APPENDIX A

GEOTECHNICAL REPORT AND SOIL BORING LOGS

City of Kirkland

DRAFT GEOTECHNICAL REPORT
PEDESTRIAN SAFETY IMPROVEMENTS PROJECT
DOWNTOWN AND NE 124TH STREET
KIRKLAND, WASHINGTON

HWA Project No. 2022-165-21

Prepared for
DKS Associates

August 25, 2023

HWA GEOSCIENCES INC.
DBE/MWBE

Geotechnical Engineering
Pavement Engineering
Geoenvironmental
Hydrogeology
Inspection & Testing

September 15, 2023
HWA Project No. 2022-165-21

DKS Associates, Inc.
719 Second Avenue, Suite 1250
Seattle, Washington 98104

Attention: Jerry Liu, P.E.
Senior Project Manager

Subject: **DRAFT GEOTECHNICAL REPORT**
Pedestrian Safety Improvements Project
Downtown and NE 124th Street
Kirkland, Washington

Dear Jerry:

Attached is our draft geotechnical report for Pedestrian Safety Improvements Project – Downtown and NE 124th Street in Kirkland, Washington. This draft geotechnical report includes the results of our field explorations, and our engineering analyses for design and construction of the proposed improvements.

We appreciate the opportunity to provide geotechnical engineering services on this project. Please call if you have any questions or comments concerning this report, or if we may be of further service.

Sincerely,

HWA GEOSCIENCES INC.

William R. Rosso, P.E.
Geotechnical Engineer

JoLyn Gillie, P.E.
Geotechnical Engineer, Principal

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DRAFT GEOTECHNICAL REPORT
PEDESTRIAN SAFETY IMPROVEMENTS PROJECT
DOWNTOWN AND NE 124TH STREET
KIRKLAND, WASHINGTON

1.0 INTRODUCTION

1.1 GENERAL

This report summarizes the results of a geotechnical study by HWA GeoSciences Inc. (HWA) in support of the Pedestrian Safety Improvements Project – Downtown and NE 124th Street in Kirkland, Washington. The purpose of this study was to evaluate soil and groundwater conditions in the vicinity proposed improvements to support developing geotechnical recommendations and construction considerations for two pedestrian HAWK signals on NE 124th Street. The approximate site location for these proposed improvements is indicated on the Vicinity Map, Figure 1.

Our scope of work included advancing one exploratory boring at each of the proposed signal locations, geotechnical laboratory testing of representative soil samples collected from these borings, providing signalization foundation recommendations, and preparation of this draft geotechnical report.

1.2 PROJECT DESCRIPTION

Our understanding is that the project will include construction of pedestrian HAWK signals along NE 124th Street, one per each of the existing pedestrian crossings near 102nd Lane NE and 105th Avenue NE in Kirkland, Washington. We understand that DKS Associates intends to use WSDOT's Standard Plan for drilled shaft signal pole foundations for this project. Additionally, we anticipate that shallow excavations will be made to accommodate the placement of utilities across the intersections.

2.0 FIELD INVESTIGATION

2.1 FIELD EXPLORATIONS

HWA completed a field subsurface investigation program which consisted of advancing two (2) exploratory borings, designated BH-1 and BH-2, within the center turn lane of NE 124th Street to a depth of approximately 30½ feet and 31 feet below the pavement surface (bgs), respectively. The exploratory borings were drilled on August 7, 2023 by Holocene Drilling, under subcontract to HWA, using a Diedrich D-50 track-mounted drill rig equipped with hollow stem auger tooling. The approximate locations of these explorations are shown on the Site and Exploration Plan, Figure 2.

Soil samples were collected within the exploratory borings at 2½- to 5-foot depth intervals using Standard Penetration Test (SPT) sampling methods, which consisted of using a 2-inch outside diameter, split-spoon sampler driven with a 140-pound auto-hammer. During the test, each sample was obtained by driving the sampler up to 18 inches into the soil with the hammer free-falling 30 inches per stroke. The number of blows required for each 6 inches of penetration was recorded. The standard penetration resistance or "N-value" of the soil was calculated as the number of blows required for the final 12 inches of penetration. If a total of 50 blows was recorded within a single 6-inch interval, the test was terminated, and the blow count was recorded as 50 blows/number of inches of penetration. This resistance provides an indication of the relative density of granular soils and the relative consistency of cohesive soils. These borings were backfilled with bentonite chips per Department of Ecology requirements after reaching their target depth.

The borings were completed under the full-time observation of a geotechnical engineer from HWA, who collected pertinent information including soil sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence, as the exploration was advanced. Soils were classified in general accordance with the classification system described in Figure A-1, which also provides a key to the exploration log symbols. The boring logs are presented on Figure A-2 and Figure A-3.

The stratigraphic contacts shown on the individual logs represent the approximate boundaries between soil types. Actual transitions may be more gradual. The soil and groundwater conditions depicted are only for the specific dates and locations reported, and therefore, are not necessarily representative of other locations and times.

2.2 Laboratory Testing

Laboratory tests were conducted at HWA's Bothell, Washington laboratory on selected samples from the explorations to characterize relevant engineering and index parameters. The tests included visual classification, natural moisture content determination, and grain size distribution. All tests were conducted in the HWA laboratory in general accordance with appropriate American Society of Testing and Materials (ASTM) standards. Testing is discussed in further detail in Appendix B. The test results are presented in Appendix B, and displayed on the exploration logs in Appendix A, as appropriate.

3.0 SITE CONDITIONS

3.1 Site Topography

The existing pedestrian crossings used to cross NE 124th Street are flasher style signals near 102nd Lane NE, just south of the North Kirkland Community Center, and between 105th Avenue NE and 105th Place NE. NE 124th Street is about 60 feet wide with two eastbound and two westbound lanes, and a center turn lane for a total of five lanes. The area around NE 124th Street in the vicinity of the crossings is generally developed with single family homes and local roadways.

The crossing at 102nd Place NE is located on a stretch on NE 124th Street at that is at about a 10% grade, sloping up from 100th Avenue NE to the west and levels out at about 105th Avenue NE to the east. The roadway is generally flat east of the crossing at 105th Avenue NE. The condition of the pavement along NE 124th Street in the vicinity of the two crossings is generally good with a few minor signs of distress, such as slight raveling and minor surficial cracking along cold joints.

3.2 General Geologic Conditions

The project is located within the Puget Lowland. The Puget Lowland has repeatedly been occupied by a portion of the continental glaciers that developed during the ice ages of the Quaternary period. During at least four periods, portions of the ice sheet advanced south from British Columbia into the lowlands of Western Washington. The southern extent of these glacial advances was near Olympia, Washington. Each major advance included numerous local advances and retreats, and each advance and retreat resulted in its own sequence of erosion and deposition of glacial lacustrine, outwash, till, and drift deposits. Between and following these glacial advances, sediments from the Olympic and Cascade Mountains accumulated in the Puget Lowland. As the most recent glacier retreated, it uncovered a sculpted landscape of elongated, north-south trending hills and valleys between the Cascade and Olympic Mountain ranges. This landscape is composed of a complex sequence of glacial and interglacial deposits.

Geological information for this site was obtained from the published *Geologic Map of the Kirkland West 7.5 Minute Quadrangle, Washington* (James P. Minard, 1983). According to this geologic map, the near-surface deposits in the vicinity of the project are identified as either recessional outwash deposits or transitional beds, which overly they Olympia gravels. Recessional outwash is deposited as glaciers receded and generally consist of stratified sand gravel with minor silt and clay layers. The transitional beds are nonglacial and glacial deposits which generally consist of massive to bedded clay, silt, and fine sands. Olympia gravels is an informal name for gravel deposits underlying the transitional beds consisting of slightly cemented sands and gravels which are fluvial sediments deposited during the pre-Fraser Olympia Interglaciation.

3.3 Site Soil Conditions

Based on our subsurface explorations, the site is underlain by deposits of recessional outwash deposits and transitional beds, which overly the Olympia gravels. Brief descriptions of the soil units observed in our explorations are presented below in order of deposition, beginning with the most recently deposited.

- **Recessional Outwash** – Recessional outwash deposits were encountered in boring BH-1 immediately beneath pavement section and extended to approximately 30 feet bgs. The material encountered in BH-1 was generally loose to medium dense, olive-brown, slightly silty sand, similar material was also encountered within the upper 5 feet of BH-2. N-values using SPT blow counts from the field ranged from 6 to 26 within this unit. An N-value of 49, which correlates to a dense granular soil, was recorded at 20 feet bgs; however, these blow counts likely overpredict the density of the soil as gravel fragments and rock dust were noted at the tip of the sampler. This could indicate the presence of gravelly soils and the potential for cobbles to be encountered in this deposit.

- **Transitional Beds** – Transitional beds were encountered in boring BH-2 starting at about 5 feet below the pavement section and extended to approximately 30 feet bgs. The material encountered below the recessional outwash in BH-2 was a stiff to hard silt with varying amounts of sand and was varying shades of gray with brownish orange mottling. The unit transitioned to a hard, gray, very sandy silt at approximately 17½ feet bgs. N-values using SPT blow counts from the field ranged from 14 to 46 within this unit.

