Geotechnical Engineering Report
21st Avenue – Westridge to Grandview
Spokane County, WA

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BAI Project Number: S22083

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CONTEXT

This geotechnical engineering report (GER) presents the results of geotechnical exploration and analysis for the proposed housing development. These services were contracted and coordinated with Whipple Consulting Engineers.

Project Considerations

Approximately 17 acres are planned for residential development in Spokane, WA. The development will consist of 41 lots with single-family homes. New streets are proposed and 21st Avenue will be extended to the west and connect with Grandview Avenue. Cuts and fills up to 5 and 10 feet, respectively, are proposed. Stormwater runoff will be directed to ponds in the northwestern and southeastern portions of the site.

Location

The site is in the NE ¼ of the SW ¼ of Section 26, Township 25N, Range 42E, Willamette Meridian. It is located between the west end of 21st Avenue and on the south side of Grandview Aveune. The physical address is 3604 W. 21st Ave. The location is illustrated in the attached *Vicinity Map* and *Site Plan*.

Scope

This geotechnical study involved interpretation of subsurface soil conditions to provide conclusions addressing the suitability of the site to support proposed structures and provide geotechnical parameters required for others to design and construct. We endeavored to conduct these services in accordance with generally accepted geotechnical engineering practices as outlined in proposal S22214, dated February 1, 2022.

The following scope was completed:

- Excavated 12 test pits to a maximum depth of 12 feet;
- Advanced dynamic cone penetrometer (DCP) soundings adjacent to test pit locations;
- Characterized the encountered subsurface conditions;
- Performed laboratory tests on representative samples of the encountered soils;
- Performed test pit infiltration tests at 2 locations; and,
- Prepared this report presenting the exploration results along with conclusions and recommendations.

The scope of this study does not include foundation evaluation for homes or outbuildings. Additional information including architectural drawings, lot grading plans, and anticipated foundation loading are required to provide foundation recommendations.

ENCOUNTERED CONDITIONS

Physical Setting

The site is located near the eastern margin of a broad plain characterized by relatively level topography with intermittent wetlands and outcroppings of igneous and metasedimentary rock. During the last ice age, repeated catastrophic flood events resulting from rupturing of the ice dams that retained Glacial Lake Missoula, inundated much of the Spokane area, and scoured pre-existing rock and sedimentary formations. The floods deposited sediment on top of pre-existing formations and in consequentially developed channels and basins. Some basins became subsequently infilled with sediment resulting from erosion of surrounding areas. Geologic mapping of the area shows Miocene basalt (*~~M~~wp*) underlies the site (WSDNR, 2004). *~~M~~wp* is described as *"Dark gray to black, fine-grained, dense basalt."*

Surface Conditions

We observed the site on March 17, 2022. The site topography consisted of a northeast-southwest trending ridge across the center of the site sloping down to lower points at the northwest corner and southeast third of the site. Total relief across the site was approximately 30 feet ranging from a high of 2,262 feet to a low of 2,232 feet (NAVD 88). The northern and western portions were characterized by outcroppings of basalt and piled fill consisting chiefly of excavated basalt. Various sized piles of fill including lawn and plant debris, soil, wood piles, and trash were observed across the site. The site was moderately populated with mature conifers with the exception of the proposed road alignments and the lowest part of the site in the southeast corner.

A primitive road was observed along the proposed alignment of 21st Avenue from Grandview to Westridge Drive. Several new residential structures were observed under construction north of the proposed intersection of Cumberland Lane and 21st Avenue. Basalt rubble piles were observed on the proposed alignment of Beard Drive as a result of previous blasting efforts. An east-west trending, approximately 4 to 5-foot-high ridge of fill was observed on the at the northern edge of "Tract A". The lowest area of the site, including most of "Tract A" was classified as *PEM1C, Seasonally Flooded* (USFWS-NWI).

Subsurface Conditions

Test pit excavations were performed concurrently with site observations. Conditions encountered in the explorations are described in the *Logs* in accordance with methods described in *Field Exploration*. The subsurface materials were differentiated based on characteristics relevant to this project.

topsoil
Log symbol:

░

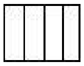
Topsoil consisting of silt and sand with organics was encountered in Test Pit 1 (TP-1) TP-2, TP-3, TP-8, TP-9, and TP-12 beginning at the ground surface and extending to a maximum depth of approximately 1.5 feet below ground surface (BGS). Gravel and cobbles were observed in minor amounts.

existing fill
Log symbols:

▩ ▚

Existing fill consisting primarily of basalt shot-rock was encountered in TP-4, TP-6, TP-7, TP-10, and TP-11 beginning at the ground surface and extending to depths ranging from 2.5 to greater than 10 feet BGS. Existing fill in TP-6 appeared to consist of imported material and included wood and metal debris. The condition varied widely, and the presence of coarse particles (cobbles and boulders) tended to interfere with DCP probes resulting in artificially high blow counts.

silt
Log symbol:

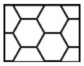


Silt was encountered in TP-2, TP-3, and TP-12 beginning beneath *topsoil* and extended to depths ranging from 4 to greater than 12 feet BGS. The condition varied and correlated N-values from DCP tests ranged from 1 to 14. Moisture contents for two representative samples were at the liquid limit. The fines content (percent, by weight, passing the U.S. #200 sieve) ranged from 78 to 99 percent.

silty sand
Log symbol:

Silty sand was encountered in TP-1, TP-4, TP-9, and TP-12 beginning beneath *topsoil, existing fill*, and *silt*. Silty sand was deposited over *basalt* in TP-1, TP-4, and TP-9 and thickness ranged from approximately 1 to 4 feet. Silty sand was observed beginning at 5 feet BGS in TP-12 and extended to depths greater than 11.5 feet BGS. The fines content was 34 and 44 percent for two representative samples tested.

basalt
Log symbol:



Basalt was encountered in the excavations, with the exception of TP-3, TP-10, and TP-12, beginning at depths ranging from 0.5 to 7 feet BGS. It consisted of slightly to moderately weathered and highly fractured, fine-grained rock. The relative rock strength was strong to very strong (R4 to R5).

N-value correlation. Triggs Wildcat® DCP tests were advanced at test pit locations to estimate relative densities of the encountered soils. The tests were initiated beginning at the ground surface and advanced to the point of refusal.

Pavement subgrade strength. Kessler® DCP tests were also initiated beginning at the ground surface and advanced to a maximum depth of 30 inches BGS. These DCP tests were used to evaluate pavement subgrade support conditions within the site.

Results of the DCP tests are presented in *Figures*.

Surface and Groundwater Hydrology

Surface water was not observed on site. Surface water was observed in several wetland areas within approximately 1 mile to the south and west. The wetlands result from perched water atop impermeable soil and basalt rock.

Groundwater was encountered in TP-3 and TP-12 beginning at depths of 7.5 and 10.5 feet BGS, respectively. Although *basalt* was not encountered in these test pits, the groundwater likely results from being perched atop *basalt*. Mottled soil textures indicate the groundwater levels fluctuate seasonally. Local groundwater, other than that which is perched atop impermeable stratum near the ground surface, is primarily encountered as confined aquifers of basalt flow interbeds within a sequence of rock that extends to depths greater than 250 feet BGS in the vicinity of the site.

CONCLUSIONS

Based on the encountered conditions described above, we conclude the site offers challenging conditions with respect to the proposed development. However, development is considered feasible provided that the recommendations in this report are implemented.

Existing fill may pose settlement risks and should be removed from beneath roads and building foundations. *Existing fill* consisted primarily of blasted *basalt* rock fragments (shot rock) and may be suitable for reuse as subgrade structural fill if screened as necessary to a maximum particle size depending on the application.

The saturated *silt* layer encountered in the southeast portion of the site in test pits TP-2, TP-3 and TP-12 poses settlement risks. Fill placement to raise the grade in this area should be expected to induce time dependent consolidation settlement. Failure to postpone construction of structures, pavements and slabs until after consolidation settlement has been allowed to occur can result in construction difficulties, damage structures, and decrease performance of paved surfaces. Potential options to mitigate settlement include removal and replacement, preloading the site and waiting for settlement to reach substantial completion, or ground improvement. Depending on the timeline for constructing the grading plan for the project, preloading may be the simplest and mostcost-effective alternative for settlement mitigation.

The encountered *silty sand* and *silt* are not suitable for use as structural fill. They are considered moisture-sensitive due to the high fines content; specifically, adjusting the moisture content to a range suitable for compaction will be more difficult, particularly in wet weather. Typically, structural fill should not include more than 15 percent fines.

In situ *basalt* was encountered throughout the majority of the site and will likely require heavy ripping and/or blasting in order to meet the proposed subgrade elevations in areas of cut.

Geotechnical site characterization criteria for use of rapid infiltration structures, such as drywells, requires the presence of a suitable target soil with high permeability, wide horizontal extent, and suitable thickness above limiting layers such as fine-grained soils, rock, or groundwater. These conditions were not encountered in explorations. *Silty sand* and *silt* exhibit low permeability due to high fines content. Shallow *basalt* and groundwater constitute limiting layers. Drywells and infiltration trenches are not considered feasible due to the absence of permeable soil and inadequate separation between the base of infiltration structures and limiting layers. Detention/evaporation ponds with limited subsurface drainage may be a viable alternative for stormwater management.

RECOMMENDATIONS

The recommendations presented throughout this chapter are intended to provide economically feasible criteria at normally accepted risk levels. More conservative design parameters can be used if lower risks are preferred. Specifically, the design should incorporate the following recommendations concerning earthwork, flexible pavement, and stormwater drainage.

Seismic Considerations

The recommended seismic site class designation is Site Class C "very dense soil and soft rock." Spectral response acceleration parameters, adjusted for Site Class C*, were calculated using USGS, U.S. Seismic Design Web Services through the Applied Technology Council (ATC) website. The values of predicted earthquake ground motion for short period structural elements (0.2 second spectral response acceleration, Ss) and for long period structural elements (1.0 second spectral response acceleration, S_1) are provided in the table below. The design parameters (S_{DS} and S_{D1}) are equal to ⅔ of the maximum earthquake spectral response accelerations (S_{MS} and S_{M1}).

Table 1. Seismic design parameters

Site Class	Latitude	Longitude	PGA	Ss	S_1	S_{DS}	S_{D1}
C	47.635 N	-117.467 W	0.137g	0.305g	0.112g	0.265g	0.112g

*Code Reference: International Building Code (ASCE 7-16)

Although shallow groundwater is present, due to the low potential for high ground acceleration, consistency, fines contents, and plasticity of encountered saturated soils, the liquefaction potential is considered low.

Earthwork

Site preparation. Select an earthwork contractor with successful experience working with fine-grained soils and discuss wet weather contingencies prior to beginning work. Strip *topsoil* so that mineral soil lacking concentrated organics is exposed. Scarify and moisture-condition soils, as necessary. Compact the upper 12 inches minimum to at least 92 percent of the maximum dry unit weight (MDUW) but do not compact past the onset of pumping. Additional subgrade evaluation will be needed if compaction produces instability. Solutions may require stabilization with strong geosynthetic such as Mirafi RS380i. Determine MDUW and optimum moisture contents for fill material in accordance with the modified Proctor method ASTM D-1557.

