8/2/2024 *(Revised 1/15/2025)*

Allito Properties
Attn: David Litowitz

Subject: **Henderson Blvd Apartments Geotechnical Investigation**
TPN: 12711110300; 7501 Henderson Blvd. SE., Tumwater, WA
Project Number: QG24-097

Dear Client,

At your request, Quality Geo NW, PLLC (QG) has completed a soils investigation of the above-referenced project. The investigation was performed in accordance with our proposal for professional services.

We would be pleased to continue our role as your geotechnical consultant of record during the project planning and construction phases, as local inspection firms have not been found to be as familiar or reliably experienced with geotechnical design. This may include soil subgrade inspections, periodic review of special inspection reports, or supplemental recommendations if changes occur during construction. We will happily meet with you at your convenience to discuss these and other additional *Time & Materials* services.

We thank you for the opportunity to be of service on this project and trust this report satisfies your project needs currently. QG wishes you the best while completing the project.

Respectfully Submitted,
Quality Geo NW, PLLC

Luke Preston McCann, L.E.G.
Owner + Principal

Ray Gean II
Staff Geologist/Project Manger

SOILS REPORT

HENDERSON BLVD APARTMENTS GEO
TPN: 12711110300; 7501 HENDERSON BLVD SE
TUMWATER, WA

Allito Properties
Attn: David Litowitz

Prepared by:

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Approved by:

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LUKE PRESTON MCCANN

8/2/2024 *(Revised 1/15/2025)*

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8/2/2024 *(Revised 1/15/2025)*

QG Project # QG24-097

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1.0 INTRODUCTION

This report presents the findings and recommendations of Quality Geo NW's (QG) soil investigation conducted in support of new site surface improvements.

1.1 PROJECT DESCRIPTION

QG understands the project entails new construction within a presently undeveloped parcel. QG has been contracted to complete a soils investigation of the proposed site from a previous report, and to provide foundation, stormwater, and earthwork recommendations. Initially, GeoResources, LLC was subcontracted by the client to complete the geotechnical fieldwork for the project. We understand they are no longer involved with the project. We were provided with their complete field results, and soil analysis. Based on our review of the logs and data, it appears that a satisfactory level of testing and exploration were completed by GeoResources, requiring no additional field testing at this time. The relevant information has been included within our report.

1.2 FIELD WORK

Site exploration activities were initially subcontracted by the client to GeoResources, LLC and performed on 10/9/2023 & 10/25/2023. We understand that GeoResources is no longer involved with the project. GeoResources directed the advancement of 14 excavated test pits (TP) and 3 Hollow Stem Auger borings with standard penetration testing (SPT) at defined intervals. The test pits were advanced within the vicinity of the anticipated development footprint areas, to maximum depths of 10.0 feet below present grade (BPG) in general accordance with the specified contract depth. The boreholes (BH) were advanced within the vicinity of the anticipated development footprint areas, to a depth of 26.5 or 41.5 feet below present grade. SPT blow counts were recorded during borehole advancement. Disturbed soil samples were collected by split-spoon at 2.5 and 5.0 -foot intervals. Exploration locations were marked in the field by GeoResources with respect to the provided map and cleared for public conductible utilities.

During explorations GeoResources logged each soil horizon we encountered, and field classified them in accordance with the Unified Soil Classification System (USCS). Representative soil samples were collected from each unit, identified according to boring location and depth, placed in plastic bags to protect against moisture loss, and were transported to the soil laboratory for supplemental classification and other tests.

2.0 EXISTING SITE CONDITIONS

2.1 AREA GEOLOGY

QG reviewed available map publications to assess known geologic conditions and hazards present at the site location. The Washington Geologic Information Portal (WGIP), maintained by the Department of Natural Resources Division of Geology and Earth Resources, provides 1:24,000-scale geologic mapping of the region. The geology of the site location and vicinity consists of Pleistocene continental glacial drift (Qgos). The sediment deposits on site are described as "Sand and silt with minor gravel interbeds; tan to brown; clasts moderately to well rounded; generally well sorted; clasts and grains consist of northern-source plutonic and metamorphic rocks and polycrystalline quartz carried by Vashon ice, and porphyritic volcanic rock from the Cascade Range 60 mi to the east; thickness varies from about 4 to 20 ft."

The WGIP Map also offers layers of mapped geohazard conditions within the state. According to the regional-scale interactive map, no landslides or known geohazards are mapped for the site. Available LiDAR imagery of the site did not reveal any obvious over-steepened or slumped areas of the slope.

The United States Department of Agriculture portal (USDA) provides a soil mapping of the region. The soils in the vicinity are mapped as Nisqually loamy fine sand (73) and Indianola loamy sand (46, 47). The Nisqually loam fine sand formed as terraces and was derived from sandy glacial outwash. The soils are described as loamy fine sand from 0 to 31 inches, and loamy sand from 31 to 60 inches. The depth to restrictive feature is more than 80 inches. The capacity of the most limiting layer to transmit water (ksat) is listed as high (1.98 to 5.95 in/hr). The depth to water table is more than 80 inches. The Indianola loamy sand formed as terraces, kames, and eskers and was derived from sandy glacial outwash. The soils are described as slightly decomposed plant material from 0 to 1 inch, loamy sand from 1 to 17 inches, and sand from 17 to 60 inches. The depth to restrictive feature is more than 80 inches. The capacity of the most limiting layer to transmit water (ksat) is listed as high to very high (5.95 to 99.90 in/hr). The depth to water table is more than 80 inches.

2.2 SITE & SURFACE CONDITIONS

The project area is a rectangular in shape parcel that is relatively flat, and near the same elevation as the adjacent Henderson Blvd. The northern corner of the site features a pond and wetland area. The pond and wetland area continue into the neighboring parcel to the north and northeast. To the northwest and west are residential homes while to the west and south are businesses and the Olympia Regional Airport. The site is currently undeveloped and is covered by vegetation in the

form of grasses, brambles, shrubs, and trees both young and mature.

2.3 SOIL LOG

Site soil conditions were generally consistent across the property in all 14 test pits and 3 bore holes. Representative lab samples were taken from TP-1, TP-2, TP-13, B-1, and B-2. General soil conditions on site were as follows:

- **0' to 0.5' – Forest Duff**

  A layer of decaying forest debris and organic matter laying on top of the surface.

- **0.5' to 6.0' – Silty Sand (SM)**

  A 5.5-foot layer of dark brown to brown to tan, loose silty sand was encountered at the surface of the site. This layer features a high amount of organic matter and no mottling. No cobbles were found within this layer across the site. The top 2 feet of this layer are inferred to be topsoil.

- **6.0' to 41.0' – Poorly Graded Sand with Silt (SP-SM)**
  Beneath silty topsoil, the soil column was composed of poorly graded sand with variable fines content. Overall, it was brown and moist in a medium dense condition. There was minor mottling observed beginning at approximately 20-feet below the surface at B-2, but the other boreholes did not show any mottling. No groundwater was encountered in any of the test pits, but groundwater was encountered at about 25 feet in B-2 and 38 feet in B-3.

2.4 SURFACE WATER AND GROUNDWATER CONDITIONS

In the northern corner of the parcel, an unnamed pond exists. Additionally, Munn Lake and Trails End Lake are approximately 1500 feet to the east of the site. During our test pit explorations, no pervasive groundwater table was encountered, but during borehole drilling, groundwater was encountered at about 25 and 38 feet in B-2 and B-3 during the drilling. Additionally, groundwater monitoring was performed by GeoResources during the wet season, where groundwater was observed as high as 21.75 feet below the surface. Based on well logs made publicly available by the WA Department of Ecology the groundwater table is reported to exist at depths greater than 16 feet beneath the entire site.

2.5 GROUNDWATER MONITORING & EVALUATION

The purpose of the water monitoring has been to document seasonal site conditions to provide information on shallow stormwater flux and perched water conditions through the wet season at the project location. Over the 2023-2024 wet season, GeoResources conducted a limited

groundwater characterization & monitoring program. The monitoring program was conducted from November 2023, through April 30, 2024, for a limited wet season monitoring period.

2.5.1 GROUNDWATER MONITORING METHODOLOGY & RESULTS

Over the course of the wet season GeoResources visited the site on a regular basis to collect direct measurements of groundwater within the monitoring portals. Piezometers were placed in each well throughout the duration of the monitoring period to monitor groundwater levels. Monitoring portals were installed in November 2023, to depths ranging from 26.5 to 41.5 feet below present grade (BPG) as access & soil conditions allowed. A pervasive water table was encountered during installation between approximately 25 and 38 feet BPG in B-2 and B-3 locations. GeoResources returned on subsequent site visits to directly measure water levels. Piezometer data was collected at the end of the monitoring period and processed using software. Summarized results of the groundwater monitoring measurements are shown below in the image and Table 1.

