January 13, 2021 KA Project No. 062-20029

Abbey Road Group Land Development Services Company, LLC
P.O. Box 1224
Puyallup, Washington 98371

Attn: Mr. Gil Hulsmann Email: Gil.Hulsmann @AbbeyRoadgroup.com
Tel: (253) 435-3699

Reference: Geotechnical Engineering Investigation
Proposed 10th Street Development Project
APNs 7845000591 and 7845000622
Puyallup, Washington

Dear Mr. Hulsmann,

In accordance with your request, we have completed a Geotechnical Engineering Investigation for the referenced site. The results of our investigation are presented in the attached report.

If you have any questions, or if we can be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Theresa R. Nunan

Theresa R. Nunan
Project Manager

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED 10TH STREET DEVELOPMENT PROJECT
ASSESSOR PARCEL NUMBERS (APNS): 7845000591 AND 7845000622
PUYALLUP, WASHINGTON

PROJECT NO. 062-20029
JANUARY 13, 2021

Prepared for:

ABBEY ROAD GROUP LAND DEVELOPMENT SERVICES COMPANY, LLC
ATTN: MR. GIL HULSMANN
P.O. BOX 1224
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GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED 10th STREET DEVELOPMENT PROJECT
APNS 7845000591 AND 7845000622
PUYALLUP, WASHINGTON

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed Cascade Shaw Road Development project located on APNs 7845000591 and 7845000622 in Puyallup, Washington, as shown on the Vicinity Map in Figure 1. Discussions regarding site conditions are presented in this report, together with conclusions and recommendations pertaining to site preparation, excavation, foundations, structural fill, utility trench backfill, concrete slabs and exterior flatwork, drainage, erosion control, and pavements.

A site plan showing the approximate location of the soil boring/monitoring well is presented following the text of this report in Figure 2. A description of the field investigation and laboratory testing, as well as the exploratory soil boring and well logs, is presented in Appendix A. Appendix B contains a guide to aid in the development of earthwork specifications. Pavement design guidelines are presented in Appendix C. The recommendations in the main text of the report have precedence over the more general specifications in the appendices.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the subsurface soil and groundwater conditions at the site, to develop geotechnical engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and earthwork construction.

Our scope of services was performed in general accordance with our proposal number G19004WAT for this project dated January 30, 2019 and included the following:

- An exploration of the subsurface soil and groundwater conditions by conducting one (1) soil boring using a subcontracted equipment operator and drill rig under the direction of a Krazan geotechnical engineer;
- Installation of one (1) groundwater monitoring well using a drilling subcontractor;

- A site plan showing the boring/monitoring well location, and comprehensive logs including soil stratification and classification, and groundwater levels where applicable;
- Recommended foundation type for the proposed structures;
- Recommendations for foundation design, including allowable foundation bearing pressure, anticipated settlements (both total and differential), coefficient of horizontal friction for footing design, and frost penetration depth;
- Recommendations for seismic design considerations including site coefficient and ground acceleration based on the 2015 IBC;
- Recommendations regarding suitability of the project site for onsite stormwater infiltration;
- Recommendations for structural fill materials, placement, and compaction;
- Recommendations for suitability of onsite soils as structural fill;
- Recommendations for temporary excavations;
- Recommendations for site drainage and erosion control;
- Recommendations for pavement design.

Environmental services, such as chemical analysis of soil and groundwater for possible environmental contaminants, were not included in our geotechnical engineering scope of services for this project.

PROPOSED CONSTRUCTION

We understand that the proposed development will include construction of two residential buildings, each housing four units, within the eastern portion of the site. A porous pavement parking area will be constructed, if feasible, in the western portion of the site with a paved entrance drive to access the site from 10th Street SE. A grass courtyard will separate the two buildings. Installation of the site utilities is planned along the access drive and within the courtyard area.

Site grading and building loads were unavailable at the time of this report. We have assumed that the residential buildings will be 1- to 2-story structures with a slab-on-grade floor system, with column and wall loads not exceeding 60 kips and 3 kips per lineal foot, respectively. We have assumed cut and fill thicknesses of no more than 2 feet will be required to attain final site grades.

At the time of this report, we do not have any details regarding the potential use of an onsite stormwater system, including the possible location(s) or type(s) of infiltration systems with the exception of proposed porous pavement.

SITE LOCATION AND DESCRIPTION

The subject property consists of two parcels, APNs 7845000591 and 7845000622, encompassing approximately 0.63 acres of land located approximately 300 feet northeast of the intersection of 10th Street SE and 7th Avenue SE, in Puyallup, Washington. Two residential buildings located within the southern portion of the site will be demolished to allow for construction of the new development. The remainder of the property is currently open fields covered in grass, with the northern portion of the site recently used agriculturally for growing pumpkins. Based on the topographic information presented on the Site Plan prepared by Abbey Road Group and dated December 17, 2018, the existing ground surface is fairly level and ranges between Elevation 47 and 48 feet.

GEOLOGIC SETTING

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

The Department of Natural Resources (DNR) Geologic Information Portal website indicates that the property is located in an area that is predominantly underlain by Quaternary alluvium (Qa), consisting of "interbedded silt, sandy silt, silty sand, sand, gravel, local areas of peat and clay". The DNR classification is consistent with the soils encountered during our field exploration of the site.

FIELD INVESTIGATION

One (1) exploratory boring and one (1) groundwater monitoring well was completed to evaluate the subsurface soil and groundwater conditions at the project site. The soil test boring was advanced and monitoring well was installed on December 11, 2020, using a subcontracted driller and drill rig under the direction of a Krazan geotechnical engineer. The soil boring, designated B-1, was advanced to a depth of about 21.5 feet below the existing ground surface (bgs) using a Geoprobe 7800-DH103 drill rig equipped with hollow stem augers. A field engineer from Krazan and Associates was present during the exploration, continuously examined and visually classified the soils in general accordance with the Unified Soil Classification System (USCS), and maintained a log of the exploration. Representative samples of the soils encountered in the soil boring were collected and sealed in plastic bags. These samples were transported to our laboratory for further examination and testing.

One monitoring well, designated MW-1, was installed within borehole B-1 at a depth of 15 feet bgs. The 21.5-foot deep borehole was backfilled with appropriate materials to a depth of 16 feet, then with filter sand to a depth of 15 feet. A 12-foot long section of slotted PVC pipe attached to a 5-foot section of solid PVC pipe was inserted into the borehole with 2-feet of the solid pipe sticking above ground. The annular space between the pipe and the augers was backfilled with filter sand to a depth of 2 feet bgs, followed by bentonite chips to the ground surface. A steel monument pipe was then installed over the monitoring well and cemented in-place to protect the well from unauthorized access.

The approximate location of the boring/monitoring well is shown on the Site Plan in Figure 2. A description of the field investigation, as well as logs of the soil test boring and monitoring well, are included in Appendix A.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Our field exploration exposed topsoil overlying alluvial soils to the explored depth of the boring. A detailed log of the boring is presented in Appendix A.

The soil boring initially encountered approximately 2 inches of grass underlain by 10 inches of brown silty sand topsoil. Brown with grey mottling silty sand was encountered beneath the topsoil layer to a depth of about 2.5 feet bgs. The silty sand (SM) was in a very loose condition based on a Standard Penetration Test resistance, N-value, of 3 blows per foot. Water bearing black, poorly graded, fine to medium grained sand (SP) was encountered beneath the silty sand and extended to the termination depth of the soil boring at about 21.5 feet bgs. Based on the N-values, the sand was in a medium dense condition.

LABORATORY TEST RESULTS

Gradation with hydrometer tests were conducted on representative samples of the soils for classification purposes and for determination of engineering properties. The gradation results are graphically depicted as Figures A-3 and A-4 in Appendix A. For additional information about the soils encountered, please refer to the soil boring log in Appendix A.