Temporary slopes. Due to varying construction methods and conditions, temporary cuts should be the responsibility of the contractor. The encountered soils are consistent with Type C materials per WISHA excavation criteria. WISHA specifies a maximum inclination of 1½ horizontal to 1 vertical (1½ H:1V) in the temporary condition for Type C.

Permanent slopes. Maximum permanent soil cut and fill slope angles of 2H:1V are recommended except where potentially submerged in drainage basins, where the slopes should be no steeper than 3H:1V. Protect completed surfaces as soon as possible with mechanical or bio-technical erosion control.

Protection of subgrade. Following compaction of subgrade, protect surfaces from degradation during inclement weather. Protection measures include erosion control maintenance, preventing tracking soil and rock offsite, and preventing driving on wet subgrade soil. Reduce frost penetration in freezing weather by leaving surfaces of soil un-compacted if left for an extended duration. Prevent frost penetration in freezing weather by covering soils, such as placing a temporary loose, insulating layer of soil on top.

Fill material. The *existing fill* is generally suitable for re-use as structural fill provided that deleterious items (anthropogenic debris, organics, over-sized materials, etc.), if encountered, are *removed* prior to re-use. Soils exhibiting high fines percentages, including *topsoil, silty sand, and silt*, should not be used for structural fill as they are considered moisture sensitive and may be difficult to compact in wet conditions. The generally recommended import fill materials and uses are illustrated in the following table:

Table 2. Fill Materials

Soil Fill Product	Allowable Use
Non-Structural Fill	• Areas not supporting structures (typically landscaped areas) • Soils should not contain particles larger than 12 inches median diameter and be reasonably free of deleterious items (wood, metal, plastic, trash, etc.)
Granular Structural Fill	
Select Borrow: WSDOT SS Section 9-03.14(2)[1]	• Fills within building footprints and paved areas to meet subgrade elevations • Over-excavations • Utility trench backfill above bedding course
Class B Gravel Backfill for Foundations: WSDOT SS 9-03.12(1)B	• Slab-on-grade aggregate • Structural fill below foundations, where required.
Gravel Backfill for Walls: WSDOT SS 9-03.12(2)	• Foundation and retaining wall backfill
Bedding Course: WSDOT SS 9-03.12(3)	• Backfill for utility and pipe zone bedding

Contact us to review alternative material selections. Structural fill should extend beyond footings a minimum distance equal to the fill depth.

Fill Placement. Place fill in lifts of thickness suited to the compaction equipment but no more than 12 inches. Compact structural fill to at least 92 percent of MDUW below footings and embankment fill below slab and pavement, except within the top 12 inches of final grade where compaction should be increased to 95 percent. Do not place fill in a frozen condition or on un-compacted frozen subgrade.

We do not recommend placing fill over the *silt* encountered in the southeast portion of the site. The *silt* should either be removed and replaced or treated to mitigate time dependent consolidation settlement prior to construction of structures, pavements, and slabs. We recommend preloading based on the amount of fill required in this area per the grading plan. Preloading involves placing a surcharge fill (beyond what's required in the grading plan) over the top of the compressible stratum. The height of the surcharge fill is equivalent to the final project loading conditions. Time is then allowed to for the ground to settle as consolidation occurs under the added surcharge. Once sufficient consolidation has occurred, the surcharge fill can be removed, and construction can commence over the improved area. Settlement monitoring is typically accomplished by installing simple and inexpensive settlement plates within the fill. The settlement plate is connected to a riser pipe extending upward through the fill inside of a plastic sleeve.

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[1] Washington State Department of Transportation, 2022, Standard Specifications, M 41-10 (WSDOT SS).

The time for substantial completion of consolidation settlement can range from several weeks to several months depending on the permeability and in situ void ratio of the native *silt*. The rate of settlement imposed by the preload can be accelerated by installation of prefabricated vertical drains to shorten the drainage path. If a better estimate of time vs settlement is desired, we recommend performing additional subsurface explorations with undisturbed sampling and laboratory consolidation testing.

Verification and application. These earthwork recommendations apply to structural fill, backfill against footings, and backfill of utility trenches. Retain a qualified earthwork technician present during fill and backfill operations to observe and test each lift of fill. A representative of the Geotechnical Engineer is best suited to provide such testing.

We recommend that in-place density testing be completed in accordance with ASTM D-6938 (nuclear density methods) on site soil and compacted structural fill at the following minimum frequencies:

- Subgrade and base course materials for footings and slabs – At least two tests per 2,000 square feet or fraction thereof, per fill lift;
- Subgrade and base course materials for roads – At least one in-place density test per 100 lineal feet per lane, per fill lift;
- Subgrade and base course materials for curbs and sidewalks – At least one in-place density test per 100 lineal feet, per fill lift; and,
- Utility trench backfill – At least one in-place density test per 5 feet of depth per 100 lineal feet of trench.

Flexible Pavement

A resilient modulus of approximately 6,000 pounds per square inch (psi) appears to be suitable for pavement design.

Information regarding the estimation of average daily traffic (ADT) was provided by Whipple Consulting Engineers. The ADT includes 10 trips per day per lot for light passenger vehicles with 4 percent heavy vehicles added (concrete trucks, construction equipment haulers, garbage trucks, moving and delivery vans, etc.). If traffic information is updated, we need to be contacted to re-evaluate pavement sections.

Factors considered in the recommended pavement section include the following:

- Estimated average daily traffic (ADT): 420 (residents coming and going, visitors, heavy vehicles, etc.);
- Future traffic growth rate of 5 percent;
- City of Spokane and Spokane County design standards; and,
- Total design equivalent single-axle loads (ESALs) equals 77,000.

The recommended minimum flexible pavement section 3 inches hot mix asphalt (HMA) over 6 inches crushed surfacing top course (CSTC) over compacted subgrade. The use of a stabilization geotextile is recommended between CSTC and subgrade materials. Where the subgrade is tested to be granular material consisting of no more than 15 percent passing the U.S. # 200 sieve, the filter fabric may be omitted.

Table 3: Pavement Compaction and Recommended Materials Summary

Layer	Compaction	Specification
3 inches Asphalt Surfacing – *HMA*	92% TM	*WSDOT SSs Section 9-03.8(6).*
6 inches Base Course - *CSTC*	95% MP	*WSDOT SSs Section 9-03.9(3)*
Separation and stabilization geotextile		*WSDOT SS 9-33.2(1), Table 3*

TM = Theoretical Maximum Unit Weight
MP = Modified Proctor *(AASHTO T-180)*

Stormwater Drainage

We recommend grading surfaces to allow positive drainage away from structures and pavements. Roof and parking lot runoff should be collected and disposed of such that water is not allowed to accumulate near the structure or pavements.

As previously stated, the use of rapid subsurface infiltration structures is not considered feasible. An alternative method to subsurface infiltration may include the use of evaporative/detention ponds with limited infiltration to the subsurface. In the event this method for stormwater treatment becomes desirable, we recommend following procedures described in the SRSM, Chapter 5, for designing such facilities. The estimated hydraulic conductivity rates of the soils at TP-3 and TP-9 locations were approximately 1.4 and 10.6 inches per hour, respectively, as determined from infiltration testing.

Additional Services

Effective geotechnical services involve cooperation with the owner, designer, and constructor as follows:

1. Preliminary study to assist in planning and to economically adapt the project to its geologic environment;
2. Soil exploration and analysis to characterize subsurface conditions and recommend design criteria;
3. Consultation with the designer to adapt the specific design to the site in accordance with the recommendations;
4. Construction observation to verify the conditions encountered and to make recommendations for modifications, as necessary; and,
5. Construction material testing, quality control, and special inspection.

This report satisfies Item 2 of the 5-phase endeavor. We are eager to provide assistance with design and construction as appropriate to assist in completing a safe and economical project.

FIELD EXPLORATION

The fieldwork was conducted by staff engineer Greyson Charon, EIT, staff geologist Jack Pappas, GIT, and supervised by geotechnical engineer John Finnegan, PE, beginning March 17 and concluding March 22, 2022. The field activities generally consisted of the following:

- Reconnaissance of the site and surrounding area;
- Logging subsurface conditions in 12 test pits;
- Conducting DCP soundings;
- Performing infiltration tests; and,
- Obtaining bulk samples of the soils.

Results are presented in *Figures*.

Excavations

Test pits were excavated by Vietzke with a CAT 308 track-mounted excavator using a 24-inch-wide, toothed bucket. Criteria governing the depth to which test pits were excavated included limits of equipment reach and digging refusal on *basalt* with a 10-ton, 70-horsepower excavator.

Soil Samples

Samples were obtained by capturing representative material from the bucket of the excavator or from within the excavation while less than 4 feet BGS.

DCP Testing

DCP Testing – ASTM D6951/ASTM STP 399. Soil strength was estimated with a series of DCP tests using two methods. Method 1 involves the use of a Kessler® DCP which consists of a 10.1-pound slide hammer and rods with 2-inch graduations. Method 2 involves the use of a Triggs Wildcat® DCP system which consists of a 35-pound slide hammer and rods with 4-inch graduations. In both methods the hammer is manually lifted and allowed to fall from a fixed height. Kessler® DCP test results can be correlated to CBR values for estimating relative soil strength for pavement design. Wildcat® DCP results can be corelated to N-values for estimating relative soil density. The results of DCP penetration per 1-inch and 4-inch intervals are presented in *Figures*.

Infiltration Testing

Infiltration tests were conducted at TP-3 and TP-9 locations. The tests were performed in accordance with the *Spokane Regional Stormwater Manual, Appendix 4C – Test Pit Method.* The results of infiltration testing are presented in *Figures*.

Soil and Rock Classification

Field descriptions of soils and rock were completed in accordance with the current version of the Washington State Department of Transportation, *Geotechnical Design Manual* (GDM), M 46-03, except that fines (silt and clay) were described in accordance with ASTM D 2487. *Whereas, the GDM uses the terms 'silty' and 'clayey' to describe a very broad range of fines from 10 to 49 percent; ASTM D 2487 uses those terms for percentages greater than 12 and the term 'with' for fines ranging from 5 to 12 percent, which is typically necessary to describe variations relevant to soil permeability per the SRSM.* A key to the descriptions is provided in *Guide to Soil and Rock Descriptions.*

Location

Horizontal & vertical control. The *Site Plan* was reproduced from a preliminary plan provided by the client from Inland Pacific Engineering (dated September 3, 1997) and is based on measured offsets from existing site features at the time of exploration.

Elevations presented in the *Logs* were correlated from contour intervals illustrated on the provided plans. Horizontal and vertical locations can be considered accurate to within 5-foot and 1-foot respectively, relative to the information provided.

LABORATORY ANALYSIS

Laboratory testing was performed on representative samples of the soils encountered to provide data used in our assessment of soil characteristics.

Tests were conducted, where practical, in accordance with nationally recognized standards (ASTM, AASHTO, etc.), which are intended to model in-situ soil conditions and behavior. The results are presented in *Figures*.