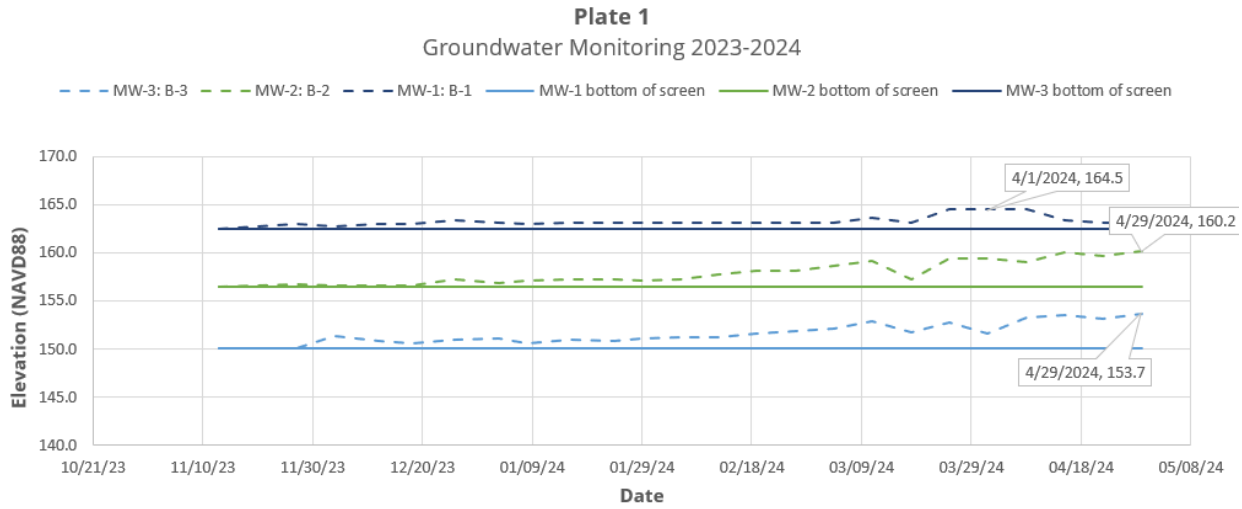


Table 1. Groundwater Monitoring Results

Monitoring Portal ID	Depth to Groundwater (feet)	Elevation of Groundwater (feet)	Date Observed
B-1	23.50	164.5	3/25/2024
B-2	21.75	160.25	4/29/2024
B-3	36.33	153.67	4/29/2024

2.5.2 INTERPRETATION OF FINDINGS & PERCHED GROUNDWATER

In general, monitoring portals appeared to experience an increase in head around mid-February to early April as the rainy season progressed. Peak groundwater elevations between monitoring portals varied by 14.58 feet. This is likely due to the elevation difference between locations, with the parcel grading to lower elevations from southeast to northwest, and the proximity of the pond on the project site and neighboring parcel to the northwest. Monitoring portals experienced

seasonal groundwater highs in March and April, where groundwater reached 21.75 feet below the surface at the shallowest recorded depth, and its highest elevation at 164.5-feet-elevation. Based on these results of seasonal groundwater monitoring, both conventional in-ground infiltration and shallow infiltration appear suitable across the site due to the year-round lack of shallow groundwater table.

3.0 GEOTECHNICAL RECOMMENDATIONS

3.1 SHALLOW FOUNDATION RECOMMENDATIONS

Assuming site preparation is completed as described below, we recommend the following:

- **Subgrade Preparation**

  QG recommends excavating and clearing any loose or organic cover soils, including the overriding layer of topsoil where necessary, from areas of proposed pavement construction, down to firm bearing conditions and benching the final bottom of subgrade elevation flat. Excavations should be performed with a smooth blade bucket to limit disturbance of subgrade soils. Vibratory compaction methods are suitable for densification of the non-organic native soils.

  After excavations have been completed to the planned subgrade elevations, but before placing fill or structural elements, the exposed subgrade should be evaluated under the periodic guidance of a QG representative. Any areas that are identified as being soft or yielding during subgrade evaluation should be brought to the attention of 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.

  The proposed buildings may utilize either stepped or continuous footings with slab-on-grade elements. For continuous footing elements, upon reaching bearing strata, we recommend benching foundation lines flat. Continuous perimeter and strip foundations may be stepped as needed to accommodate variations in final subgrade level. We also recommend maximum steps of 18 inches with spacing of at least 5 feet be constructed unless specified otherwise by the design engineer. Structural fill may then be placed as needed to reestablish final foundation grade.

- **Allowable Bearing Capacity:**

  Up to 1,500 pounds per square foot (psf) for foundations placed on 24 inches of compacted import structural fill placed in accordance with the recommendations of *Section 4.2*. Bearing capacities, at or below 1,500 psf may eliminate the need for additional inspection requirements if approved by the county. 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 also penetrate to the prescribed bearing stratum cited above. Minimum depths are referenced per IBC requirements for frost protection; other design concerns may dictate greater values be applied.

- **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:**

  All concrete settles after placement. We estimate that the maximum settlements will be on the order of 0.5 inch, or less, with a differential settlement of ½ inch, or less, over 50 linear feet. Settlement is anticipated to occur soon after the load is applied during construction.

3.2 LATERAL SOIL & CONCRETE FOUNDATION CONSIDERATIONS

The results of QG's investigation indicate shallow subsurface conditions at the proposed building area consist of generally silty sands.

The finished grade is assumed to be similar to the existing grade. In general, native soils are not considered suitable for use as backfill against new in-ground structures or direct bearing. QG understands that the building structures may likely incorporate continuous perimeter grade beams as well as isolated footings, incorporating soil amendment as determined by the structural design team. For lateral support of these structures, the following soil parameters should be considered regarding any structural fill against these features (ignoring the upper 18 inches, due to freeze/thaw softening, unless covered in concrete or asphalt).

Table 2. Lateral Earth Pressures

Soil Type	Active Pressure (PSF*H)	At-Rest Pressure (PSF*H)	Seismic Surcharge (PSF*H)	Grade Beam Passive Equivalent Fluid Weight (PCF)	Grade Beam Coefficient of Friction
Existing Soils (SM)	45	60	9	187*	0.35**
New Structural Fill	35	55	10	200	0.35

*Factor of Safety: 2.0
**Factor of Safety: 1.5

All concrete foundation elements must bear on approved, imported, granular, structural fill per the requirements of *Section 4.2 Structural Fill Materials and Compaction*. To ensure adequate friction,

no fabric shall be placed between the structural fill and native soils when placed under primary building foundations & grade beams.

The proposed buildings may utilize continuous grade beams with slab-on-grade, where appropriate, depending on the chosen development style. For continuous footing elements, upon reaching bearing strata, we recommend benching foundation lines flat.

3.3 SEISMIC DESIGN PARAMETERS AND LIQUEFACTION

According to the Liquefaction Susceptibility Map of Seismic Design Maps Portal, the site is identified as having low to moderate susceptibility. This is generally consistent with the findings of QG's investigation to date. 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 Washington Interactive Geologic Map - Seismic Site Class Map* classifies the project regional vicinity as *Site Class D.*

The USGS Seismic Design Map Tool was used to determine seismic design coefficients and spectral response accelerations assuming Site Class D, representing a generally stiff soil profile (upper 100 feet). Parameters in Table 3 were calculated using 2014 USGS hazard data and ASCE 7-16 was referenced for site Peak Ground Acceleration.

Table 3. Seismic Design Parameters

Seismic Design Category		D	D	D-Default
Reference		ASCE 7-10	ASCE 7-16	ASCE 7-16
Risk Category		II	II	II
MCE_R ground motion (period=0.2s)	S_S	1.302	1.375	1.375
MCER ground motion (period=1.0s)	S_1	0.537	0.514	0.514
Site-modified spectral acceleration value	S_{MS}	1.302	1.375	1.65
Site-modified spectral acceleration value	S_{M1}	0.805	NULL	NULL
Numeric seismic design value at 0.2s SA	S_{DS}	0.868	0.917	1.1
Numeric seismic design value at 1.0s SA	S_{D1}	0.537	NULL	NULL
Site amplification factor at 0.2s	F_a	1.0	1.0	1.2
Site amplification factor at 1.0s	F_v	1.5	NULL	NULL
Site modified peak ground acceleration	PGA_M	0.5	0.652	0.712

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

3.4 BUILDING SLAB ON GRADE FLOOR

QG anticipates that slab-on-grade floors are planned for the interior of the proposed building. Based on typical construction practices, we assume finished slab grade will be similar to or marginally above present grade for the below recommendations. If floor grades are planned to be substantially raised or lowered from existing grade, QG should be contacted to provide revised or alternative recommendations.

- **Capillary Break:**

  A capillary break will be helpful to maintain a dry slab floor and reduce the potential for floor damage resulting from shallow perched water inundation. To provide a capillary moisture break, a 6-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, QG 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 5.2.2* of this report.