GROUNDWATER

Groundwater was encountered in the soil boring during drilling at a depth of about 2.25 feet bgs. Monitoring well MW-1, installed on the site, was read on December 14 and 23, 2020 and January 3, 2021, with groundwater levels indicated at 1.7, 0.4 feet and 0.9 feet bgs, respectively.

It should be recognized that groundwater elevations may fluctuate with time. The groundwater level will also be dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, water levels at the time of the field investigation may be different from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

GEOLOGIC HAZARDS

Erosion Concern/Hazard

The Natural Resources Conservation Services (NRCS) map for Pierce County Area, Washington (WA653), classifies the site area as Puyallup fine sandy loam. The NRCS classifies the fine sandy loam as Hydrologic Soil Group A. Group A soils are designated as having low potential for erosion in a disturbed state.

It has been our experience that soil erosion can be minimized through landscaping and surface water runoff control. Typically, erosion of exposed soils will be most noticeable during periods of rainfall and may be controlled by the use of normal temporary erosion control measures, i.e., silt fences, hay bales, mulching, control ditches or diversion trenching, and contour furrowing. Erosion control measures should be in place before the onset of wet weather.

Seismic Hazard

The 2015 International Building Code (IBC), Section 1613.3.2, refers to Chapter 20 of 2010 ASCE 7 for Site Class Definitions.

It is our opinion that the overall soil profile corresponds to Site Class D as defined by Table 20.3-1 "Site Class Definitions," according to the 2010 ASCE 7 Standard. Site Class D applies to a "stiff soil" profile. The seismic site class is based on a soil profile extending to a depth of 100 feet. The soil boring conducted on this site extended to a maximum depth of 21.5 feet and this seismic site class designation is based on the assumption that similar soil conditions continue below the depth explored.

We referred to the ATC Hazards by Location Website and 2015 IBC to obtain values for S_S, S_{MS}, S_{DS}, S_1, S_{M1}, S_{D1}, F_a, and F_v. The ATC website includes the most updated published data on seismic conditions. The seismic design parameters for this site are as follows:

Table 1: Seismic Design Parameters
(Reference: 2015 IBC Section 1613.3.2, ASCE 7-10, and ATC)

Seismic Item	Value
Site Coefficient F_a	1.00
S_s	1.249
S_{MS}	1.249
S_{DS}	0.833
Site Coefficient F_v	1.52
S_1	0.480
S_{M1}	0.729
S_{D1}	0.486

Liquefaction Hazard: Additional seismic considerations include liquefaction potential and amplification of ground motions by loose/soft soil deposits. Liquefaction usually occurs under vibratory conditions such as those induced by seismic events. The liquefaction potential is highest for loose sand with a high groundwater table. Soil liquefaction is a state where soil particles lose contact with each other and become suspended in a viscous fluid. This suspension of the soil grains results in a complete loss of strength as the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sand.

We have reviewed "Liquefaction Susceptibility Map of Pierce County, Washington" by Stephen P. Palmer et al., (WA DNR, 2004). The map indicates that the site area is located in a zone of high liquefaction susceptibility. However, at the client's request, we have not conducted a liquefaction analysis for the soils encountered at the project site.

CONCLUSIONS AND RECOMMENDATIONS

General

It is our opinion that the planned improvements at this site are feasible, provided that the geotechnical engineering recommendations presented in this report are included in the project design and implemented during construction. Based on our exploration, it is our opinion that conventional spread foundations supported on medium dense or firmer native soils, or on structural fill extending to these soils, would be appropriate for the new buildings.

The surficial soils encountered on this site are considered highly moisture-sensitive and may disturb easily in wet conditions. We recommend that construction take place during the drier summer months, if possible. If construction is to take place during wet weather or if perched water conditions in drier months affect the subgrade soils, additional expenses and delays should be expected due to the wet conditions. Additional expenses could include the need for placing a blanket of rock spalls to protect exposed subgrade and construction traffic areas. The lateral extent and depth of rock spalls, if required, should be determined based on evaluation of the near surface soil conditions at the time of construction. Additional measures to minimize disturbance to the subgrade and near-surface soils may include the use of excavators equipped with wide tracks or use of smooth rather than toothed buckets to complete site grading. The prepared subgrade should be protected from construction traffic and surface water should be diverted around the prepared subgrade.

In our opinion, the onsite silty sand soils are not considered suitable for re-use as structural fill material due to their high silt content. The poorly graded black sand encountered beneath the silty sand may be re-used as structural fill. If soil types other than those revealed during our field exploration are encountered during construction, then Krazan should be consulted regarding the suitability of these soils for use as structural fill.

Site Preparation

General site clearing should include removal of any undocumented fill, organics, asphaltic concrete, abandoned utilities, structures, rubble, and rubbish. In addition, any septic tanks, underground storage tanks, debris pits, cesspools, or similar structures should be completely removed and backfilled with structural fill. After stripping operations, the new building and pavement areas should be visually inspected to identify any loose/soft areas. Any loose/soft areas should be removed to expose competent native soils and backfilled with structural fill. Additional recommendations for preparation of specific areas are provided in the Foundations, Pavement Design, and Floor Slabs and Exterior Flatwork sections of this report.

Existing Buildings: Two existing buildings are located on the project site. We understand that the existing buildings are supported on a shallow foundation system. The existing buildings and asphalt pavement will be demolished to allow for the new construction. Existing concrete footings should be completely removed within the footprint of the new building, and to a depth of at least 1-foot below the planned subgrade elevation in new pavement areas. Undocumented fill may be encountered within the building footprint during demolition of the existing buildings, particularly where foundations for the existing buildings are located. Undocumented fill, if encountered, should be removed in its entirety and the resulting depression backfilled with properly placed and compacted structural fill. Krazan & Associates should be onsite full-time during the demolition activities of the foundation system to document that all below-grade structures have been properly removed and backfilled with properly placed and compacted structural fill, and that the resulting debris from the demolition activities have been hauled off-site and not re-used as fill at any location on the property.

Existing Utilities: All existing utilities should be completely removed from within planned building areas. For any utility line to be considered acceptable to remain, i.e. be abandoned in-place, within the building footprint, the utility line must be completely filled with grout or sand-cement slurry, the ends outside the building area capped with concrete, and the existing trench backfill removed and replaced with properly placed and compacted structural fill. Assessment of the level of risk posed by a particular utility line to the structure will determine whether the utility may be abandoned in-place or needs to be completely removed. The risks associated with abandoning utilities in-place include the potential for future differential settlement of existing trench fills and/or potential ground loss into utility lines that are not completely filled with grout if the abandonment requirements stated above are not followed.

Based on our field exploration, the soils expected to be encountered within the upper 2.5 feet of the site during construction are considered extremely moisture sensitive and may disturb easily in wet conditions. During wet weather conditions, subgrade stability problems and grading difficulties may develop due to excess moisture, disturbance of sensitive soils, and/or the presence of perched groundwater. Construction during the extended periods of wet weather could result in the need to remove wet disturbed soils if they cannot be suitably compacted due to elevated moisture contents. Groundwater level readings obtained in the monitoring well MW-1 between December 11, 2020 and January 4, 2021 during the wet weather season indicated groundwater at depths at 0.4 to 2.25 feet bgs. The prepared subgrade should be protected from construction traffic and surface water should be diverted around the prepared subgrade. Soils that have become unstable may require drying and re-compaction or over-excavation and replacement with structural fill. If over-excavation is necessary, it should be confirmed through continuous monitoring and testing by a qualified geotechnical engineer or geologist. Selective drying may be accomplished by scarifying or windrowing surficial material during extended periods of dry, warm weather (typically during the summer months). If the soils cannot be dried back to a workable moisture condition, remedial measures may be required. These remedial measures could include placement of a blanket of rock spalls to protect exposed subgrade and construction traffic areas. The lateral extent and depth of rock spalls, if required, should be determined based on evaluation of the near surface soil conditions at the time of construction. Additional measures to minimize disturbance to the subgrade and near-surface soils may include the use of excavators equipped with wide tracks or use of smooth rather than toothed buckets to complete site grading.