Index Parameters

Moisture content – ASTM D2216. Moisture contents were determined by direct weight proportion (weight of water/weight of dry soil) determined by drying soil samples in an oven until reaching constant weight.

Gradation – ASTM D6913. Gradation analysis was performed by the mechanical sieve method. The mechanical sieve method is utilized to determine particle size distribution based upon the dry weight of sample passing through sieves of varying mesh sizes. The results of gradation are provided in *Grain Size Distribution Results*.

Atterberg Limits – ASTM D4318. Atterberg limits describe the properties of the fine-grained constituents of soils by relating the water content to the plastic and liquid limits of engineering behavior. As the water content increases, the state of the soil changes from a brittle solid, to a plastic solid, and then to a viscous liquid.

The liquid limit (LL) is the water content above which the soil tends to behave as a viscous liquid. Similarly, the plastic limit (PL) is defined as the water content below which the soil tends to behave as a brittle solid. The plasticity index describes the range of water content over which a soil is plastic and is derived by subtracting the PL from the LL. The soil is classified as “non-plastic” if rolling a 1/8-inch bead is not possible at any water content.

Chemical Parameters

pH – AASHTO T289. The quantified measurement of soil pH (acidity = pH <7) and minimum resistivity are useful variables in determining the potential corrosivity of the soil. Certain clayey soils exhibit excess acidity that attacks concrete, iron, and buried utilities.

LIMITATIONS

The conclusions and recommendations presented herein are based upon the results of field explorations and laboratory testing results. They are predicated upon our understanding of the project, its design, and its location as defined in by the client. We endeavored to conduct this study in accordance with generally accepted geotechnical engineering practices in this area.

This GER presents our professional interpretation of exploration data developed, which we believe meets the standards of the geotechnical profession in this area; we make no other warranties, express or implied. Attached is a document titled "*Important Information About Your Geotechnical Engineering Report,*" which we recommend you review carefully to better understand the context within which these services were completed.

Unless test locations are specified by others or limited by accessibility, the scope of analysis is intended to develop data from a representative portion of the site. However, the areas tested are discreet. Interpolation between these discreet locations is made for illustrative purposes only but should be expected to vary. If a greater level of detail is desired, the client should request an increased scope of exploration.

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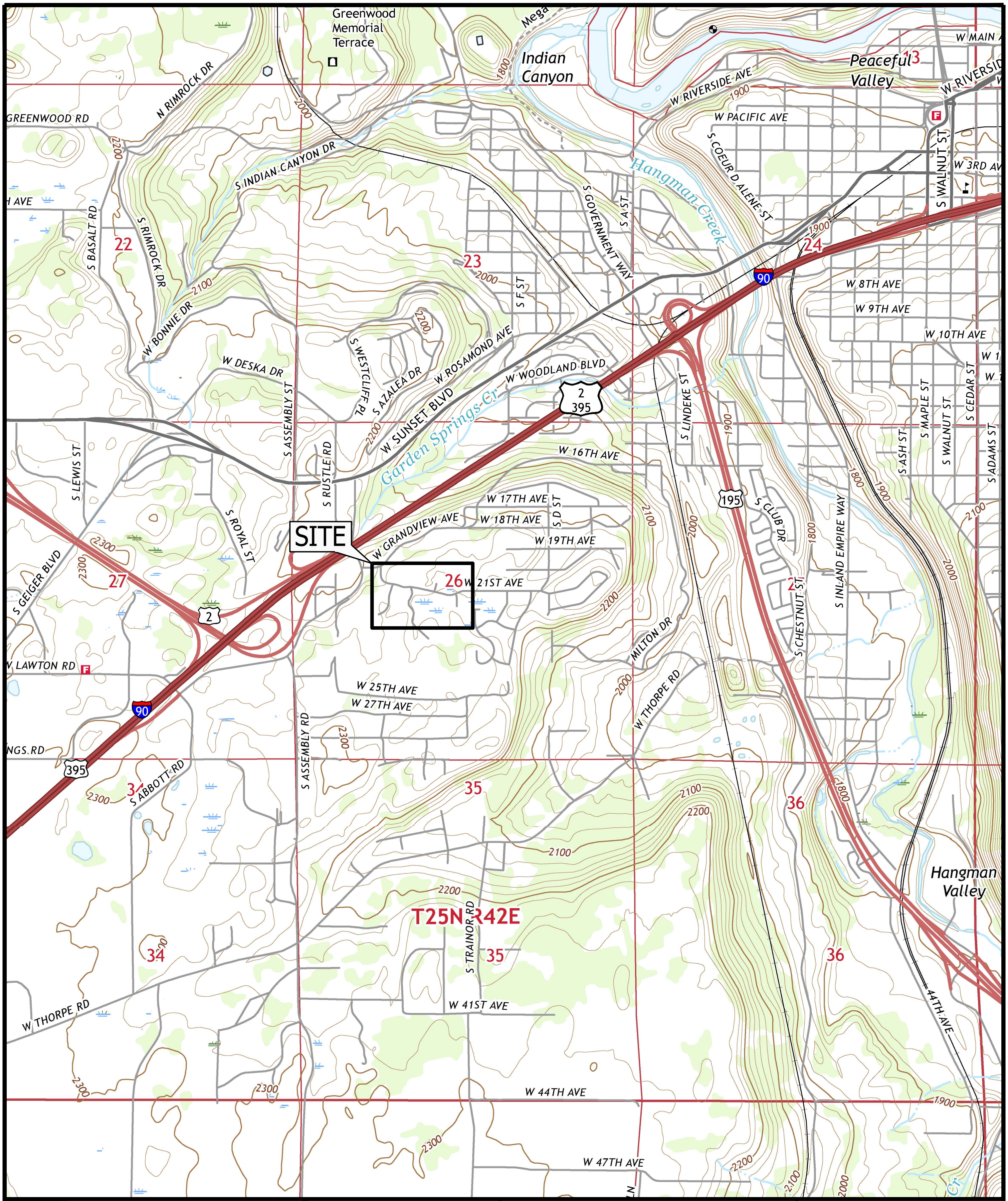

N

SCALE: 1"=2000'

0 1000 2000

SECTION 26
T 25 N R 42 E
USGS 2017

Budinger
& Associates

VICINITY MAP

21ST AVE. - WESTRIDGE TO GRANDVIEW
SPOKANE, WASHINGTON

FIGURE 1

PROJECT NUMBER S22083

DATE: 3/2022

▣ TEST PIT LOCATION (1)

BASE PLAN FROM INLAND PACIFIC ENGINEERING (9/1997)
SATELLITE IMAGERY FROM GOOGLE EARTH (8/2020)

N

SCALE: 1"=200'

0 100 200

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SITE PLAN

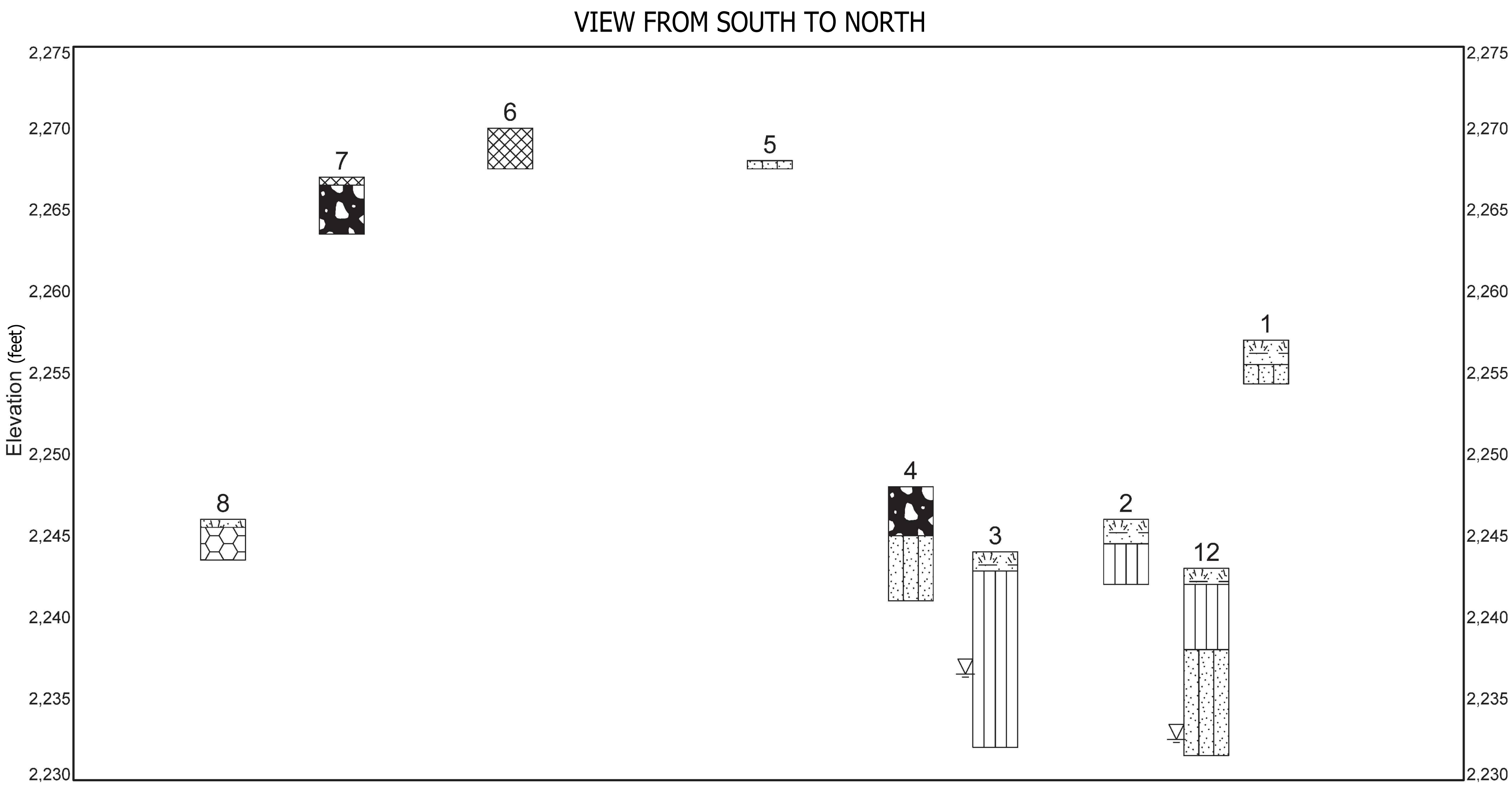
21ST AVE. - WESTRIDGE TO GRANDVIEW

SPOKANE, WASHINGTON

FIGURE 2-1

PROJECT NUMBER S22083

DATE: 3/2022



▨ TOPSOIL

▨ EXISTING FILL

▨ SILT

▨ SILTY SAND

▨ BASALT

DISTANCE ALONG BASELINE

SCALE: 1"=200'