- **Olympia Gravels** – Olympia gravels were identified in BH-2 at approximately 30 feet bgs and, based on the drastic increase in SPT blow counts, were likely also encountered at 30 feet bgs in boring BH-1; however, there was no soil recovered from the sampler at this depth in BH-1, so the unit was not confirmed. The Olympia gravels encountered were very dense, gray, gravelly, silty sand. N-values using SPT blow counts from the field ranged from 50 blows for 4 inches to 50 blows for 5 inches within this unit.

3.4 GROUNDWATER

Groundwater was not observed in boring BH-1 and BH-2 at the time of drilling, though a wet lens of material was observed within the transitional beds at about 25 feet in BH-2. Each of the subsurface investigations were completed during the dry season and it is anticipated that perched groundwater conditions are likely to be encountered during wetter times of the year. For design and construction estimating purposes we recommend that perched groundwater be anticipated as well as lenses of water bearing materials within the transitional beds, but the local groundwater level at the crossings is anticipated to be deeper than 30 feet below the ground surface.

Prospective contractors should be prepared to encounter and manage seasonally varying groundwater conditions and in response to significant precipitation events. The volume of groundwater may increase where the proposed excavations intersect existing utility trenches, as significant groundwater flows are likely to occur in the permeable gravel backfill within existing trenches, particularly in trenches within the fine grained soils.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 General

The subsurface soils are sufficient to support the proposed signalization improvements. Our subsurface investigation suggests that WSDOT's Standard Plan for signal foundations will be appropriate to support the HAWK signals. Cobbles, or possibly boulders, may be encountered within the subsurface soils and should be accounted for during subsurface excavations and signal pole foundation construction. Contractors should be prepared to use temporary casing to prevent side wall caving of the proposed foundation excavations.

4.2 Seismic Design and Liquefaction Considerations

Earthquake loading for the project location was developed in accordance with the General Procedure provided in Section 3.10 of the *AASHTO LRFD Bridge Design Specifications*, 9th Edition (AASHTO, 2020) and the Washington State Department of Transportation (WSDOT) amendments to the AASHTO *Guide Specifications* provided in the *Bridge Design Manual (LRFD)* (WSDOT, 2022). For seismic analysis, the Site Class is required to be established and is determined based on the average soil properties in the upper 100 feet below the ground surface. Based on our subsurface exploration completed at the two existing crosswalks and our understanding of site geology, it is our opinion that the site is underlain by soils that are consistent with Site Class D.

The mapped seismic design coefficients for the design level event, which has a probability of exceedance of 7 percent in 75 years (equal to a return period of 1,033 years) were obtained from the USGS Uniform Hazard Tool website using the U.S. 2014 Dynamic Conterminous edition (v4.2.0), which provides the probabilistic seismic hazard parameters from the *2014 Updates to the National Hazard Maps* (Peterson, et al., 2014). Site coefficients were developed following the WSDOT BDM that adopts the site coefficients provided in ASCE 7-16. Table 1 presents the design coefficients to use assuming Site Class D for the site.

Table 1 - Seismic Coefficients Using AASHTO Guide Specifications calculated by USGS Seismic Hazard Map

Period (sec)	Mapped AASHTO LRFD Spectral Response Acceleration (g)		Site Coefficients		Design Spectral Response Acceleration (g)	
0.0	PGA	0.389	F_{PGA}	1.211	A_s	0.471
0.2	S_s	0.881	F_a	1.148	S_{Ds}	1.011
1.0	S_1	0.257	F_v	2.085	S_{D1}	0.531

Transition Point	Period (sec)
T_0	0.106
T_s	0.531

Seismic Design Category
D

Notes: *7% Probability of Exceedance in 75 years for Latitude 47.71121° and Longitude -122.20489°*
PGA = Peak ground acceleration
F_{PGA} = PGA site coefficient
As = Design Seismic Coefficient equal to the mapped PGA adjusted for Site Class effects
S_S = Short period (0.2 second) Mapped Spectral Acceleration
S_1 = 1.0 second period Mapped Spectral Acceleration
S_{DS} = Design Spectral Response Acceleration for short period =2/3 • S_{MS}
S_{D1} = Design Spectral Response Acceleration for 1-second period =2/3 • S_{M1}
Fa = Short Period Site Coefficients
F_V = Long Period Site Coefficients
$T_0 = 0.2 \cdot S_{D1}/S_{DS}$
$T_S = S_{D1}/S_{DS}$

4.2.1 Seismic Hazards

Earthquake-induced geologic hazards typically include land sliding, fault rupture, settlement, and liquefaction phenomena and their associated effects (loss of shear strength, bearing capacity failures, loss of lateral support, ground oscillations, lateral spreading, etc.).

Liquefaction typically occurs when loose to medium dense, granular, saturated soils are subjected to ground shaking. Based on the lack of groundwater observed at the site, we consider the potential for liquefaction at the site to be low. We also anticipate the potential for slope instability within existing slopes at the site is low during a seismic event.

Based on a review of the USGS fault database there is a mapped trace of the Southern Whidbey Island Fault Zone approximately 1¾ miles to the north; however, it is not mapped as crossing the site and therefore potential for fault rupture in the site can be considered low.

4.3 Signal Pole Design Recommendations

We understand that the proposed signalization improvements will consist of cantilever signal poles conforming to the WSDOT's Traffic Signal Standard Foundations, Standard Plan J-26.10-03. To utilize the standard plan's foundation design, the required signal standard foundation depths and diameters are a function of the total "XYZ" value of each mast arm and the allowable lateral bearing pressure of the surrounding soils.

Table 17-2 of the *WSDOT Geotechnical Design Manual* (WSDOT, 2022) provides allowable lateral bearing pressures based on Standard Penetration Test (SPT) resistance N-values (blows/foot). We recommend that signal poles at both crossings be designed using the information presented in Table 2 below, which presents our recommended average N-values and corresponding allowable lateral bearing pressures to use for design of the signal poles foundations in the vicinity of boreholes BH-1 and BH-2.

Table 2 – Lateral Bearing Pressures from the WSDOT Geotechnical Design Manual

Crossing Location	Boring	Recommended Average N-Value (bpf)	Lateral Bearing Pressure (psf)
102nd Ln NE	BH-1	10	1,500
105th Ave NE	BH-2	15	2,500

4.3.1 Signal Pole Foundation Construction Considerations

While not encountered in our explorations, the contractor should be prepared to handle potential obstructions during advancement of the shaft excavations. The shaft excavations for the proposed signal pole locations will extend through medium dense sandy soils and stiff to hard fine grained soils at the proposed locations for the HAWK signals. The recessional outwash soils encountered in BH-1 and BH-2 were loose to medium dense with a relatively low fines content; these types of sands tend to slough during excavations. Temporary casing may be required to maintain shaft sidewall stability at locations where the foundation excavations encounter these soils.

Drilled shaft bottoms should be cleaned to the extent practical using appropriate methods. Perched groundwater may cause seepage into shaft excavations at each intersection depending on the season. Shaft foundations should be placed in such a manner as to prevent segregation of the aggregate, if shaft foundations extend more than 4 feet below the ground surface a tremie, elephant pipe, or other method should be used to prevent segregation. Shaft foundations where more than 6 inches of water are present in the shaft, concrete should be placed by the tremie method into the shafts. The signal pole shaft locations should also be checked to confirm that the proposed excavations do not conflict with existing utilities. Where foundation/utility conflicts are present, the foundation location should be adjusted, or the utility should be relocated.

A qualified geotechnical engineer should observe shaft excavation and concrete placement. This will also provide the opportunity to confirm conditions assumed in design and provide corrective recommendations as necessary to adapt to conditions observed during construction.

4.4 STORMWATER MANAGEMENT

It is our understanding that construction of the proposed intersection improvements will not change the amount of impermeable surface across the intersection. In the event that additional stormwater management facilities are required, the use of onsite infiltration is likely to be feasible. The gradation of the subsurface soils is conducive to the use of shallow, low impact, onsite infiltration. If additional stormwater management facilities are required for flow control, HWA should be contacted to review the designs and evaluate if additional field explorations or testing will be required.

4.5 GENERAL EARTHWORK

4.5.1 General

We understand that trenching and excavations are planned to be conducted in support of the installation of electrical conduit trenches. Additionally, a variety of existing utilities are currently in the project vicinity and may require relocation due to proposed improvements. Our understanding is that any utility relocation work will conform to the appropriate City of Kirkland Pre-Approved plan. While specifics for utility alignments to support the HAWK signals have not been provided to us, we anticipate that most trench work will be shallow for electrical conduits and trenches will not extend to depth greater than about 4 feet bgs. If trenches are anticipated to extend to depth greater than 4 feet, HWA should be notified to ensure the recommendations provided within this report remain applicable.

4.5.2 Temporary Shoring and Sloped Excavations

We expect that temporary shoring for utility work will not be required. Design of temporary shoring and maintenance of safe working conditions, including temporary excavation stability is the responsibility of the contractor. In accordance with Part N of Washington Administrative Code (WAC) 296-155, all temporary cuts in excess of 4 feet in height must be either sloped or shored prior to entry by personnel. The existing native soils are generally classified as Type C soils per WAC 296-155. Where shoring is not used, temporary cuts in Type C soils should be sloped no steeper than 1½H:1V (horizontal:vertical). We anticipate that the contractor should be able to manage perched groundwater seepage using sumps and pumps. If significant perched groundwater seepage is encountered within the trench excavations, unshored excavations will require flatter side slopes of at least 4H:1V.