- **Vapor Barrier:**

  A vapor retarding membrane such as 10 mil polyethylene film should be placed beneath all floor slabs to prevent transmission of moisture where floor coverings may be affected. Care should be taken during construction not to puncture or damage the membrane. To protect the membrane, a layer of sand no more than 2 inches thick may be placed over the membrane if desired. If excessive relict organic fill material is discovered at any location, additional sealant or more industrial gas barriers may be required to prevent off-gassing of decaying material from infiltrating the new structure. These measures shall be determined by the structural engineer to meet local code requirements as necessary.

- **Structural Design Considerations:**

  QG assumes the design and specifications of slabs will be assessed by the project design engineer. We suggest a minimum unreinforced concrete structural section of 4.0 inches be considered to help protect against cracking and localized settlement, especially where larger equipment or localized loads are anticipated. It is generally recommended that any floor slabs and annular exterior concrete paving subject to vehicular loading be designed to incorporate reinforcing. Additionally, some level of reinforcing, such as a wire mesh may be desirable to prolong slab life due to the overwhelming presence of such poor underlying soils. It should be noted that QG does not offer any guarantee or warranty for proposed slab sections.

3.5 INFILTRATION RATE DETERMINATION

QG understands the design of on-site stormwater controls are pending the results of this study to confirm design parameters and interpreted depths to perched seasonal groundwater and restrictive soil features.

3.5.1 GRADATION ANALYSIS METHODS & RESULTS

During test pit excavations for general site investigation, GeoResources additionally collected representative samples of native soil deposits among potential infiltration strata and depths. Representative soil samples were selected from test pits and boreholes on the site (TP-1, TP-2, TP-13, B-2, and B-3) to characterize the local infiltration conditions.

QG understand the project will be subject to infiltration design based on the Washington Department of Ecology Stormwater Management Manual for Western Washington (DoE SMMWW). For initial site infiltration characterization within the scope of this study, laboratory gradation analyses were completed including sieve and hydrometer tests for stormwater design characterization and rate determination to supplement field observations. Results of laboratory testing in terms of rate calculation are summarized below.

Laboratory results were interpreted to recommended design inputs in accordance with methods of the 2019 DoE SMMWW. Gradation results were applied to the Massmann (2003) equation (1) to calculate Ksat representing the initial saturated hydraulic conductivity.

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

Corrected Ksat values presented below are a product of the initial Ksat and correction factor CFT. For a generalized site-wide design situation, we have applied a site variability factor of CFv = 0.7 along with typical values of CFt = 0.4 (for the Grain Size Method) and CFm = 0.9 (assuming standard influent control).

(2) $CFT = CFv \times CFt \times CFm = 0.7 \times 0.4 \times 0.9 = 0.25$

Results were cross-referenced with test pit logs to determine the validity and suitability of unique materials as an infiltration receptor. Additional reduction factors were applied for practical rate determination based on our professional judgement.

Table 4. Results Of Massmann Analysis

TP #	Sample Depth *(BPG)*	Unit Extent *(ft)*	Soil Type	D10	D60	D90	Fines (%)	Ksat *(in/hr)*	Corrected Ksat *(in/hr)*	LT Design Infiltration Rate*(in/hr)*
1	0.5-3.0ft	0.5 to 3.0’	SM	0.001	0.24	0.39	12.8	20.69	5.17	**5.17**
2	6.0ft	0.5 to 7.5’	SM	0.001	0.19	0.30	13.4	20.12	5.03	**5.03**
2	9.0-10.0ft	9.0 to 10.0’+	SM	0.001	0.14	0.30	40.7	5.43	1.36	**1.36**
13	9.0ft	6.0 to 10.0’	SP-SM	0.084	0.18	0.24	6.3	40.70	10.18	**10.18**
B-1	15.0ft	15.0 to 26.5’	SM	0.001	0.14	0.21	16.9	17.03	4.26	**4.26**
B-2	15.0ft	5.0 to 26.5’	SP-SM	0.080	0.22	0.33	8.4	36.12	9.03	**9.03**

Beneath topsoil, the SM and SP-SM soils were observed to exhibit a variable amount of fines content. In B-2, minimal oxidation patterns in the form of mottling at depths greater than 20 feet. In-ground infiltration structures are required to maintain a minimum of 5-feet separation from restrictive soil & perched water features. Available well logs did not indicate the potential for shallow ground water. The required separation appears generally achievable across the site. At this time, QG does not recommend mounding analysis due to the generally suitable site conditions.

Due to some underlying lenses of more fine-grained-rich sediments across the site, the design rates will vary depending on location. **For in-ground infiltration galleries, QG recommends location specific maximum design rates of 10.18 in/hour for the northwest (near TP-10 & 13), 9.03 in/hour in the center (near BH-2), and 5.17 in/hour for the southeast (near TP-1) be considered.** For any shallow infiltration features such as rain gardens, pervious pavement, or swales, we recommend the designer consider a reduced rate of 1.0 inches per hour which is typically suitable and considers potential reductions from compaction during construction. In-situ infiltration verification testing during construction shall be completed prior to completion of the infiltration features, in each of the proposed locations.

QG recommends the facility designer review these results and stated assumptions 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 the resulting design values based on these criteria to ensure design and operational intent is met. We recommend that we be contacted if substantial changes to rate determination are considered.

3.5.2 TREATMENT POTENTIAL

Depending on stormwater and runoff sources, some stormwater features, such as rain gardens or pervious pavements may require treatment. Stormwater facilities utilizing native soils as treatment media typically require Cation Exchange Capacities (CEC) of greater than 5 milliequivalents per 100grams (meq/100g) and organic contents greater than 1% (this may vary depending on local code). CEC and LOI analyses were not conducted by GeoResources. The import of traditional treatment media may be required within infiltration receptors, unless further testing is required for permitting or design.

3.5.3 DRAINAGE RECOMMENDATIONS

QG recommends proper drainage controls for stormwater runoff during and after site development to protect the site. The ground surface adjacent to structures should be sloped to drain away at a 5% minimum to prevent ponding of water adjacent to them.

Foundations shall incorporate a wraparound footing drain composed of imported clean granular drain rock. There shall be a perforated drainpipe connected around the perimeter of the footing drain (within the rock) graded to gravity drain to an outfall pipe, to allow any accumulated water to be released to an approved drainage feature or location. The outfall point must be lower in elevation than the lowest point of possible water accumulation in the mat fill, so as to allow any captured water within the mat or crawlspace to completely drain away from the building footprint preventing standing water from accumulating. QG recommends all stormwater catchments (new or existing) be tightlined (piped) away from structures to an existing catch basin, stormwater system, established channel, or approved outfall to be released using appropriate energy-dissipating features at the outfall to minimize point erosion. Roof and footing drains should be tightlined separately or should be gathered in an appropriately sized catch basin structure and redistributed collectively. If storm drains are incorporated for impervious flatworks (driveways, sidewalks, etc.) collected waters should also be discharged according to the above recommendations. Appropriate measures should be taken by the site designer to consider and allow for an adequate emergency outfall location in the event of a future record stormwater fall that cannot be anticipated.

4.0 CONSTRUCTION RECOMMENDATIONS

4.1 EARTHWORK

4.1.1 GRADING & EXCAVATION

A grading plan was not available to QG at the time of this report. However, based on provided conceptual plans, this study assumes finished site grade will approximate current grade. Therefore, depths referred to in this report are considered roughly equivalent to final depths. Excavations can generally be performed with conventional earthmoving equipment such as bulldozers, scrapers, and excavators.

4.1.2 SUBGRADE EVALUATION & PREPARATION

After excavations have been completed to the planned subgrade elevations, but before placing fill or structural elements, the exposed subgrade should be evaluated under the part-time observation and guidance of a QG representative.

The special inspection firm should continuously evaluate all backfilling. 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.

4.1.3 SITE PREPARATION, EROSION CONTROLL, WET WEATHER

Any silty or organic rich native soils may be moisture-sensitive and become soft and difficult to traverse with construction equipment when wet. During wet weather, the contractor should take measures to protect any exposed soil subgrades, limit construction traffic during earthwork activities, and limit machine use only to areas undergoing active preparation.

Once the geotechnical engineer has approved the 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 the 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 runoffs 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.

QG recommends earthwork activities take place during the summer dry season.

4.2 STRUCTURAL FILL MATERIALS AND COMPACTION

4.2.1 MATERIALS

All material placed below structures or pavement areas should be considered structural fill. Excavated native soils are not considered suitable for reuse as structural fill. Imported material should be used as structural fill. Care should be taken by the earthwork contractor during grading to avoid contaminating stockpiled soils that are planned for reuse as structural fill with native organic materials. Frozen soil is not suitable for use as structural fill. Fill material may not be placed on frozen soil.