0 100 200

Budinger & Associates

FENCE DIAGRAM

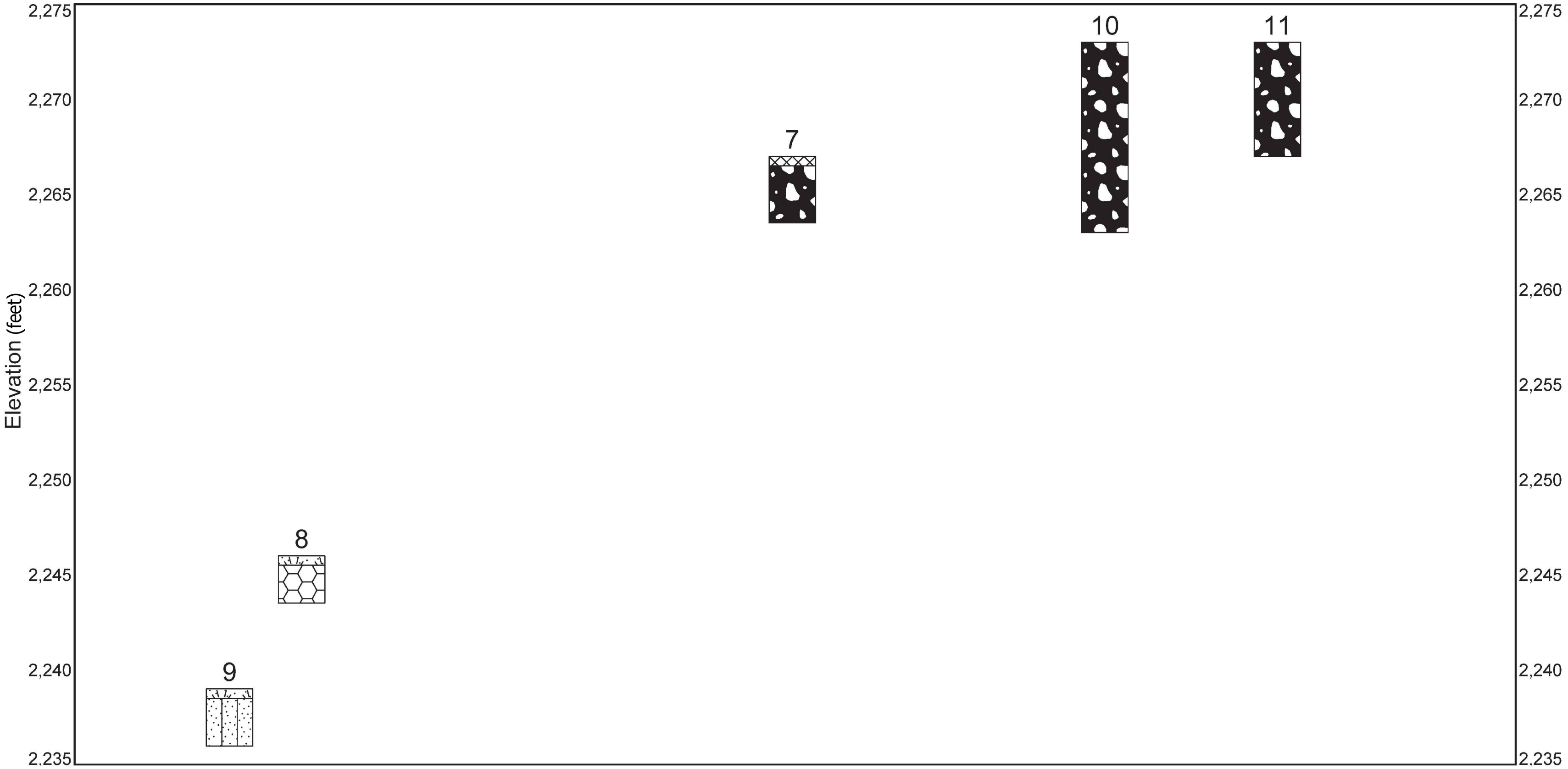
21ST AVE. - WESTRIDGE TO GRANDVIEW
SPOKANE, WASHINGTON

FIGURE 2-2

PROJECT NUMBER S22083

DATE: 4/2022

VIEW FROM WEST TO EAST



▨ TOPSOIL

▨ SILTY SAND

■ ▨ EXISTING FILL

▨ BASALT

DISTANCE ALONG BASELINE
SCALE: 1"=120'
0 60 120

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& Associates

FENCE DIAGRAM

21ST AVE. - WESTRIDGE TO GRANDVIEW
SPOKANE, WASHINGTON

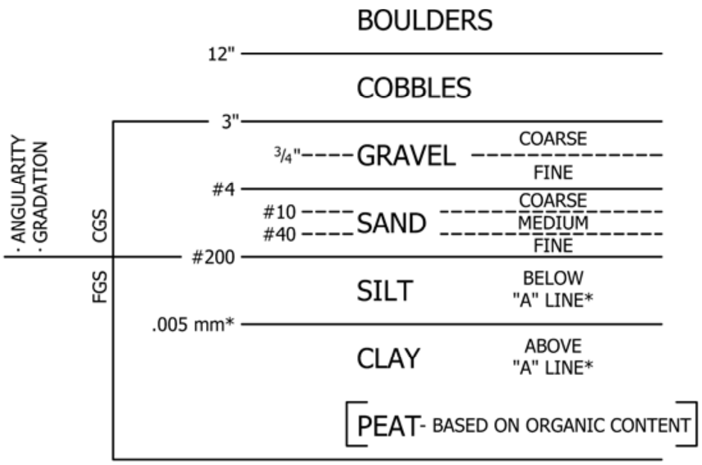
FIGURE 2-3

PROJECT NUMBER S22083

DATE: 4/2022

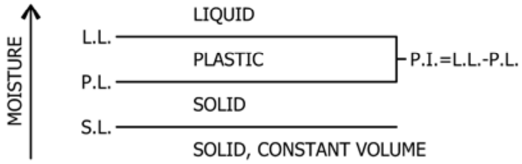
GUIDE TO SOIL & ROCK DESCRIPTIONS

SOIL CLASSIFICATION

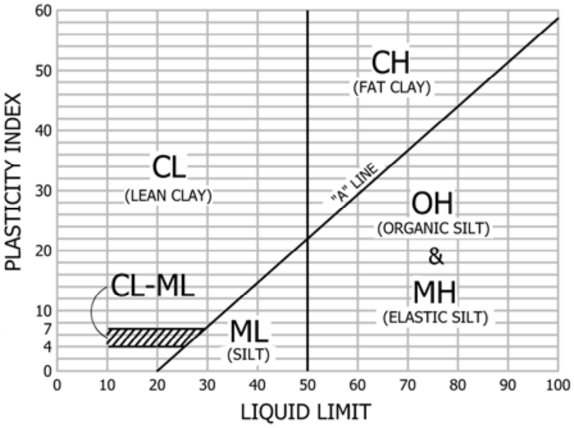


** SEE PLASTICITY CHART*
CGS - COARSE GRAINED SOIL - MORE THAN 50% RETAINED ON A #200 SIEVE
FGS - FINE GRAINED SOIL - 50% MORE PASSES, #200 SIEVE
FINES - PORTION FINER THAN #200 SIEVE

ATTERBERG LIMITS



PLASTICITY CHART



NOTE - CHART APPLIES TO FGS AND MINUS #40 SIEVE FRACTION OF CGS

GUIDE TO SOIL DESCRIPTION MODIFIERS, MOISTURE, AND CONDITION PRESENTED ON LOGS

MODIFIER	ESTIMATED PERCENTAGE OF MATERIAL
SUFFIX "LY" OR "Y".....................	30% OR MORE FOR COARSE PARTS IN FGS GREATER THAN 12% FOR FINES IN CGS
WITH	15% - 29% FOR COARSE PARTS IN FGS 5% - 12% FOR FINES IN CGS

NOTE - VISUAL ESTIMATES OF MATERIAL PERCENTAGES TYPICALLY VARY 0 TO 10% FROM THOSE DETERMINED BY LABORATORY TESTING.

MOISTURE

- DRY
- MOIST
- SATURATED OR WET

SOIL CONDITION

- CGS:
  - VERY LOOSE
  - LOOSE
  - MEDIUM DENSE
  - DENSE
  - VERY DENSE
- FGS:
  - VERY SOFT
  - SOFT
  - MEDIUM STIFF
  - STIFF
  - VERY STIFF
  - HARD

SAMPLES

◩	STANDARD 2" PENETRATION TEST SAMPLER WITH BLOWS PER FOOT
■	3" SPLIT SPOON SAMPLER WITH BLOWS PER FOOT
□	DRILL CUTTING SAMPLE
▨	BULK SAMPLE
⧖	THIN-WALLED TUBE SAMPLE
⌶	DIAMOND CORE RUN WITH % RECOVERY & ROCK QUALITY DESIGNATION
☒	2.5" SPLIT SPOON SAMPLER WITH BLOWS PER FOOT
▧	CONTINUOUS SOIL SAMPLE
R	REFUSAL OF SAMPLE (50+ BLOWS PER 6")

ROCK WEATHERING

- FRESH
- SLIGHTLY WEATHERED
- MODERATELY WEATHERED
- HIGHLY WEATHERED
- COMPLETELY WEATHERED
- RESIDUAL SOIL

ROCK CONDITION

- EXTREMELY WEAK
- VERY WEAK
- MODERATELY WEAK
- MODERATELY STRONG
- STRONG
- VERY STRONG

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FIGURE 3

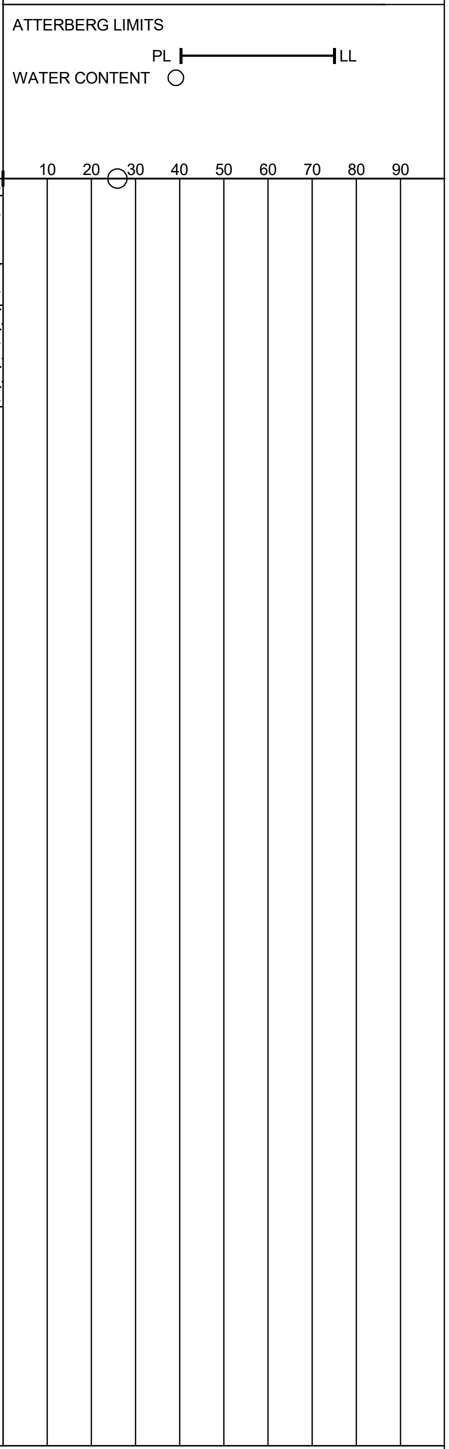
TEST PIT 1

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: Proposed 21st Alignment STA 26+40; 30' Right
Surface: grass and weeds