4.5.3 Utility Line Trench Caving

The native sandy soils are expected to generally be medium dense in nature and are prone to sloughing during excavation, if not properly sloped or shored. Trench sidewall caving can result in undermining adjacent pavements, utilities and other structures. Some level of sidewall caving should be anticipated during utility trenching, and mitigation measures should be implemented to avoid damage to adjacent pavements, utilities and structures. To reduce the potential for trench sidewall caving to undermine adjacent pavement, we recommend that the pavement along the trench alignment be sawcut and removed a minimum of 2-feet beyond the anticipated trench width, in all directions. Where the proposed trenches are extended next to utilities at higher elevation, cross under existing utilities, or run close to structural foundations, the effect of trench wall caving should be evaluated and mitigated.

4.5.4 Utility Trench Subgrade Preparation

Any unsuitable materials, such as peat, organics, or deleterious material (e.g., logs, stumps etc.) are not anticipated, but if encountered at the base of the excavation they should be removed. Such materials should be over-excavated, and the exposed subgrade compacted to a firm state, as determined by the geotechnical engineer. Over-excavated areas should be backfilled, up to 1 foot below the utility invert, with 1½-inch crushed ledge rock that is tamped into an unyielding condition. Over-excavation should extend on either side of the pipe a distance equal to the depth of the over-excavation beneath the invert elevation or full width of the trench.

Once over-excavated areas have been backfilled up to 1 foot below the pipe invert the improved subgrade and native subgrade, or areas where no unsuitable soils were observed, should be compacted to a firm state as determined by the geotechnical engineer. Trench bottoms should be free of debris and standing water. If subgrade soils are disturbed, the disturbed material should be removed down to undisturbed soil and replaced with properly placed and compacted structural fill bedding material. To minimize trench subgrade disturbance during excavation, the excavator should use a smooth-edged bucket rather than a toothed bucket.

4.5.5 Utility Pipe Bedding Recommendations

The subsurface soils are generally expected to consist of medium dense sandy granular soils and stiff to hard fine grained soils, both are expected to provide adequate support for utilities.

Where the native soils are competent and do not require over-excavation, bedding material should be placed directly on the undisturbed native soils. We recommend the utilities be founded on suitable bedding material that meets the relevant City of Kirkland's Pre-Approved plan for the utility. Generally, the City of Kirkland's plans call for the use of either Crushed Surfacing Top

Course (CSTC) or pea gravel, native soils will not be suitable for utility bedding. Pipe bedding should provide a firm uniform cradle for support of the pipes. Prior to installation of the pipe, the pipe bedding should be shaped to fit the lower part of the pipe exterior with reasonable closeness to provide uniform support along the pipe.

4.5.6 Structural Fill

All excavations should be backfilled with structural fill. Recessional outwash soils encountered in the explorations generally consist of poorly graded sands with a fines content of less than 10 percent and may be suitable for reuse as structural fill. If utility installation is performed during the local wet season or the native sandy soils are unable to be reused as structural fill, imported structural fill may be required. All structural fills should be uniformly moisture conditioned to within about 3 percent of their optimum moisture content prior to placement.

During periods of dry weather, the sandy recessional outwash soils may be suitable for use as structural fill; however, because these soils are uniformly graded, they can be challenging to compact if not properly moisture conditioned, even in dry weather. Fine grained material should not be considered suitable for reuse as structural fill, or any other backfill, and should be removed from the site or stored separately from the sandy recessional outwash soils. If fine grained soil becomes mixed with the sandy recessional outwash soils the entire stockpile should be considered unsuitable for reuse. Where trench excavations encounter transitions from sandy to fine grained material, the composite material should not be considered suitable for reuse.

Imported structural fill should consist of imported, clean, free-draining, granular soils clear of organic matter or other deleterious materials. Such materials should conform to the specifications for Crushed Surfacing Top Course specified in Section 9-03.9(3) of the WSDOT *Standard Specifications* (WSDOT, 2023). The fine-grained portion of structural fill soils should be non-plastic.

4.5.7 Trench Backfill Placement and Compaction

Proper preparation, placement, and compaction of the native soils and structural fill is extremely important to limit future settlement of the ground surface around structures and along trenches.

Structural fill soils should be moisture conditioned and compacted to the requirements specified in Section 2-03.3(14)C, Method C, of the WSDOT *Standard Specifications* (WSDOT, 2023); except the standard of compaction achieved shall not be less than 95% of the soils theoretical maximum dry density (MDD) as determined by test method ASTM D1557 (Modified Proctor). Subgrade compaction in roadbed areas should conform to the requirements of Section 2 06.3(1) of the WSDOT *Standard Specifications*.

Achievement of proper density of a compacted fill depends on the size and type of compaction equipment, the number of passes, thickness of the layer being compacted, and soil moisture-density properties. In areas where limited space restricts the use of heavy equipment, smaller equipment can be used, but the soil must be placed in thin enough layers to achieve the required relative compaction. During placement of the initial lifts, the backfill material should not be bulldozed into the trench or dropped directly on the utility. Heavy vibratory equipment should not be permitted to operate directly over utilities until a minimum of 2 feet of backfill has been placed over the utility and compacted.

Typically, 6-inch-thick loose lifts or less is appropriate for smaller equipment (plate compactors, jumping jacks, etc.) and larger equipment (large vibratory drum roller, large hoe packs, etc.) may be able to compact up to 12-inch-thick loose lifts of structural fill, depending on the equipment. Generally, loosely compacted soils result from poor construction technique and/or improper moisture content. Soils with high fines contents are particularly susceptible to becoming too wet, and coarse-grained materials easily become too dry, for proper compaction. The contractor is responsible for implementing compaction methods that consistently produce adequate compaction levels.

Observation and testing of trench backfill by a representative of the Geotechnical Engineer is recommended to help the contractor achieve proper backfill preparation and uniform moisture conditioning, loose lift thickness control, and application of appropriate compaction effort.

4.5.8 Wet Weather Earthwork

General recommendations relative to earthwork performed in wet weather or in wet conditions are presented below. These recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation of unsuitable and/or softened soil should be followed promptly by placement and compaction of clean structural fill. The size and type of construction equipment used may need to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic.

- For wet weather conditions, the allowable fines content of the structural fill should be reduced to no more than 5 percent by weight of the portion of the fill material passing the ¾-inch sieve. The fines should be non-plastic. It should be noted this is an additional restriction on the structural fill materials specified.

- The ground surface within the construction area should be graded to promote surface water run-off and to prevent ponding.

- Within the construction area, the ground surface should be sealed on completion of each shift by a smooth drum vibratory roller, or equivalent, and under no circumstances should soil be left uncompacted and exposed to moisture infiltration.
- Bales of straw and/or geotextile silt fences should be strategically located to control erosion and the movement of soil.
- Temporary slopes and material stockpiles should be protected from the elements by covering them with plastic sheeting or similar means. Sheeting sections should overlap by at least 12 inches and be tightly secured with sandbags, tires, staking, or other means to prevent wind from exposing the soils under the sheeting.

4.6 Pavement Design

4.6.1 General

We anticipate that pavement replacements across the intersection will be constructed to match the thickness and geometry of the existing roadway pavements per City of Kirkland Pre-Approved Plan No. CK-R.12. Therefore, no pavement design recommendations have been provided for this project. Construction considerations associated with the replacement of the existing pavement section have been provided below and the existing pavement thicknesses encountered in out explorations are presented in Appendix A.

4.6.2 Pavement Subgrade Preparation

Subgrade preparation is key to ensure the replacement pavement section functions as designed. After utility repairs are complete and the area has been graded, all deleterious materials should be removed and the exposed subgrade recompacted with multiple passes by a vibratory drum roller, a sheepsfoot roller may be required if fine grained native soils are encountered near the surface. Prior to placement of Crushed Surfacing Top Course (CSTC), the recompacted subgrade should be thoroughly proof-rolled with a minimum of two passes per lane by a fully loaded dump truck, water truck, or similar heavy equipment weighing at least 20 tons under the full time observation of a geotechnical engineer or qualified earthworks inspector.

Where large displacements are observed during proof rolling, additional over-excavation and replacement may be required to provide a suitable base for the proposed pavement section. The amount of over-excavation and replacement required along the roadway will vary and may depend on factors such as the time of year of construction, contractor’s method of construction, and the condition of the subgrade soils. After the subgrade has been evaluated, CSTC should be placed and compacted in accordance with the recommendations for structural fill.

4.6.3 Placement of HMA

Placement of HMA should be in accordance with Section 5-04 of the WSDOT *Standard Specifications* (WSDOT, 2023). Particular attention should be paid to the following:

- HMA should not be placed until the engineer has evaluated and approved the surface grading or milling of the existing pavement.
- HMA should not be placed on any frozen or wet surface.
- HMA should not be placed when precipitation is anticipated before the pavement can be compacted, or before any other weather conditions which could prevent proper handling and compaction of HMA.
- HMA should not be placed when the average surface temperatures are less than 45° F.
- HMA temperature behind the paver should be in excess of 240° F. Compaction should be completed before the mix temperature drops below 180° F. Comprehensive temperature records should be kept during the HMA placement.
- A sufficient tack coat must be applied uniformly and allowed to break and set before placing HMA above an existing HMA layer in order to create a strong bond between layers. The surface of the pavement should be thoroughly cleaned prior to tack coat application. Improper tack coat application can cause unbonded layers and will lead to premature pavement distress/failure.
- For cold joints, tack coat should be applied to the edge to be joined and the paver screed should be set to overlap the first mat by 1 to 2 inches.

