM		SILTY SAND WITH GRAVEL and some CLAY, light brown, loose to medium dense, slightly moist. **Subsoil**				
2	SM		SILTY SAND WITH GRAVEL and some CLAY, light brown, medium dense to dense, slightly moist. Some orange mottling throughout Gravel is subrounded 2-4" dia on average and up to 18" clasts observed. **Weathered Glacial Till**				
3							
4	GP-SM		SILTY GRAVEL with SAND to SILTY SAND WITH GRAVEL, gray, dense to very dense, slightly moist. Gravel is subrounded Unit is consolidated. **Unweathered Glacial Till**				
5			Test Pit terminated at 4.5 feet due to a large boulder. No free water seepage observed.				
6							
7							
8							
9							
10							

Log of Test Pit TP-6

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : NW side (See Map)
Logged By : MF/JC

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown, soft, moist. Moderate organic content **Subsoil**				
2							
3	GM		SILTY GRAVEL with SAND and some CLAY, light brown, loose to medium dense, very moist to wet. Orange mottling throughout Gravel is subrounded 2-4" dia on average and up to 8" clasts observed. **Weathered Glacial Till**				
4	GP-SM		SILTY GRAVEL with SAND to SILTY SAND WITH GRAVEL, gray, dense to very dense, slightly moist to moist. Gravel is subrounded and up to 2" Unit is consolidated. **Glacial Till**				
5			Light seepage observed near upper contact at 2.6' BPG				
6							
7							
8			Test Pit terminated at 7.5 feet at planned depth. Light seepage observed at 2.6' BPG.				
9							
10							

Log of Test Pit TP-7

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : NW corner (See Map)
Logged By : MF/JC

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown, soft, moist. Moderate organic content **Subsoil**				
2	ML-GM		SANDY SILT with GRAVEL to SILTY GRAVEL with SAND, light brown, loose to medium dense, moist to wet. Orange mottling throughout Gravel is subrounded 2-3" dia on average and up to 12" clasts observed. **Weathered Glacial Till**				
4	GP		GRAVEL with SAND , gray, dense to very dense, slightly moist to moist. Gravel is subrounded and 4-6" dia Unit is consolidated. **Glacial Till** Seepage observed at upper contact at 4' BPG		X	3.1%	11.7%
6.5			Test Pit terminated at 6.5 feet at planned depth. Light seepage observed at 4.0' BPG.				
7							
8							
9							
10							

Log of Test Pit TP-8

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : N Central area (See Map)
Logged By : MF

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
	OL		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content - Charred wood **Relic Topsoil / Charred Material**				
1	ML		SANDY SILT with CLAY, light brown, soft, moist. Moderate organic content **Subsoil**				
2	ML-SM		SANDY SILT with GRAVEL to SILTY SAND with GRAVEL, light brown, loose to medium dense, moist to wet. Orange mottling throughout Gravel is subrounded 2-3" dia on average and up to 12" clasts observed. **Weathered Glacial Till**		☒	36.6%	31.3%
3							
4	GP-SM		SILTY GRAVEL with SAND to SILTY SAND WITH GRAVEL, gray, medium dense to very dense, slightly moist to moist. Gravel is subrounded and 4-6" dia Unit is consolidated. **Glacial Till** Seepage observed from sand lenses at 3.6 and 3.8 feet BPG.				
5							
6							
7			Test Pit terminated at 7.3 feet at planned depth. Light seepage observed at 3.6' and 3.8' BPG.				
8							
9							
10							

Log of Test Pit TP-9

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : NE Central area (See Map)
Logged By : MF

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown, soft, moist. Moderate organic content **Subsoil**				
2	SM		SILTY SAND with GRAVEL, light brown, loose to medium dense, moist to wet. Orange mottling throughout Gravel is subrounded 2-3" dia on average and up to 12" clasts observed. **Weathered Glacial Till** Seepage observed throughout.				
4	GP-SM		SILTY GRAVEL with SAND to SILTY SAND WITH GRAVEL, gray, medium dense to very dense, slightly moist to moist. Some orange mottling observed in the upper 2.5' Gravel is subrounded and 4-6" dia Unit is consolidated. **Glacial Till** Seepage observed from sand lenses at 3.6 and 3.8 feet BPG.				
8			Test Pit terminated at 7.5 feet at planned depth. Light seepage observed throughout the weathered unit (2' to 3.8' BPG).				
10							

Log of Test Pit TP-10

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : NE central area (See Map)
Logged By : MF

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown, soft, moist. Moderate organic content **Subsoil**				
2	ML		SANDY SILT with CLAY, light brown, loose to medium dense, moist. Orange mottling throughout Gravel is subrounded 2-3" dia on average and up to 6" clasts observed. **Weathered Glacial Till**				
3	GP-SM		SILTY GRAVEL with SAND to SILTY SAND WITH GRAVEL, gray, medium dense to very dense, slightly moist. Gravel is subrounded and 2-6" dia Unit is consolidated. **Glacial Till**				
4							
5							
6			Increase in gravel content at 6.0 feet BPG				
			Test Pit terminated at 6.4 feet at planned depth. No free water seepage observed.				
7							
8							
9							
10							

Log of Test Pit TP-11

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : E central side (See Map)
Logged By : MF

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown to red, soft, moist. Moderate organic content **Subsoil**				
2	SM		SILTY SAND with CLAY and GRAVEL, light brown, loose to medium dense, moist. Orange mottling throughout Gravel is subrounded 2-4" dia on average and up to 6" clasts observed. **Weathered Glacial Till**				
4	SM		SILTY SAND WITH GRAVEL, gray, medium dense to very dense, slightly moist. Some orange mottling observed throughout. Gravel is subrounded and 2-6" dia Unit is consolidated. **Glacial Till** Seepage observed at 4' BPG from a sandy lens		X	29.2%	12.6%
7			Test Pit terminated at 6.5 feet at planned depth. Seepage observed in a sandy lens at 4' BPG.				