General project site winterization should consist of the placement of aggregate base and the protection of exposed soils during the construction phase. It should be understood that even if Best Management Practices (BMP's) for wintertime soil protection are implemented and followed there is a significant chance that moisture disturbed soil mitigation work will still be required.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation are an integral part of our service, as acceptance of earthwork construction is dependent upon compaction and stability of the material. The geotechnical engineer may reject any material that does not meet compaction and stability requirements. Further recommendations, contained in this report, are predicated upon the assumption that earthwork construction will conform to the recommendations set forth in this section and in the Structural Fill Section.

Onsite Stormwater Infiltration

We understand that an onsite stormwater infiltration system was being considered for the proposed site. Groundwater was encountered at depths ranging from 0.4 to 2.25 feet bgs during our field exploration and subsequent readings of monitoring well MW-1 installed on the site during our field exploration. Therefore, based on the anticipated high groundwater level, it is our opinion that an onsite stormwater infiltration system is not considered suitable for this site.

Temporary Excavations

The onsite soils have variable cohesion and/or friction strengths, therefore the safe angles to which these materials may be cut for temporary excavations is variable, as the soils may be prone to caving and slope failures in temporary excavations deeper than 4 feet, especially where seepage or perched water is encountered in the excavation. Temporary excavations in the very loose to medium dense native soils should be sloped no steeper than 1.5H:1V (horizontal to vertical) where room permits. If undocumented fill is exposed during the excavation, then the excavation should be sloped no steeper than 2H:1V where room permits. Flatter inclinations may be necessary where groundwater seepage is present.

All temporary cuts should be in accordance with Washington Administrative Code (WAC) Part N, Excavation, Trenching, and Shoring. The temporary slope cuts should be visually inspected daily by a qualified person during construction work activities and the results of the inspections should be included in daily reports. The contractor is responsible for maintaining the stability of the temporary cut slopes and minimizing slope erosion during construction. The temporary cut slopes should be covered with plastic sheeting to help minimize erosion during wet weather and the slopes should be closely monitored until the permanent retaining systems are complete. Materials should not be stored and equipment operated within 10 feet of the top of any temporary cut slope.

A Krazan & Associates geologist or geotechnical engineer should observe, at least periodically, the temporary cut slopes during the excavation work. The reasoning for this is that all soil conditions may not be fully delineated by the limited sampling of the site from the geotechnical explorations. In the case of temporary slope cuts, the existing soil conditions may not be fully revealed until the excavation work exposes the soil. Typically, as excavation work progresses the maximum inclination of the temporary slope will need to be evaluated by the geotechnical engineer so that supplemental recommendations can be made. Soil and groundwater conditions can be highly variable. Scheduling for soil work will need to be adjustable, to deal with unanticipated conditions, so that the project can proceed smoothly and required deadlines can be met. If any variations or undesirable conditions are encountered during construction, Krazan & Associates should be notified so that supplemental recommendations can be made.

Structural Fill

Fill placed beneath foundations, pavement, or other settlement-sensitive structures should be placed as structural fill. Structural fill, by definition, is placed in accordance with prescribed methods and standards, and is monitored by an experienced geotechnical professional or soils technician. Field monitoring procedures would include the performance of a representative number of in-place density tests to document the attainment of the desired degree of relative compaction. The area to receive the fill should be suitably prepared as described in the Site Preparation section of this report prior to beginning fill placement.

Best Management Practices (BMP's) should be followed when considering the suitability of the existing materials for use as structural fill. The near-surface silty sand soils encountered to a depth of 2.25 feet bgs during our field exploration are considered extremely moisture-sensitive and may disturb easily in wet conditions. In our opinion, the silty sand soils are not considered suitable for re-use as structural fill material due to their high silt content. The poorly graded black sand encountered below the silty sand soils contained less than 10 percent fines (material passing the U.S. Standard No. 200 Sieve) and are considered suitable for re-use as structural fill, provided these soils are placed as further described in this section, and are not mixed with the upper silty sand during removal or storage onsite. If soil types other than those revealed during our field exploration are encountered during construction, then Krazan should be consulted regarding the suitability of these soils for use as structural fill.

During wet weather conditions, the soils with higher silt contents will be moisture sensitive, easily disturbed, and may be difficult or impossible to compact to structural fill requirements. Furthermore, during the winter, soils typically have elevated natural moisture contents, which will limit the use of these materials as structural fill without proper mitigation measures. The contractor should use Best Management Practices to protect the soils during construction activities and be familiar with wet weather and wintertime soil work. An allowance for importing structural fill should be incorporated into the construction cost of the project.

Imported, all weather structural fill material should consist of well-graded gravel or a sand and gravel mixture with a maximum grain size of 3 inches and less than 5 percent fines (material passing the U.S. Standard No. 200 Sieve). Structural fill also can consist crushed rock, rock spalls and controlled density fill (CDF). All structural fill material should be submitted for approval to the geotechnical engineer at least 48 hours prior to delivery to the site.

Fill soils should be placed in horizontal lifts not exceeding 8 inches in loose thickness, moisture-conditioned as necessary (moisture content of soil shall not vary by more than ±2 percent of optimum moisture), and the material should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. In-place density tests should be performed on all structural fill to document proper moisture content and adequate compaction. Additional lifts should not be placed if the previous lift did not meet the compaction requirements or if soil conditions are not considered stable. Placing several lifts of fill and then potholing down to each lift to conduct compaction testing is not acceptable, and will require complete removal of the fill down to the first lift. Ponding and jetting the soil is not an approved method of soil compaction.

Foundations

Based on our explorations, the soils at the site are interpreted as native alluvial soils to the termination depth of the boring at 21.5 feet bgs. The very loose silty sands encountered to a depth of about 2.25 feet bgs in our soil boring are not considered suitable for support of the foundation loads. The very loose silty sand may be encountered at shallower or deeper depths in unexplored areas of the site, particularly in the northern portion of the site where the land was previously used for agricultural purposes. We recommend the very loose silty sand soils be over-excavated to expose the underlying medium dense or firmer soils.

We recommend that any existing undocumented fill, if encountered, be removed and replaced with structural fill in accordance with the Structural Fill recommendations of this report. Undocumented fill was not encountered in our soil boring; however, undocumented fill may be encountered at the location of the existing buildings or other unexplored areas of the site.

The proposed structures may be supported on a shallow foundation system bearing on medium dense or firmer soil, or on structural fill or CDF extending to medium dense or firmer native soils. Footing excavations should be inspected by Krazan & Associates to prior to placement of concrete forms to verify that the foundations bear on suitable material.

If structural fill is used, then the foundation excavations would need to be widened on each side of the footing a distance equal to one-half of the depth of the over-excavation below the bottom of the footing. Structural fill consisting of granular soils should then be placed to the bottom of footing elevation and compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. To simplify structural fill placement, it may be practical to place CDF to fill the footing excavations to the planned footing subgrade elevations.

The City of Puyallup requires exterior footings be located a minimum of 12 inches below grade for frost protection. We recommend that exterior footings bear a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower, for frost protection and bearing capacity considerations. Interior footings should bear a minimum depth of 12 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footing widths should be based on the anticipated loads and allowable soil bearing pressure. Additionally, footings should conform to current International Building Code (IBC) guidelines. Water should not be allowed to accumulate in footing trenches. Footings should have a minimum width of 12 inches regardless of load. All loose or disturbed soil should be removed from the foundation excavation prior to placing concrete.