5.0 CONDITIONS AND LIMITATIONS

We have prepared this geotechnical report for the City of Kirkland and DKS Associates for use in design for this project. The conclusions and interpretations presented in this report should not be construed as our warranty of subsurface conditions at the site. Experience has shown that soil and groundwater conditions can vary significantly over small distances and with time. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study of this scope and nature. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HWA should be notified for review of the recommendations of this report, and revision of such if necessary.

Within the limitations of scope, schedule and budget, HWA attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology in the area at the time the report was prepared. No warranty, express or implied, is made.

HWA does not practice or consult in the field of safety engineering. We do not direct the contractor's operations and cannot be responsible for the safety of personnel other than our own on the site. As such, the safety of others is the responsibility of the contractor. The contractor should notify the owner if any of the recommended actions presented herein are considered unsafe.

We appreciate the opportunity to provide geotechnical services on this project. Should you have any questions or comments, or if we may be of further service, please do not hesitate to call.

Sincerely,

HWA GEOSCIENCES INC.

William R. Rosso, P.E.
Geotechnical Engineer

JoLyn Gillie, P.E.
Geotechnical Engineer, Principal

6.0 REFERENCES

American Association of State Highway and Transportation Officials, 2020*, AASHTO Guide Specifications for LRFD Seismic Bridge Design,* 9th edition, American Association of State Highway and Transportation Officials. Washington, DC.

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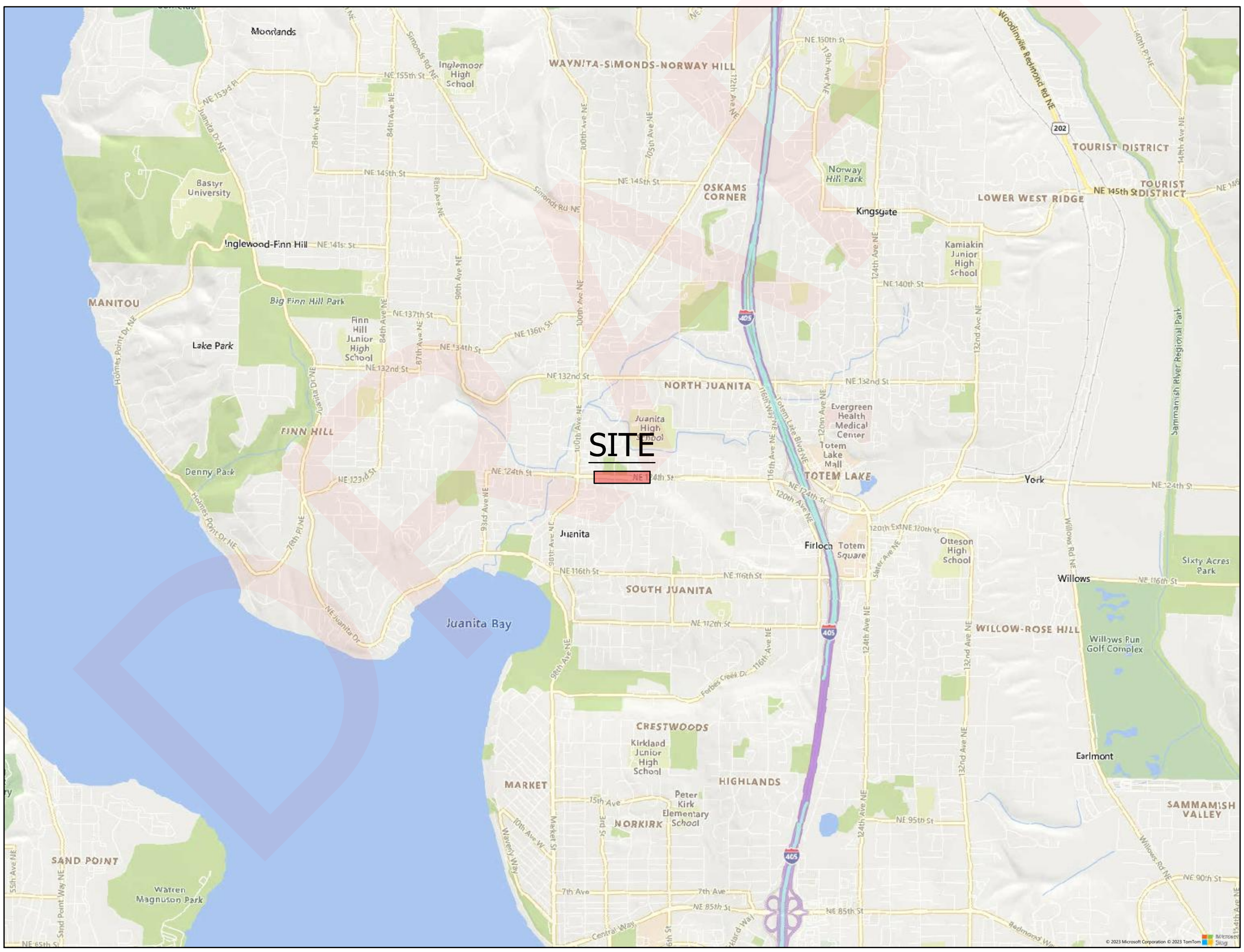
SITE MAP

0 250' 500' 750' 1000'

SCALE: 1" = 500'



VICINITY MAP

0 2500' 5000' 7500' 10000'

SCALE: 1" = 5000'

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DBE/MWBE

SITE AND VICINITY MAP

KIRKLAND PEDESTRIAN SAFETY IMPROVEMENTS
NE 124 ST AT 102ND LN AND 105TH PL
KIRKLAND, WASHINGTON

FIGURE NO.:	
1	
DRAWN BY:	CHECK BY:
CF	WRR
PROJECT #	
2022-165-21	

C:\USERS\CFRY\DESKTOP\2022-165-21 KIRKLAND PEDESTRIAN IMPROVEMENTS\2022-165-21 KIRKLAND PEDESTRIAN IMPROVEMENTS.DWG <1> Plotted: 8/30/2023 11:41 AM

NE 124TH ST
Scale: 1" = 100'-0"

EXPLORATION LEGEND

BH-1 ⊕ 30-FT HSA EXPLORATION DESIGNATION AND APPROXIMATE LOCATION

N

0 50 100 150 200

SCALE: 1" = 100'

BASE MAP PROVIDED BY: BING

HWA GEOSCIENCES INC. DBE/MWBE

KIRKLAND PEDESTRIAN SAFETY IMPROVEMENTS NE 124 ST AT 102ND LN AND 105TH PL KIRKLAND, WASHINGTON	SITE & EXPLORATION PLAN	DRAWN BY: CF CHECK BY: WRR	FIGURE NO.: 2 PROJECT NO.: 2022-165-21

C:\USERS\CFRY\DESKTOP\2022-165-21 KIRKLAND PEDESTRIAN IMPROVEMENTS\2022-165-21 KIRKLAND PEDESTRIAN IMPROVEMENTS.DWG <2> Plotted: 8/30/2023 11:42 AM

APPENDIX A

FIELD INVESTIGATION

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COHESIONLESS SOILS			COHESIVE SOILS		
Density	N (blows/ft)	Approximate Relative Density(%)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	35 - 65	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	over 30	>4000

USCS SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP DESCRIPTIONS	
Coarse Grained Soils More than 50% Retained on No. 200 Sieve Size	Gravel and Gravelly Soils More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravel (little or no fines)	GW	Well-graded GRAVEL
			GP	Poorly-graded GRAVEL
		Gravel with Fines (appreciable amount of fines)	GM	Silty GRAVEL
			GC	Clayey GRAVEL
	Sand and Sandy Soils 50% or More of Coarse Fraction Passing No. 4 Sieve	Clean Sand (little or no fines)	SW	Well-graded SAND
			SP	Poorly-graded SAND
		Sand with Fines (appreciable amount of fines)	SM	Silty SAND
			SC	Clayey SAND
Fine Grained Soils 50% or More Passing No. 200 Sieve Size	Silt and Clay	Liquid Limit Less than 50%	ML	SILT
			CL	Lean CLAY
			OL	Organic SILT/Organic CLAY
	Silt and Clay	Liquid Limit 50% or More	MH	Elastic SILT
			CH	Fat CLAY
			OH	Organic SILT/Organic CLAY
Highly Organic Soils			PT	PEAT

TEST SYMBOLS

%F	Percent Fines
AL	Atterberg Limits: PL = Plastic Limit, LL = Liquid Limit
CBR	California Bearing Ratio
CN	Consolidation
DD	Dry Density (pcf)
DS	Direct Shear
GS	Grain Size Distribution
K	Permeability
MD	Moisture/Density Relationship (Proctor)
MR	Resilient Modulus
OC	Organic Content
pH	pH of Soils
PID	Photoionization Device Reading
PP	Pocket Penetrometer (Approx. Comp. Strength, tsf)
Res.	Resistivity
SG	Specific Gravity
CD	Consolidated Drained Triaxial
CU	Consolidated Undrained Triaxial
UU	Unconsolidated Undrained Triaxial
TV	Torvane (Approx. Shear Strength, tsf)
UC	Unconfined Compression

SAMPLE TYPE SYMBOLS

- 2.0" OD Split Spoon (SPT) (140 lb. hammer with 30 in. drop)
- Shelby Tube
- Non-standard Penetration Test (3.0" OD Split Spoon with Brass Rings)
- Small Bag Sample
- Large Bag (Bulk) Sample
- Core Run
- 3-1/4" OD Split Spoon

GROUNDWATER SYMBOLS

- ∇ Groundwater Level (measured at time of drilling)
- ▼ Groundwater Level (measured in well or open hole after water level stabilized)

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5 mm) to No. 200 (0.074 mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074mm)

COMPONENT PROPORTIONS

PROPORTION RANGE	DESCRIPTIVE TERMS
< 5%	Clean
5 - 12%	Slightly (Clayey, Silty, Sandy)
12 - 30%	Clayey, Silty, Sandy, Gravelly
30 - 50%	Very (Clayey, Silty, Sandy, Gravelly)

Components are arranged in order of increasing quantities.