Log of Test Pit TP-12

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : SE central area (See Map)
Logged By : MF

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown to red, soft, moist. Moderate organic content **Subsoil**				
	OL		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content - Charred wood **Relic Topsoil / Charred Material**				
2	ML		SANDY SILT with CLAY, light brown to red, soft, moist. Moderate organic content **Subsoil**				
	SM-ML		SANDY SILT to SILTY SAND with CLAY and GRAVEL, light brown, loose to medium dense, moist to very moist. Orange mottling throughout Gravel is subrounded 1-2" dia on average **Weathered Glacial Till**				
3							
4	SM-GM		SILTY SAND WITH GRAVEL to SILTY GRAVEL with SAND, gray, dense to very dense, slightly moist. Some orange mottling observed throughout. Gravel is subrounded and 4-6" dia Unit is consolidated. **Glacial Till**				
5							
6							
7			Test Pit terminated at 7.0 feet at planned depth. No free water seepage observed.				
8							
9							
10							

Log of Test Pit TP-13

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : SE corner (See Map)
Logged By : MF

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown to red, soft, moist. Moderate organic content **Subsoil**				
2	SM		SILTY SAND with CLAY and GRAVEL, light brown, loose to medium dense, moist. Orange mottling throughout Gravel is subrounded 1-2" dia on average **Weathered Glacial Till**		☒	32.4%	21.9%
3	SM-GM		SILTY SAND WITH GRAVEL to SILTY GRAVEL with SAND, gray, dense to very dense, slightly moist to moist. Some orange mottling observed throughout. Gravel is subrounded and 4-6" dia Unit is consolidated. **Glacial Till**				
4							
5							
6							
7			Test Pit terminated at 6.9 feet at planned depth. No free water seepage observed.				
8							
9							
10							

Log of Test Pit TP-14

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : Central N (See Map)
Logged By : MF

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown to red, soft, moist. Moderate organic content **Subsoil**				
2	SM		SILTY SAND with GRAVEL, light brown, loose to medium dense, moist. Orange mottling throughout Gravel is subrounded 1-2" dia on average **Weathered Glacial Till**				
3	SM		SILTY SAND WITH GRAVEL and CLAY, gray, dense to very dense, slightly moist to moist. Gravel is subrounded and 4-6" dia Unit is consolidated. **Glacial Till**				
4							
5							
6							
7			Test Pit terminated at 6.6 feet at planned depth. No free water seepage observed.				
8							
9							
10							

Log of Test Pit TP-15

Eagle Peak Mixed use Geotech
Parcel #31052400302000
Arlington, WA

MTC Job # 20B093

Date Started : 4/30/2020
Date Completed : 4/30/2020
Sampling Method : Grab Samples
Location : Central S (See Map)
Logged By : MF

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Water Level	Sample	% Finer than #200	% Moisture
0	SM		SILTY SAND with some GRAVEL, dark brown, loose, slightly moist. High organic content **Topsoil**				
1	ML		SANDY SILT with CLAY, light brown to red, soft, moist. Moderate organic content **Subsoil**				
2	SM		SILTY SAND with GRAVEL, light brown, loose to medium dense, moist. Orange mottling throughout Gravel is subrounded 1-2" dia on average **Weathered Glacial Till**				
3	SM		SILTY SAND with GRAVEL and CLAY, gray, dense to very dense, moist to very moist. Gravel is subrounded and 2-6" dia with rare cobble up to 12" Unit is consolidated. **Glacial Till**				
4							
5	SM		Gravel content increased at 5' BPG.				
6							
7			Test Pit terminated at 7.0 feet at planned depth. No free water seepage observed.				
8							
9							
10							

WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 20B093
DATE STARTED: 04-30-2020
DATE COMPLETED: 04-30-2020

HOLE #: DCP-1
CREW: MF
PROJECT: Eagle Peak Geo
ADDRESS: Hwy 9 & SR 531, Parcel #31052400302000
LOCATION: At TP-1

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	2	8.9	••	2	VERY LOOSE	SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
- 1 ft	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	3	13.3	•••	3	VERY LOOSE	SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 2 ft	3	13.3	•••	3	VERY LOOSE	SOFT
-	15	66.6	•••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
-	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 3 ft	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 1 m	50	222.0	••	-	VERY DENSE	HARD
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 20B093
DATE STARTED: 04-30-2020
DATE COMPLETED: 04-30-2020

HOLE #: DCP-2
CREW: MF
PROJECT: Eagle Peak Geo
ADDRESS: Hwy 9 & SR 531, Parcel #31052400302000
LOCATION: At TP-2

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 1 ft	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 2 ft	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 3 ft	12	53.3	••••••••••••••	15	MEDIUM DENSE	STIFF
- 1 m	12	53.3	••••••••••••••	15	MEDIUM DENSE	STIFF
-	31	119.7	••••••••••••••••••••••••••••••••	-	DENSE	HARD
- 4 ft	50	193.0	••	-	VERY DENSE	HARD
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

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Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 20B093
DATE STARTED: 04-30-2020
DATE COMPLETED: 04-30-2020

HOLE #: DCP-3
CREW: MF
PROJECT: Eagle Peak Geo
ADDRESS: Hwy 9 & SR 531, Parcel #31052400302000
LOCATION: At TP-4

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 ft	2	8.9	••	2	VERY LOOSE	SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
- 2 ft	2	8.9	••	2	VERY LOOSE	SOFT
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
-	8	35.5	••••••••••	10	LOOSE	STIFF
- 3 ft	11	48.8	••••••••••••••	13	MEDIUM DENSE	STIFF
- 1 m	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	10	38.6	••••••••••	11	MEDIUM DENSE	STIFF
- 4 ft	21	81.1	••••••••••••••••••••••	23	MEDIUM DENSE	VERY STIFF
-	50	193.0	••	-	VERY DENSE	HARD
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

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Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 20B093
DATE STARTED: 05-01-2020
DATE COMPLETED: 05-01-2020

