GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED MEDICAL ADDICTION TREATMENT (MAT) FACILITY
APNS: 03301933000 AND 033019339010
SEQUIM, WASHINGTON

PROJECT NO.102-19020
OCTOBER 24, 2019

Prepared for:

JAMESTOWN S'KLALLAM TRIBE
ATTN: MR. KIRK NELSON
1033 OLD BLYN HIGHWAY
SEQUIM, WA 98382

Prepared by:

KRAZAN & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING DIVISION
1230 FINN HILL RD. NW, SUITE A
POULSBO, WASHINGTON 98370
(360) 598-2126

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

October 24, 2019 KA Project No. 102-19020

Jamestown S'Klallam Tribe
1033 Old Blyn Highway
Sequim, WA 98382

Attn: Kirk Nelson, Construction Manager
Email: knelson@jamestowntribe.org
Tel: 360-681-4602

Reference: Geotechnical Engineering Investigation
Proposed MAT Facility
Assessor Parcel Numbers (APNs): 03301933000 and 033019339010
Sequim, WA

Dear Mr. Nelson,

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.

Vijay Chaudhary, P.E.
Project Engineer

VC:MR

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INTRODUCTION

This report presents the results of our geotechnical engineering investigation for the proposed MAT Facility project on APNs 03301933000 and 033019339010 in Sequim, 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, excavations, structural fill, utility trench backfill, foundations, drainage, stormwater infiltration, and erosion control.

A site plan showing the approximate exploration locations is presented following the text of this report in Figure 2. A description of the field investigation, summary exploration logs, and the exploration log legend are presented in Appendix A along with the laboratory testing results. Appendix B contains a guide to 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 subject property to develop geotechnical engineering recommendations for use in the 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 for this project, dated August 15, 2019 (Proposal Number G19025WAP) and included the following:

- Provide an exploration of the subsurface soil and groundwater conditions by conducting one (1) Cone Penetrometer Test (CPT) using a subcontracted testing rig and excavating six (6) to eight (8) test pits. The excavation services were provided by the client;
- Provide a site plan showing the CPT and test pit locations;
- Provide comprehensive CPT and test pit logs including soil stratification and classification, and groundwater levels where applicable;

- Provide recommended foundation type for the proposed structure;
- Provide recommendations for foundation design, including allowable foundation bearing pressure, anticipated settlements (both total and differential), coefficient of horizontal friction, passive soil pressure and frost penetration depth;
- Provide recommendations for seismic design considerations including site coefficient and ground acceleration based on the 2012/2015 IBC;
- Provide recommendations for structural fill materials, placement, and compaction;
- Provide recommendations regarding the suitability of on-site soils as structural fill;
- Provide recommendations for temporary excavations;
- Provide recommendations for site drainage and erosion control;
- Provide opinions and recommendations regarding stormwater infiltration feasibility and a design infiltration rate as per Volume III, Chapter 3 of the 2014 SMMWW
- Provide recommendations for the pavement design.

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

PROPOSED CONSTRUCTION

Based on our review of the conceptual site plan and area map, prepared by Rice Fergus Miller, dated June 25, 2019, it is our understanding that that the northern portion of the site will be developed with the MAT Facility and will cover an area of roughly 15, 000 square feet. There are other structures shown on conceptual plan, which we understand will be developed in different phase. We understand that development will also include paved parking and landscape areas, and stormwater management system.

SITE CONDITIONS

The site consists of two (2) parcels covering an area of approximately 19.15 acres. The site is located between S 7th Avenue and S 9th Avenue, immediately east of S 9th Avenue in Sequim, Washington. The property is currently cleared and undeveloped. The property is mainly vegetated with grasses and there is a row of trees that runs through the middle of the property. There is an abandoned barn/outbuilding near the tree line. The site is bordered by scattered single family residences to the north, a residential development to the east, State Highway 101 to the south, and South 9th Avenue to the west with scattered single family residences beyond.

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/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 Geologic Map of the Carlsborg 7.5-Minute Quadrangle, Clallam County, Washington, prepared by Henry W. Schasse and Karl W. Wegmann, (WA DNR Open File Report 2000-7) indicates that the site vicinity is underlain by Alluvium (Qa) and is near a contact with Older Alluvium (Qoa). Alluvium generally consists of moderately sorted silt, sand and gravel deposited by streams and rivers. Older Alluvium generally consists cobbly, pebbly, and bouldery gravel in a matrix of sand, silt, and clay.

FIELD INVESTIGATION

Six (6) exploratory test pits were completed to evaluate the subsurface soil and groundwater conditions in the proposed development area. The test pits were completed on October 3, 2019 with an excavator provided by the client. The test pits were excavated to depths of approximately 6.0 feet to 7.0 feet below the existing ground surface (BGS). A field engineer from Krazan and Associates was present during the explorations, examined the soils and geologic conditions encountered, obtained samples of the different soil types, and maintained logs of the explorations.

Representative samples of the subsurface soils encountered in the test pits were collected and sealed in plastic bags. These samples were transported to our laboratory for further examination and testing. The soils encountered in the exploratory test pits were continuously examined and visually classified in accordance with the Unified Soil Classification System (USCS).

Additionally, three (3) Cone Penetrometer Tests (CPT) were advanced at the site near the proposed building location. The explorations using the CPT rig were completed on same day as our test pit explorations. The CPT method consists of pushing an instrumented cone into the ground at a controlled rate and recording the measured soil parameters such as tip resistance, friction ratio, and pore pressure. These parameters are used to determine the geotechnical engineering properties of soils and delineate soil stratigraphy. The results of the CPT are included in Appendix A. The approximate locations of the CPTs are also shown on the Site Plan in Figure 2.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Six (6) exploratory test pits were completed at this site. Our exploratory test pits generally exposed medium dense native granular soils to the depth explored at 7.0 feet BGS. This section of the report is intended to provide a general description the subsurface conditions. Detailed descriptions of the soils encountered in each of the test pits are presented in the test pit logs in Appendix A.

TP-1 exposed 6-inches of organic topsoil underlain by moist, medium dense to dense, tan-brown gravel with sand and cobbles extending to a depth of approximately 4.0 feet BGS. Underlying the gravel with sand, TP-1 exposed moist, dense, brown sand with silt and gravel and cobbles to the depth explored at 6.0 feet BGS.