Elevation: 2257 ft
Logged by: G. Charon
Size of hole: 8 X 3 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown, very loose	SANDY SILT with organics and small roots (TOPSOIL)	
		dry, moderate brown, medium dense	SILTY SAND, medium to fine, angular to subrounded	
		no free groundwater observed	(digging refusal on Basalt) End of Excavation @ 2.7 ft	
5				
10				
15				

TEST RESULTS



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TEST PIT LOGS

FIGURE 4-1

Project: 21st Ave. - Westridge to Grandview
Location: Spokane, WA
Number: S22083

TEST PIT 2

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: Proposed 21st Alignment STA 24+00
Surface: grass and weeds

Elevation: 2246 ft
Logged by: G. Charon
Size of hole: 4 X 9 feet

TEST RESULTS

ATTERBERG LIMITS
PL ├────┤ LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0	▨	moist, dark brown, very loose	SANDY SILT with organics and small roots (TOPSOIL)	
	▨	moist, light brown, medium stiff to stiff	SILT	
		no free groundwater observed	(digging refusal on Basalt) End of Excavation @ 4 ft	
5				
10				
15				

TEST PIT LOGS

FIGURE 4-2

Project: 21st Ave. - Westridge to Grandview

Location: Spokane, WA

Number: S22083

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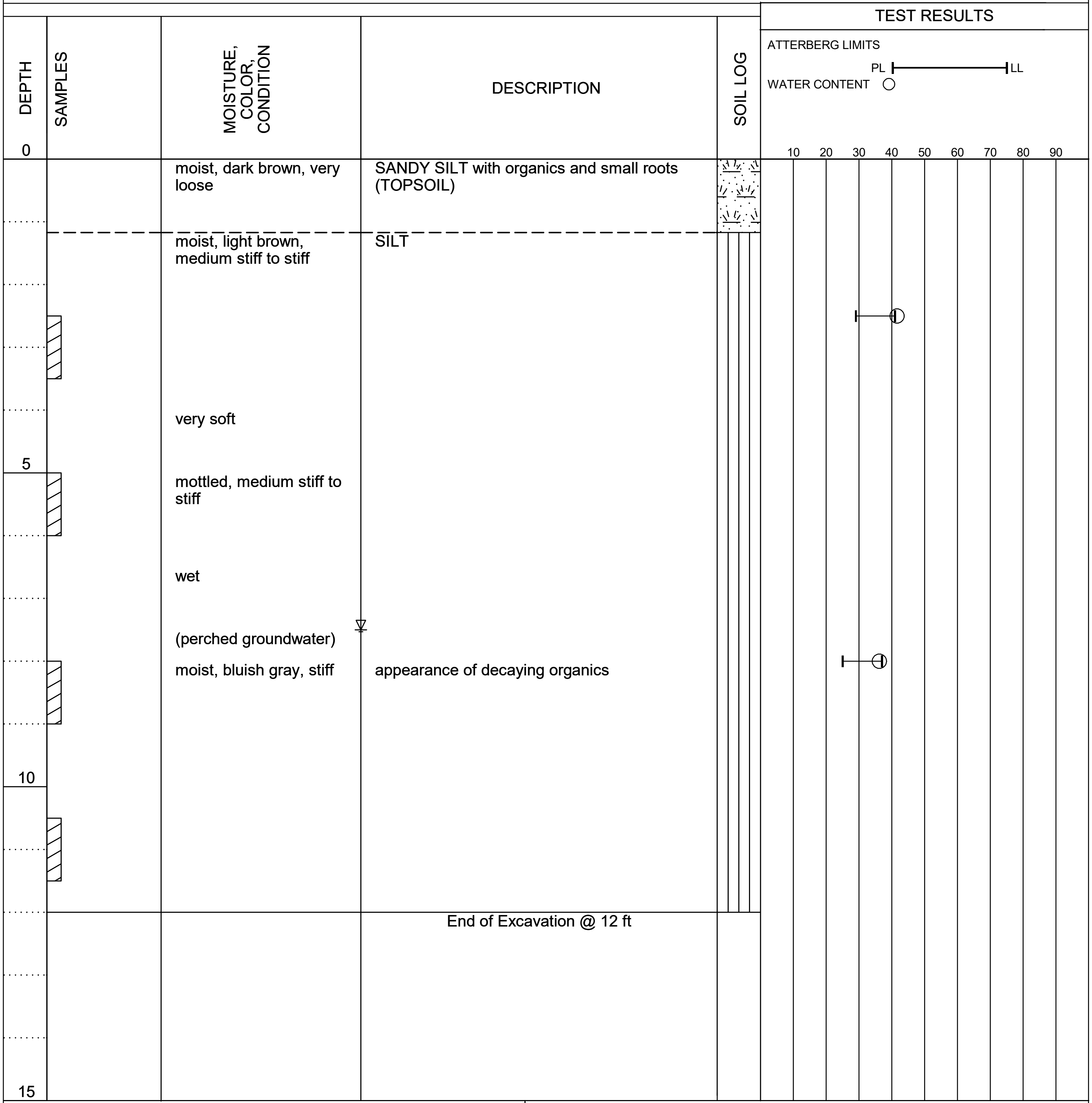
TEST PIT 3

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: Northeast corner proposed Tract A
Surface: grass and weeds

Elevation: 2244 ft
Logged by: G. Charon
Size of hole: 4 X 12 feet



MOISTURE, COLOR, CONDITION	DESCRIPTION
moist, dark brown, very loose	SANDY SILT with organics and small roots (TOPSOIL)
moist, light brown, medium stiff to stiff	SILT
very soft	
mottled, medium stiff to stiff	
wet	
(perched groundwater)	
moist, bluish gray, stiff	appearance of decaying organics
	End of Excavation @ 12 ft

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TEST PIT LOGS

FIGURE 4-3

Project: 21st Ave. - Westridge to Grandview
Location: Spokane, WA
Number: S22083

TEST PIT 4

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: Proposed 21st Alignment STA 21+60
Surface: cobbles and grass

Elevation: 2248 ft
Logged by: G. Charon
Size of hole: 5 X 10 feet

TEST RESULTS

ATTERBERG LIMITS
PL ├──┤ LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG	TEST RESULTS
0		moist, dark to moderate brown, very loose to medium dense	Cobbles and Boulders with Silt, Sand and Gravel, angular to subangular, shot-rock (FILL)		
		moist, moderate brown, loose	SILTY SAND with Gravel		
	▨				○
5		medium dense			
			appearance of Basalt Cobbles		
		no free groundwater observed	(digging refusal on Basalt) End of Excavation @ 7 ft		
10					
15					

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TEST PIT LOGS **FIGURE 4-4**

Project: 21st Ave. - Westridge to Grandview

Location: Spokane, WA

Number: S22083

TEST PIT 5

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: Proposed 21st Alignment STA 19+75
Surface: bare

Elevation: 2268 ft
Logged by: G. Charon
Size of hole: 6 X 4 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG	TEST RESULTS ATTERBERG LIMITS PL ⊢—⊣ LL WATER CONTENT ○ 10 20 30 40 50 60 70 80 90
0		moist, moderate brown	SILTY SAND with Gravel, coarse to fine, angular to subangular, disturbed soil	▨	
		no free groundwater observed	(digging refusal on Basalt) End of Excavation @ 0.5 ft		
5					
10					
15					

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TEST PIT LOGS

FIGURE 4-5

Project: 21st Ave. - Westridge to Grandview

Location: Spokane, WA

Number: S22083

TEST PIT 6

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: Proposed 21st Alignment STA 16+65
Surface: bare

Elevation: 2270 ft
Logged by: G. Charon
Size of hole: 6 X 4 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG	TEST RESULTS ATTERBERG LIMITS PL ├──┤ LL WATER CONTENT ○ 10 20 30 40 50 60 70 80 90
0	▨	moist, dark brown, dense to very dense	SILTY SAND with Gravel and Cobbles, coarse to fine, subangular to subrounded, wood and metal debris (FILL)	▩	
		no free groundwater observed	(digging refusal on Basalt) End of Excavation @ 2.5 ft		
5					
10					
15					

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TEST PIT LOGS

FIGURE 4-6

Project: 21st Ave. - Westridge to Grandview

Location: Spokane, WA

Number: S22083

TEST PIT 7

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: Proposed 21st Alignment STA 14+40
Surface: bare

Elevation: 2267 ft
Logged by: G. Charon
Size of hole: 4 X 7 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG	TEST RESULTS ATTERBERG LIMITS PL ├──┤ LL WATER CONTENT ○ 10 20 30 40 50 60 70 80 90
0		moist, dark brown	SILTY SAND with organics and small roots, coarse to fine, (FILL)	▨	
		moist, dark to moderate brown, very dense	Cobbles and Boulders with Silt, Sand and Gravel, angular to subangular, shot-rock (FILL)	●	
		no free groundwater observed	(digging refusal on Basalt) End of Excavation @ 3.5 ft		
5					
10					
15					

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TEST PIT LOGS

FIGURE 4-7

Project: 21st Ave. - Westridge to Grandview

Location: Spokane, WA

Number: S22083

TEST PIT 8

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: Proposed 21st Alignment STA 12+50
Surface: bare

Elevation: 2246 ft
Logged by: G. Charon
Size of hole: 6 X 4 feet

TEST RESULTS

ATTERBERG LIMITS PL ├──┤ LL

WATER CONTENT ○

10 20 30 40 50 60 70 80 90

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown	SILTY SAND with organics and small roots, coarse to fine, (TOPSOIL)	
		dark brown to dark bluish gray	BASALT, moderately weathered, highly fractured	
		no free groundwater observed	(digging refusal on Basalt) End of Excavation @ 2.5 ft	
5				
10				
15				