HOLE #: DCP-4
CREW: MF
PROJECT: Eagle Peak Geo
ADDRESS: Hwy 9 & SR 531, Parcel #31052400302000
LOCATION: At TP-7

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
- 2 ft	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
-	9	40.0	••••••••••	11	MEDIUM DENSE	STIFF
-	18	79.9	••••••••••••••••••••••	22	MEDIUM DENSE	VERY STIFF
- 3 ft	8	35.5	•••••••••	10	LOOSE	STIFF
- 1 m	9	40.0	••••••••••	11	MEDIUM DENSE	STIFF
-	11	42.5	•••••••••••	12	MEDIUM DENSE	STIFF
- 4 ft	11	42.5	•••••••••••	12	MEDIUM DENSE	STIFF
-	10	38.6	••••••••••	11	MEDIUM DENSE	STIFF
-	12	46.3	••••••••••••	13	MEDIUM DENSE	STIFF
- 5 ft	20	77.2	••••••••••••••••••••	22	MEDIUM DENSE	VERY STIFF
-	31	119.7	••••••••••••••••••••••••••••••••	-	DENSE	HARD
-	39	150.5	••	-	DENSE	HARD
- 6 ft	50	193.0	••	-	VERY DENSE	HARD
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 20B093
DATE STARTED: 05-01-2020
DATE COMPLETED: 05-01-2020

HOLE #: DCP-5
CREW: MF
PROJECT: Eagle Peak Geo
ADDRESS: Hwy 9 & SR 531, Parcel #31052400302000
LOCATION: At TP-6

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 ft	0	0.0		0	VERY LOOSE	VERY SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 2 ft	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
-	9	40.0	••••••••••••	11	MEDIUM DENSE	STIFF
- 3 ft	8	35.5	••••••••••	10	LOOSE	STIFF
- 1 m	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	29	111.9	••••••••••••••••••••••••••••••••	-	DENSE	HARD
- 4 ft	50	193.0	••	-	VERY DENSE	HARD
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 20B093
DATE STARTED: 05-01-2020
DATE COMPLETED: 05-01-2020

HOLE #: DCP-6
CREW: MF
PROJECT: Eagle Peak Geo
ADDRESS: Hwy 9 & SR 531, Parcel #31052400302000
LOCATION: At TP-10

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	0	0.0		0	VERY LOOSE	VERY SOFT
- 1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
- 2 ft	8	35.5	••••••••••	10	LOOSE	STIFF
-	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
- 3 ft	9	40.0	••••••••••••	11	MEDIUM DENSE	STIFF
- 1 m	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	37	142.8	••	-	DENSE	HARD
- 4 ft	50	193.0	••	-	VERY DENSE	HARD
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

WILDCAT.XLS

WILDCAT DYNAMIC CONE LOG

Page 1 of 1

Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 20B093
DATE STARTED: 05-01-2020
DATE COMPLETED: 05-01-2020

HOLE #: DCP-7
CREW: MF
PROJECT: Eagle Peak Geo
ADDRESS: Hwy 9 & SR 531, Parcel #31052400302000
LOCATION: At TP-13

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 2 ft	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	8	35.5	•••••••••	10	LOOSE	STIFF
- 3 ft	12	53.3	••••••••••••••	15	MEDIUM DENSE	STIFF
- 1 m	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
-	30	115.8	••••••••••••••••••••••••••••••••	-	DENSE	HARD
- 4 ft	50	193.0	••	-	VERY DENSE	HARD
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

WILDCAT.XLS

WILDCAT DYNAMIC CONE LOG

Page 1 of 1

Materials Testing and Consulting
805 Dupont, Suite 5
Bellingham, WA 98225

PROJECT NUMBER: 20B093
DATE STARTED: 05-01-2020
DATE COMPLETED: 05-01-2020

HOLE #: DCP-8
CREW: MF
PROJECT: Eagle Peak Geo
ADDRESS: Hwy 9 & SR 531, Parcel #31052400302000
LOCATION: At TP-15

SURFACE ELEVATION: PG
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 ft	2	8.9	••	2	VERY LOOSE	SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	3	13.3	•••	3	VERY LOOSE	SOFT
- 2 ft	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	8	35.5	••••••••••	10	LOOSE	STIFF
-	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 3 ft	16	71.0	••••••••••••••••••••	20	MEDIUM DENSE	VERY STIFF
- 1 m	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	22	84.9	••••••••••••••••••••••••	24	MEDIUM DENSE	VERY STIFF
- 4 ft	50	193.0	••	-	VERY DENSE	HARD
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

WILDCAT.XLS

Appendix D. Laboratory Results

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Sieve Report

Project: Eagle Peak Plat Geotechnical Investigation
Project #: 20B093
Client: TerraVista, NW, LLC.
Source: TP-1 @ 7.0'
Sample#: B20-0467

Date Received: 7-May-20
Sampled By: M. Furman
Date Tested: 30-Apr-20
Tested By: C. Kriss