For foundations constructed as outlined above, we recommend that an allowable design bearing capacity of **2,000 pounds per square foot (psf)** may be used for foundation design for this project. A representative of Krazan and Associates should evaluate the foundation bearing soil prior to footing form construction.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.35 acting between the bases of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 250 pounds per cubic foot (pcf) acting against the appropriate vertical footing faces (neglecting the upper 12 inches). The allowable friction factor and allowable equivalent fluid passive pressure values include a factor of safety of 1.5. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A 1/3 increase in the above values may be used for short duration wind and seismic loads.

For foundations constructed as recommended, the total settlement is not expected to exceed 1-inch. Differential settlement, along a 20-foot exterior wall footing, or between adjoining column footings should be less than ½ inch. Most settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated. It should be noted that the settlement provided herewith is a static settlement and does not include liquefaction induced dynamic settlement. Static settlement is induced by the applied dead load from the structures. Liquefaction analysis and evaluation of associated dynamic settlements were not performed in this study as requested by the client.

Seasonal rainfall, water run-off, and the normal practice of watering trees and landscaping areas around the proposed structures should not be permitted to flood and/or saturate foundation subgrade soils. To prevent the buildup of water within the footing areas, continuous footing drains (with cleanouts) should be provided at the base of the footings. The footing drains should consist of a minimum 4-inch diameter rigid perforated PVC pipe, sloped to drain with perforations placed near the bottom, and enveloped in all directions by washed rock wrapped with filter fabric to limit the migration of silt and clay into the drain.

Floor Slabs and Flatwork

Based on our explorations, the near surface soils at the site are interpreted as very loose native soils. Due to the location of the existing buildings, undocumented fill may be encountered within the footprint of the new buildings, particularly at the location of existing footings. Undocumented fill, if encountered, should be completely removed from within the proposed footprint of the new buildings.

The very loose silty sand soils are unsuitable for support of slabs. We recommend over-excavation of the silty sand to a depth of at least 12 inches below the planned floor subgrade elevation. The exposed grade after the over-excavation should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. Depending on the time of year construction takes place, it may be necessary to place a layer of rock spalls and/or a high-strength geotextile fabric over the soils at the bottom of the over-excavation if water accumulates and softens the soils. The area should then be filled to the planned subgrade elevation with structural fill. The structural fill should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. In-place density tests should be performed to verify proper moisture content and adequate compaction.

Any additional fill used to increase the elevation of the floor slab should meet the requirements of structural fill. Fill soils should be placed in horizontal lifts not exceeding 8 inches in loose thickness, moisture-conditioned as necessary, (moisture content of soil shall not vary by more than ±2 percent of optimum moisture) and the material should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557.

Floor slabs may be designed using a modulus of subgrade reaction value of k = 200 pounds per cubic inch (pci) for slabs supported on compacted structural fill.

In areas where it is desired to reduce floor dampness, such as areas covered with moisture sensitive floor coverings, we recommend that concrete slab-on-grade floors be underlain by a water vapor retarder system. According to ASTM guidelines, the water vapor retarder should consist of a vapor retarder sheeting underlain by a minimum of 6-inches of compacted clean (less than 5 percent passing the U.S. Standard No. 200 Sieve), open-graded, coarse rock of ¾-inch maximum size. The vapor retarder sheeting should be protected from puncture damage.

The exterior floors should be placed separately in order to act independently of the walls and foundation system. All fill placed in the building pads should be structural fill.

For sidewalks and pedestrian pathways, if loose/soft or undocumented fill soils are exposed, then we recommended that over-excavation of at least 6-inches below the planned subgrade elevation be performed. The resulting excavation should be backfilled with structural fill.

It is recommended that utility trenches within the building pads be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the drainage and irrigation adjacent to the buildings is recommended. Grading should establish drainage away from the structures and this drainage pattern should be maintained. Water should not be allowed to collect adjacent to the structures. Excessive irrigation within landscaped areas adjacent to the structures should not be allowed to occur. In addition, ventilation of the structures may be prudent to reduce the accumulation of interior moisture.

Erosion and Sediment Control

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

1) Phase the soil, foundation, utility, and other work, requiring excavation or the disturbance of the site soils, to take place during the dry season (generally May through September). However, provided precautions are taken using Best Management Practices (BMP's), grading activities

can be undertaken during the wet season (generally October through April). It should be noted that this typically increases the overall project cost.

2) All site work should be completed and stabilized as quickly as possible.

3) Additional perimeter erosion and sediment control features may be required to reduce the possibility of sediment entering the surface water. This may include additional silt fences, silt fences with a higher Apparent Opening Size (AOS), construction of a berm, or other filtration systems.

4) Any runoff generated by dewatering discharge should be treated through construction of a sediment trap if there is sufficient space. If space is limited other filtration methods will need to be incorporated.

Groundwater Influence on Structures and Earthwork Construction

Groundwater level readings obtained at the site during December 11, 2020 through January 4, 2021, indicated groundwater at 0.4 to 2.25 feet bgs. It should be recognized that these readings were obtained during the wet weather season, and groundwater elevations will likely fluctuate with time, such as during the drier months of the year. The groundwater level will also be dependent upon seasonal precipitation, irrigation, land use, and climatic conditions, as well as other factors. Therefore, groundwater levels at the time of the field investigation may be different from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

Although we do not anticipate deep excavations for this project, a relatively high groundwater level may be encountered during excavations for foundations or utility installation if constructed during the wet season. If groundwater is encountered during construction, we should observe the conditions to determine if dewatering will be necessary. Design of temporary dewatering systems to remove groundwater should be the responsibility of the contractor. If earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated. These soils may “pump,” and the materials may not respond to densification techniques. Typical remedial measures include: disking and aerating the soil during dry weather; mixing the soil with drier materials; removing and replacing the soil with an approved fill material. Krazan should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Drainage

The ground surface should slope away from building pads and pavement areas, toward appropriate drop inlets or other surface drainage devices. It is recommended that adjacent exterior grades be sloped a minimum of 2 percent for a minimum distance of 5 feet away from structures. Roof drains should be tightlined away from foundations and steep slopes. Roof drains should not be connected to the footing drains, but may use the same outfall piping if connected well away from the structure and with enough fall such that roof water will not backup into the footing drains.

Subgrade soils in pavement areas should be inclined at a minimum of 1 percent and drainage gradients should be maintained to carry all surface water to collection facilities and suitable outlets. These grades should be maintained for the life of the project.

Utility Trench Backfill

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

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

The contractor is responsible for removing all water-sensitive soils from the trenches regardless of the backfill location and compaction requirements. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Pavement Design

Porous Pavement: Porous asphalt pavement consists of a permeable asphalt surface overlaying a granular working surface on top of a reservoir of larger stone. Porous asphalt pavement is generally used in areas with light vehicle traffic and is not recommended for areas that will experience high frequency or heavy truck traffic. Due to the high groundwater level encountered at the site, it is our opinion that porous pavement is <u>not suitable</u> for this project.

Asphalt Concrete and Portland Cement Pavement: Based on our field exploration, the soils at the site are interpreted as native soils consisting of very loose silty sand (SM) and medium dense poorly graded sand (SP). The very loose silty sand is considered an unsuitable subgrade for support of the pavement section and traffic loads. We recommend over-excavation of the very loose silty sand, as well as any loose/soft soils or undocumented fill encountered elsewhere within the proposed pavement areas, to a depth of at least 12 inches below the planned subgrade elevation. The exposed grade after the over-excavation should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557.