NOTES: Soil classifications presented on exploration logs are based on visual and laboratory observation. Soil descriptions are presented in the following general order:

Density/consistency, color, modifier (if any) GROUP NAME, additions to group name (if any), moisture content. Proportion, gradation, and angularity of constituents, additional comments. (GEOLOGIC INTERPRETATION)

Please refer to the discussion in the report text as well as the exploration logs for a more complete description of subsurface conditions.

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
MOIST	Damp but no visible water.
WET	Visible free water, usually soil is below water table.

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Pedestrian Safety Improvements Project
Downtown and NE 124th Street
Kirkland, Washington

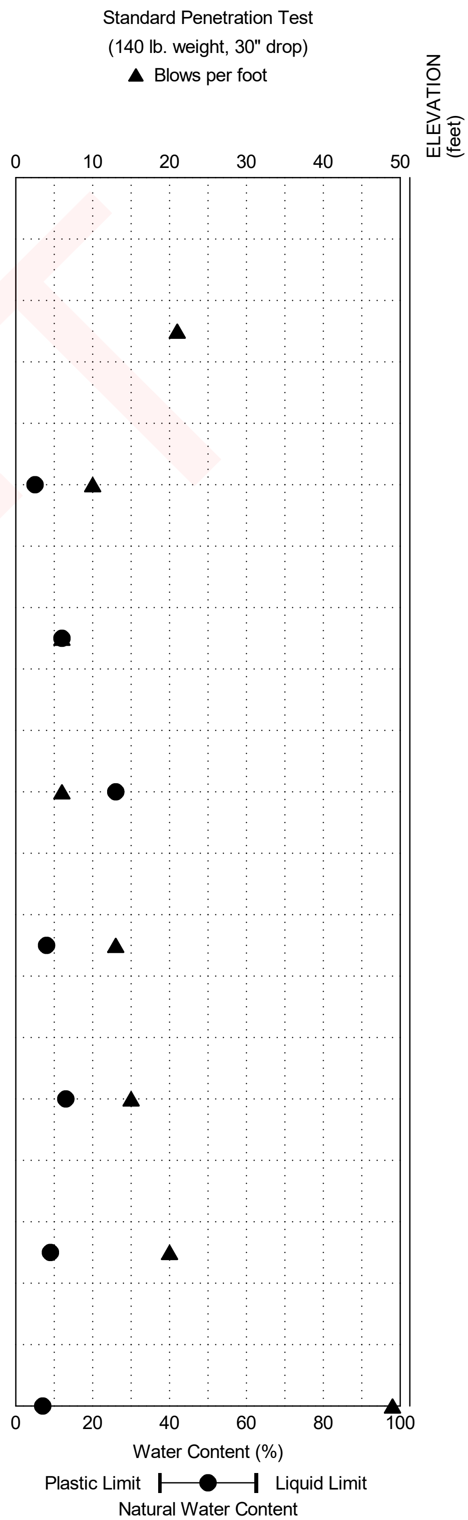
LEGEND OF TERMS AND SYMBOLS USED ON EXPLORATION LOGS

PROJECT NO.: 2022-165-21 FIGURE: A-1

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Hollow Stem Auger, Diedrich D-50 Track Rig
SAMPLING METHOD: SPT / Autohammer
LOCATION: Lat: 47.711211, Long: -122.20489, WGS84 See Figure 2

DATE STARTED: 8/7/2023
DATE COMPLETED: 8/7/2023
LOGGED BY: W. Rosso

DEPTH (feet)	USCS SOIL CLASS	DESCRIPTION	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
0		Asphalt 9.5 inches **(HMA)**				
	GP	Brown, sandy GRAVEL, moist. Fine to coarse angular gravel, 6 inches. **(AGGREGATE BASE)**				
	SW SM	Medium dense, olive brown, slightly silty well-graded SAND, moist. Medium sand. **(RECESSIONAL OUTWASH)** No recovery. Representative sample collected from cuttings. *No Recovery.*	S-1	5-10-11		
5			S-2	4-5-5	GS	
	SP SM	Loose, olive brown, slightly silty SAND, moist. Medium sand. *Recovered 16 inches.*	S-3	3-3-3		
10		*Recovered 18 inches.*	S-4	3-3-3	%F	
	ML	Medium stiff, olive, sandy SILT, moist. Fine sand, brownish orange to brown mottling.				
	SP SM	Medium dense, olive, slightly silty SAND, moist. Medium sand. *Recovered 14 inches.*	S-5	3-6-7		
15	SM	Medium dense, olive-gray, silty SAND, moist. Fine to medium sand, grades to olive brown with depth. *Recovered 16 inches.*	S-6	3-5-10	GS	
		Recovered 15 inches.	S-7	7-7-13	GS	
20						



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

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Pedestrian Safety Improvements Project
Downtown and NE 124th Street
Kirkland, Washington

BORING:
BH-1

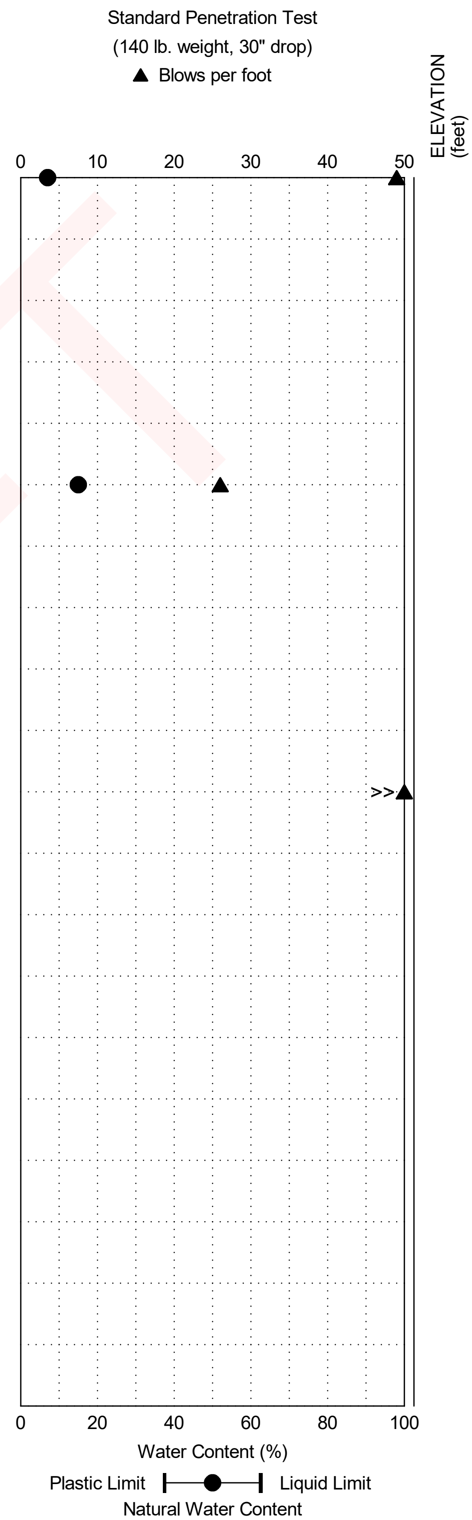
PROJECT NO.: 2022-165-21 FIGURE: A-2

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Hollow Stem Auger, Diedrich D-50 Track Rig
SAMPLING METHOD: SPT / Autohammer
LOCATION: Lat: 47.711211, Long: -122.20489, WGS84 See Figure 2

DATE STARTED: 8/7/2023
DATE COMPLETED: 8/7/2023
LOGGED BY: W. Rosso

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
20			Becomes dense. Gravel fragments and dust in tip of sampler. *Recovered 9 inches.*		S-8	7-16-33		
25		SM	Medium dense, brown, slightly gravelly, very silty SAND, moist. Fine to medium sand. *Recovered 14 inches.*		S-9	6-9-17	GS	
30			Becomes very dense. *No Recovery.*		S-10	50/4"		
35								
40								

Boring terminated at approximately 30½ feet bgs. Boring was backfilled with bentonite chips and patched with concrete dyed black at the surface. Groundwater was not observed while drilling.