TP-2 exposed 6-inches of organic topsoil underlain by moist, medium dense to dense, tan-brown gravel with sand and cobbles extending to a depth of approximately 5.0 feet BGS. Underlying the gravel with sand, TP-2 exposed moist, dense, brown sand with silt and gravel and cobbles to the depth explored at 7.0 feet BGS.

TP-3 exposed 6-inches of organic topsoil underlain by moist, medium dense to dense, tan-brown gravel with sand and cobbles extending to a depth of approximately 3.5 feet BGS. Underlying the gravel with sand, TP-3 exposed moist, dense, brown sand with silt and gravel and cobbles to the depth explored at 6.0 feet BGS.

TP-4 exposed 6-inches of organic topsoil underlain by moist, medium dense to dense, tan-brown gravel with sand and cobbles extending to a depth of approximately 4.5 feet BGS. Underlying the gravel with sand, TP-4 exposed moist, dense, brown sand with silt and gravel and cobbles to the depth explored at 7.0 feet BGS.

TP-5 exposed 6-inches of organic topsoil underlain by moist, medium dense to dense, tan-brown gravel with sand and cobbles extending to a depth of approximately 5.0 feet BGS. Underlying the gravel with sand, TP-5 exposed moist, dense, brown sand with silt and gravel and cobbles to the depth explored at 6.0 feet BGS.

TP-6 exposed 6-inches of organic topsoil underlain by moist, medium dense to dense, tan-brown gravel with sand and cobbles extending to a depth of approximately 4.5 feet BGS. Underlying the gravel with sand, TP-6 exposed moist, dense, brown sand with silt and gravel and cobbles to the depth explored at 6.5 feet BGS.

GEOLOGIC HAZARDS

Erosion Concern/Hazard

The Natural Resources Conservation Services (NRCS) map for Clallam County Area, Washington, classifies the site area as Carlsborg gravelly sandy loam (0 to 5 percent slopes). The NRCS classifies the Carlsborg gravelly sandy loam as Hydrologic Group A with low potential for erosion in a disturbed state.

It has been our experience that soil erosion potential 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, such as 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 ASCE-7 for Site Class Definitions. It is our opinion that the overall soil profile corresponds to Site Class C as defined by Table 20.3-1 "Site Class Definitions," according to the 2010 ASCE-7 Standard. Site Class C 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 explorations on this site extended to a maximum depth of approximately 8 feet and this seismic site class designation is based on the assumption that medium dense to very dense conditions continue below the depth explored.

We referred to the Applied Technology Council (ATC) 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 utilizes the most updated published data on seismic conditions from the United States Geological Survey. The seismic design parameters for this site are presented in the following table:

Seismic Design Parameters
(Reference: 2015 IBC Section 1613.3.2, ASCE, and ATC)

Seismic Item	Value
Site Coefficient F_a	1.000
S_s	1.320
S_{MS}	1.320
S_{DS}	0.880
Site Coefficient F_v	1.500
S_1	0.544
S_{M1}	0.816
S_{D1}	0.544

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 loose sand in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sand.

The "Liquefaction Susceptibility Map of Clallam County, Washington," by Stephen Palmer, et al. (WADNR, September 2004) indicates that the property is located in an area of moderate to high liquefaction susceptibility. However, our explorations indicated the site is underlain by medium dense to very dense sand with gravel and cobbles are considered to have a ***low*** potential for liquefaction and amplification of ground motion.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on our explorations, it is our opinion that conventional spread foundations supported on medium dense or firmer native soil, or on structural fill extending to the medium dense or firmer native soil would provide adequate support for the proposed new building.

Our explorations generally encountered approximately 6-inches of organic topsoil underlain by the medium dense to dense granular native soils. The medium dense or firmer native soil should provide

adequate support for foundations, and pavement. Footings should extend through any organic soil, or loose/soft soil and be founded on the underlying medium dense or firmer native soil or structural fill extending to the competent native soils.

The upper 6.5 feet of soils encountered on this site are considered moisture-sensitive and will be easily disturbed and difficult to compact when wet. We recommend that construction take place during extended periods of dry weather in the summer months, if possible. If construction is to take place during wet weather, 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 subgrades and construction traffic areas.

The on-site granular soils encountered may be suitable for use as structural fill material, provided the moisture content is near optimum and the soil could be suitably compacted to specifications. This will depend on the moisture content of the soils at the time of construction. Krazan and Associates should be retained to determine if the on-site soils can be used as structural fill material at the time of construction.

Site Preparation

In general, site clearing should include removal of any vegetation and associated root systems; wood; abandoned utilities; structures including foundations, basement walls and floors; rubble; and rubbish. Site stripping in the proposed building pad area should extend until all the organic topsoil has been removed. Further site preparation recommendations are provided in the **Foundations, Pavement,** and **Floor Slab and Exterior Flatwork** sections of this report.

After stripping is completed, the building pad area should be proof-rolled with a loaded tandem-axle dump truck and be visually inspected to identify any loose/soft areas. Any loose/soft soils should be excavated to expose firm native soils. The resulting excavations should be filled with structural fill consisting of approved on-site material, or imported materials. Structural fill material should be within ± 2 percent of the optimum moisture content, and the soils should be compacted to a minimum of 95 percent of the maximum dry density as determined by the ASTM D 1557 Test Method.

During wet weather conditions, which typically occur from October through May, subgrade stability problems and grading difficulties may develop due to excess moisture, disturbance of moisture sensitive soils and/or the presence of perched groundwater. Earthwork construction during extended periods of wet weather could create the need to remove wet disturbed soils if they cannot be suitably compacted due to elevated moisture contents. The on-site soils encountered in our test pits are considered to be moisture sensitive. If over-excavation is necessary, it should be confirmed through continuous monitoring and testing by a qualified geotechnical engineer or geologist. Soils that have become unstable may require drying to near their optimal moisture content before compaction is feasible. 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. Preparation of the site for wet weather conditions may

consist of the placement of a layer of aggregate base for the protection of exposed soils during construction.

It should be understood that even if Best Management Practices (BMPs) for soil protection are implemented for the wet season, there is a significant chance that additional soil mitigation work will be needed.

Any buried structures encountered during construction should be completely removed and backfilled with structural fill. Excavations, depressions, or soft and pliant areas extending below the planned subgrade elevations should be excavated to expose medium dense or firmer soil, and be backfilled with structural fill. In general, any septic tanks, underground storage tanks, debris pits, cesspools, or similar structures and deleterious materials should be completely removed. Any concrete footings encountered in the planned foundation area should be removed to depth of at least 3 feet below proposed footing elevations or as recommended by the geotechnical engineer. The resulting excavations should be backfilled with structural fill.