Due to the high sensitivity of the silt soils, it may be difficult to attain the required degree of compaction on the over-excavated subgrade. In this case, it may be necessary to place a working surface layer of clean crushed rock or rock spalls on the over-excavated subgrade, followed by placement of a high-strength geotextile separation fabric, such as Mirafi 600X or equivalent. After the fabric is placed, the area should be filled to the planned pavement subgrade elevation with structural fill. The structural fill should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. In-place density tests should be performed to verify proper moisture content and adequate compaction. Subgrade modification such as this is intended to disperse surcharge loads and therefore aid in pavement performance.

A proof roll of the over-excavated subgrade soil may be performed in lieu of the compaction and in-place density tests. It should be noted that subgrade soils that have relatively high silt contents may be highly sensitive to moisture conditions. The subgrade strength and performance characteristics of a silty subgrade material may be dramatically reduced if this material becomes wet.

Traffic loads were not provided, however, based on our knowledge of the proposed project, we expect the traffic to range from light duty (passenger automobiles) to heavy duty (delivery and fire trucks). Pavement design life of 20 years was assumed for our analysis. Recommendations for an asphaltic concrete flexible pavement section and Portland Cement Concrete (PCC) rigid pavement section are provided in Tables 2 and 3 below.

Table 2: ASPHALTIC CONCRETE (FLEXIBLE) PAVEMENT

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

Table 3: PORTLAND CEMENT CONCRETE (RIGID) PAVEMENT
4000 psi with FIBER MESH

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

** A proof roll may be performed in lieu of in-place density tests*

The asphaltic concrete depth listed in Table 2 for the flexible pavement section should be a surface course type asphalt, such as Washington Department of Transportation (WSDOT) ½-inch Hot Mix Asphalt (HMA). The pavement specification in Appendix C provides additional recommendations, including aggregate base material.

Testing and Inspection

A representative of Krazan & Associates, Inc. should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our services as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor. Furthermore, Krazan & Associates is not responsible for the contractor's procedures, methods, scheduling, or management of the work site.

LIMITATIONS

Geotechnical engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences improves. Although your site was analyzed using the most appropriate current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to improvements in the field of geotechnical engineering, physical changes in the site either due to excavation or fill placement, new agency regulations, or possible changes in the proposed structure after the time of completion of the soils report may require the soils report to be professionally reviewed. In light of this, the owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that two years be considered a reasonable time for the usefulness of this report.

This report has been prepared for the exclusive use of the Abbey Road Group Land Development Services Company, LLC and their assigns, for the specific application to the subject site. Foundation and earthwork construction is characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. Our report, design conclusions, and interpretations should not be construed as a warranty of the subsurface conditions. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report.

The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those encountered during our field investigation. The findings and conclusions of this report can be affected by the passage of time, seasonal weather conditions, manmade influences such as construction on or adjacent to the site, and natural events such as earthquakes, slope instability, flooding, or groundwater fluctuations. If any variations or undesirable conditions are encountered during construction, the geotechnical engineer should be notified so that supplemental recommendations can be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The geotechnical engineer should be notified of any changes so that the recommendations can be reviewed and re-evaluated.

Misinterpretations of this report by other design team members can result in project delays and cost over-runs. These risks can be reduced by having Krazan & Associates, Inc. involved with the design team's meetings and discussions before and following submission of the geotechnical report. Krazan & Associates, Inc. should also be retained for reviewing pertinent elements of the design team's plans and specifications. Contractors can also misinterpret this report. To reduce this risk Krazan & Associates should participate in pre-bid and preconstruction meetings, and provide construction observations during the site work.

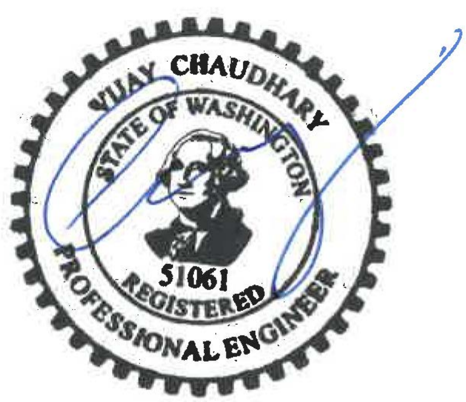
This report is a geotechnical engineering investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any environmental site assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater or atmosphere, or the presence of wetlands. Any statements, or absence of statements, in this report or on any test pits regarding odors, unusual or suspicious items, or conditions observed are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessments.

The geotechnical information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical developments. We emphasize that this report is valid for this project as outlined above, and should not be used for any other site. Our report is prepared for the exclusive use of our client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (253) 939-2500.

Respectfully submitted,

KRAZAN & ASSOCIATES, INC.