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel
Sample Color:
brown

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

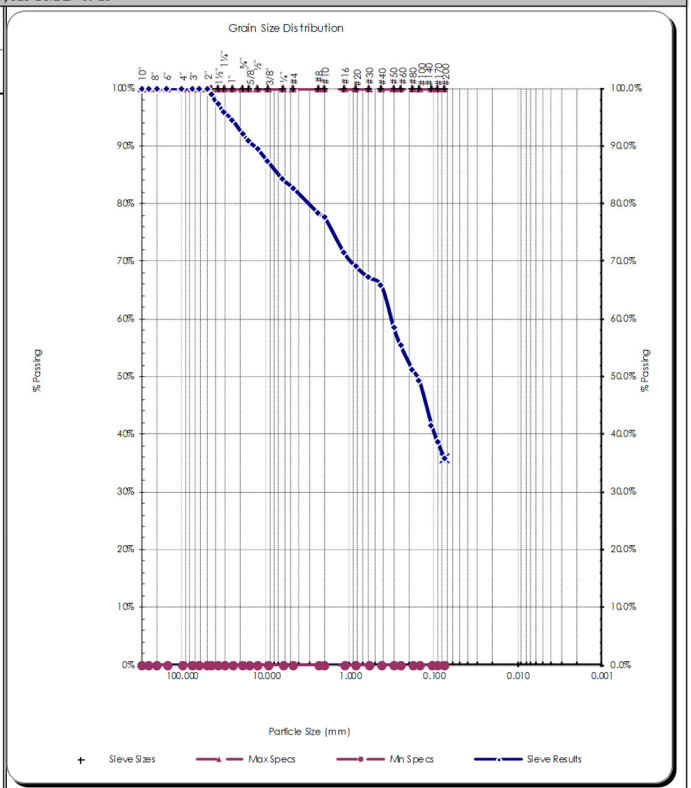
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ = 0.010 mm	% Gravel = 17.3%	Coeff. of Curvature, C_C = 0.58
$D_{(10)}$ = 0.021 mm	% Sand = 46.9%	Coeff. of Uniformity, C_U = 15.62
$D_{(15)}$ = 0.031 mm	% Silt & Clay = 35.9%	Fineness Modulus = 2.13
$D_{(30)}$ = 0.063 mm	Liquid Limit = n/a	Plastic Limit = n/a
$D_{(50)}$ = 0.160 mm	Plasticity Index = n/a	Moisture %, as sampled = 14.7%
$D_{(60)}$ = 0.327 mm	Sand Equivalent = n/a	Req'd Sand Equivalent =
$D_{(90)}$ = 13.892 mm	Fracture %, 1 Face = n/a	Req'd Fracture %, 1 Face =
Dust Ratio = 49/90	Fracture %, 2+ Faces = n/a	Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		99%	100.0%	0.0%
1.50"	37.50		97%	100.0%	0.0%
1.25"	31.50		96%	100.0%	0.0%
1.00"	25.00	94%	94%	100.0%	0.0%
3/4"	19.00	92%	92%	100.0%	0.0%
5/8"	16.00		91%	100.0%	0.0%
1/2"	12.50	89%	89%	100.0%	0.0%
3/8"	9.50	87%	87%	100.0%	0.0%
1/4"	6.30		84%	100.0%	0.0%
#4	4.75	83%	83%	100.0%	0.0%
#8	2.36		78%	100.0%	0.0%
#10	2.00	78%	78%	100.0%	0.0%
#16	1.18		72%	100.0%	0.0%
#20	0.850		69%	100.0%	0.0%
#30	0.600		67%	100.0%	0.0%
#40	0.425	66%	66%	100.0%	0.0%
#50	0.300		58%	100.0%	0.0%
#60	0.250		55%	100.0%	0.0%
#80	0.180		51%	100.0%	0.0%
#100	0.150	49%	49%	100.0%	0.0%
#140	0.106		41%	100.0%	0.0%
#170	0.090		39%	100.0%	0.0%
#200	0.075	35.9%	35.9%	100.0%	0.0%



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-1 @ 7.0'** Eagle Peak Geo Parcel #31052400302000 Arlington, WA	**FIGURE** **4**

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Sieve Report

Project: Eagle Peak Plat Geotechnical Investigation
Project #: 20B093
Client: TerraVista, NW, LLC.
Source: TP-4 @ 6.0'
Sample#: B20-0468

Date Received: 7-May-20
Sampled By: M. Furman
Date Tested: 30-Apr-20
Tested By: C. Kriss

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel
Sample Color:
brown

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

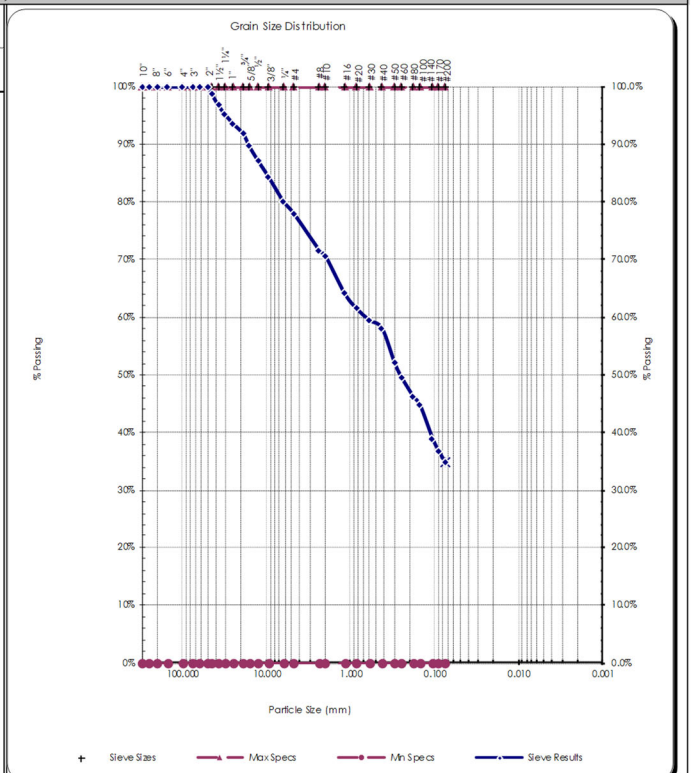
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ = 0.011 mm	% Gravel = 22.0%	Coeff. of Curvature, C_C = 0.29
$D_{(10)}$ = 0.022 mm	% Sand = 43.2%	Coeff. of Uniformity, C_U = 30.82
$D_{(15)}$ = 0.032 mm	% Silt & Clay = 34.8%	Fineness Modulus = 2.54
$D_{(30)}$ = 0.065 mm	Liquid Limit = n/a	Plastic Limit = n/a
$D_{(50)}$ = 0.258 mm	Plasticity Index = n/a	Moisture %, as sampled = 10.7%
$D_{(60)}$ = 0.664 mm	Sand Equivalent = n/a	Req'd Sand Equivalent =
$D_{(90)}$ = 16.529 mm	Fracture %, 1 Face = n/a	Req'd Fracture %, 1 Face =
Dust Ratio = 3/5	Fracture %, 2+ Faces = n/a	Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		99%	100.0%	0.0%
1.50"	37.50		97%	100.0%	0.0%
1.25"	31.50		95%	100.0%	0.0%
1.00"	25.00	94%	94%	100.0%	0.0%
3/4"	19.00	92%	92%	100.0%	0.0%
5/8"	16.00		90%	100.0%	0.0%
1/2"	12.50	87%	87%	100.0%	0.0%
3/8"	9.50	84%	84%	100.0%	0.0%
1/4"	6.30		80%	100.0%	0.0%
#4	4.75	78%	78%	100.0%	0.0%
#8	2.36		72%	100.0%	0.0%
#10	2.00	71%	71%	100.0%	0.0%
#16	1.18		64%	100.0%	0.0%
#20	0.850		61%	100.0%	0.0%
#30	0.600		59%	100.0%	0.0%
#40	0.425	58%	58%	100.0%	0.0%
#50	0.300		52%	100.0%	0.0%
#60	0.250		50%	100.0%	0.0%
#80	0.180		46%	100.0%	0.0%
#100	0.150	45%	45%	100.0%	0.0%
#140	0.106		39%	100.0%	0.0%
#170	0.090		37%	100.0%	0.0%
#200	0.075	34.8%	34.8%	100.0%	0.0%