Structural fill material shall be free of deleterious materials, have a maximum particle size of 4 inches, and be compactable to the required compaction level. Imported structural fill material should conform to the WSDOT manual Section 9-03.14(1) Gravel Borrow, or an approved alternative import material. 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.

Imported materials utilized for trench back fill shall conform to Section 9-03.19, Trench Backfill, 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)*. Imported materials utilized as grade fill beneath roads shall conform to WSDOT Section 9-03.10, Gravel Base.

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.

Soils with fines content near or greater than 10% fines content may likely be moisture sensitive and become difficult to use during wet weather. Care should be taken by the earthwork contractor during grading to avoid contaminating stockpiled soils that are planned for reuse as structural fill with native organic materials.

The contractor should submit samples of each of the required earthwork materials to the materials testing lab 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.

4.2.2 FILL PLACEMENT AND COMPACTION

For lateral and bearing support, structural fill placement below footings shall extend at minimum a distance past each edge of the base of the footing equal to the depth of structural fill placed below the footing [i.e., extending at least a 1H:1V past both the interior and the exterior of the concrete footing].

Prior to placement and compaction, structural fill should be moisture conditioned to within 3 percent of its optimum moisture content. Loose lifts of structural fill shall not exceed 12 inches in thickness. All structural fill shall be compacted to a firm 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 & wall backfill (upper 2 feet): 95 Percent
- Pavement Subgrades & wall backfill (below 2 feet): 90 Percent
- Utility Trenches (upper 4 feet): 95 Percent
- Utility Trenches (below 4 feet): 90 Percent

A sufficient number of tests should be performed to verify the 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.

Jetting or flooding is not a substitute for mechanical compaction and should not be allowed.

4.3 TEMPORARY EXCAVATIONS AND TRENCHES

All excavations and trenches 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 QG is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred. The contractor shall be responsible for the safety of personnel working in utility trenches. Given that steep excavations in native soils 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. Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed near the top of any excavation.

Temporary excavations and trenches should be protected from the elements by covering them 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.

5.0 SPECIAL INSPECTION

The recommendations made in this report assume that an adequate program of tests and observations will be made throughout 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 cutslopes and shoring if needed,
- Consultation as necessary during construction.

QG recommends that we be retained for construction phase soils testing and periodic earthwork observation in accordance with the local code requirements. We also strongly recommend that QG be retained as the project Geotechnical Engineering Firm of Record (GER) during the construction of this project to perform periodic supplementary geotechnical observations and review the special inspectors reports during construction.

Our knowledge of the project site and the design recommendations contained herein will be of great 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 would be pleased to meet with you at your convenience to discuss the *Time & Materials* scope and cost for these services.

6.0 LIMITATIONS

Upon acceptance and use of this report, and its interpretations and recommendations, the user shall agree to indemnify and hold harmless QG, including its owners, employees and subcontractors, from any adverse effects resulting from development and occupation of the subject site. Ultimately, it is the owner's choice to develop and live in such an area of possible geohazards (which exist in perpetuity across the earth in one form or another), and therefore the future consequences, both anticipated and unknown, are solely the responsibility of the owner. By using this report for development of the subject property, the owner must accept and understand that it is not possible to fully anticipate all inherent risks of development. The recommendations provided above are intended to reduce (but may not eliminate) such risks.

This report does not represent a construction specification or engineered plan and shall not be used or referenced as such. The information included in this report should be considered supplemental to the requirements contained in the project plans & specifications and should be read in conjunction with the above referenced information. The selected recommendations presented in this report are intended to inform only the specific corresponding subjects. All other requirements of the above-mentioned items remain valid, unless otherwise specified.

Recommendations contained in this report are based on our understanding of the proposed development and construction activities, field observations and explorations, and 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 differ from those described herein, or if the scope of the proposed construction changes from that described in this report, QG should be notified immediately in order to review and provide supplemental recommendations.

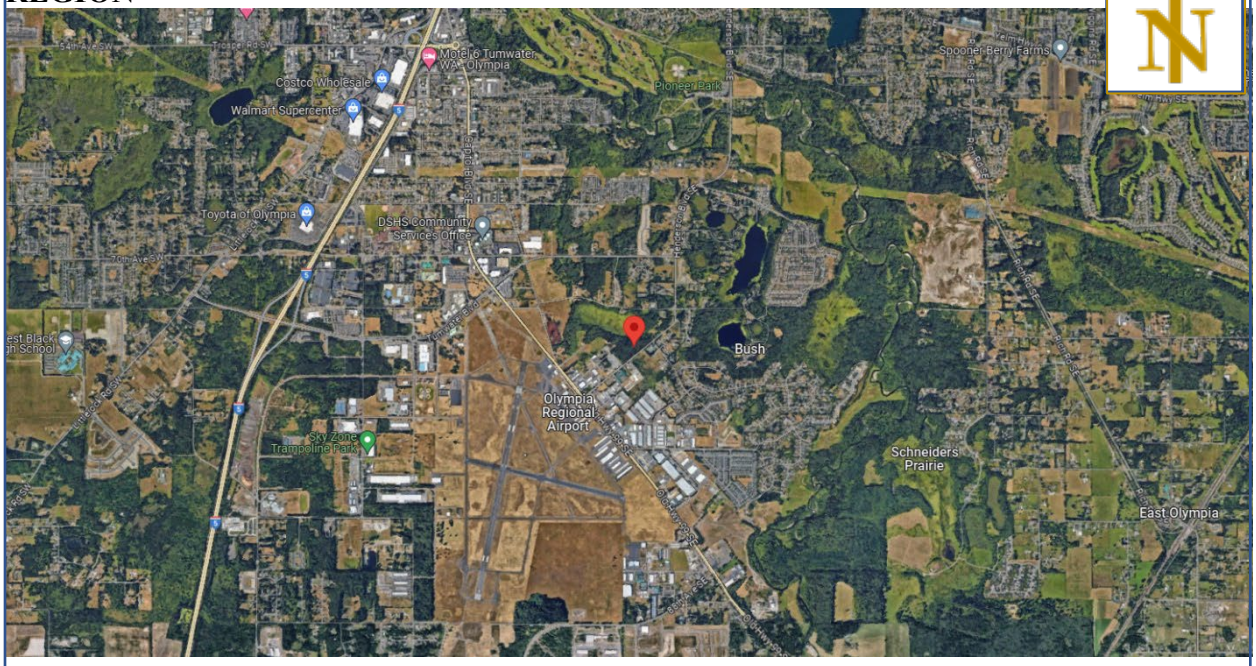
The findings of this study are limited by the level of scope applied. We have prepared this report in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the subject region. No warranty, expressed or implied, is made. The recommendations provided in this report assume that an adequate program of tests and observations will be conducted by a WABO approved special inspection firm 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.

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, QG 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 QG 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 QG from any claim or liability associated with such unauthorized use or non-compliance. We recommend that QG 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.