A representative of our firm should be available on request during all grading operations to observe, test and evaluate earthwork construction. This testing and observation is 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 subsection of this report.

Temporary Excavations

The on-site soils have variable cohesion strengths, therefore the safe angles to which these materials may be cut for temporary excavations is limited, as the soils may be prone to caving and slope failures in temporary excavations deeper than 4 feet. We did not observe caving in our test pits. Temporary excavations in the native soils should be sloped no steeper than 1H:1V (horizontal to vertical) where room permits.

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 or other erosion control materials to help minimize erosion during wet weather and the slopes should be closely monitored until the permanent retaining systems and erosion control measures are complete. Materials should not be stored and equipment should not be 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 reason 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 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. 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** subsection 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 on-site soils may be suitable for reuse as structural fill, provided the soil is free of organic material and debris, and it is within ± 2 percent of the optimum moisture content. If the native soils are stockpiled for later use as structural fill, the stockpiles should be covered to protect the soil from wet weather conditions. We recommend that a representative of Krazan & Associates be on site during the excavation work to determine which soils are suitable for placement as structural fill.

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). 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 thickness prior to compaction, 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 D1557 Test Method. 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.

Foundations

Shallow Foundation

General: The proposed structure may be supported on a conventional spread foundation system bearing on the medium dense or firmer native soils or on structural fill including rock spalls or Control Density Fill (CDF) extending to the medium dense or firmer native soils. Based on our soil explorations, we interpreted the medium dense to dense, native bearing soils at this site to be approximately 1-foot below the current grade. We recommend that we evaluate the foundation subgrade soils during construction to determine the consistency throughout the building pad.

Soil Bearing: Conventional shallow spread footings supported on medium dense of firmer native soils, or on structural fill extending to the medium dense or firmer native soils, may be designed using an allowable bearing pressure of **2,500 pounds per square foot (psf)** for dead plus live loads. We have assumed isolated column loads of 30,000 pounds and wall loads of 2,000 pounds per lineal foot. *We should be contacted to re-evaluate the allowable bearing pressure, if the design loads are different than the stated assumed values.* This value may be increased by 1/3 for short duration loads such as wind or seismic loading. A representative of Krazan and Associates should evaluate the foundation bearing soil and observe structural fill placement.

Footings should have a minimum embedment depth of 18 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. Footings should have a minimum width of at least 12 inches regardless of load. Water should not be allowed to accumulate in footing trenches. All loose or disturbed soil should be removed from the foundation excavations prior to placing concrete. Water should not be allowed to collect in the foundation excavations.

Structural Fill in Footing Areas: If rock spalls or structural fill soils are used, then the foundation excavations would need to be widened on both sides of the footing a distance equal to one-half of the depth of the over-excavation below the bottom of the footing. Structural fill should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. To reduce the volume of extra excavation needed for the footing trenches and to simplify structural fill placement, it may be practical to place Control Density Fill (CDF) to fill the deeper footing trenches to the planned footing subgrade elevations. If CDF is used, the trench may be excavated only slightly wider (6 inches wider on each side) than the footing.

Potential Foundation Settlement: For foundations constructed as recommended, the total settlement is not expected to exceed 1-inch. Differential settlement 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 risk of liquefaction is considered low, given the composition and density of the native, on-site soils.

Design Parameters – Lateral Resistance: Resistance to lateral displacement can be computed using an allowable friction factor of 0.35 acting between the bases of foundations and the supporting subgrade soil. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 300 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.

Lateral Earth Pressures and Retaining Walls

We have developed criteria for the design of retaining or below grade walls. Our design parameters are based on retention of the in-place soils. The parameters are also based on level, well-drained wall backfill conditions. Walls may be designed as "restrained" retaining walls based on "at-rest" earth pressures, plus any surcharge on top of the walls as described below, if the walls are braced to restrain movement and/or movement is not acceptable. Unrestrained walls may be designed based on "active" earth pressure, if the walls are not part of the buildings and some movement of the retaining walls is acceptable. Acceptable lateral movement equal to at least 0.2 percent of the wall height would warrant the use of "active" earth pressure values for design. We recommend that walls supporting horizontal backfill and not subjected to hydrostatic forces be designed using a triangular earth pressure distribution equivalent to that exerted by a fluid with a density of 35 pcf for yielding (active condition) walls, and 55 pcf for non-yielding (at-rest condition) walls.

The stated lateral earth pressures do not include the effects of hydrostatic pressure generated by water accumulation behind the retaining walls or loads imposed by construction equipment, foundations or roadways adjacent to the wall (surcharge loads). To minimize the lateral earth pressure and prevent the buildup of water pressure against the walls, continuous footing drains (with cleanouts) should be provided at the bases of the walls. The footing drains should consist of a minimum 4-inch diameter rigid PVC perforated pipe, sloped to drain, with perforations placed near the bottom. The drainpipe should be enveloped by 6 inches of washed gravel in all directions wrapped in filter fabric to prevent the migration of silt and clay into the drain.

The wall fill adjacent to and extending a lateral distance of at least 2 feet behind the walls should consist of free-draining granular material. All free-draining backfill should contain less than 3 percent fines (passing the U.S. Standard No. 200 Sieve) based upon the fraction passing the U.S. Standard No. 4 Sieve with at least 30 percent of the material being retained on the U.S. Standard No. 4 Sieve. Alternatively, a drainage composite may be used. It should be realized that the primary purpose of the free-draining material is the reduction of hydrostatic pressure. Some potential for the moisture to contact the back face of the wall may exist, even with treatment, which may require that more extensive waterproofing be specified for walls, which require interior moisture sensitive finishes.

We recommend that the wall fill be compacted to at least 95 percent of the maximum dry density based on ASTM D1557 Test Method. In-place density tests should be performed to verify adequate compaction. Soil compactors place transient surcharges on the backfill. Consequently, only light hand

operated equipment is recommended for fill compaction within 3 feet of walls so that excessive stress is not imposed on the walls.