1/13/21



Theresa R. Nunan

Theresa R. Nunan
Project Manager

Vijay Chaudhary, P.E.
Assistant Regional Engineering Manager

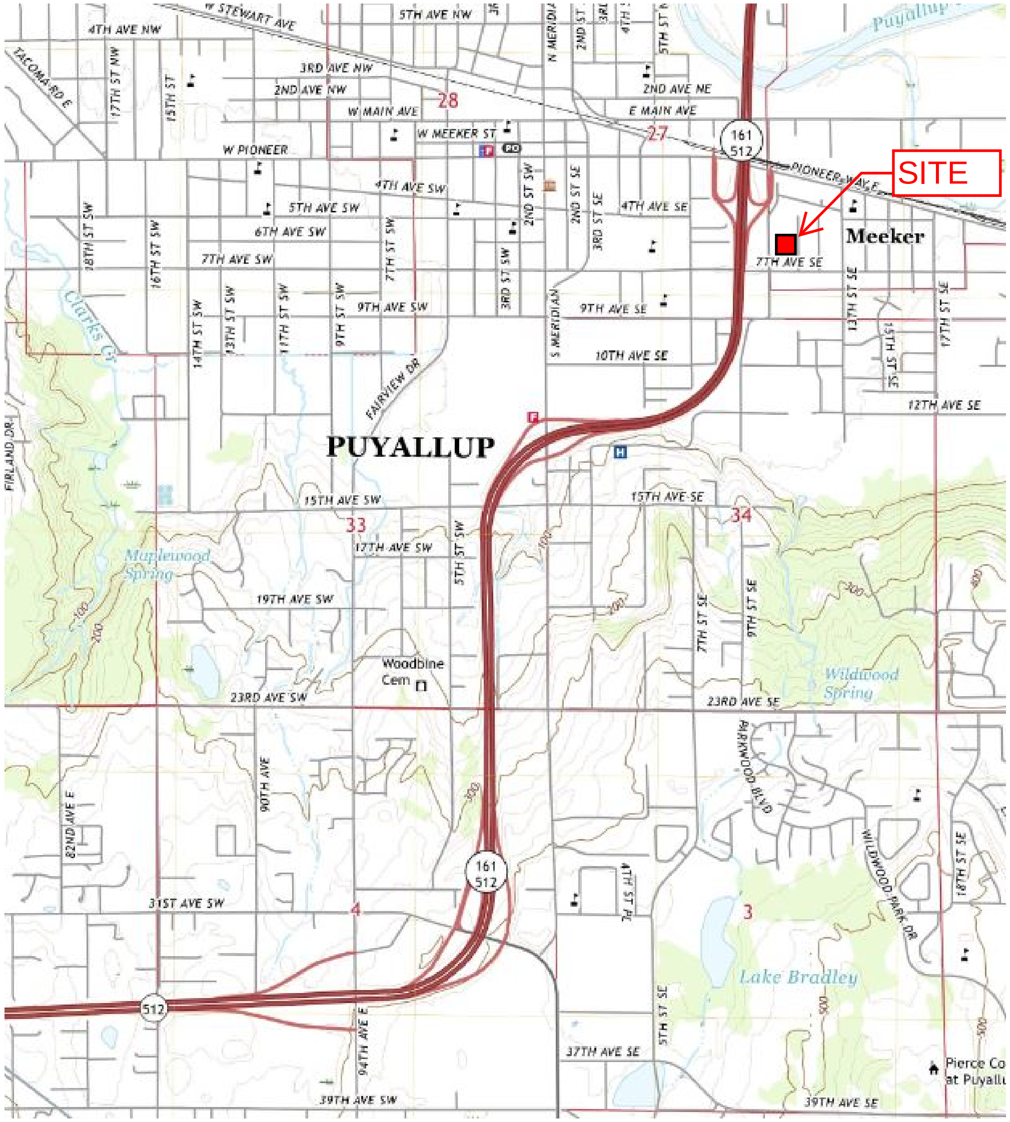
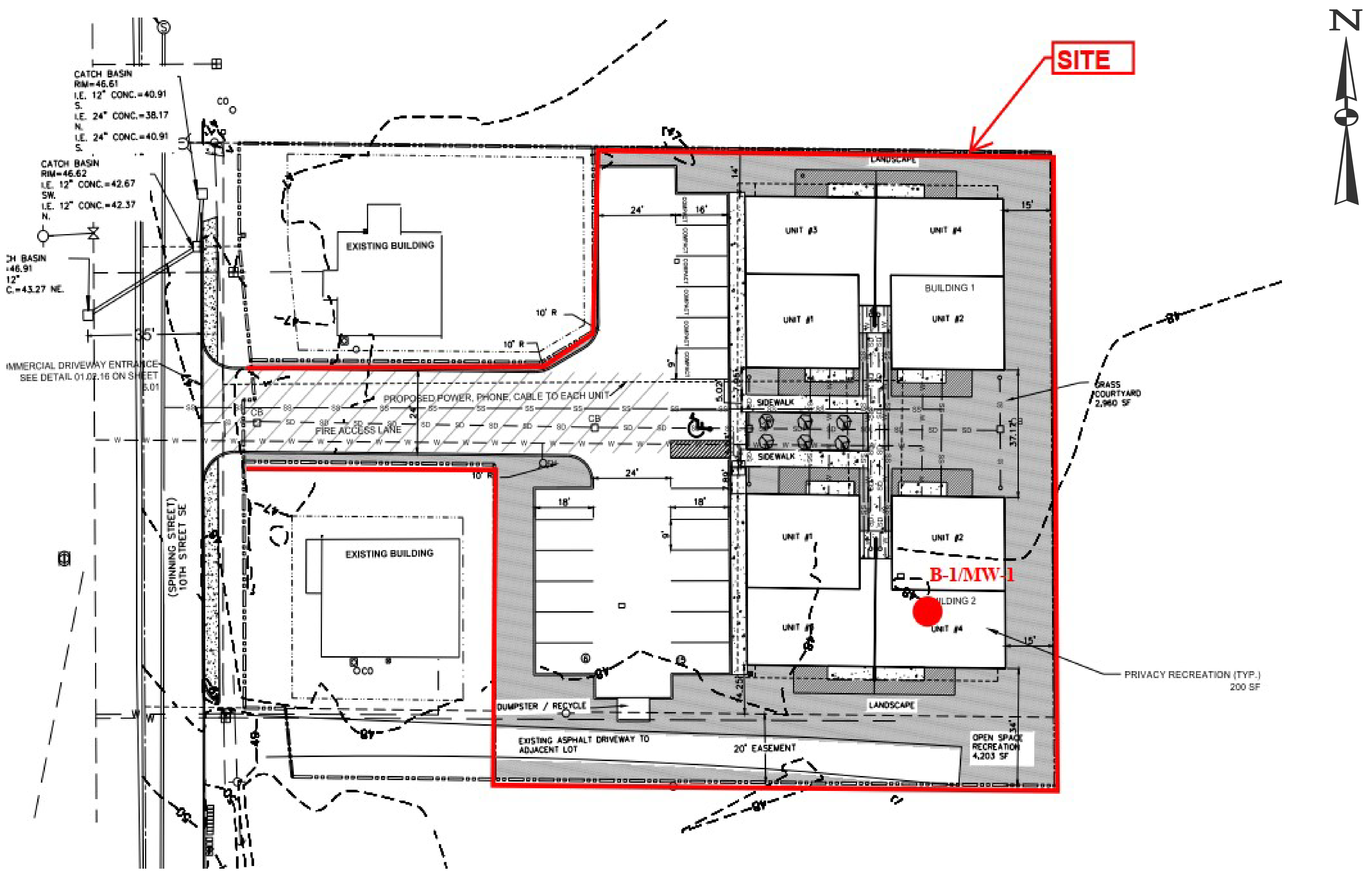


Figure 1: Vicinity Map

Reference: USGS topographic map titled "Puyallup Quadrangle, Washington - Pierce County, 7.5-Minute Series", dated 2020.

Krazan		
Proposed 10th St. Development Project, Near NE Corner 10th St. SE & 7th Ave. SE, Puyallup, WA		
Date: December 2020	Project Number: 062-20029	
Drawn By: TN	Figure: 1	Not to scale



Krazan & Associates, Inc.

825 Center St., Ste. A
Tacoma, WA 98409

Phone: (253) 939-2500
Fax: (253) 9392556

PROJECT NUMBER: 062-20029

PROJECT NAME: Proposed 10th Street Development Project

SCALE: N.T.S.
(NOT FOR CONSTRUCTION)

DATE: December2020

FIGURE 2
SITE PLAN

LEGEND

● B-1 / M-1 Approximate location of soil boring & monitoring well

REFERENCE: SITE PLAN PREPARED BY ABBEY ROAD GROUP, DATED DECEMBER 17, 2018.

APPENDIX A

FIELD INVESTIGATION – LABORATORY TESTING

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploration program. One (1) soil boring, designated B-1, was drilled and sampled for the subsurface investigation at this site. The soil boring was drilled on December 11, 2020 utilizing a subcontracted operator and drill rig equipped with hollow stem augers under the direction of a Krazan geotechnical engineer. The boring was advanced to a depth of 21.5 feet below the existing ground surface (bgs). A groundwater monitoring well, designated MW-1, was installed within borehole B-1 to a depth of 15feet below the existing ground surface, using 12 feet of slotted PVC pipe and 3 feet of solid PVC pipe. The annular space between the PVC casing and the borehole was backfilled with filter sand up to a depth of 2 feet below the ground surface, with the remaining depth backfilled with bentonite pellets. A protective steel monument casing was installed over the monitoring well. The approximate boring/well location is shown on the Site Plan (Figure 2). The boring location was field located based on existing site features. The boring log with well log are presented in this Appendix as Figure A-1. The depths shown on the attached logs are from the existing ground surface at the time of our exploration.

The soils encountered in the boring were logged in the field during the exploration and are described in accordance with the Unified Soil Classification System (USCS). The Soil Classification Chart is attached as Figure A-2. Select soil samples were returned to our laboratory for evaluation and testing.

Laboratory Testing

The laboratory testing program consisted of gradation tests with hydrometer analyses, and was developed primarily to determine the index and engineering properties of the soils. Test results were used for soil classification and as criteria for determining the engineering suitability of the subsurface materials encountered. The gradation test results are graphically depicted in Figures A-3 and A-4.