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-4 @ 6.0'** Eagle Peak Geo Parcel #31052400302000 Arlington, WA	**FIGURE** **5**

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Sieve Report

Project: Eagle Peak Plat Geotechnical Investigation
Project #: 20B093
Client: TerraVista, NW, LLC.
Source: TP-7 @ 5.7'
Sample#: B20-0469

Date Received: 7-May-20
Sampled By: M. Furman
Date Tested: 30-Apr-20
Tested By: C. Kriss

ASTM D-2487 Unified Soils Classification System
GP, Poorly graded Gravel with Sand
Sample Color:
brown

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

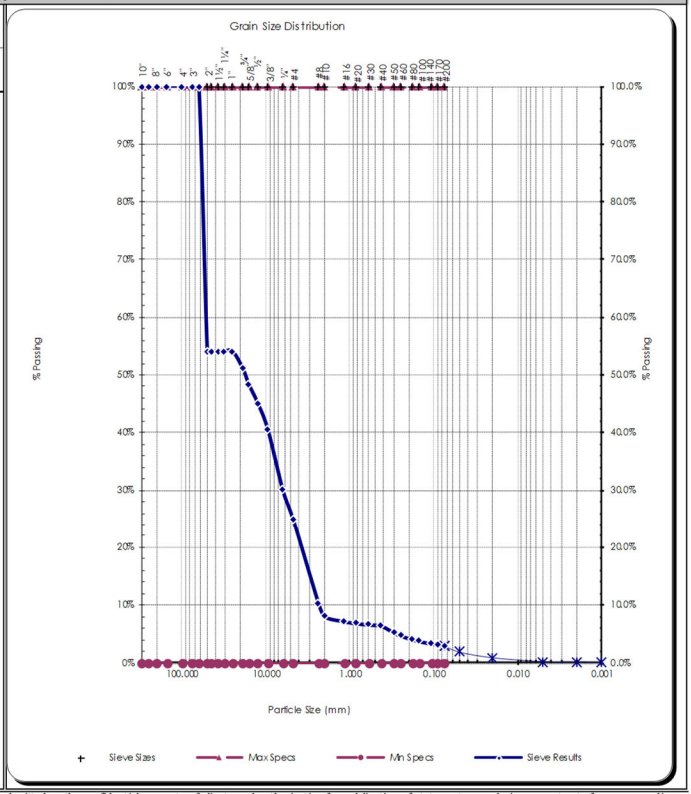
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ = 0.274 mm	% Gravel = 75.0%	Coeff. of Curvature, C_C = 0.33
$D_{(10)}$ = 2.315 mm	% Sand = 21.9%	Coeff. of Uniformity, C_U = 22.31
$D_{(15)}$ = 3.129 mm	% Silt & Clay = 3.1%	Fineness Modulus = 6.96
$D_{(30)}$ = 6.285 mm	Liquid Limit = n/a	Plastic Limit = n/a
$D_{(50)}$ = 17.698 mm	Plasticity Index = n/a	Moisture %, as sampled = 11.7%
$D_{(60)}$ = 51.663 mm	Sand Equivalent = n/a	Req'd Sand Equivalent =
$D_{(90)}$ = 60.166 mm	Fracture %, 1 Face = n/a	Req'd Fracture %, 1 Face =
Dust Ratio = 9/19	Fracture %, 2+ Faces = n/a	Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00	100%	100%	100.0%	0.0%
2.00"	50.00	54%	54%	100.0%	0.0%
1.75"	45.00		54%	100.0%	0.0%
1.50"	37.50		54%	100.0%	0.0%
1.25"	31.50		54%	100.0%	0.0%
1.00"	25.00	54%	54%	100.0%	0.0%
3/4"	19.00	51%	51%	100.0%	0.0%
5/8"	16.00		48%	100.0%	0.0%
1/2"	12.50	45%	45%	100.0%	0.0%
3/8"	9.50	41%	41%	100.0%	0.0%
1/4"	6.30		30%	100.0%	0.0%
#4	4.75	25%	25%	100.0%	0.0%
#8	2.36		10%	100.0%	0.0%
#10	2.00	8%	8%	100.0%	0.0%
#16	1.18		7%	100.0%	0.0%
#20	0.850		7%	100.0%	0.0%
#30	0.600		7%	100.0%	0.0%
#40	0.425	6%	6%	100.0%	0.0%
#50	0.300		5%	100.0%	0.0%
#60	0.250		5%	100.0%	0.0%
#80	0.180		4%	100.0%	0.0%
#100	0.150		4%	100.0%	0.0%
#140	0.106		3%	100.0%	0.0%
#170	0.090		3%	100.0%	0.0%
#200	0.075	3.1%	3.1%	100.0%	0.0%