Floor Slabs and Exterior Flatwork

Before the placement of concrete floors or sidewalks on the site, or before any floor supporting fill is placed, the organic topsoil must be removed. The subgrade should then be proof-rolled to confirm that the subgrade contains no soft or deflecting areas. Areas of yielding soils should be excavated to *at least 1 foot* below the planned slab subgrade and then backfilled with structural fill.

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 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 medium dense or firmer native soils or on structural fill extending to medium dense or firmer native soil.

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 4-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.

It is recommended that the utility trenches within the building pads be compacted, as specified in this 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 structure should not be allowed to occur. In addition, ventilation of the structure 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 implemented and these measures should be in general accordance with local regulations. As 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 (BMPs), grading activities can be undertaken during the wet season (generally October through April), but it should also be known that this may increase the overall cost of the project.

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

The explorations were checked for the presence of groundwater seepage during exploratory operations. Groundwater seepage was not encountered in the test pits.

It should be recognized that groundwater elevations may fluctuate with time. The groundwater level will 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.

If groundwater is encountered during construction, we should observe the conditions to determine if dewatering will be needed. 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. A qualified geotechnical engineering firm 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. Roof drains should not be connected to the footing drains.

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.

Specific recommendations for and design of storm water disposal systems or septic disposal systems are beyond the scope of our services and should be prepared by other consultants that are familiar with design and discharge requirements.

Utility Trench Backfill

We recommend that utility trench backfill be placed in general accordance with typical recommendations for structural fill placement. A firm and unyielding subgrade should allow for the proper placement of subsurface utilities. This could include the placement of geotextile and quarry rock in the bottom of utility trenches prior to placement of pipe bedding, utilities and 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. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

All utility trench backfill should consist of structural fill. 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.

We should be retained to evaluate proposed structural fill materials prior to construction to provide recommendations regarding how to place and evaluate fill performance. Pipe bedding should be in accordance with the pipe manufacturer's recommendations.

Pavement Design

Our explorations generally encountered medium dense to dense native granular soils. Undocumented fill was not encountered in our explorations. However, loose soils or undocumented fill maybe encountered in unexplored areas of the site. If loose soils or undocumented fill are encountered in the pavement subgrade, we recommend that subgrade modification techniques be considered. Subgrade modification typically includes the overexcavation of unsuitable materials, the placement of a high-strength geotextile fabric at the bottom of the over-excavated area, and then the placement of structural fill. Subgrade modification such as this is intended to disperse surcharge loads and therefore aid in pavement performance.

Where loose soils are encountered in the pavement subgrade, we recommend overexcavation of the loose soil/undocumented fill to at least 12 inches below the planned pavement subgrade elevation. We recommend that a high-strength geotextile separation fabric, such as Mirafi 600X or equivalent then be placed over the compacted soil. After the fabric is placed, the area should be filled to the planned pavement subgrade elevation with structural fill consisting of clean crushed rock, rock spalls or CDF. 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 it 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 (firetrucks). The following tables show the recommended pavement sections for both light duty and heavy duty traffic loads.

ASPHALTIC CONCRETE (FLEXIBLE) PAVEMENT

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

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.

** 95% compaction based on ASTM Test Method D1557*
*** A proof roll may be performed in lieu of in place density tests*

The asphaltic concrete depth in the flexible pavement tables should be a surface course type asphalt, such as Washington Department of Transportation (WSDOT) ½ inch HMA. The pavement specification in

Appendix C provides additional recommendations including aggregate base material. The asphaltic concrete depth in the flexible pavement tables should be a surface course type asphalt, such as Washington State Department of Transportation (WSDOT) ½ inch HMA.

Infiltration Testing and Analysis

The preliminary design infiltration rate was developed per the Small-Scale PIT method as stated in Volume III, Chapter 3 of the Department of Ecology 2014 Stormwater Management Manual for Western Washington (SWMMWW). This method provides a field test to estimate the initial saturated hydraulic conductivity (K_{sat}) for the subsurface soils encountered below the proposed infiltration facility. Correction factors are then applied to this measured value to account for site variability and number of locations tested, test method, and degree of influent control.

Changes in soil conditions and the corresponding infiltration rates are possible at different locations and depths. Accordingly, we recommend that additional tests (Small-Scale PIT) be performed once the design team establishes the type and location of the stormwater management system.

Based on our field explorations and small-scale PIT results, it is our opinion that the site is suitable for infiltration and the *preliminary* design infiltration rate of **6.0 inches per hour** would be appropriate for a well-maintained infiltration system using the native soils. The rate provided is a long-term design infiltration rate. The on-site stormwater infiltration system should be designed by a Washington State Licensed Civil Engineer.

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. We should also be present during the construction of stormwater management system to evaluate the soils. 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.

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 disclosed during our field investigation. The findings and conclusions of this report can be affected by the passage of time, such as seasonal weather conditions, manmade influences, such as construction on or adjacent to the site, 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 reevaluated.

Misinterpretations of this report by other design team members can result in project delays and cost overruns. These risks can be reduced by having Krazan & Associates, Inc. involved with the design team's meetings and discussions after submitting the 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. Inc. 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 soils log 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 (360) 598-2126.