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

DRAFT

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Pedestrian Safety Improvements Project
Downtown and NE 124th Street
Kirkland, Washington

BORING:
BH-1

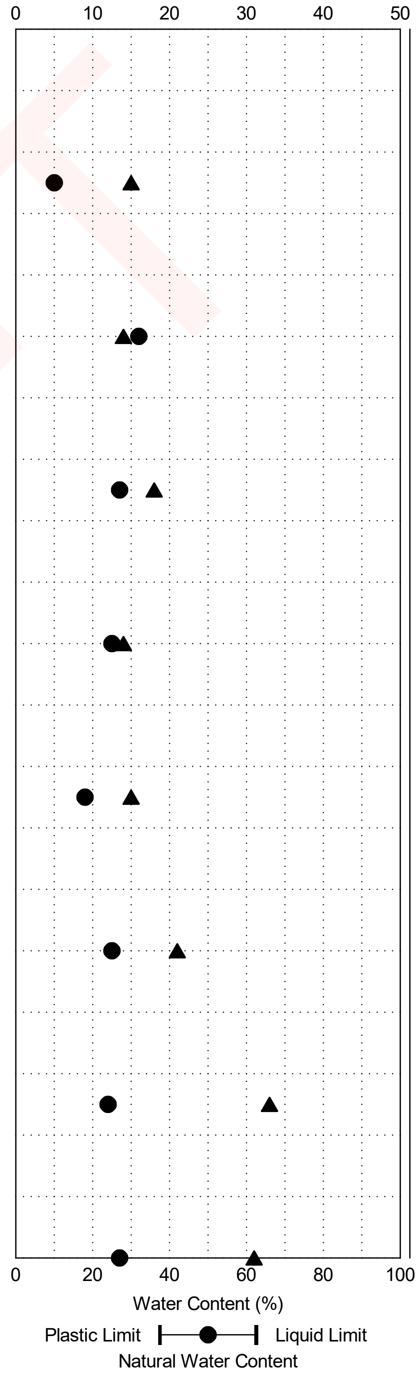
PROJECT NO.: 2022-165-21 FIGURE: A-2

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Hollow Stem Auger, Diedrich D-50 Track Rig
SAMPLING METHOD: SPT / Autohammer
LOCATION: Lat: 47.711199, Long: -122.20103, WGS84 See Figure 2

DATE STARTED: 8/7/2023
DATE COMPLETED: 8/7/2023
LOGGED BY: W. Rosso

DEPTH (feet)	USCS SOIL CLASS	DESCRIPTION	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
0		Asphalt 10 inches **(HMA)**				
	GP	Brown, sandy GRAVEL, moist. Fine to coarse angular gravel, 7 inches. **(AGGREGATE BASE)**				
	SP SM	Medium dense,dark grayish-brown, slightly silty SAND, moist. Medium sand. **(RECESSIONAL OUTWASH)** *Recovered 13 inches.*	S-1	8-8-7	GS	
5	ML	Stiff, olive gray, SILT, moist. Trace fine sand, brownish orange to brown mottling. **(TRANSITIONAL BEDS)** *Recovered 18 inches.*	S-2	2-4-10		
		Two 1 inch thick sand lenses observed in sample. Sand lenses were reddish brown and medium grained. *Recovered 18 inches.*	S-3	5-8-10	%F	
10		One 1 inch thick sand lenses observed in sample. Sand lens was reddish brown and medium grained. *Recovered 18 inches.*	S-4	2-7-7		
	ML	Very stiff, dark gray, very sandy SILT, moist. Fine sand. *Recovered 18 inches.*	S-5	4-6-9	%F	
15		*Recovered 18 inches.*	S-6	7-9-12	%F	
		Becomes hard. *Recovered 14 inches.*	S-7	12-16-17	GS	
20						

Standard Penetration Test
(140 lb. weight, 30" drop)
▲ Blows per foot



ELEVATION (feet)

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

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Pedestrian Safety Improvements Project
Downtown and NE 124th Street
Kirkland, Washington

BORING:
BH-2

PROJECT NO.: 2022-165-21 FIGURE: A-3

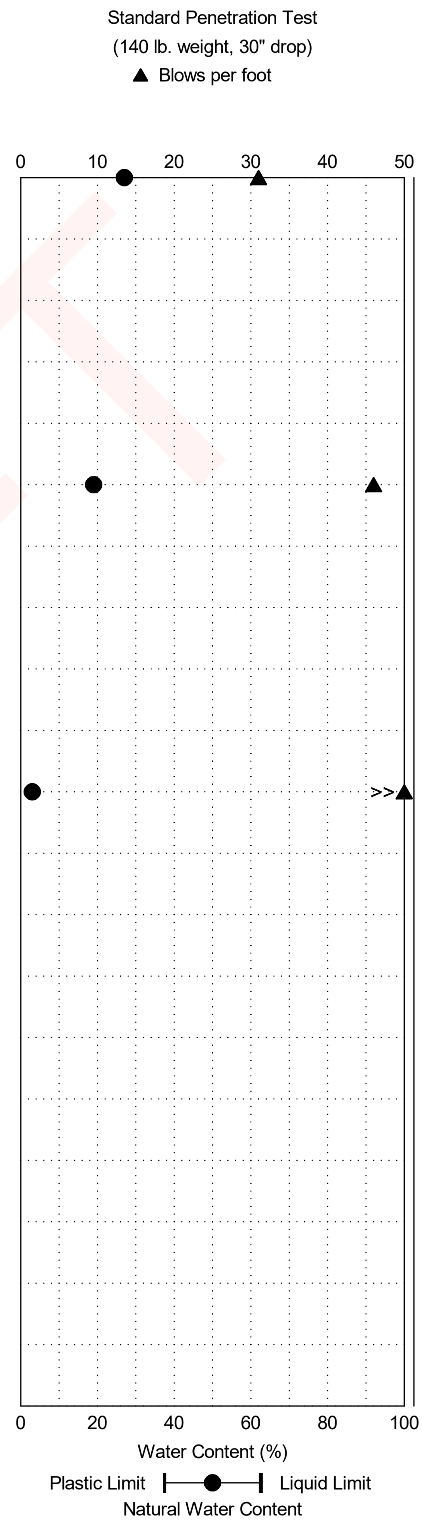
BORING-DSM 2022-165-21.GPJ 9/15/23

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Hollow Stem Auger, Diedrich D-50 Track Rig
SAMPLING METHOD: SPT / Autohammer
LOCATION: Lat: 47.711199, Long: -122.20103, WGS84 See Figure 2

DATE STARTED: 8/7/2023
DATE COMPLETED: 8/7/2023
LOGGED BY: W. Rosso

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER	ELEVATION (feet)
20			*Recovered 13 inches.*		S-8	9-13-18			
25			Becomes moist to wet, silt content increases. *Recovered 13 inches.*		S-9	11-20-26	%F		
30		SP SM	Very dense, gray, gravelly, slightly silty SAND, moist. Medium to coarse sand, fine rounded to subangular gravel. *Recovered 8 inches.* **(OLYMPIA GRAVEL)**		S-10	28-50/5"			
35									
40									

Boring terminated at approximately 31 feet bgs.
Boring was backfilled with bentonite chips and patched with concrete dyed black at the surface.
Groundwater was not observed while drilling.



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

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Pedestrian Safety Improvements Project
Downtown and NE 124th Street
Kirkland, Washington

BORING:
BH-2

PROJECT NO.: 2022-165-21 FIGURE: A-3

APPENDIX B

LABORATORY INVESTIGATION

APPENDIX B

LABORATORY INVESTIGATION

Representative soil samples obtained from the explorations were placed in plastic bags to prevent loss of moisture and transported to our Bothell, Washington, laboratory for further examination and testing. Laboratory tests were conducted on selected soil samples to characterize relevant engineering and index properties of the site soils. Laboratory testing was conducted as described below:

MOISTURE CONTENT OF SOIL: The moisture content of selected soil samples (percent by dry mass) was determined in general accordance with ASTM D 2216. The results are shown at the sampled intervals on the appropriate summary logs in Appendix A.

PARTICLE SIZE ANALYSIS OF SOILS (SIEVE AND HYDROMETER): Selected samples were tested to determine the particle distribution in general accordance with ASTM D6913 and D7928. The results are summarized in the attached Grain Size Distribution report, Figure B-2, which also provides information regarding the classification of the sample and the moisture content at the time of testing.

EXPLORATION DESIGNATION	TOP DEPTH (feet)	BOTTOM DEPTH (feet)	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	SPECIFIC GRAVITY	ATTERBERG LIMITS (%) LL	PL	PI	% GRAVEL	% SAND	% FINES	ASTM SOIL CLASSIFICATION	SAMPLE DESCRIPTION
BH-1,S-2	5.0	6.5	4.9						6.4	83.5	10.1	SW-SM	Light olive-brown, well-graded SAND with silt
BH-1,S-3	7.5	9.0	11.7									SP-SM	Light olive-brown, poorly graded SAND with silt
BH-1,S-4	10.0	11.5	26.4								80.9	ML	Olive, SILT with sand
BH-1,S-5	12.5	14.0	8.1									SP-SM	Olive, poorly graded SAND with silt
BH-1,S-6	15.0	16.5	13.4							81.1	18.9	SM	Olive-gray, silty SAND
BH-1,S-7	17.5	19.0	9.2							79.6	20.4	SM	Olive, silty SAND
BH-1,S-8	20.0	21.5	7.0									SM	Olive, silty SAND
BH-1,S-9	25.0	26.5	14.7						5.6	53.9	40.5	SM	Olive-gray, silty SAND
BH-2,S-1	2.5	4.0	9.6						3.2	85.4	11.4	SP-SM	Dark grayish-brown, poorly graded SAND with silt
BH-2,S-2	5.0	6.5	32.4									ML	Olive, SILT with sand
BH-2,S-3	7.5	9.0	26.7								76.8	ML	Olive-brown, SILT with sand
BH-2,S-4	10.0	11.5	25.3									ML	Olive-brown, SILT with sand
BH-2,S-5	12.5	14.0	17.8								57.1	ML	Very dark gray, sandy SILT
BH-2,S-6	15.0	16.5	25.1								67.0	ML	Very dark gray, sandy SILT
BH-2,S-7	17.5	19.0	24.1							43.8	56.2	ML	Very dark gray, sandy SILT
BH-2,S-8	20.0	21.5	26.5									ML	Very dark gray, sandy SILT
BH-2,S-9	25.0	26.5	19.0								58.3	ML	Very dark gray, sandy SILT
BH-2,S-10	30.0	30.9	2.8									SP-SM	Dark grayish-brown, poorly graded SAND with silt and gravel

Notes: 1. This table summarizes information presented elsewhere in the report and should be used in conjunction with the report test, other graphs and tables, and the exploration logs.
2. The soil classifications in this table are based on ASTM D2487 and D2488 as applicable.