Appendix A. Region & Vicinity Maps

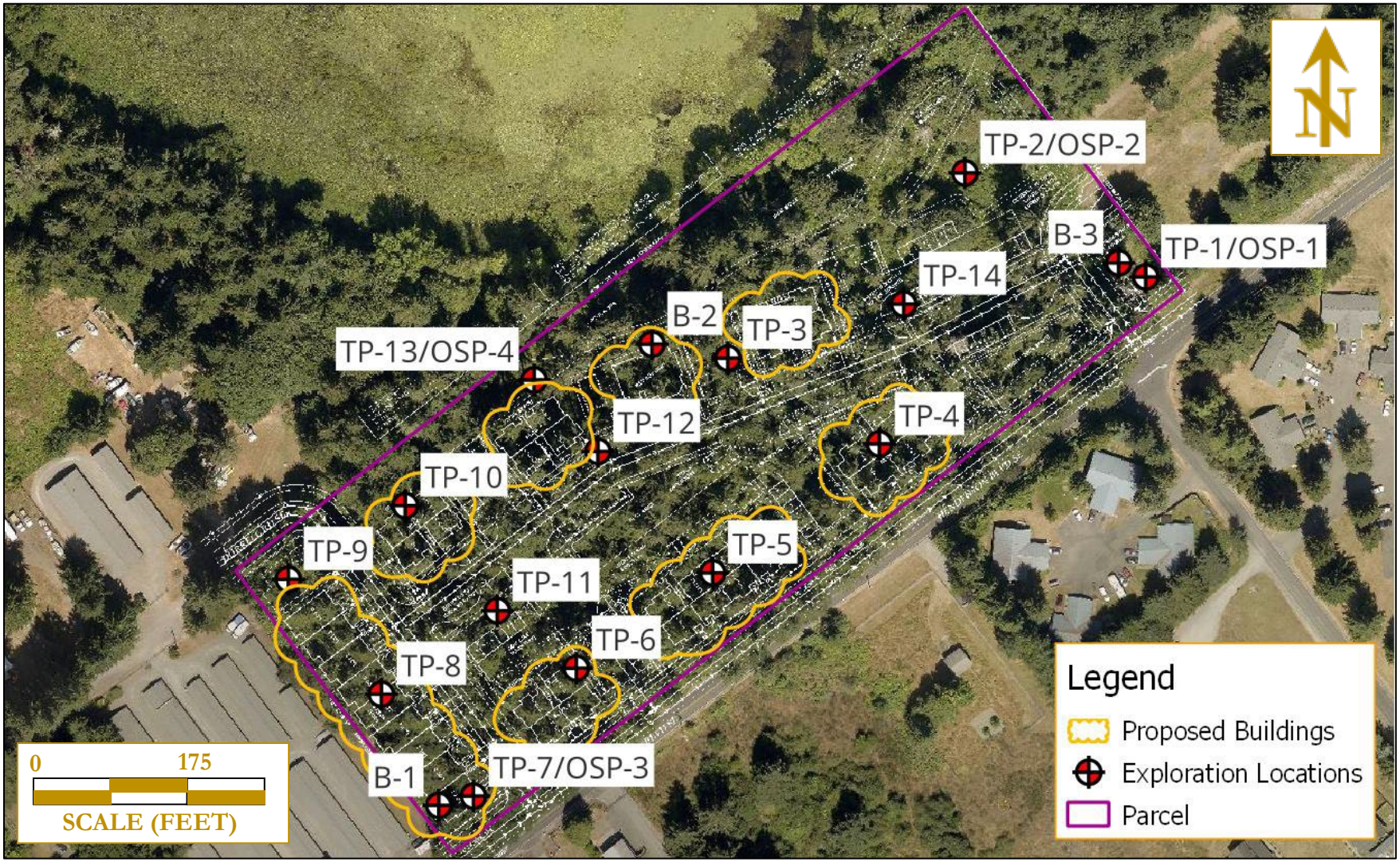
REGION



VICINITY

Quality Geo NW, PLLC	**Site Region** Henderson Blvd Apts Geo	Source: Google Imagery, 2024 **Scale & Locations are approx.** **Not for Construction**	**Figure 1**

Appendix B. Exploration Map



Quality Geo NW, PLLC	**Site Map** Henderson Blvd Apts Geo	Source: Thusrton Co. GIS, 2024 **Scale & Locations are approx.** **Not for Construction**	**Figure 2**

Appendix C. Exploration Logs

Test Pit TP-1

Location: Proposed stormwater facility, NE area of site
Approximate Elevation: 188 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	1.5	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
1.5	-	3.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
3.0	-	6.0	SP-SM	Tan silty SAND (medium dense, moist) (weathered recessional outwash)
6.0	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.
Piezometer set to 9.5 feet below existing grades.

Test Pit TP-2

Location: Proposed stormwater facility, N area of site
Approximate Elevation: 184 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	1.5	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
1.5	-	6.0	SM	Brown silty fine SAND (loose to medium dense, moist) (weathered recessional outwash)
6.0	-	7.5	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
7.5	-	9.0	SP	Gray fine SAND with silt (medium dense, moist) (recessional outwash)
9.0	-	10.0	SM	Golden brown silty fine SAND (dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.
Piezometer set to 9.5 feet below existing grades.

Logged by: AES **Excavated on: October 9, 2023**

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Test Pit Logs
Proposed Multi-Family Development
7501 Henderson Boulevard Southeast
Tumwater, Washington
PN: 12711110300

DocID: DJLInvestments.HendersonMF.F	Jun 2024	Figure A-2

Test Pit TP-3

Location: Proposed 3-story building, N area of site
Approximate Elevation: 184 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	3.0	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
3.0	-	6.0	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
6.0	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.

Test Pit TP-4

Location: Proposed 3-story building, E area of site
Approximate Elevation: 187 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	2.0	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
2.0	-	4.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
4.0	-	5.0	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
5.0	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.

Logged by: AES **Excavated on: October 9, 2023**

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Test Pit TP-5

Location: Proposed 3-story building, E central area of site
Approximate Elevation: 189 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	2.0	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
2.0	-	4.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
4.0	-	5.0	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
5.0	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.

Test Pit TP-6

Location: Proposed 3-story building, S area of site
Approximate Elevation: 189 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	2.0	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
2.0	-	3.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
3.0	-	7.0	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
7.0	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.

Logged by: AES **Excavated on: October 9, 2023**

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Test Pit TP-7

Location: Proposed stormwater facility, SW area of site
Approximate Elevation: 190 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	2.0	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
2.0	-	4.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
4.0	-	7.5	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
7.5	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.
Piezometer set to 9.5 feet below existing grades.

Test Pit TP-8

Location: Proposed single story building, SW area of site
Approximate Elevation: 189 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	2.0	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
2.0	-	4.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
4.0	-	7.0	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
7.0	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.

Logged by: AES **Excavated on: October 9, 2023**

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Test Pit TP-9

Location: Proposed open space, SW area of site
Approximate Elevation: 189 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	2.0	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
2.0	-	4.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
4.0	-	6.5	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
6.5	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.

Test Pit TP-10

Location: Proposed 3-story building, W area of site
Approximate Elevation: 188 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	2.0	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
2.0	-	4.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
4.0	-	6.5	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
6.5	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.

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Test Pit TP-11

Location: Proposed 2-story building
Approximate Elevation: 189 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	2.0	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
2.0	-	4.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
4.0	-	6.5	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
6.5	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.

Test Pit TP-12

Location: Near proposed clubhouse/pool building, central area of site
Approximate Elevation: 186 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	2.0	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
2.0	-	4.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
4.0	-	7.0	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
7.0	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.

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Test Pit TP-13

Location: Proposed stormwater facility, W area of site
Approximate Elevation: 183 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	2.0	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
2.0	-	4.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
4.0	-	6.0	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
6.0	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.
Piezometer set to 9.5 feet below existing grades.

Test Pit TP-14

Location: E area of site
Approximate Elevation: 186 feet

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Forest duff
0.5	-	1.5	SM	Dark brown silty fine SAND, rootzone (loose, moist) (weathered recessional outwash)
1.5	-	3.0	SM	Brown silty fine SAND (loose, moist) (weathered recessional outwash)
3.0	-	5.0	SM	Tan silty fine SAND (medium dense, moist) (weathered recessional outwash)
5.0	-	10.0	SP-SM	Gray fine SAND with silt (medium dense, moist) (recessional outwash)

Terminated at 10.0 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed.

Logged by: AES **Excavated on: October 9, 2023**

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LOG OF BORING — B-1

Proposed Multi-Family Residence

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company:	Boretec1, Inc.	Logged By:	AES
Drilling Method:	HSA	Drilling Date:	10/25/2023
Drilling Rig:	EC 95 Track Drill	Datum:	NAVD 88
Sampler Type:	Split Spoon	Elevation:	190
Hammer Type:	Cathead	Termination Depth:	26.5
Hammer Weight:	140 lbs	Latitude:	46.9780937
		Longitude:	-122.8919362

Notes: Well Tag: BNV 640

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts	Sampler	Symbol	Test Results	Groundwater
0	190		Forest Duff				Plastic Limit — Liquid Limit; % Fines (<0.075mm) ◇; % Water Content ●; Penetration - ▲ (blows per foot)	NE
			Dark brown silty SAND (loose, moist) (SM) (weathered recessional outwash)					
			Brown silty SAND (loose, moist) (SM) (weathered recessional outwash)	4 4 5				
5	185		Tan silty SAND (medium dense, moist) (SM) (weathered recessional outwash)	6 7 8				
			Gray poorly graded SAND with silt (medium dense, moist) (SP-SM) (recessional outwash)					
10	180			7 7 6				
15	175	Becomes dense	Silty SAND (SM)	10 15 13				
20	170			9 13 15				
25	165	density decreases		5 8 7				
			(Termination Depth - 10/25/2023)					
30	160							

Topsoil | Silty sand | Poorly graded sand with silt

Sheet 1 of 1 | JOB: DJLInvestments.HendersonMF | FIG.