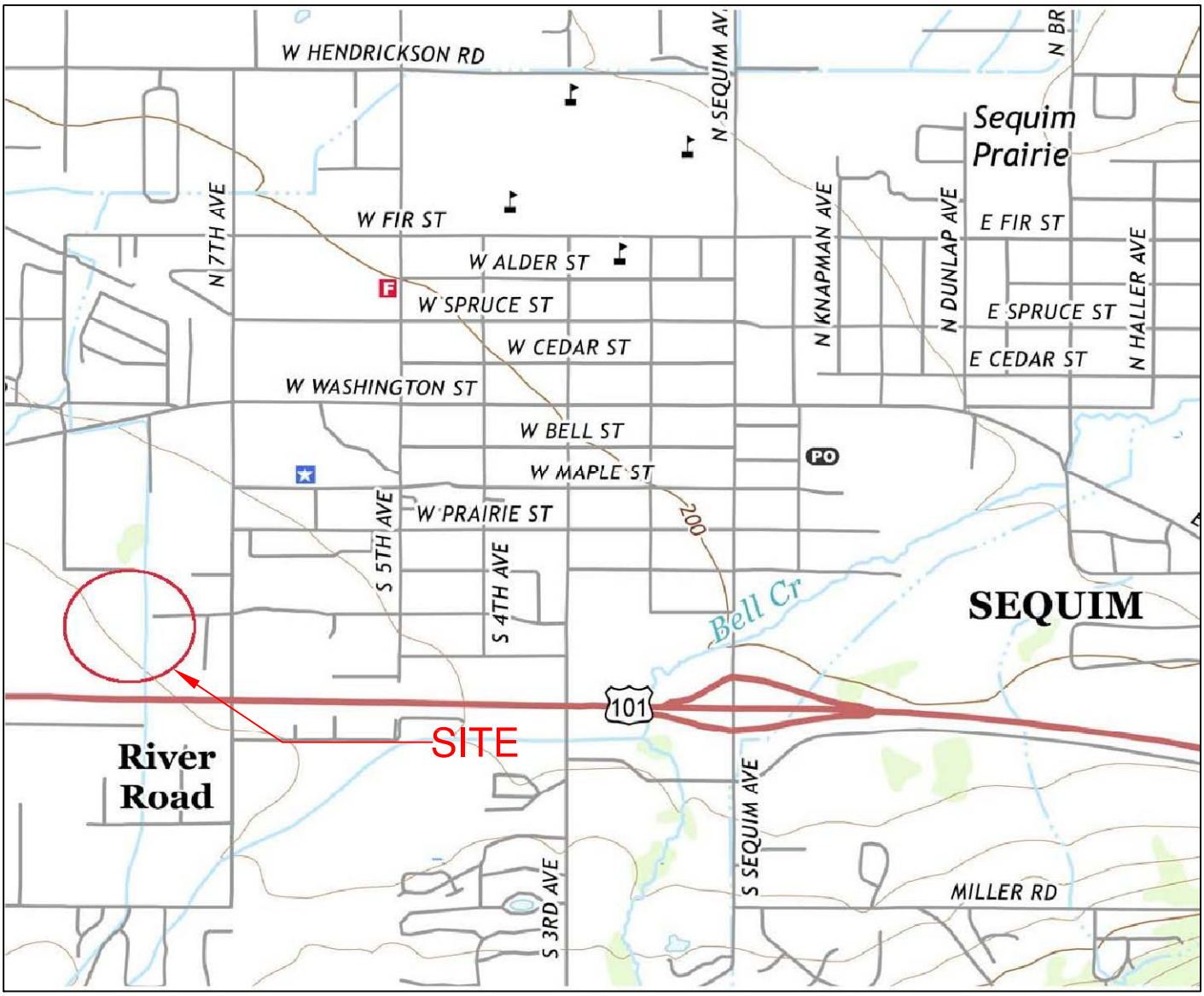
Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

10/24/19

Michael D. Rundquist, P.E.
Senior Project Manager

Vijay Chaudhary, P.E.
Project Engineer

VC:MR



Reference: USGS topographic map titled "Sequim Quadrangle, Washington, 7.5-Minute Series", dated 2017.

Vicinity Map	
Proposed MAT Facility	Figure 1
Sequim, WA	
Project Number: 102-19020	Drawn By: V.C. Date: October 2019
Krazan & ASSOCIATES, INC.	Not to Scale

LEGEND

TP-1 Number and Approximate Location of Test Pits

C-1 Number and Approximate Location of Cone Penetration Test (CPT)

Reference: Conceptual Site Plan, prepared by Rice Fergus Miller, dated June 25, 2019.

Site Plan

Proposed MAT Facility	Figure 2
Sequim, WA	
Project Number: 102-19020	Drawn By: V.C. Date: October 2019
Krazan & ASSOCIATES, INC.	Not to Scale

APPENDIX A

FIELD INVESTIGATION – LABORATORY TESTING

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploration program. Six (6) exploratory test pits were excavated and sampled for subsurface exploration at this site. The test pits were completed on October 3, 2019 with an excavator. The excavation services was provided by the client. The test pits were excavated approximately to a depth 6.0 feet to 7.0 feet BGS. The approximate exploratory test pit locations are shown on the Site Plan (Figure 2). The depths shown on the attached test pit logs are from the existing ground surface at the time of our exploration.

The soils encountered were logged in the field during the exploration and are described in accordance with the Unified Soil Classification System (USCS). All samples were returned to a Krazan laboratory for further evaluation. The logs of the soil exploration are presented in this appendix.

We also explored the subsurface conditions at the site with three (3) Cone Penetration Tests (CPT). The CPT method consists of pushing an instrumented cone into the ground at a controlled rate and recording the measured soil parameters such as tip resistance, friction ratio, and pore pressure. These parameters are used to determine the geotechnical engineering properties of soils and delineate soil stratigraphy. Each of the CPTs were terminated at refusal when the cone could not be advanced any deeper. CPT-1 extended to a depth of approximately 8.0 feet BGS, CPT-2 extended to a depth of approximately 5.0 feet BGS, and CPT-3 extended to a depth of approximately 6.0 feet BGS. The approximate locations of the Cone Penetrometer Tests are shown on the Site Plan in Figure 2.

Laboratory Testing

The laboratory testing program was developed primarily to determine the index properties of the soils. Test results were used for soil classification and as criteria for determining the engineering suitability of the surface and subsurface materials encountered. The laboratory test results are included in this appendix.

KRAZAN AND ASSOCIATES, INC.

LOG OF EXPLORATORY TEST PIT TP-1

PROJECT: MAT Facility | **DATE: 10/3/19**
PROJECT NO.: 102-19020 | **PAGE: 1 of 1**
CONTRACTOR: Jamestown | **SURFACE ELEV.:**
SAMPLE METHOD: Grab | **LOCATION: Sequim, WA**

DEPTH (ft)	USC SYMBOL	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE No.	SAMPLE TYPE	Moisture Content and Atterberg Limits (10 20 30 40 50 60 70 80)
			Organic Topsoil			
1			**Gravel with Sand (GP)** Tan-brown fine to coarse sand with gravel and cobbles. (moist, medium dense to dense)			
2				S-1	G	
3						
4			**Sand with Silt and Gravel (SW-SM)** Brown fine to coarse sand with silt and gravel and cobbles. (moist, dense)			
5				S-2	G	
6			End of Exploratory Test Pit			
7						
8						
9						
10						

Water Level Initial: Final:

Water Observations: Groundwater seepage was not encountered.

Notes: Small-Scale PIT was performed at approximatley 3 feet below ground surface.

Logged By: CB

KRAZAN AND ASSOCIATES, INC.