USCS Soil Classification				
Major Division			Group Description	
Coarse-Grained Soils < 50% passes #200 sieve	Gravel and Gravelly Soils < 50% coarse fraction passes #4 sieve	Gravel (with little or no fines)	GW	Well-Graded Gravel
			GP	Poorly Graded Gravel
		Gravel (with > 12% fines)	GM	Silty Gravel
			GC	Clayey Gravel
	Sand and Sandy Soils > 50% coarse fraction passes #4 sieve	Sand (with little or no fines)	SW	Well-Graded Sand
			SP	Poorly Graded Sand
		Sand (with > 12% fines)	SM	Silty Sand
			SC	Clayey Sand
Fine-Grained Soils > 50% passes #200 sieve	Silt and Clay Liquid Limit < 50		ML	Silt
			CL	Lean Clay
			OL	Organic Silt and Clay (Low Plasticity)
	Silt and Clay Liquid Limit > 50		MH	Inorganic Silt
			CH	Inorganic Clay
			OH	Organic Clay and Silt (Med. to High Plasticity)
Highly Organic Soils			PT	Peat

Relative Density with Respect to SPT N-Value			
Coarse-Grained Soils		Fine-Grained Soils	
Density	N-Value (Blows/Ft)	Density	N-Value (Blows/Ft)
Very Loose	0 - 4	Very Soft	0 - 1
Loose	5 -10	Soft	2 - 4
Medium Dense	11 - 30	Medium Stiff	5 - 8
Dense	31 - 50	Stiff	9 - 15
Very Dense	> 50	Very Stiff	16 - 30
		Hard	> 30

Figure A-2: Soil Classification Chart

Krazan & ASSOCIATES, INC.

Proposed 10th Street Development: Near NE Corner 10th St. SE & 7th Ave. SE, Puyallup, WA

Date: December 2020	References: USCS	
Drawn By: TRN		Project Number: 062-20029

Krazan & ASSOCIATES, INC.

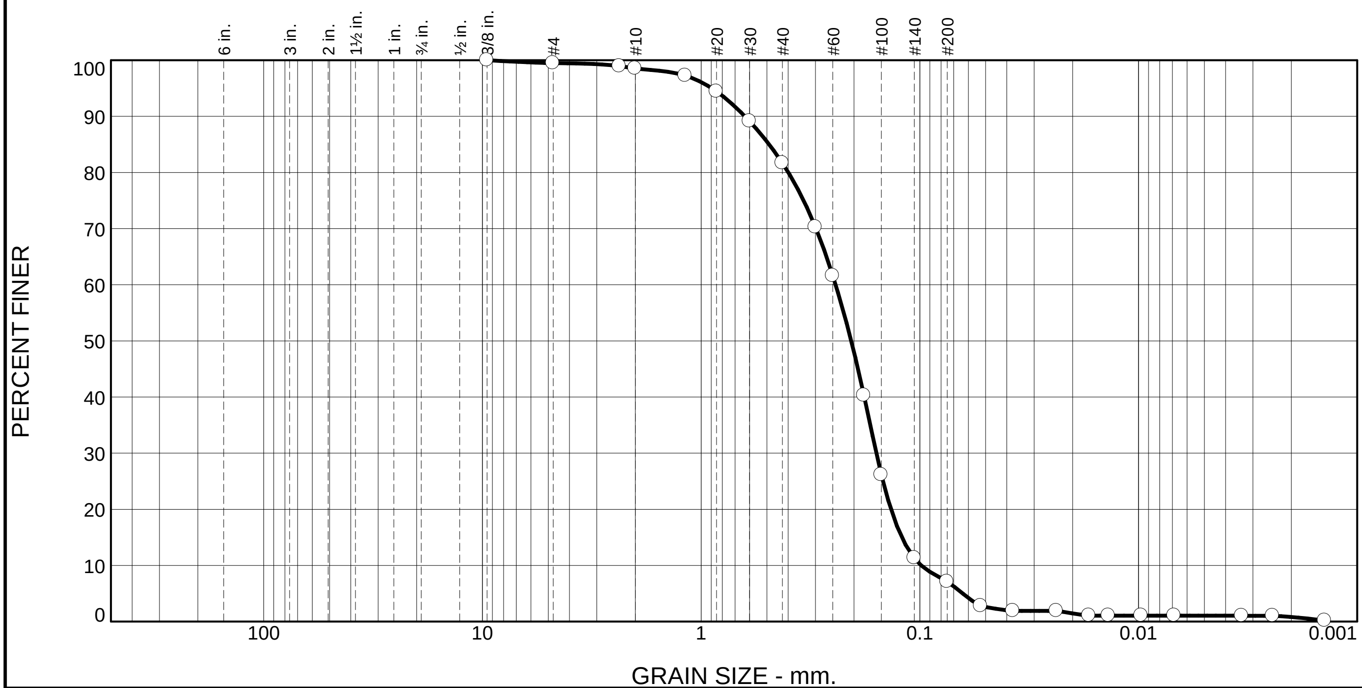
Project:	Project Number:	Client:	Boring/Well No.
10th Street Development Project	062-20029	Abbey Road Group	B-1 / MW-1
Address, City, State: 619-1/2 10th Street SE, Puyallup, WA			**Drilling Company:** ESN Northwest
Project Manager: Theresa Nunan	Date — **Started:** 12.11.20		**Equipment:** Geoprobe 7800 - DH103
Field Engineer: T. Nunan	**Completed:** 12.11.20		**Drilling Method:** Hollow Stem Augers
Notes:	**Backfilled:** 12.11.20		**Hammer Type:** Automatic
Ground Surface Elevation:	**Groundwater Depth:** 2.25 feet	**Groundwater Elev.:**	**Total Depth of Boring:** 21.5 feet

Elev. (feet)	Depth (feet)	Sample Type	Sample ID	Blow Counts	N-Value (blows/ft)	Classification
		SPT	S-1	WOH 1 2	3	2 inches Grass over 10 inches of Dark Brown Silty SAND **Topsoil**
						Brown with Grey Mottling **Silty SAND (SM)**, very loose, moist to wet **(ALLUVIUM)**
		SPT	S-2	4 5 6	11	Black Poorly Graded **SAND (SP-SM)** with Silt, fine to medium grained, medium dense, saturated
	5					
		SPT	S-3	7 11 13	24	- - - same
	10	SPT	S-4	2 7 9	16	- - - same
	15	SPT	S-5	4 7 11	18	- - - same
	20	SPT	S-6	1 2 3	*5	- - - medium dense based on drilling resistance; *SPT N-value very low due to soil heave disturbance **(ALLUVIUM)**
						End of Boring at 21.5 Feet
	25					

Well Log MW-1

Figure A-1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	1.0	16.8	74.6	6.0	1.1

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	99.5		
#8	98.9		
#10	98.5		
#16	97.3		
#20	94.4		
#30	89.1		
#40	81.7		
#50	70.3		
#60	61.6		
#80	40.3		
#100	26.1		
#140	11.3		
#200	7.1		
0.0527 mm.	2.8		
0.0374 mm.	1.9		
0.0237 mm.	1.9		
0.0168 mm.	1.1		
0.0137 mm.	1.1		
0.0097 mm.	1.1		
0.0069 mm.	1.1		
0.0034 mm.	1.0		
0.0024 mm.	1.0		
0.0014 mm.	0.2		

* (no specification provided)

Material Description

Black poorly graded sand with silt.
Sampled by T.Nunan.