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LOG OF BORING — B-2

Proposed Multi-Family Residence

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company:	Boretec1, Inc.	Logged By:	AES
Drilling Method:	HSA	Drilling Date:	10/25/2023
Drilling Rig:	EC 95 Track Drill	Datum:	NAVD 88
Sampler Type:	Split Spoon	Elevation:	182
Hammer Type:	Cathead	Termination Depth:	26.5
Hammer Weight:	140 lbs	Latitude:	46.9797802
		Longitude:	-122.8906705

Notes: Well Tag: BNV 641

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts	Sampler	Symbol
0	180		Forest Duff			
			Dark brown silty SAND (loose, moist) (SM) (weathered recessional outwash)			
			Brown silty SAND (loose, moist) (SM) (weathered recessional outwash)	4 3 5		
5	175		Tan silty SAND (loose, moist) (SM) (weathered recessional outwash)	4 6 6		
			Gray poorly graded SAND with silt (medium dense, moist) (SP-SM) (recessional outwash)	5 6 7		
10	170			6 7 8		
15	165		Golden brown poorly graded SAND with silt (medium dense, moist) (SP-SM) (recessional outwash)	5 6 7		
20	160		Gray, orange iron oxide stained coarse SAND with silt (medium dense, moist) (SP-SM) (recessional outwash)	6 8 10		
25	155	becomes wet		7 8 5		
			(Termination Depth - 10/25/2023)			
30	150					

Test Results: Plastic Limit — Liquid Limit; % Fines (<0.075mm) ◇; % Water Content ●

Penetration - ▲ (blows per foot) 0 10 20 30 40

Groundwater: ATD

Topsoil | Silty sand | Poorly graded sand with silt

Sheet 1 of 1 | JOB: DJLInvestments.HendersonMF | FIG.

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LOG OF BORING — B-3

Proposed Multi-Family Residence

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company:	Boretec1, Inc.	Logged By:	AES
Drilling Method:	HSA	Drilling Date:	10/25/2023
Drilling Rig:	EC 95 Track Drill	Datum:	NAVD 88
Sampler Type:	Split Spoon	Elevation:	188
Hammer Type:	Cathead	Termination Depth:	41.5
Hammer Weight:	140 lbs	Latitude:	46.9780937
		Longitude:	-122.8919362

Notes: Well Tag: BNV 642

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts	Sampler	Symbol	Test Results: Plastic Limit — Liquid Limit; % Fines (<0.075mm) ◇; % Water Content ●; Penetration - ▲ (blows per foot)	Groundwater
0	188		Forest Duff					
			Dark brown silty SAND (loose, moist) (SM) (weathered recessional outwash)	4 4 3				
5	185		Tan silty SAND (loose, moist) (SM) (weathered recessional outwash)	4 4 4				
			Gray poorly graded SAND with silt (medium dense, moist) (SP-SM) (recessional outwash)	4 5 8				
10	180			3 4 6				
15	175			7 8 7				
20	170			7 6 8				
25	165			5 9 9				
30	160							

Topsoil | Silty sand | Poorly graded sand with silt

Sheet 1 of 2 | JOB: DJLInvestments.HendersonMF | FIG.

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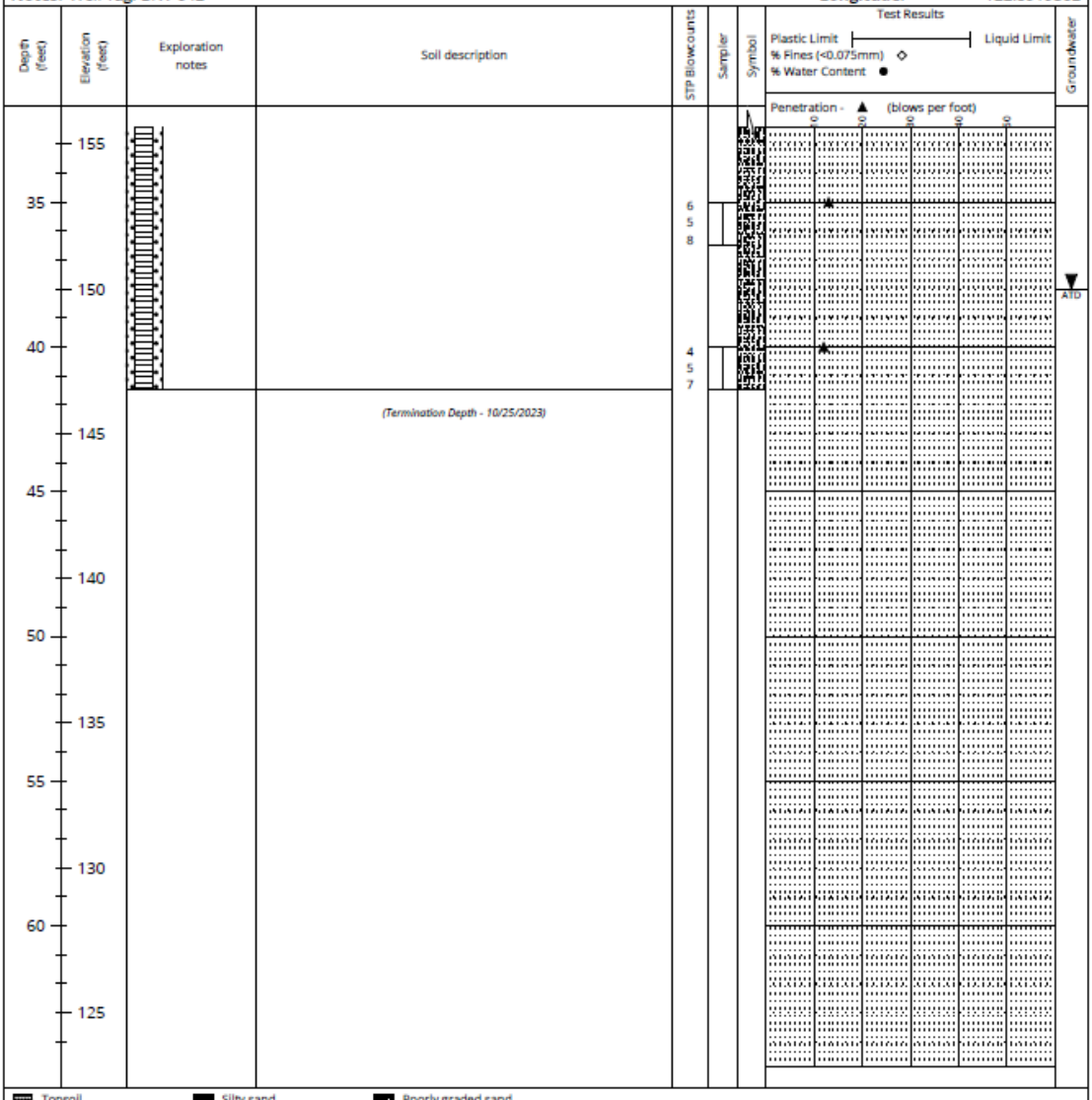
LOG OF BORING — B-3

Proposed Multi-Family Residence

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company:	Boretec1, Inc.	Logged By:	AES
Drilling Method:	HSA	Drilling Date:	10/25/2023
Drilling Rig:	EC 95 Track Drill	Datum:	NAVD 88
Sampler Type:	Split Spoon	Elevation:	188
Hammer Type:	Cathead	Termination Depth:	41.5
Hammer Weight:	140 lbs	Latitude:	46.9780937
		Longitude:	-122.8919362

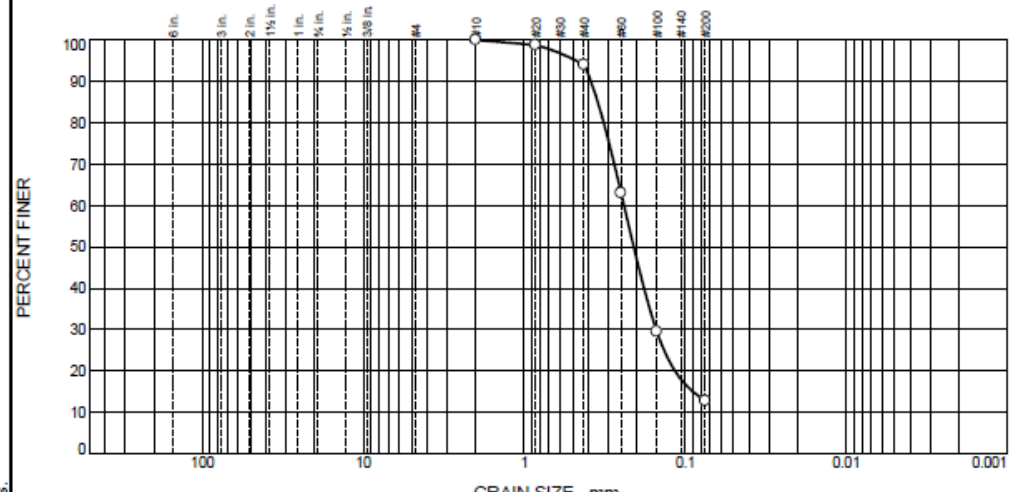
Notes: Well Tag: BNV 642



Sheet 2 of 2 | JOB: DJLInvestments.HendersonMF | FIG.