LOG OF EXPLORATORY TEST PIT TP-2

PROJECT: MAT Facility | **DATE: 10/3/19**
PROJECT NO.: 102-19020 | **PAGE: 1 of 1**
CONTRACTOR: Jamestown | **SURFACE ELEV.:**
SAMPLE METHOD: Grab | **LOCATION: Sequim, WA**

DEPTH (ft)	USC SYMBOL	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE No.	SAMPLE TYPE	Moisture Content and Atterberg Limits (10 20 30 40 50 60 70 80)
			Organic Topsoil			
1			**Gravel with Sand (GP)** Tan-brown fine to coarse gravel with sand and cobbles. (moist, medium dense to dense)			
2						
3				S-1	G	
4						
5			**Sand with Silt and Gravel (SW-SM)** Brown fine to coarse sand with silt and gravel and cobbles. (moist, dense)			
6				S-2	G	
7			End of Exploratory Test Pit			
8						
9						
10						

Water Level Initial: Final:

Water Observations: Groundwater seepage was not encountered.

Notes: Caving was not encountered.

Logged By: CB

KRAZAN AND ASSOCIATES, INC.

LOG OF EXPLORATORY TEST PIT TP-3

PROJECT: MAT Facility | **DATE: 10/3/19**
PROJECT NO.: 102-19020 | **PAGE: 1 of 1**
CONTRACTOR: Jamestown | **SURFACE ELEV.:**
SAMPLE METHOD: Grab | **LOCATION: Sequim, WA**

DEPTH (ft)	USC SYMBOL	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE No.	SAMPLE TYPE	Moisture Content and Atterberg Limits (10 20 30 40 50 60 70 80)
			Organic Topsoil			
1			**Gravel with Sand (GP)** Tan-brown fine to coarse gravel with sand and cobbles. (moist, medium dense to dense)			
2						
3				S-1	G	
4			**Sand with Silt and Gravel (SW-SM)** Brown fine to coarse sand with silt and gravel and cobbles. (moist, dense)			
5						
6				S-2	G	
			End of Exploratory Test Pit			
7						
8						
9						
10						

Water Level Initial: ▽ Final: ▼

Water Observations: Groundwater seepage was not encountered.

Notes: Caving was not encountered.

Logged By: CB

KRAZAN AND ASSOCIATES, INC.

LOG OF EXPLORATORY TEST PIT TP-4

PROJECT: MAT Facility | **DATE: 10/3/19**
PROJECT NO.: 102-19020 | **PAGE: 1 of 1**
CONTRACTOR: Jamestown | **SURFACE ELEV.:**
SAMPLE METHOD: Grab | **LOCATION: Sequim, WA**

DEPTH (ft)	USC SYMBOL	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE No.	SAMPLE TYPE	Moisture Content and Atterberg Limits (10 20 30 40 50 60 70 80)
			Organic Topsoil			
1			**Gravel with Sand (GP)** Tan-brown fine to coarse gravel with sand and cobbles. (moist, medium dense to dense)			
2						
3				S-1	G G	
4						
5			**Sand with Silt and Gravel (SW-SM)** Brown fine to coarse sand with silt and gravel and cobbles. (moist, dense)			
6						
7				S-2	G G	
			End of Exploratory Test Pit			
8						
9						
10						

Water Level Initial: ▽ Final: ▼

Water Observations: Groundwater seepage was not encountered.

Notes: Caving was not encountered.

Logged By: CB

KRAZAN AND ASSOCIATES, INC.

LOG OF EXPLORATORY TEST PIT TP-5

PROJECT: MAT Facility | **DATE: 10/3/19**
PROJECT NO.: 102-19020 | **PAGE: 1 of 1**
CONTRACTOR: Jamestown | **SURFACE ELEV.:**
SAMPLE METHOD: Grab | **LOCATION: Sequim, WA**

DEPTH (ft)	USC SYMBOL	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE No.	SAMPLE TYPE	Moisture Content and Atterberg Limits (10 20 30 40 50 60 70 80)
			Organic Topsoil			
1			**Gravel with Sand (GP)** Tan-brown fine to coarse gravel with sand and cobbles. (moist, medium dense to dense)			
2						
3				S-1	G G	
4						
5			**Sand with Silt and Gravel (SW-SM)** Brown fine to coarse sand with silt and gravel and cobbles. (moist, dense)	S-2	G G	
6			End of Exploratory Test Pit			
7						
8						
9						
10						

Water Level Initial: ▽ Final: ▼

Water Observations: Groundwater seepage was not encountered.

Notes: Caving was not encountered.

Logged By: CB

KRAZAN AND ASSOCIATES, INC.

LOG OF EXPLORATORY TEST PIT TP-6

PROJECT: MAT Facility | **DATE: 10/3/19**
PROJECT NO.: 102-19020 | **PAGE: 1 of 1**
CONTRACTOR: Jamestown | **SURFACE ELEV.:**
SAMPLE METHOD: Grab | **LOCATION: Sequim, WA**

DEPTH (ft)	USC SYMBOL	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE No.	SAMPLE TYPE	Moisture Content and Atterberg Limits (10 20 30 40 50 60 70 80)
			Organic Topsoil			
1			**Gravel with Sand (GP)** Tan-brown fine to coarse gravel with sand and cobbles. (moist, medium dense to dense)			
2						
3				S-1	G	
4						
5			**Sand with Silt and Gravel (SW-SM)** Brown fine to coarse sand with silt and gravel and cobbles. (moist, dense)			
6				S-2	G	
7			End of Exploratory Test Pit			
8						
9						
10						

Water Level Initial: Final:

Water Observations: Groundwater seepage was not encountered.

Notes: Caving was not encountered.