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}= 0.6307 D_{85}= 0.4888 D_{60}= 0.2427
D_{50}= 0.2059 D_{30}= 0.1581 D_{15}= 0.1209
D_{10}= 0.0985 C_u= 2.46 C_c= 1.05

Remarks

Sample ID:20L952
Sample Date:12-11-20

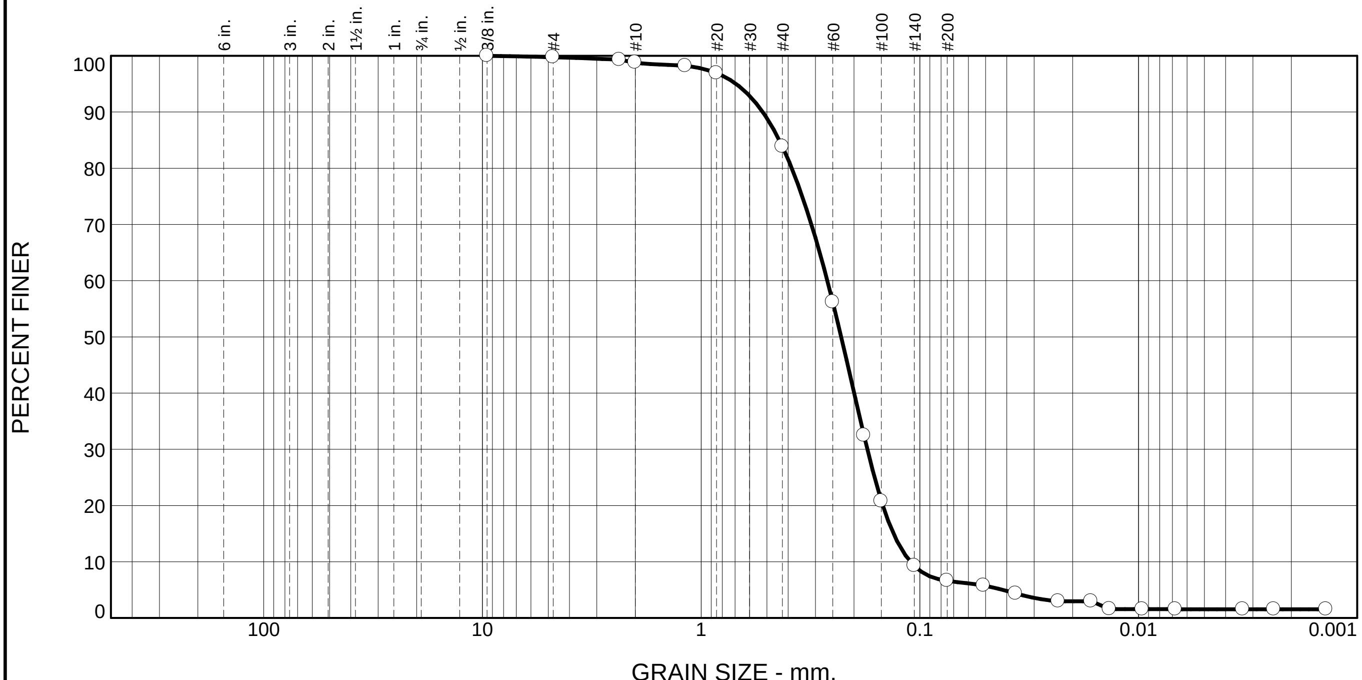
Date Received: 12-26-20 **Date Tested:** 12-28-20
Tested By: M.Thomas
Checked By: T.Nunan
Title: Project Manager

Location: B-1 S2 **Date Sampled:** 12-11-20
Sample Number: 20L952 **Depth:** 3' to 4.5'

Krazan

Client: Abbey Road Group Land Developement Services Company, LLC.
Project: 10th St. Developement
Project No: 062-20029 **Figure** A-3

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.9	14.9	77.3	5.0	1.6

TEST RESULTS (D422)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	99.7		
#8	99.3		
#10	98.8		
#16	98.2		
#20	96.9		
#40	83.9		
#60	56.2		
#80	32.5		
#100	20.8		
#140	9.3		
#200	6.6		
0.0511 mm.	5.8		
0.0365 mm.	4.4		
0.0233 mm.	3.0		
0.0165 mm.	3.0		
0.0136 mm.	1.6		
0.0096 mm.	1.6		
0.0068 mm.	1.6		
0.0033 mm.	1.5		
0.0024 mm.	1.5		
0.0014 mm.	1.5		

* (no specification provided)

Material Description

Black poorly graded sand with silt.
Sampled by T.Nunan.

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}= 0.5226 D_{85}= 0.4392 D_{60}= 0.2648
D_{50}= 0.2289 D_{30}= 0.1738 D_{15}= 0.1320
D_{10}= 0.1103 C_u= 2.40 C_c= 1.03

Remarks

Sample ID:20L953
Sample Date:12-11-20

Date Received: 12-26-20 **Date Tested:** 12-28-20
Tested By: M.Thomas
Checked By: T.Nunan
Title: Project Manager

Location: B-1 S3
Sample Number: 20L953 **Depth:** 6' to 7.5' **Date Sampled:** 12-11-20

Krazan

Client: Abbey Road Group Land Developement Services Company, LLC.
Project: 10th St. Developement

Project No: 062-20029 **Figure** A-4

APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including but not limited to the furnishing of all labor, tools, and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans, and disposal of excess materials.

PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of Krazan and Associates, Inc., hereinafter known as the Geotechnical Engineer and/or Testing Agency. Attainment of design grades when achieved shall be certified to by the project Civil Engineer. Both the Geotechnical Engineer and Civil Engineer are the Owner's representatives. If the contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory as determined by both the Geotechnical Engineer and Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Geotechnical Engineer, Civil Engineer or project Architect.

No earthwork shall be performed without the physical presence or approval of the Geotechnical Engineer. The Contractor shall notify the Geotechnical Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner of the Engineers.

TECHNICAL REQUIREMENTS: All compacted materials shall be compacted to a density not less than 95 percent of maximum dry density as determined by ASTM Test Method D1557 as specified in the technical portion of the Geotechnical Engineering Report. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Geotechnical Engineer.

SOIL AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report. The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the contractor for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including Court costs of codefendants, for all claims related to dust or windblown materials attributable to his work.

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing and preparations of foundation materials for receiving fill.

CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter, and all other matter determined by the Geotechnical Engineer to be deleterious. Such materials shall become the property of the Contractor and shall be removed from the site. Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots larger than 1 inch. Tree root removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill or tree root excavation should not be permitted until all exposed surfaces have been inspected and the Geotechnical Engineer is present for the proper control of backfill placement and compaction. Burning in areas, which are to receive fill materials, shall not be permitted.

SUBGRADE PREPARATION: Subgrade should be prepared as described in our site preparation section of this report.

EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Geotechnical Engineer. Material from the required site excavation may be utilized for construction site fills provided prior approval is given by the Geotechnical Engineer. All materials utilized for constructing site fills shall be free from vegetable or other deleterious matter as determined by the Geotechnical Engineer.

PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Geotechnical Engineer.

Both cut and fill shall be surface compacted to the satisfaction of the Geotechnical Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Geotechnical Engineer indicates that the moisture content and density of previously placed fill are as specified.

APPENDIX C

PAVEMENT SPECIFICATIONS

1. DEFINITIONS – The term "pavement" shall include asphalt concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

2. SCOPE OF WORK – This portion of the work shall include all labor, materials, tools and equipment necessary for and reasonable incidental to the completion of the pavement shown on the plans and as herein specified, except work specifically notes as "Work Not Included."

3. PREPARATION OF THE SUBGRADE – The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans and pavement design section of this report. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum compaction of 95% of maximum dry density as determined by test method ASTM D1557. The finished subgrades shall be tested and approved by the Geotechnical Engineer prior to the placement of additional pavement of additional pavement courses.

4. AGGREGATE BASE – The aggregate base shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base should conform to WSDOT Standard Specification for Crushed Surfacing Base Course or Top Course (Item 9-03.9(3)). The base material shall be compacted to a minimum compaction of 95% as determined by ASTM D1557. Each layer of subbase shall be tested and approved by the Geotechnical Engineer prior to the placement of successive layers.

5. ASPHALTIC CONCRETE SURFACING – Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The drying, proportioning, and mixing of the materials shall conform to WSDOT Specifications.

The prime coat, spreading and compaction equipment, as well as the process of spreading and compacting the mixture, shall conform to WSDOT Specifications, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with combination steel-wheel and pneumatic rollers, as described in WSDOT Specifications. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

6. TACK COAT – The tack (mixing type asphaltic emulsion) shall conform to and be applied in accordance with the requirements of WSDOT Specifications.