Appendix D. Laboratory Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	6.0	81.2	12.8	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	98.8		
#40	94.0		
#60	63.0		
#100	29.5		
#200	12.8		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients

D_{90}= 0.3849 D_{85}= 0.3490 D_{60}= 0.2397
D_{50}= 0.2087 D_{30}= 0.1515 D_{15}= 0.0893
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 9.1%

Date Received: 10/9/23 Date Tested: 10/19/23
Tested By: MAW
Checked By: KSS
Title: PM

Location: TP-1, S-1 Date Sampled: 10/9/23
Sample Number: 104412 Depth: 0.5-3'

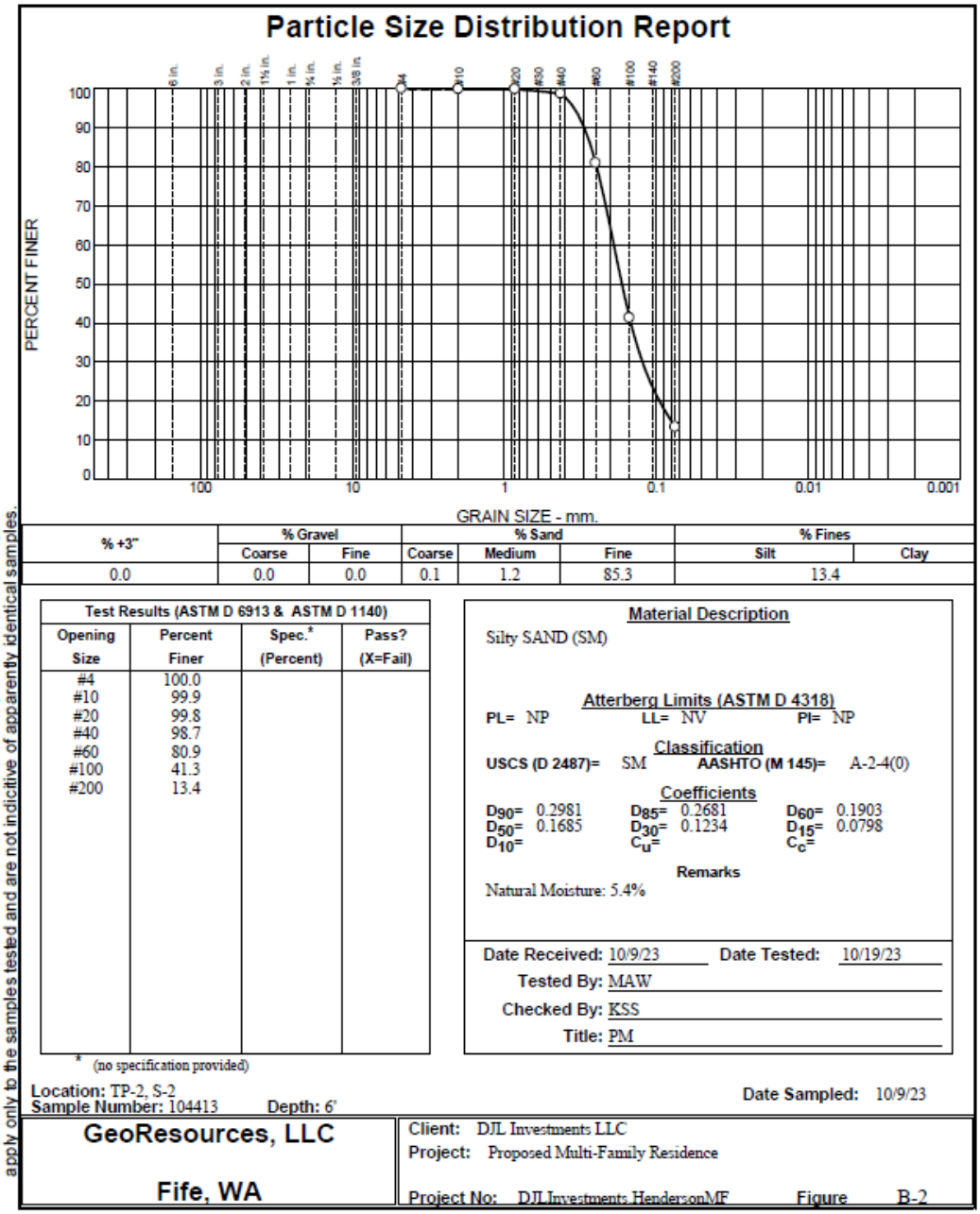
GeoResources, LLC

Fife, WA

Client: DJL Investments LLC
Project: Proposed Multi-Family Residence
Project No: DJLInvestments.HendersonMF Figure B-1

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ Checked By: _____



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.2	85.3	13.4	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	99.8		
#40	98.7		
#60	80.9		
#100	41.3		
#200	13.4		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients

D_{90}= 0.2981 D_{85}= 0.2681 D_{60}= 0.1903
D_{50}= 0.1685 D_{30}= 0.1234 D_{15}= 0.0798
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 5.4%

Date Received: 10/9/23 Date Tested: 10/19/23
Tested By: MAW
Checked By: KSS
Title: PM

Location: TP-2, S-2 Date Sampled: 10/9/23
Sample Number: 104413 Depth: 6'

GeoResources, LLC

Fife, WA

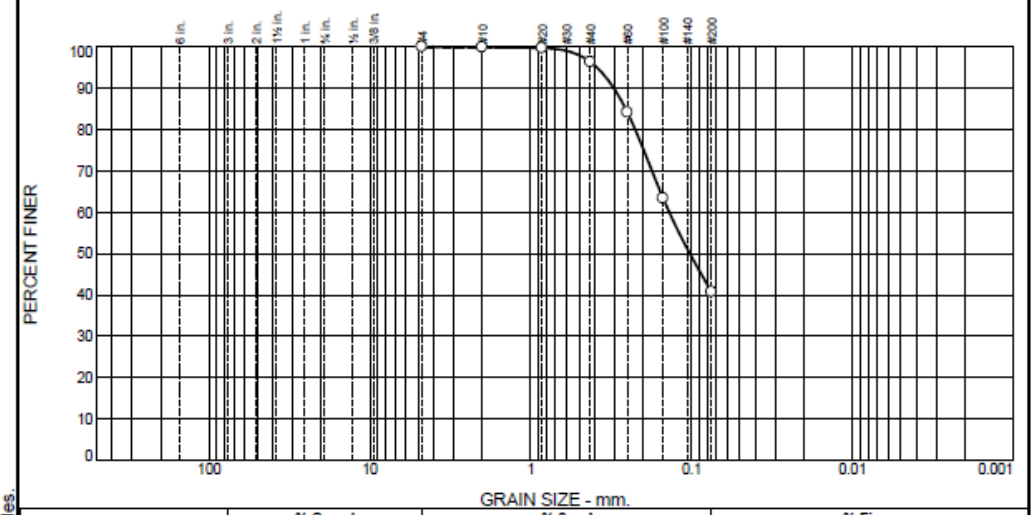
Client: DJL Investments LLC
Project: Proposed Multi-Family Residence

Project No: DJLInvestments HendersonMF Figure B-2

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ Checked By: _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	3.6	55.6	40.7	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	99.7		
#40	96.3		
#60	84.1		
#100	63.3		
#200	40.7		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-4(0)

Coefficients

D_{90}= 0.3041 D_{85}= 0.2566 D_{60}= 0.1375
D_{50}= 0.1024 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 16.3%

Date Received: 10/9/23 Date Tested: 10/19/23

Tested By: MAW

Checked By: KSS

Title: PM

Location: TP-2, S-4 Date Sampled: 10/9/23
Sample Number: 104414 Depth: 9-10'

GeoResources, LLC

Fife, WA

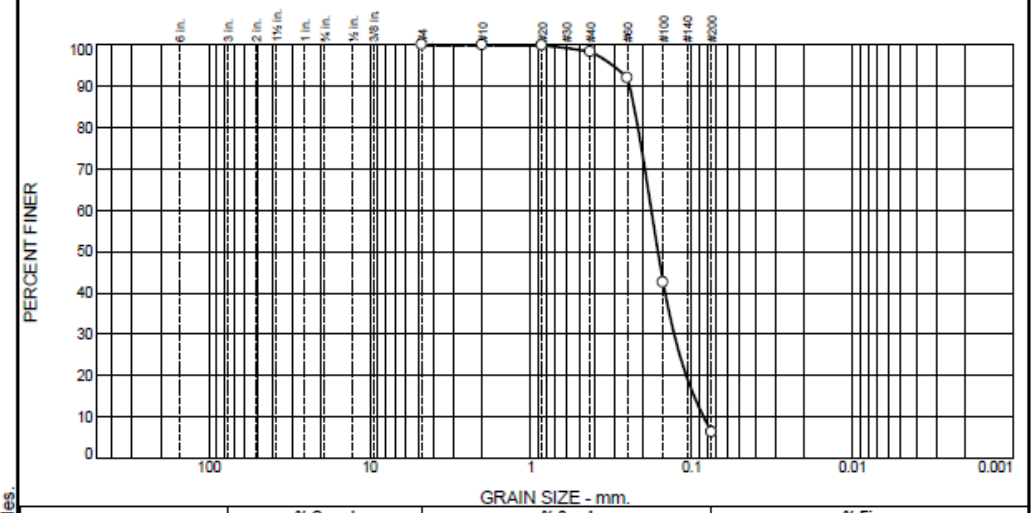
Client: DJL Investments LLC
Project: Proposed Multi-Family Residence