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-7 @ 5.7'** Eagle Peak Geo Parcel #31052400302000 Arlington, WA	**FIGURE** **6a**

Hydrometer Report

Project:	Eagle Peak Plat Geotechnical Investigation	**Date Received:**	7-May-20
Project #:	20B093	**Sampled By:**	M. Furman
Client :	TerraVista, NW, LLC.	**Date Tested:**	30-Apr-20
Source:	TP-7 @ 5.7'	**Tested By:**	C. Kriss
Sample#:	B20-0469		

ASTMD 2487 Soils Classification
GP, Poorly graded Gravel with Sand
Sample Color
brown

ASTM D-422, HYDROMETER ANALYSIS

Assumed Sp Gr :	2.70	
Sample Weight:	50.18	grams
Hydroscopic Moist.:	3.94%	
Adj. Sample Wgt :	48.28	grams

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter
2	8	1.3%	0.0368 mm
5	6	1.0%	0.0235 mm
15	4.5	0.7%	0.0137 mm
30	2.5	0.4%	0.0098 mm
60	1.5	0.2%	0.0070 mm
250	1	0.2%	0.0034 mm
1440	1	0.2%	0.0014 mm

%Gravel:	75.0%	**Liquid Limit:**	n/a
%Sand:	21.9%	**Plastic Limit:**	n/a
%Silt:	2.9%	**Plasticity Index:**	n/a
%Clay:	0.2%		

ASTM C-136

Sieve Analysis
Grain Size Distribution

Sieve Size	Percent Passing	Soils Particle Diameter
3.0"	100%	75.000 mm
2.0"	100%	50.000 mm
1.5"	54%	37.500 mm
1.25"	54%	31.500 mm
1.0"	54%	25.000 mm
3/4"	51%	19.000 mm
5/8"	48%	16.000 mm
1/2"	45%	12.500 mm
3/8"	41%	9.500 mm
1/4"	30%	6.300 mm
#4	25%	4.750 mm
#10	8%	2.000 mm
#20	7%	0.850 mm
#40	6%	0.425 mm
#100	4%	0.150 mm
#200	3.1%	0.075 mm
Silts	3.0%	0.074 mm
	1.9%	0.050 mm
	0.9%	0.020 mm
Clays	0.2%	0.005 mm
	0.2%	0.002 mm
Colloids	0.1%	0.001 mm

USDA Soil Textural Classification

		Particle Size
%Sand:	76.1%	2.0 - 0.05 mm
%Silt:	21.8%	0.05 - 0.002 mm
%Clay:	2.1%	< 0.002 mm

USDA Soil Textural Classification
Loamy Sand

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-7 @ 5.7'** Eagle Peak Geo Parcel #31052400302000 Arlington, WA	**FIGURE** **6b**

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Sieve Report

Project: Eagle Peak Plat Geotechnical Investigation
Project #: 20B093
Client: TerraVista, NW, LLC.
Source: TP-8 @ 2.0'
Sample#: B20-0470

Date Received: 7-May-20
Sampled By: M. Furman
Date Tested: 30-Apr-20
Tested By: C. Kriss

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel
Sample Color:
brown

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

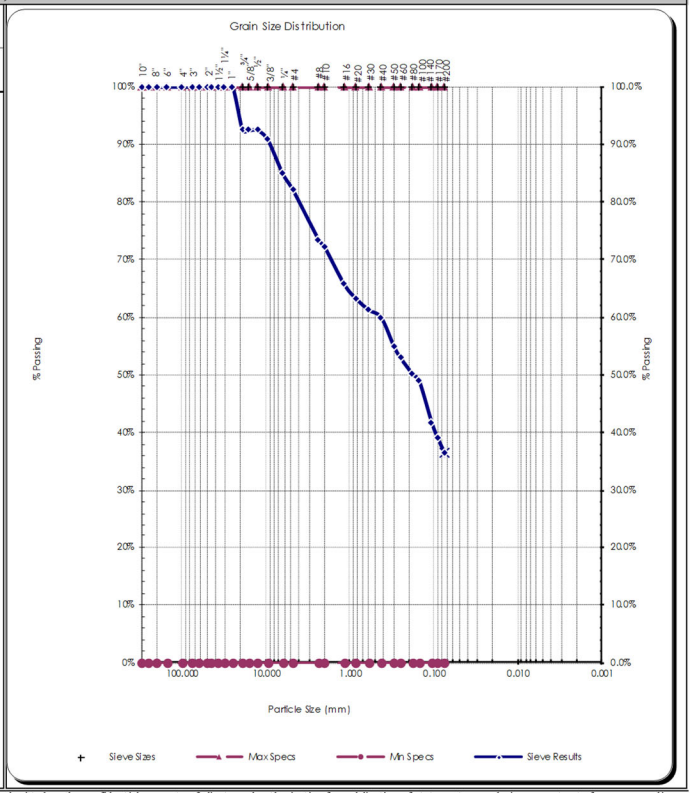
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