TEST PIT LOGS

FIGURE 4-8

Project: 21st Ave. - Westridge to Grandview

Location: Spokane, WA

Number: S22083

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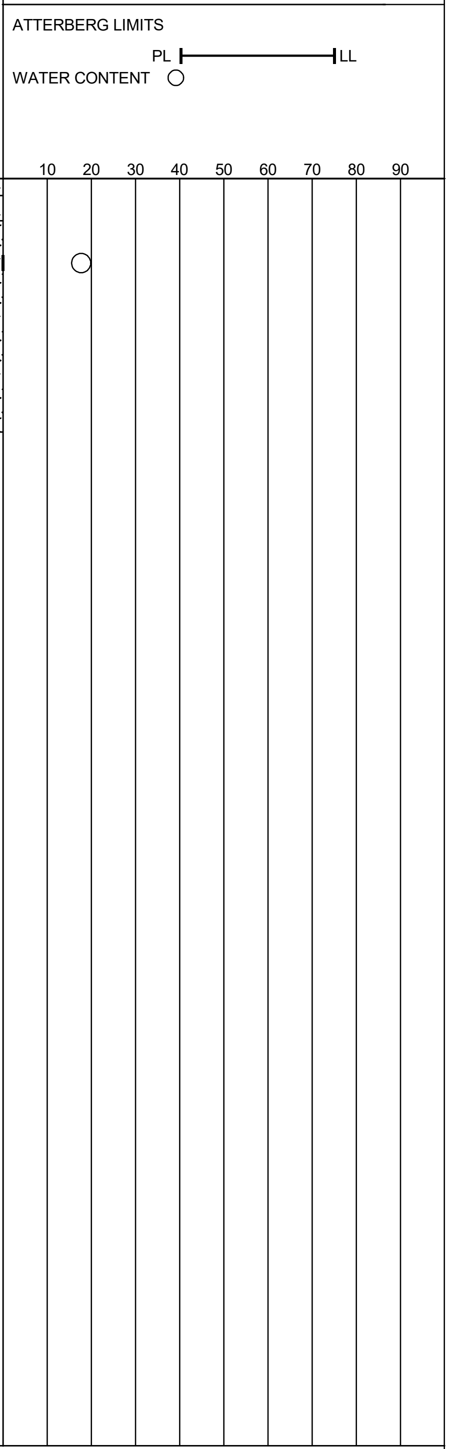
TEST PIT 9

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: North end of proposed Tract C
Surface: grass and weeds

Elevation: 2239 ft
Logged by: G. Charon
Size of hole: 5 X 7 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		moist, dark brown	SILTY SAND with organics and small roots, coarse to fine, (TOPSOIL)	
	▨	moist, dark brown, very loose	SILTY SAND with Cobbles and Boulders	
		no free groundwater observed	(digging refusal on Basalt) End of Excavation @ 3 ft	
5				
10				
15				

TEST RESULTS



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TEST PIT LOGS

FIGURE 4-9

Project: 21st Ave. - Westridge to Grandview

Location: Spokane, WA

Number: S22083

TEST PIT 10

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: Proposed Beard Alignment STA 23+25
Surface: cobbles and boulders

Elevation: 2273 ft
Logged by: G. Charon
Size of hole: 10 X 14 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG	TEST RESULTS ATTERBERG LIMITS PL ⊢—⊣ LL WATER CONTENT ○ 10 20 30 40 50 60 70 80 90
0		moist, dark to moderate brown, dense	Cobbles and Boulders with Silt, Sand and Gravel, angular to subangular, shot-rock (FILL)		
5					
10		no free groundwater observed	(side walls caving excessively) End of Excavation @ 10 ft		
15					

TEST PIT LOGS

FIGURE 4-10

Project: 21st Ave. - Westridge to Grandview

Location: Spokane, WA

Number: S22083

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TEST PIT 11

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: Proposed Beard Alignment STA 22+65
Surface: cobbles and boulders

Elevation: 2273 ft
Logged by: G. Charon
Size of hole: 7 X 10 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG	TEST RESULTS ATTERBERG LIMITS PL ├────┤ LL WATER CONTENT ○ 10 20 30 40 50 60 70 80 90
0		moist, dark to moderate brown, dense	Cobbles and Boulders with Silt, Sand and Gravel, angular to subangular, shot-rock (FILL)		
5					
		no free groundwater observed	(digging refusal on Basalt) End of Excavation @ 6 ft		
10					
15					

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TEST PIT LOGS

FIGURE 4-11

Project: 21st Ave. - Westridge to Grandview

Location: Spokane, WA

Number: S22083

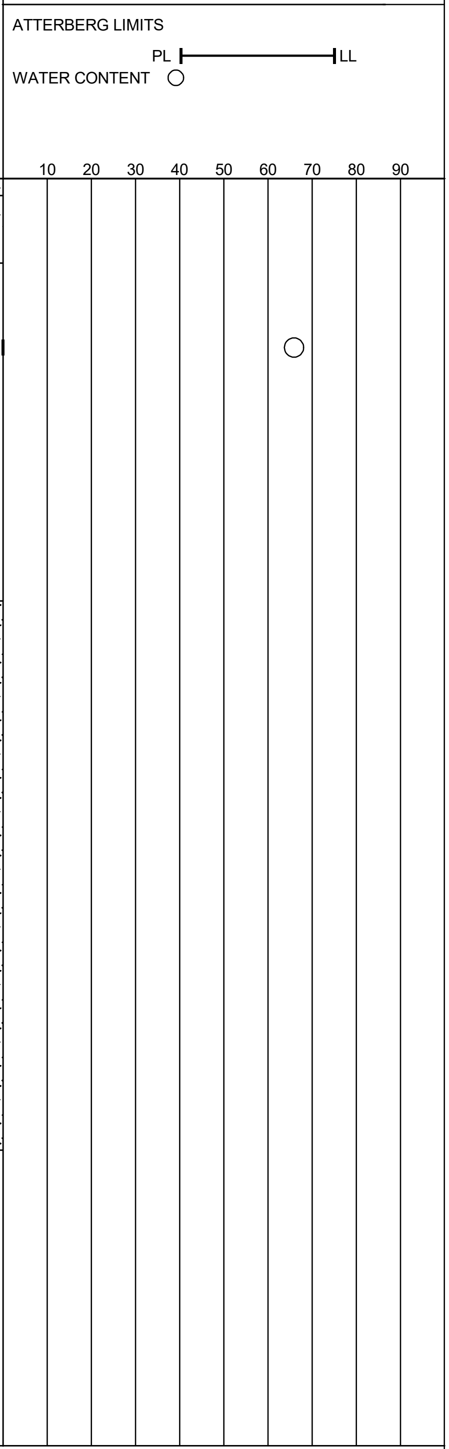
TEST PIT 12

Date: 3-17-22
Excavator: Vietzke
Equipment: CAT 308
Location: Proposed Westridge Alignment STA 24+55
Surface: grass and weeds

Elevation: 2243 ft
Logged by: G. Charon
Size of hole: 7 X 12 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION
0		moist, dark brown, very loose	SANDY SILT with organics and small roots (TOPSOIL)
	▨ ▨	moist, light brown, soft to medium stiff mottled, stiff to very stiff	SILT with Sand
5	▨	moist, mottled, medium dense wet groundwater encountered beginning at 10.5 feet	SILTY SAND, medium to fine, angular to subangular
10			(side walls caving excessively) End of Excavation @ 11.5 ft
15			

TEST RESULTS



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TEST PIT LOGS

FIGURE 4-12

Project: 21st Ave. - Westridge to Grandview
Location: Spokane, WA
Number: S22083

WILDCAT DYNAMIC CONE LOG

PROJECT NUMBER: S22083
DATE STARTED: 03-22-2022
DATE COMPLETED: 03-22-2022

HOLE #: DCP @ TP-1
CREW: Cameron Andrews
PROJECT: 21st Ave. - Westridge to Grandview
ADDRESS:
LOCATION: Spokane, WA

SURFACE ELEVATION: 2257
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
-	2	8.9	••	2	VERY LOOSE	SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 1 ft	2	8.9	••	2	VERY LOOSE	SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	3	13.3	•••	3	VERY LOOSE	SOFT
- 2 ft	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	18	79.9	•••••••••••••••••••••••	22	MEDIUM DENSE	VERY STIFF
-	20	88.8	•••••••••••••••••••••••••	25	MEDIUM DENSE	VERY STIFF
- 3 ft	24	106.6	••••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
- 1 m	50	222.0	••	25+	VERY DENSE	HARD
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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Figure 5-1

WILDCAT DYNAMIC CONE LOG

Page 1 of 1

PROJECT NUMBER: S22083
DATE STARTED: 03-22-2022
DATE COMPLETED: 03-22-2022

HOLE #: DCP @ TP-2
CREW: Cameron Andrews
PROJECT: 21st Ave. - Westridge to Grandview
ADDRESS:
LOCATION: Spokane, WA

SURFACE ELEVATION: 2246
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

	BLOWS	RESISTANCE	GRAPH OF CONE RESISTANCE		TESTED CONSISTENCY	
DEPTH	PER 10 cm	Kg/cm²	0 50 100 150	N'	NON-COHESIVE	COHESIVE
-	2	8.9	••	2	VERY LOOSE	SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 1 ft	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
-	3	13.3	•••	3	VERY LOOSE	SOFT
- 2 ft	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
- 3 ft	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
- 1 m	9	40.0	•••••••••••	11	MEDIUM DENSE	STIFF
-	9	34.7	••••••••••	9	LOOSE	STIFF
- 4 ft	11	42.5	••••••••••••	12	MEDIUM DENSE	STIFF
-	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
-	50	193.0	••	25+	VERY DENSE	HARD
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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Figure 5-2

WILDCAT DYNAMIC CONE LOG

PROJECT NUMBER: S22083
DATE STARTED: 03-22-2022
DATE COMPLETED: 03-22-2022

HOLE #: DCP @ TP-3
CREW: Cameron Andrews
PROJECT: 21st Ave. - Westridge to Grandview
ADDRESS:
LOCATION: Spokane, WA

SURFACE ELEVATION: 2244
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

	BLOWS	RESISTANCE	GRAPH OF CONE RESISTANCE		TESTED CONSISTENCY	
DEPTH	PER 10 cm	Kg/cm²	0 50 100 150	N'	NON-COHESIVE	COHESIVE
-	2	8.9	••	2	VERY LOOSE	SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 1 ft	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	3	13.3	•••	3	VERY LOOSE	SOFT
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
- 2 ft	8	35.5	••••••••••	10	LOOSE	STIFF
-	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	9	40.0	•••••••••••	11	MEDIUM DENSE	STIFF
- 3 ft	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 1 m	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	3.9	•	1	VERY LOOSE	VERY SOFT
- 4 ft	1	3.9	•	1	VERY LOOSE	VERY SOFT
-	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	7	27.0	•••••••	7	LOOSE	MEDIUM STIFF
- 5 ft	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
-	8	30.9	••••••••	8	LOOSE	MEDIUM STIFF
-	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
- 6 ft	15	57.9	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
- 2 m	12	46.3	•••••••••••••	13	MEDIUM DENSE	STIFF
- 7 ft	10	34.2	•••••••••	9	LOOSE	STIFF
-	11	37.6	••••••••••	10	LOOSE	STIFF
-	14	47.9	•••••••••••••	13	MEDIUM DENSE	STIFF
- 8 ft	9	30.8	••••••••	8	LOOSE	MEDIUM STIFF
-	10	34.2	•••••••••	9	LOOSE	STIFF
-	9	30.8	••••••••	8	LOOSE	MEDIUM STIFF
- 9 ft	8	27.4	•••••••	7	LOOSE	MEDIUM STIFF
-	8	27.4	•••••••	7	LOOSE	MEDIUM STIFF
-	10	34.2	•••••••••	9	LOOSE	STIFF
- 3 m 10 ft	10	34.2	•••••••••	9	LOOSE	STIFF
-	12	36.7	••••••••••	10	LOOSE	STIFF
-	12	36.7	••••••••••	10	LOOSE	STIFF
-	13	39.8	•••••••••••	11	MEDIUM DENSE	STIFF
- 11 ft	14	42.8	••••••••••••	12	MEDIUM DENSE	STIFF
-	15	45.9	•••••••••••••	13	MEDIUM DENSE	STIFF
-	11	33.7	•••••••••	9	LOOSE	STIFF
- 12 ft	16	49.0	••••••••••••••	13	MEDIUM DENSE	STIFF
-	18	55.1	•••••••••••••••	15	MEDIUM DENSE	STIFF
-	17	52.0	•••••••••••••••	14	MEDIUM DENSE	STIFF
- 4 m 13 ft	21	64.3	••••••••••••••••••	18	MEDIUM DENSE	VERY STIFF