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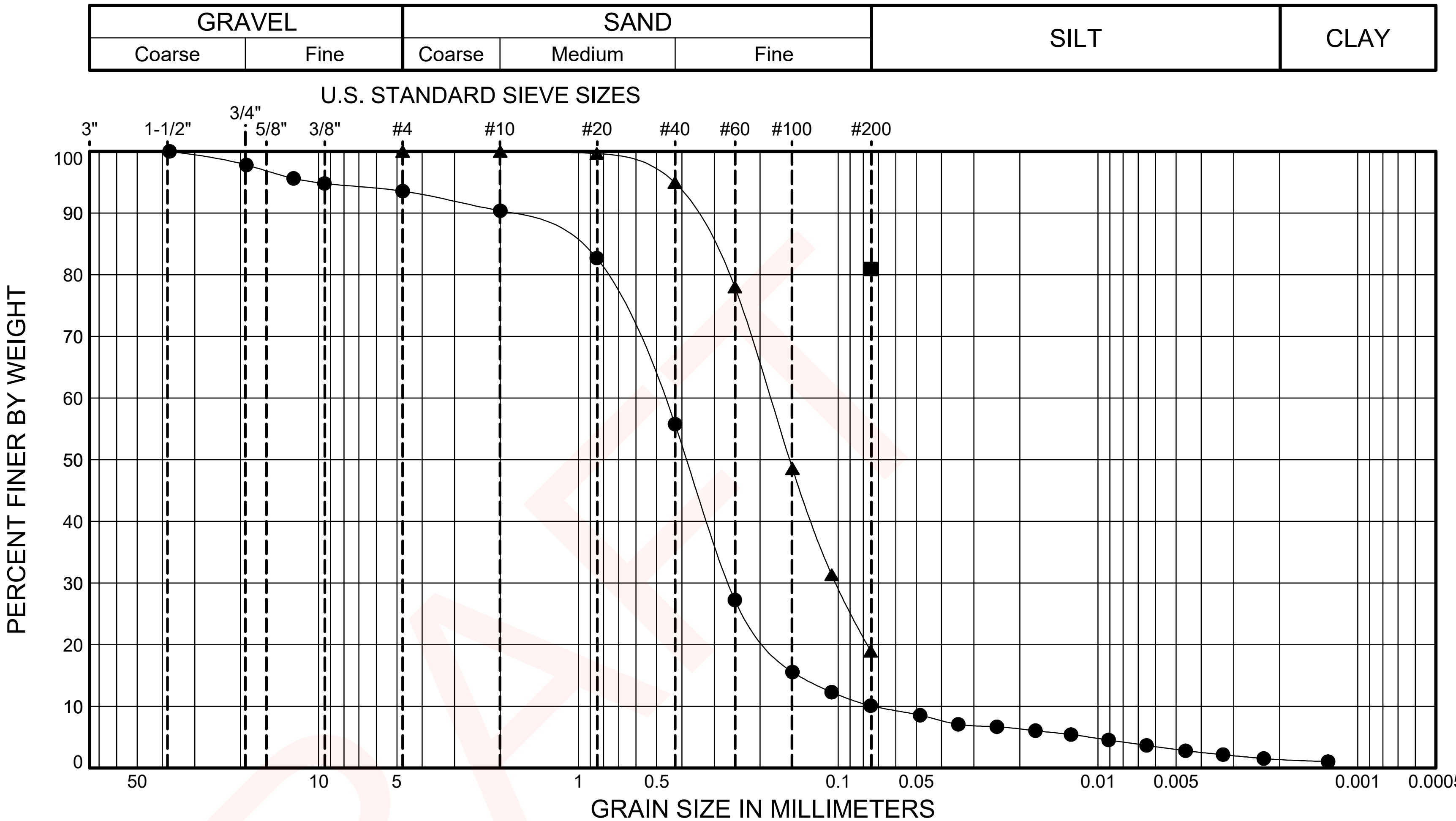
Kirkland, Washington

SUMMARY OF MATERIAL PROPERTIES

PROJECT NO.: 2022-165-21 FIGURE: B-1



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-1	S-2	5.0 - 6.5	(SW-SM) Light olive-brown, well-graded SAND with silt	5				6.4	83.5	8.7	1.4	
■	BH-1	S-4	10.0 - 11.5	(ML) Olive, SILT with sand	26								80.9
▲	BH-1	S-6	15.0 - 16.5	(SM) Olive-gray, silty SAND	13					81.1			18.9

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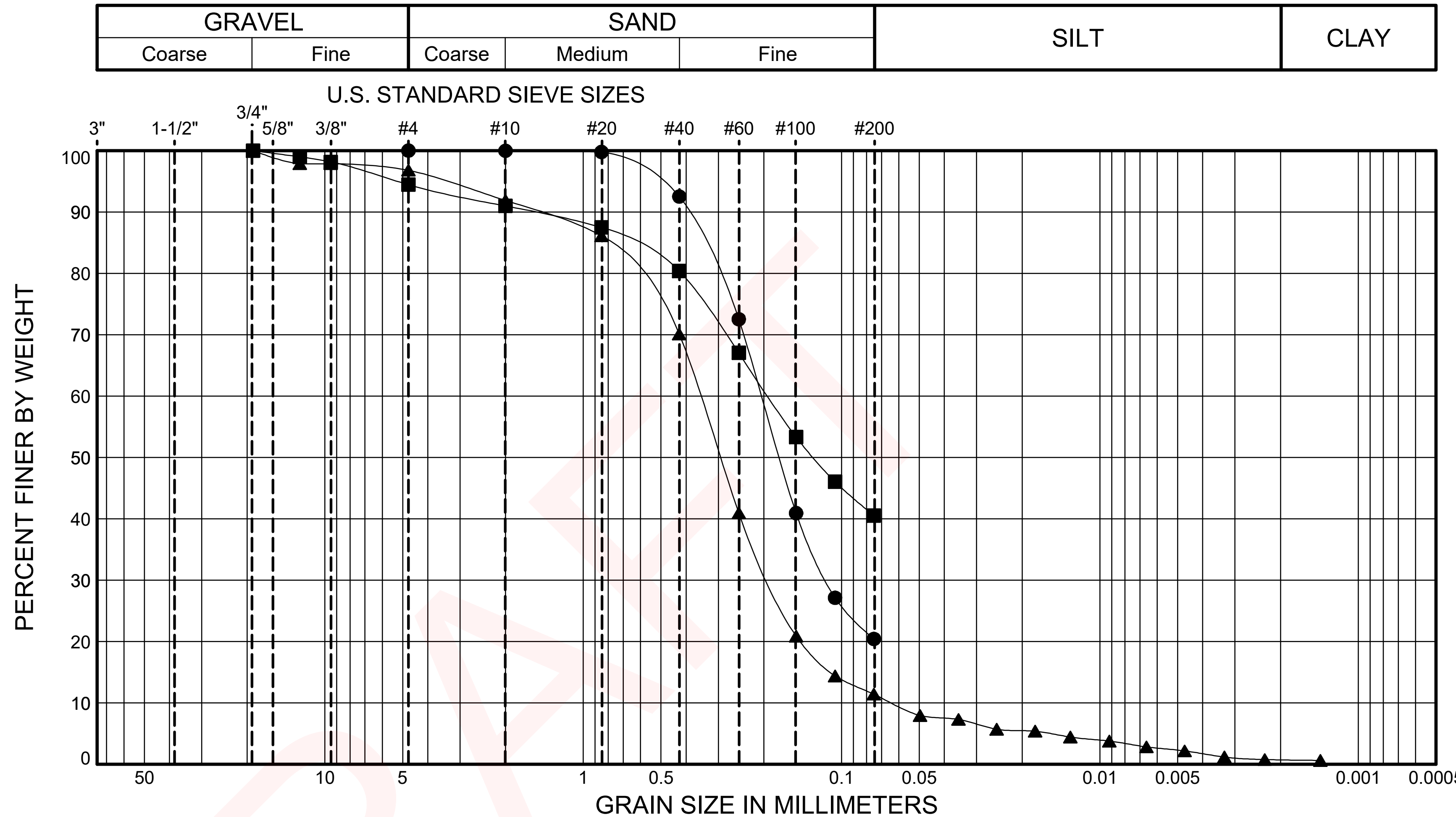
Pedestrian Safety Improvements Project
Downtown and NE 124th Street
Kirkland, Washington

PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928

PROJECT NO.: 2022-165-21 FIGURE: B-1



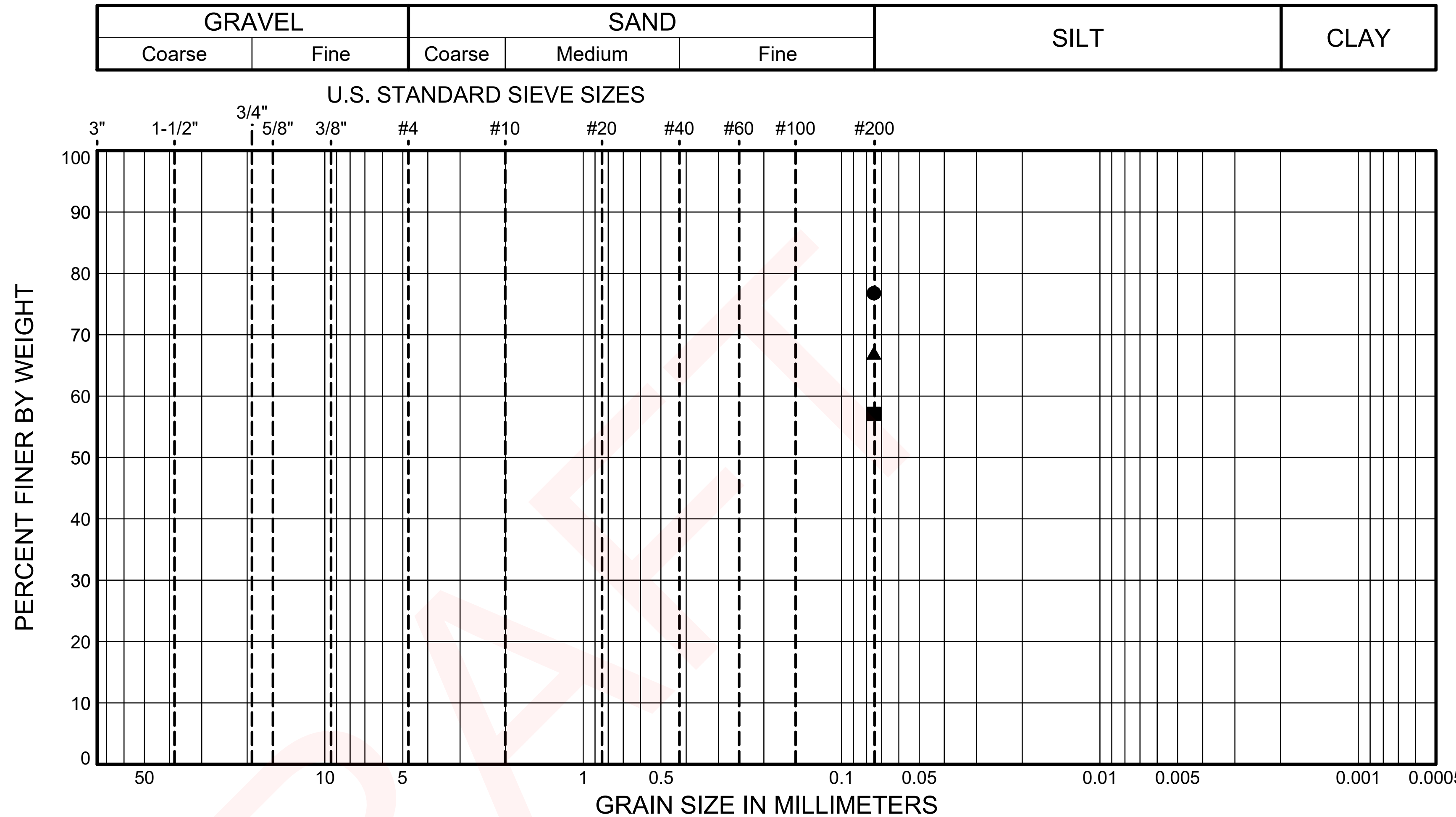
SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-1	S-7	17.5 - 19.0	(SM) Olive, silty SAND	9					79.6			20.4
■	BH-1	S-9	25.0 - 26.5	(SM) Olive-gray, silty SAND	15				5.6	53.9			40.5
▲	BH-2	S-1	2.5 - 4.0	(SP-SM) Dark grayish-brown, poorly graded SAND with silt	10				3.2	85.4	10.7	0.7	

HWA GEOSCIENCES INC.

Pedestrian Safety Improvements Project
Downtown and NE 124th Street
Kirkland, Washington

PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928

PROJECT NO.: 2022-165-21 FIGURE: B-2



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-2	S-3	7.5 - 9.0	(ML) Olive-brown, SILT with sand	27								76.8
■	BH-2	S-5	12.5 - 14.0	(ML) Very dark gray, sandy SILT	18								57.1
▲	BH-2	S-6	15.0 - 16.5	(ML) Very dark gray, sandy SILT	25								67.0

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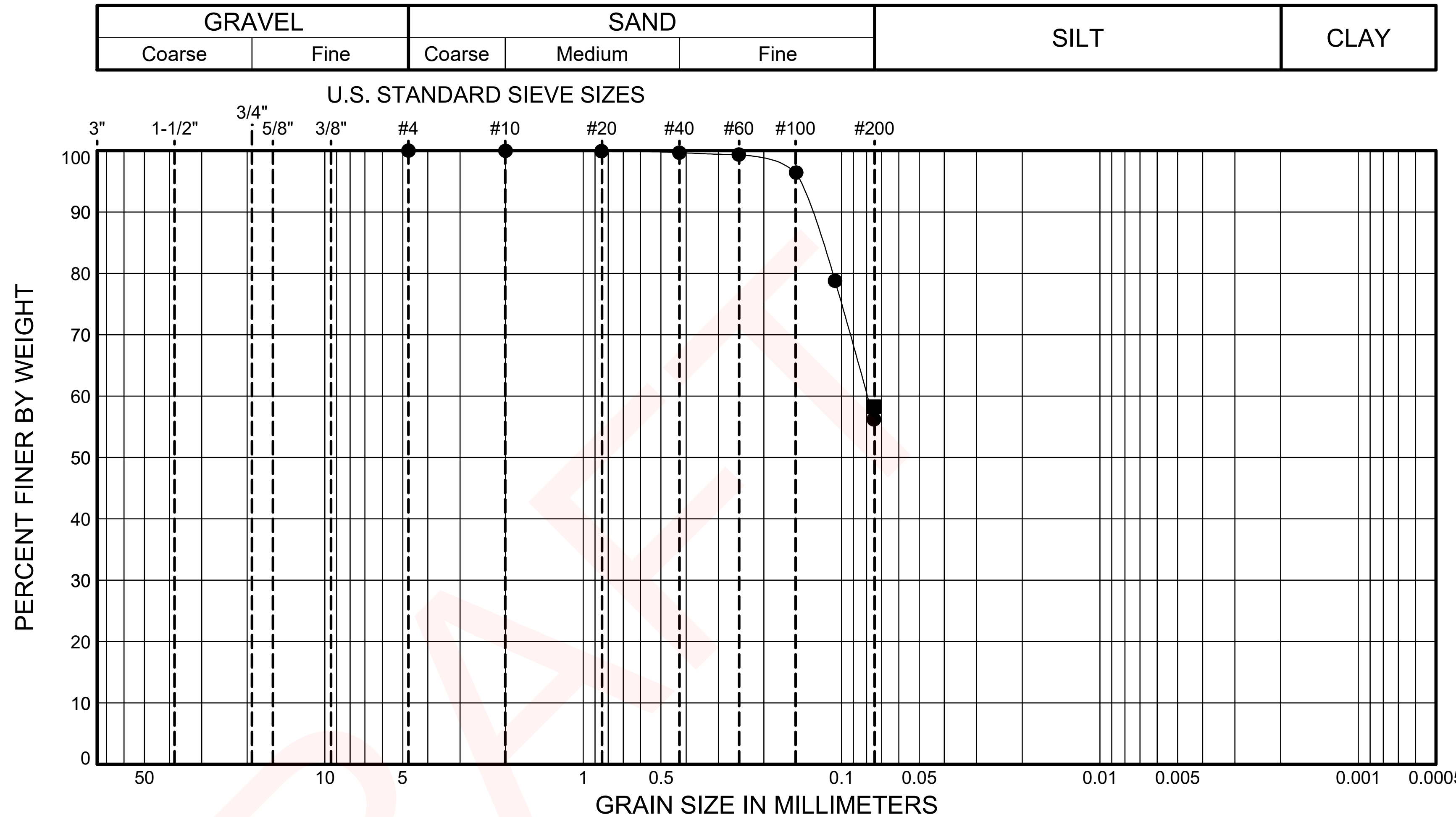
Pedestrian Safety Improvements Project
Downtown and NE 124th Street
Kirkland, Washington

PARTICLE-SIZE ANALYSIS OF SOILS METHODS ASTM D6913/D7928

PROJECT NO.: 2022-165-21 FIGURE: B-3



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-2	S-7	17.5 - 19.0	(ML) Very dark gray, sandy SILT	24					43.8			56.2
■	BH-2	S-9	25.0 - 26.5	(ML) Very dark gray, sandy SILT	19								58.3

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Pedestrian Safety Improvements Project
Downtown and NE 124th Street
Kirkland, Washington

PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928

PROJECT NO.: 2022-165-21 FIGURE: B-4