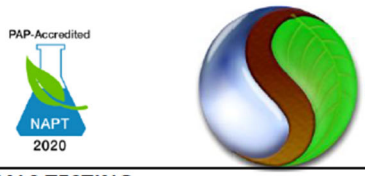
$D_{(5)}$ = 0.010 mm	% Gravel = 17.9%	Coeff. of Curvature, C_C = 0.43
$D_{(10)}$ = 0.020 mm	% Sand = 45.4%	Coeff. of Uniformity, C_U = 20.74
$D_{(15)}$ = 0.031 mm	% Silt & Clay = 36.6%	Fineness Modulus = 2.30
$D_{(30)}$ = 0.061 mm	Liquid Limit = n/a	Plastic Limit = n/a
$D_{(50)}$ = 0.174 mm	Plasticity Index = n/a	Moisture %, as sampled = 31.3%
$D_{(60)}$ = 0.425 mm	Sand Equivalent = n/a	Req'd Sand Equivalent =
$D_{(90)}$ = 9.075 mm	Fracture %, 1 Face = n/a	Req'd Fracture %, 1 Face =
Dust Ratio = 47/77	Fracture %, 2+ Faces = n/a	Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	100%	100%	100.0%	0.0%
3/4"	19.00	92%	92%	100.0%	0.0%
5/8"	16.00		92%	100.0%	0.0%
1/2"	12.50	92%	92%	100.0%	0.0%
3/8"	9.50	91%	91%	100.0%	0.0%
1/4"	6.30		85%	100.0%	0.0%
#4	4.75	82%	82%	100.0%	0.0%
#8	2.36		74%	100.0%	0.0%
#10	2.00	72%	72%	100.0%	0.0%
#16	1.18		66%	100.0%	0.0%
#20	0.850		63%	100.0%	0.0%
#30	0.600		61%	100.0%	0.0%
#40	0.425	60%	60%	100.0%	0.0%
#50	0.300		55%	100.0%	0.0%
#60	0.250		53%	100.0%	0.0%
#80	0.180		50%	100.0%	0.0%
#100	0.150	49%	49%	100.0%	0.0%
#140	0.106		42%	100.0%	0.0%
#170	0.090		39%	100.0%	0.0%
#200	0.075	36.6%	36.6%	100.0%	0.0%



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-8 @ 2.0'** Eagle Peak Geo Parcel #31052400302000 Arlington, WA	**FIGURE** **7a**



MATERIALS TESTING
777 CHRYSLER DR

Burlington , WA 98233
Laboratory #: S20-07110

Date Received: 5/8/2020
Grower: EAGLE PEAK PLAT
Sampled By:
Field: B20-0470 TP-8 AT 2.0FT
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	9.4

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

		Lbs/Acre		
Ammonium - N	mg/kg			
Organic Matter W.B.	%	1.9	ENR:	38

Other Tests:

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-8 @ 2.0'** Eagle Peak Geo Parcel #31052400302000 Arlington, WA	**FIGURE** **7b**

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Sieve Report

Project: Eagle Peak Plat Geotechnical Investigation
Project #: 20B093
Client: TerraVista, NW, LLC.
Source: TP-11 @ 6.0'
Sample#: B20-0471

Date Received: 7-May-20
Sampled By: M. Furman
Date Tested: 30-Apr-20
Tested By: C. Kriss

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel
Sample Color:
brown

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

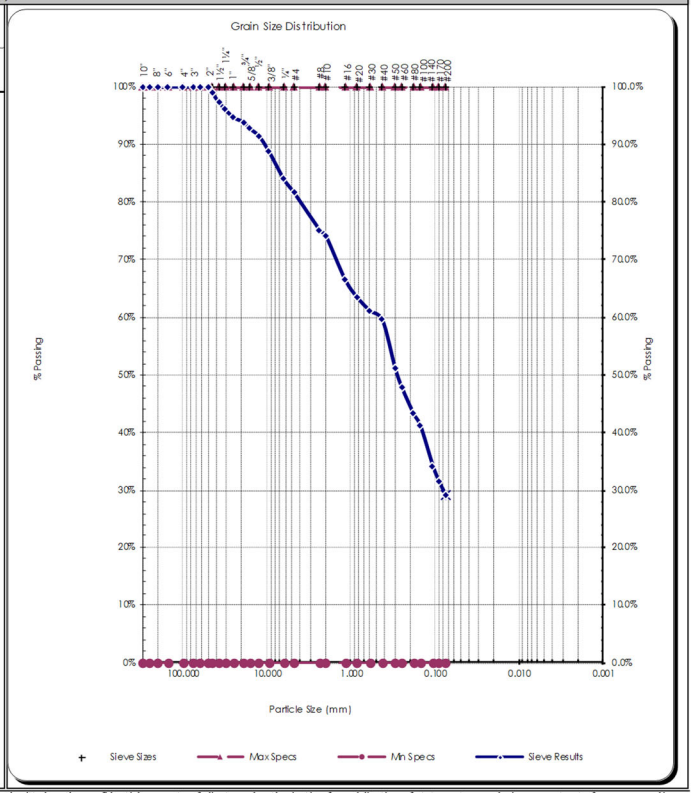
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ = 0.013 mm	% Gravel = 18.4%	Coeff. of Curvature, C_C = 0.53
$D_{(10)}$ = 0.026 mm	% Sand = 52.4%	Coeff. of Uniformity, C_U = 18.28
$D_{(15)}$ = 0.038 mm	% Silt & Clay = 29.2%	Fineness Modulus = 2.40
$D_{(30)}$ = 0.080 mm	Liquid Limit = n/a	Plastic Limit = n/a
$D_{(50)}$ = 0.281 mm	Plasticity Index = n/a	Moisture %, as sampled = 12.6%
$D_{(60)}$ = 0.469 mm	Sand Equivalent = n/a	Req'd Sand Equivalent =
$D_{(90)}$ = 10.870 mm	Fracture %, 1 Face = n/a	Req'd Fracture %, 1 Face =
Dust Ratio = 26/53	Fracture %, 2+ Faces = n/a	Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		99%	100.0%	0.0%
1.50"	37.50		97%	100.0%	0.0%
1.25"	31.50		96%	100.0%	0.0%
1.00"	25.00	95%	95%	100.0%	0.0%
3/4"	19.00	94%	94%	100.0%	0.0%
5/8"	16.00		93%	100.0%	0.0%
1/2"	12.50	91%	91%	100.0%	0.0%
3/8"	9.50	89%	89%	100.0%	0.0%
1/4"	6.30		84%	100.0%	0.0%
#4	4.75	82%	82%	100.0%	0.0%
#8	2.36		75%	100.0%	0.0%
#10	2.00	74%	74%	100.0%	0.0%
#16	1.18		67%	100.0%	0.0%
#20	0.850		64%	100.0%	0.0%
#30	0.600		61%	100.0%	0.0%
#40	0.425	60%	60%	100.0%	0.0%
#50	0.300		51%	100.0%	0.0%
#60	0.250		48%	100.0%	0.0%
#80	0.180		43%	100.0%	0.0%
#100	0.150	41%	41%	100.0%	0.0%
#140	0.106		34%	100.0%	0.0%
#170	0.090		32%	100.0%	0.0%
#200	0.075	29.2%	29.2%	100.0%	0.0%