Figure 5-3

HOLE #: DCP @ TP-3

WILDCAT DYNAMIC CONE LOG

PROJECT: 21st Ave. - Westridge to Grandview

PROJECT NUMBER: S22083

	BLOWS	RESISTANCE	GRAPH OF CONE RESISTANCE		TESTED CONSISTENCY	
DEPTH	PER 10 cm	Kg/cm²	0 50 100 150	N'	NON-COHESIVE	COHESIVE
-	25	69.3	••••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
-	23	63.7	••••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
- 14 ft	31	85.9	••••••••••••••••••••••••	24	MEDIUM DENSE	VERY STIFF
-	29	80.3	•••••••••••••••••••••••	22	MEDIUM DENSE	VERY STIFF
-	50	138.5	••	25+	DENSE	HARD
- 15 ft						
-						
-						
- 16 ft						
- 5 m						
-						
- 17 ft						
-						
-						
- 18 ft						
-						
-						
- 19 ft						
-						
- 6 m						
- 20 ft						
-						
-						
- 21 ft						
-						
-						
- 22 ft						
-						
-						
- 7 m 23 ft						
-						
-						
- 24 ft						
-						
-						
- 25 ft						
-						
-						
- 26 ft						
- 8 m						
-						
- 27 ft						
-						
-						
- 28 ft						
-						
-						
- 29 ft						
-						
- 9 m						

Figure 5-4

WILDCAT DYNAMIC CONE LOG

PROJECT NUMBER: S22083
DATE STARTED: 03-22-2022
DATE COMPLETED: 03-22-2022

HOLE #: DCP @ TP-4
CREW: Cameron Andrews
PROJECT: 21st Ave. - Westridge to Grandview
ADDRESS:
LOCATION: Spokane, WA

SURFACE ELEVATION: 2248
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

	BLOWS	RESISTANCE	GRAPH OF CONE RESISTANCE		TESTED CONSISTENCY	
DEPTH	PER 10 cm	Kg/cm²	0 50 100 150	N'	NON-COHESIVE	COHESIVE
-	3	13.3	•••	3	VERY LOOSE	SOFT
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
- 1 ft	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
-	9	40.0	•••••••••••	11	MEDIUM DENSE	STIFF
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
- 2 ft	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
-	3	13.3	•••	3	VERY LOOSE	SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
- 3 ft	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
- 1 m	3	13.3	•••	3	VERY LOOSE	SOFT
-	11	42.5	••••••••••••	12	MEDIUM DENSE	STIFF
- 4 ft	9	34.7	••••••••••	9	LOOSE	STIFF
-	9	34.7	••••••••••	9	LOOSE	STIFF
-	14	54.0	•••••••••••••••	15	MEDIUM DENSE	STIFF
- 5 ft	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
-	16	61.8	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
-	11	42.5	••••••••••••	12	MEDIUM DENSE	STIFF
- 6 ft	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
-	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
- 2 m	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
- 7 ft	12	41.0	•••••••••••	11	MEDIUM DENSE	STIFF
-	29	99.2	••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
-	50	171.0	••	25+	DENSE	HARD
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

Figure 5-5

WILDCAT DYNAMIC CONE LOG

Page 1 of 1

PROJECT NUMBER: S22083
DATE STARTED: 03-22-2022
DATE COMPLETED: 03-22-2022

HOLE #: DCP @ TP-6
CREW: Cameron Andrews
PROJECT: 21st Ave. - Westridge to Grandview
ADDRESS:
LOCATION: Spokane, WA

SURFACE ELEVATION: 2270
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY	
					NON-COHESIVE	COHESIVE
-	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
- 1 ft	28	124.3	••••••••••••••••••••••••••••••••••••	25+	DENSE	HARD
-	50	222.0	••	25+	VERY DENSE	HARD
-						
- 2 ft						
-						
-						
- 3 ft						
- 1 m						
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

Figure 5-6

WILDCAT DYNAMIC CONE LOG

Page 1 of 1

PROJECT NUMBER: S22083
DATE STARTED: 03-22-2022
DATE COMPLETED: 03-22-2022

HOLE #: DCP @ TP-7
CREW: Cameron Andrews
PROJECT: 21st Ave. - Westridge to Grandview
ADDRESS:
LOCATION: Spokane, WA

SURFACE ELEVATION: 2267
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

	BLOWS	RESISTANCE	GRAPH OF CONE RESISTANCE		TESTED CONSISTENCY	
DEPTH	PER 10 cm	Kg/cm²	0 50 100 150	N'	NON-COHESIVE	COHESIVE
-	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	31	137.6	•••••••••••••••••••••••••••••••••••••••	25+	DENSE	HARD
- 1 ft	50	222.0	••	25+	VERY DENSE	HARD
-						
-						
- 2 ft						
-						
-						
- 3 ft						
- 1 m						
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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Figure 5-7

WILDCAT DYNAMIC CONE LOG

Page 1 of 1

PROJECT NUMBER: S22083
DATE STARTED: 03-22-2022
DATE COMPLETED: 03-22-2022

HOLE #: DCP @ TP-8
CREW: Cameron Andrews
PROJECT: 21st Ave. - Westridge to Grandview
ADDRESS:
LOCATION: Spokane, WA

SURFACE ELEVATION: 2246
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
-	12	53.3	•••••••••••••••	15	MEDIUM DENSE	STIFF
-	12	53.3	•••••••••••••••	15	MEDIUM DENSE	STIFF
- 1 ft	45	199.8	••	25+	VERY DENSE	HARD
-	50	222.0	••	25+	VERY DENSE	HARD
-						
- 2 ft						
-						
-						
- 3 ft						
- 1 m						
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

Figure 5-8

WILDCAT DYNAMIC CONE LOG

PROJECT NUMBER: S22083
DATE STARTED: 03-22-2022
DATE COMPLETED: 03-22-2022

HOLE #: DCP @ TP-9
CREW: Cameron Andrews
PROJECT: 21st Ave. - Westridge to Grandview
ADDRESS:
LOCATION: Spokane, WA

SURFACE ELEVATION: 2239
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

	BLOWS	RESISTANCE	GRAPH OF CONE RESISTANCE		TESTED CONSISTENCY	
DEPTH	PER 10 cm	Kg/cm²	0 50 100 150	N'	NON-COHESIVE	COHESIVE
-	3	13.3	•••	3	VERY LOOSE	SOFT
-	3	13.3	•••	3	VERY LOOSE	SOFT
- 1 ft	3	13.3	•••	3	VERY LOOSE	SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 2 ft	2	8.9	••	2	VERY LOOSE	SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	3	13.3	•••	3	VERY LOOSE	SOFT
- 3 ft	2	8.9	••	2	VERY LOOSE	SOFT
- 1 m	3	13.3	•••	3	VERY LOOSE	SOFT
-	3	11.6	•••	3	VERY LOOSE	SOFT
- 4 ft	2	7.7	••	2	VERY LOOSE	SOFT
-	50	193.0	••	25+	VERY DENSE	HARD
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

Figure 5-9

WILDCAT DYNAMIC CONE LOG

Page 1 of 1

PROJECT NUMBER: S22083
DATE STARTED: 03-22-2022
DATE COMPLETED: 03-22-2022

HOLE #: DCP @ TP-12
CREW: Cameron Andrews
PROJECT: 21st Ave. - Westridge to Grandview
ADDRESS:
LOCATION: Spokane, WA

SURFACE ELEVATION: 2243
WATER ON COMPLETION:
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
-	2	8.9	••	2	VERY LOOSE	SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 1 ft	2	8.9	••	2	VERY LOOSE	SOFT
-	3	13.3	•••	3	VERY LOOSE	SOFT
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
- 2 ft	8	35.5	••••••••••	10	LOOSE	STIFF
-	8	35.5	••••••••••	10	LOOSE	STIFF
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
- 3 ft	3	13.3	•••	3	VERY LOOSE	SOFT
- 1 m	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	4	15.4	••••	4	VERY LOOSE	SOFT
- 4 ft	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
-	8	30.9	••••••••	8	LOOSE	MEDIUM STIFF
-	9	34.7	••••••••••	9	LOOSE	STIFF
- 5 ft	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
-	17	65.6	•••••••••••••••••••	18	MEDIUM DENSE	VERY STIFF
-	18	69.5	••••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
- 6 ft	19	73.3	•••••••••••••••••••••	20	MEDIUM DENSE	VERY STIFF
-	16	61.8	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
- 2 m	14	54.0	•••••••••••••••	15	MEDIUM DENSE	STIFF
- 7 ft	17	58.1	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	14	47.9	•••••••••••••	13	MEDIUM DENSE	STIFF
-	13	44.5	••••••••••••	12	MEDIUM DENSE	STIFF
- 8 ft	13	44.5	••••••••••••	12	MEDIUM DENSE	STIFF
-	12	41.0	•••••••••••	11	MEDIUM DENSE	STIFF
-	10	34.2	•••••••••	9	LOOSE	STIFF
- 9 ft	12	41.0	•••••••••••	11	MEDIUM DENSE	STIFF
-	12	41.0	•••••••••••	11	MEDIUM DENSE	STIFF
-	11	37.6	••••••••••	10	LOOSE	STIFF
- 3 m 10 ft	14	47.9	•••••••••••••	13	MEDIUM DENSE	STIFF
-	15	45.9	•••••••••••••	13	MEDIUM DENSE	STIFF
-	11	33.7	•••••••••	9	LOOSE	STIFF
-	27	82.6	•••••••••••••••••••••••	23	MEDIUM DENSE	VERY STIFF
- 11 ft	33	101.0	•••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
-	41	125.5	••••••••••••••••••••••••••••••••••••	25+	DENSE	HARD
-	50	153.0	••	25+	DENSE	HARD
- 12 ft						
-						
-						
- 4 m 13 ft						