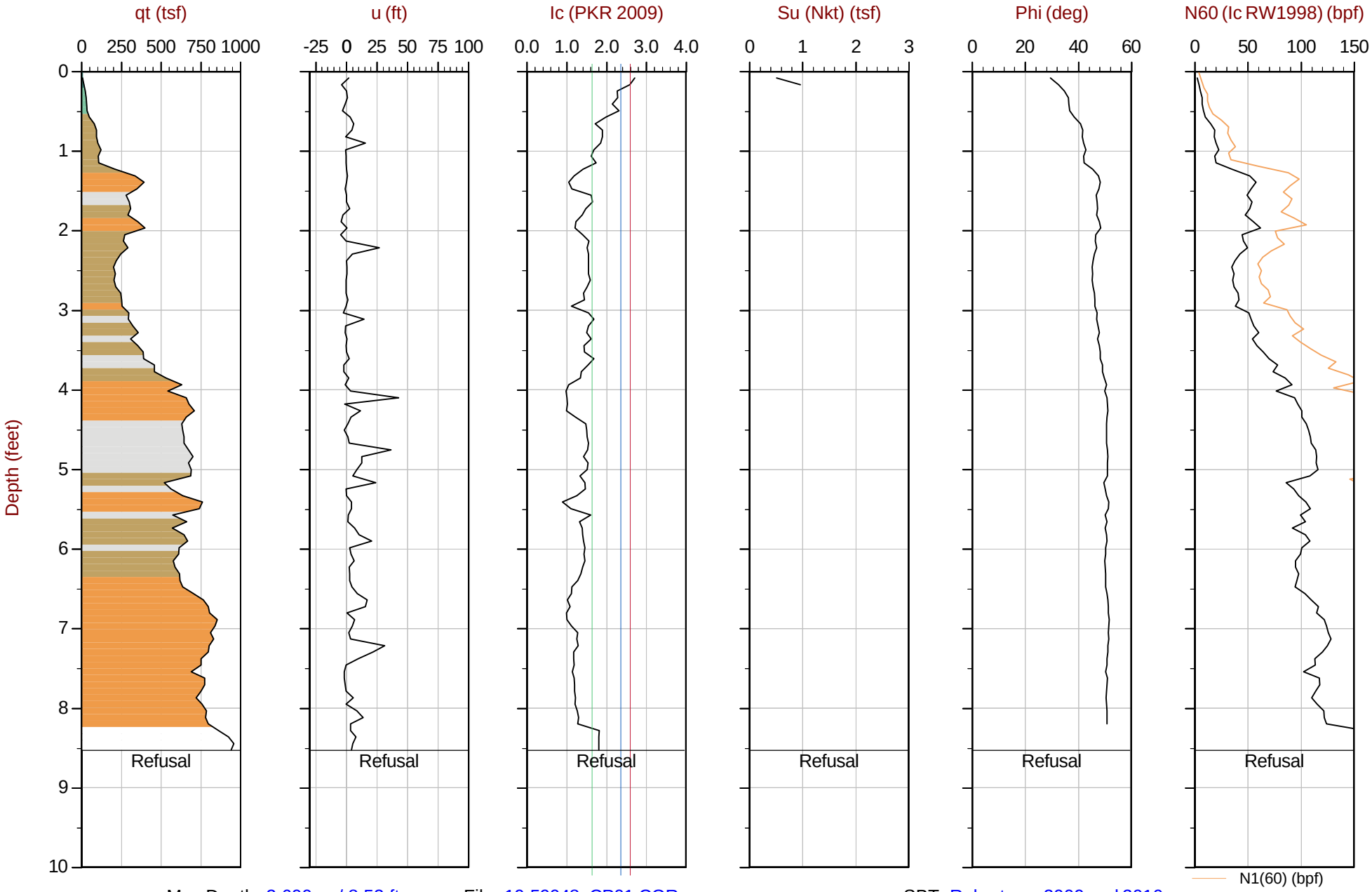
Logged By: CB

CONETEC

Krazan & Associates

Job No: 19-59048
Date: 2019-10-08 09:46
Site: MAT Facility

Sounding: CPT-01
Cone: 536:T1500F15U500



Max Depth: 2.600 m / 8.53 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-59048_CP01.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 48.07561 Long: -123.12284

△ Dissipation with estimated Ueq value ▲ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq) —— Hydrostatic Line

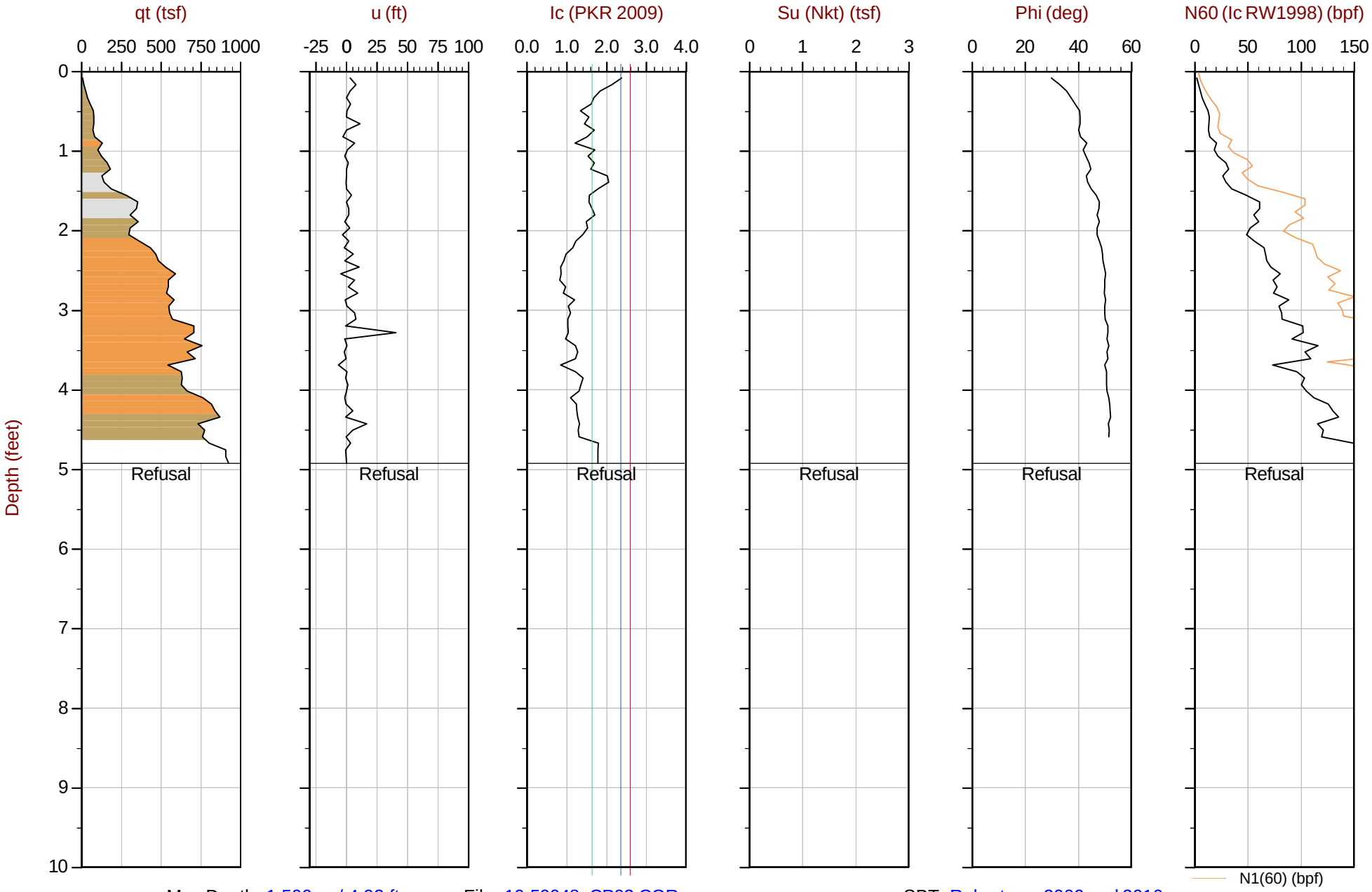
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Krazan & Associates