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-11 @ 6.0'** Eagle Peak Geo Parcel #31052400302000 Arlington, WA	**FIGURE** **8**

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting

Sieve Report

Project: Eagle Peak Plat Geotechnical Investigation
Project #: 20B093
Client: TerraVista, NW, LLC.
Source: TP-13 @ 2.5'
Sample#: B20-0472

Date Received: 7-May-20
Sampled By: M. Furman
Date Tested: 30-Apr-20
Tested By: C. Kriss

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel
Sample Color:
brown

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

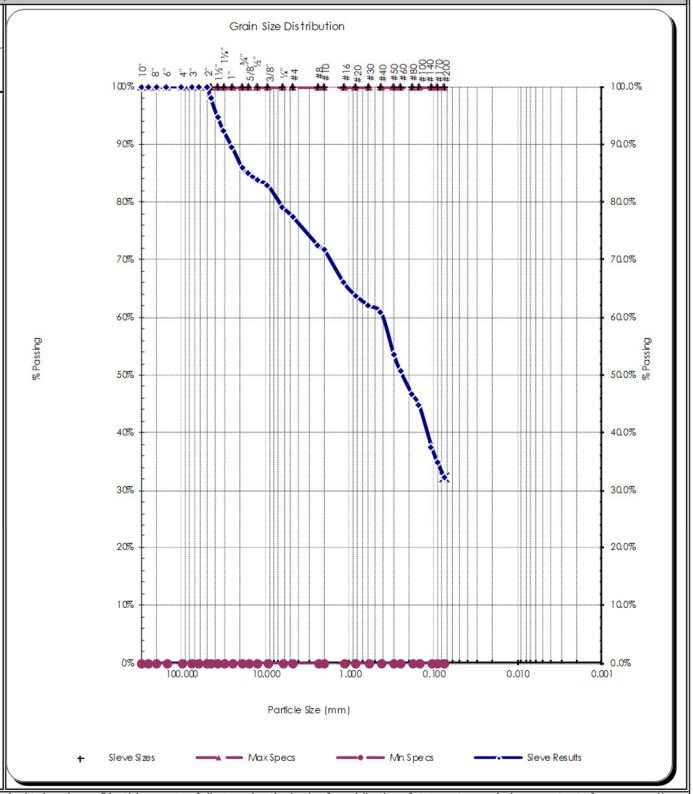
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ = 0.012 mm	% Gravel = 22.6%	Coeff. of Curvature, C_C = 0.51
$D_{(10)}$ = 0.023 mm	% Sand = 45.0%	Coeff. of Uniformity, C_U = 17.67
$D_{(15)}$ = 0.035 mm	% Silt & Clay = 32.4%	Fineness Modulus = 2.55
$D_{(30)}$ = 0.070 mm	Liquid Limit = n/a	Plastic Limit = n/a
$D_{(50)}$ = 0.238 mm	Plasticity Index = n/a	Moisture %, as sampled = 21.9%
$D_{(60)}$ = 0.410 mm	Sand Equivalent = n/a	Req'd Sand Equivalent =
$D_{(90)}$ = 26.270 mm	Fracture %, 1 Face = n/a	Req'd Fracture %, 1 Face =
Dust Ratio = 17/32	Fracture %, 2+ Faces = n/a	Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		98%	100.0%	0.0%
1.50"	37.50		95%	100.0%	0.0%
1.25"	31.50		92%	100.0%	0.0%
1.00"	25.00	89%	89%	100.0%	0.0%
3/4"	19.00	86%	86%	100.0%	0.0%
5/8"	16.00		85%	100.0%	0.0%
1/2"	12.50	84%	84%	100.0%	0.0%
3/8"	9.50	83%	83%	100.0%	0.0%
1/4"	6.30		79%	100.0%	0.0%
#4	4.75	77%	77%	100.0%	0.0%
#8	2.36		72%	100.0%	0.0%
#10	2.00	72%	72%	100.0%	0.0%
#16	1.18		66%	100.0%	0.0%
#20	0.850		64%	100.0%	0.0%
#30	0.600		62%	100.0%	0.0%
#40	0.425	61%	61%	100.0%	0.0%
#50	0.300		54%	100.0%	0.0%
#60	0.250		51%	100.0%	0.0%
#80	0.180		47%	100.0%	0.0%
#100	0.150	45%	45%	100.0%	0.0%
#140	0.106		38%	100.0%	0.0%
#170	0.090		35%	100.0%	0.0%
#200	0.075	32.4%	32.4%	100.0%	0.0%



Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-13 @ 2.5'** Eagle Peak Geo Parcel #31052400302000 Arlington, WA	**FIGURE** **9a**

PAP-Accredited NAPT 2020

soiltest farm consultants, inc.
2925 Driggs Dr., Moses Lake, Wa 98837 - www.soiltestlab.com
Office: (509)765-1622 - Fax:(509)765-0314 - (800)764-1622

Soil & Plant Program 2020 NAPT Participating Laboratory

MATERIALS TESTING
777 CHRYSLER DR

Burlington , WA 98233
Laboratory #: S20-07111

Date Received: 5/8/2020
Grower: EAGLE PEAK PLAT
Sampled By:
Field: B20-0472 TP-13 AT 2.5FT
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	8.4

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

Lbs/Acre

Ammonium - N mg/kg
Organic Matter W.B. % 1.6 ENR: 32

Other Tests:

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Lab Sample: TP-13 @ 2.5'** Eagle Peak Geo Parcel #31052400302000 Arlington, WA	**FIGURE** **9b**