Project No: DJLInvestments HendersonMF Figure B-3

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ Checked By: _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.6	92.0	6.3	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	99.8		
#40	98.3		
#60	92.0		
#100	42.5		
#200	6.3		

* (no specification provided)

Material Description

Poorly graded SAND with silt (SP-SM)

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= A-3

Coefficients

D_{90}= 0.2426 D_{85}= 0.2274 D_{60}= 0.1778
D_{50}= 0.1619 D_{30}= 0.1282 D_{15}= 0.0963
D_{10}= 0.0839 C_u= 2.12 C_c= 1.10

Remarks

Natural Moisture: 6%

Date Received: 10/9/23 Date Tested: 10/19/23
Tested By: MAW
Checked By: KSS
Title: PM

Location: TP-13, S-3 Date Sampled: 10/9/23
Sample Number: 104415 Depth: 9'

GeoResources, LLC

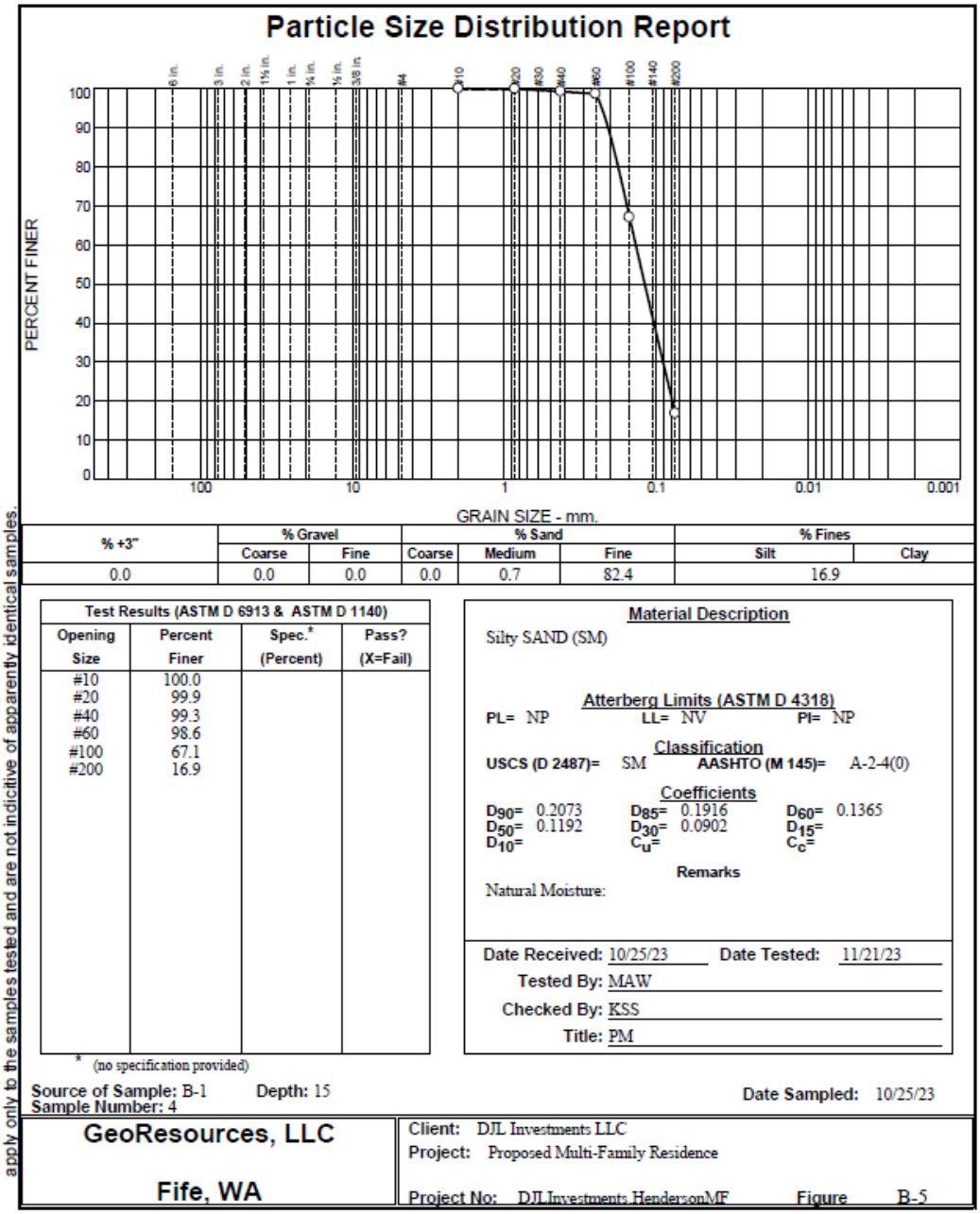
Fife, WA

Client: DJL Investments LLC
Project: Proposed Multi-Family Residence

Project No: DJLInvestments HendersonMF Figure B-4

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ Checked By: _____



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.7	82.4	16.9	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#40	99.3		
#60	98.6		
#100	67.1		
#200	16.9		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SM AASHTO (M 145)= A-2-4(0)

Coefficients

D_{90}= 0.2073 D_{85}= 0.1916 D_{60}= 0.1365
D_{50}= 0.1192 D_{30}= 0.0902 D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture:

Date Received: 10/25/23 Date Tested: 11/21/23
Tested By: MAW
Checked By: KSS
Title: PM

Source of Sample: B-1 Depth: 15
Sample Number: 4

Date Sampled: 10/25/23

GeoResources, LLC

Fife, WA

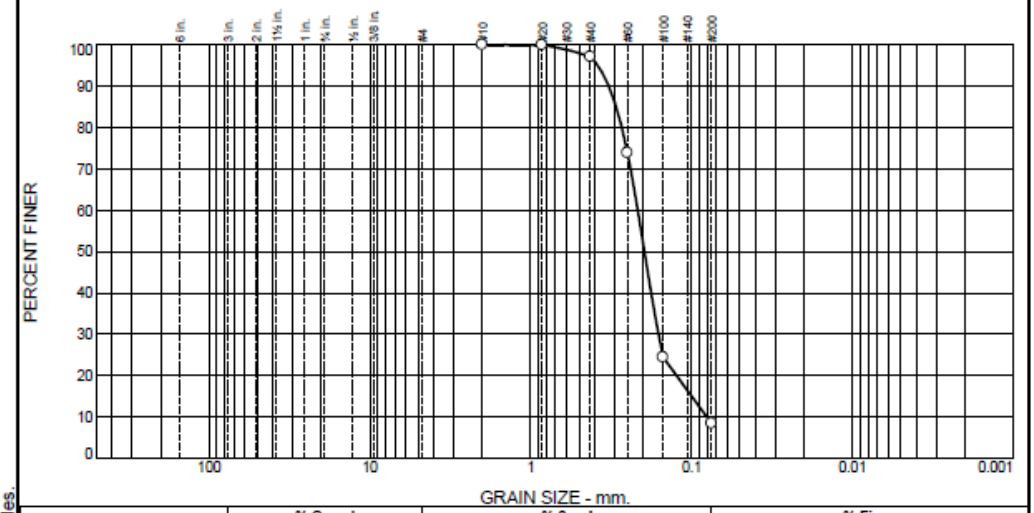
Client: DJL Investments LLC
Project: Proposed Multi-Family Residence

Project No: DJLInvestments HendersonMF Figure B-5

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ Checked By: _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.9	88.7	8.4	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#40	97.1		
#60	73.9		
#100	24.5		
#200	8.4		

* (no specification provided)

Material Description

Golden brown poorly graded silty SAND (medium dense, moist) (SP-SM) (recessional outwash)

Atterberg Limits (ASTM D 4318)

PL= NP LL= NV PI= NP

Classification

USCS (D 2487)= SP-SM AASHTO (M 145)= A-3

Coefficients

D_{90}= 0.3270 D_{85}= 0.2943 D_{60}= 0.2158
D_{50}= 0.1961 D_{30}= 0.1605 D_{15}= 0.0996
D_{10}= 0.0802 C_u= 2.69 C_c= 1.49

Remarks

Natural Moisture: 6.7%

Date Received: 10/25/23 Date Tested: 11/21/23
Tested By: MAW
Checked By: KSS
Title: PM

Source of Sample: B-2 Depth: 15
Sample Number: 5
Date Sampled: 10/25/23

GeoResources, LLC

Fife, WA

Client: DJL Investments LLC
Project: Proposed Multi-Family Residence
Project No: DJLInvestments HendersonMF Figure B-6

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ Checked By: _____