Job No: 19-59048
Date: 2019-10-08 10:29
Site: MAT Facility

Sounding: CPT-02
Cone: 536:T1500F15U500



Max Depth: 1.500 m / 4.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-59048_CP02.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 48.07575 Long: -123.12237

△ Dissipation with estimated Ueq value ▲ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq) —— Hydrostatic Line

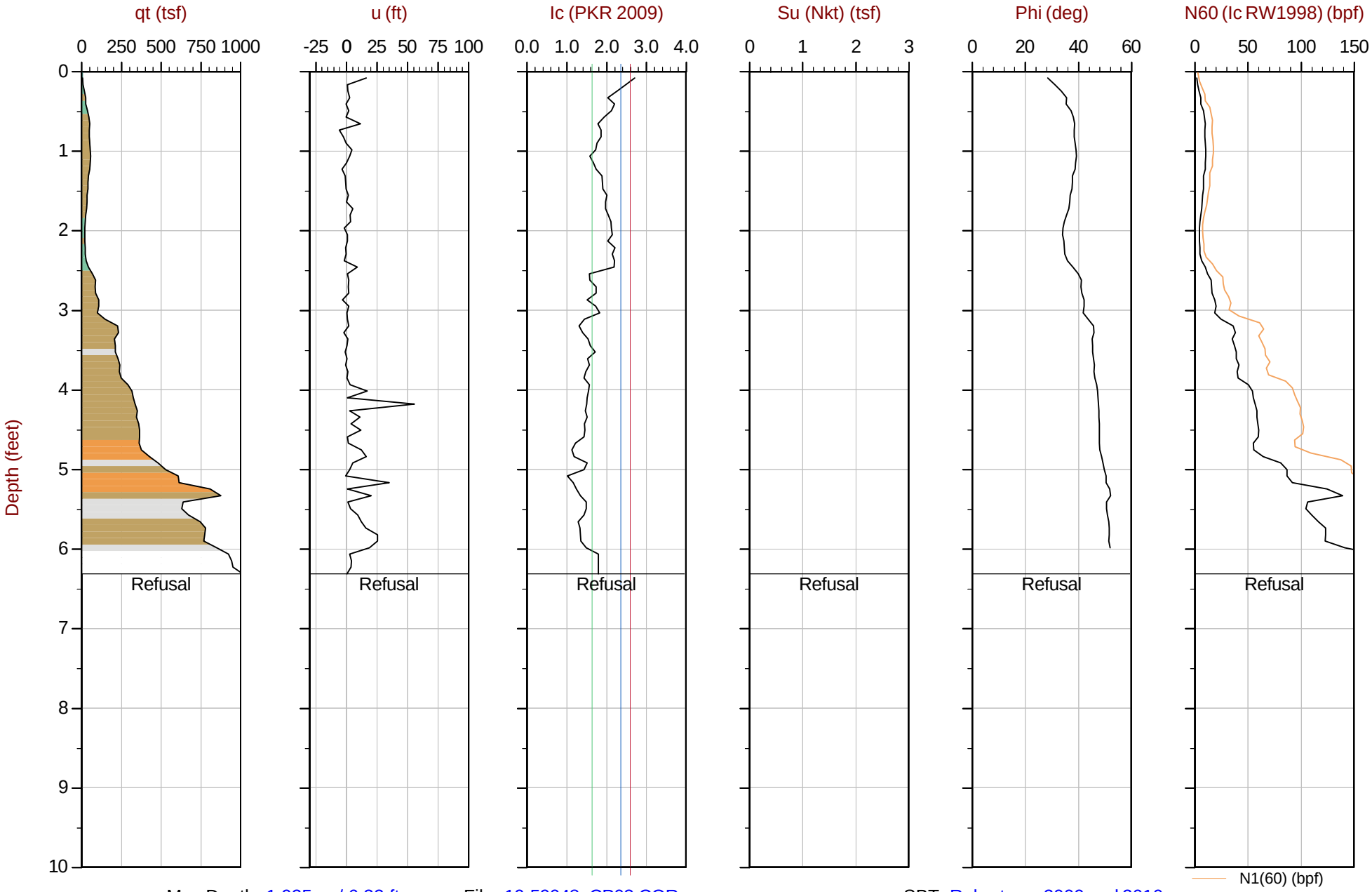
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Krazan & Associates

Job No: 19-59048
Date: 2019-10-08 10:58
Site: MAT Facility

Sounding: CPT-03
Cone: 536:T1500F15U500



Max Depth: 1.925 m / 6.32 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-59048_CP03.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt: 15.0

SBT: Robertson, 2009 and 2010
Coords: Lat: 48.07563 Long: -123.12257

△ Dissipation with estimated Ueq value ▲ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq) —— Hydrostatic Line

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

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: We recommend that all fill materials used on this site consist of clean, free-draining rock materials. We should be retained to evaluate proposed structural fill materials prior to construction to provide recommendations regarding how to place and evaluate fill performance.

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 noted 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 as per the 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 – Due to the presence of shallow groundwater, loose moisture sensitive and mapped liquefiable soils there is potential for adverse impacts to this property if large compaction equipment is used. Hence, we recommend that clean crushed rock should be used as aggregate base.

5. ASPHALTIC CONCRETE SURFACING – Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at 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 compacting equipment, and 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.