Figure 5-10

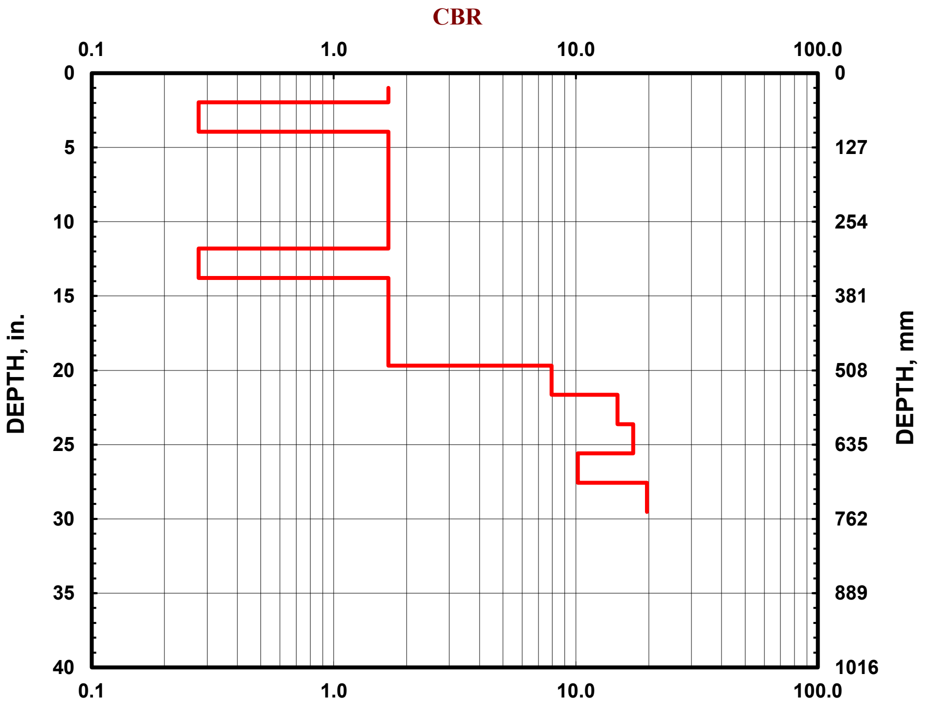
DCP TEST DATA

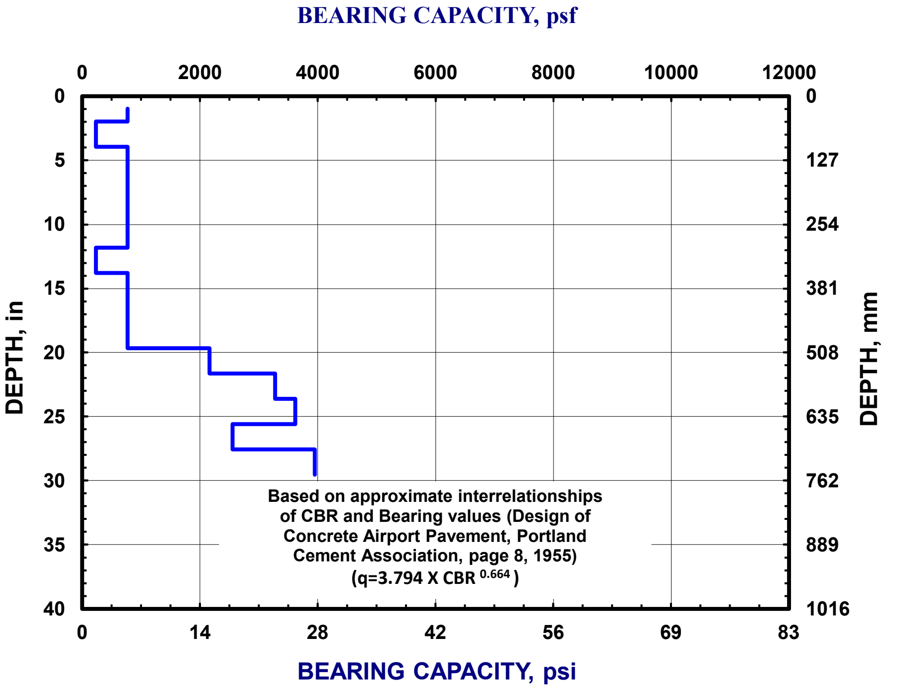
Project: *21st Ave. - Westridge to Grandview*
Date: 22-Mar-22
Location: TP-1
Soil Type(s): Silt & Sand

Hammer
● 10.1 lbs.
○ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0.5	25	2
0.5	50	2
0.1	75	2
0.1	100	2
0.5	125	2
0.5	150	2
0.5	175	2
0.5	200	2
0.5	225	2
0.5	250	2
0.5	275	2
0.5	300	2
0.1	325	2
0.1	350	2
0.5	375	2
0.5	400	2
0.5	425	2
0.5	450	2
0.5	475	2
0.5	500	2
2	525	2
2	550	2
3.5	575	2
3.5	600	2
4	625	2
4	650	2
2.5	675	2
2.5	700	2
4.5	725	2
4.5	750	2
		2
		2
		2
		2
		2
		2
		2
		2
		2
		2
		2
		2
		2





Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955) ($q=3.794 \times CBR^{0.664}$)

Figure 5-11

DCP TEST DATA

Project: *21st Ave. - Westridge to Grandview* **Date:** 22-Mar-22

Location: TP-2 **Soil Type(s):** Silt & Sand

Hammer
● 10.1 lbs.
○ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0.5	25	2
0.5	50	2
0.1	75	2
0.1	100	2
0.5	125	2
0.5	150	2
0.5	175	2
0.5	200	2
1	225	2
1	250	2
1.5	275	2
1.5	300	2
1.5	325	2
1.5	350	2
1	375	2
1	400	2
2	425	2
2	450	2
1	475	2
1	500	2
1	525	2
1	550	2
0.5	575	2
0.5	600	2
1	625	2
1	650	2
0.5	675	2
0.5	700	2
1	725	2
1	750	2
		2
		2
		2
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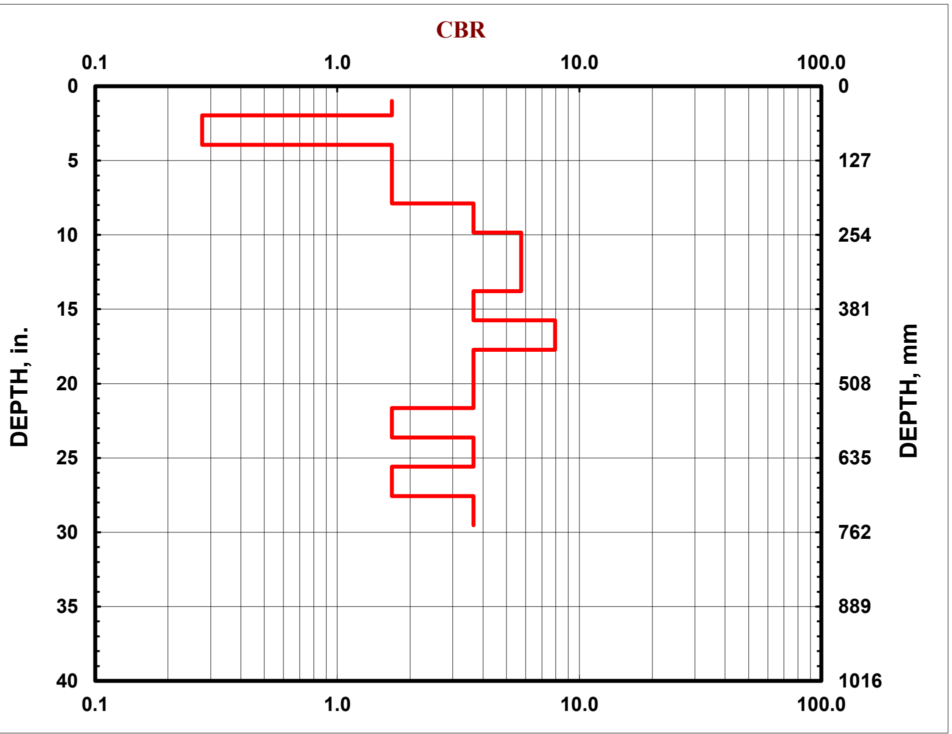
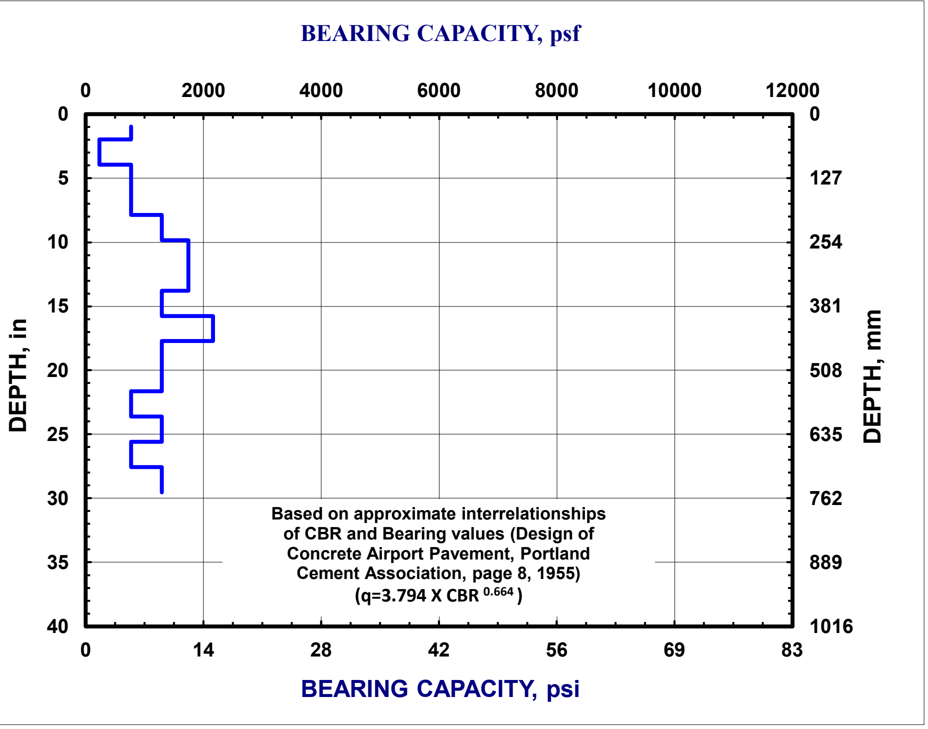
		2
		2
		2
		2





Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955) ($q=3.794 \times CBR^{0.664}$)

Figure 5-12

DCP TEST DATA

Project: *21st Ave. - Westridge to Grandview*
Date: 22-Mar-22
Location: TP-4
Soil Type(s): Silt & Sand

Hammer
● 10.1 lbs.
○ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0.5	25	2
0.5	50	2
0.5	75	2
0.5	100	2
0.5	125	2
0.5	150	2
0.5	175	2
0.5	200	2
1	225	2
1	250	2
0.5	275	2
0.5	300	2
0.5	325	2
0.5	350	2
0.5	375	2
0.5	400	2
0.5	425	2
0.5	450	2
1	475	2
1	500	2
1	525	2
1	550	2
1	575	2
1	600	2
0.5	625	2
0.5	650	2
0.5	675	2
0.5	700	2
0.1	725	2
0.1	750	2
		2
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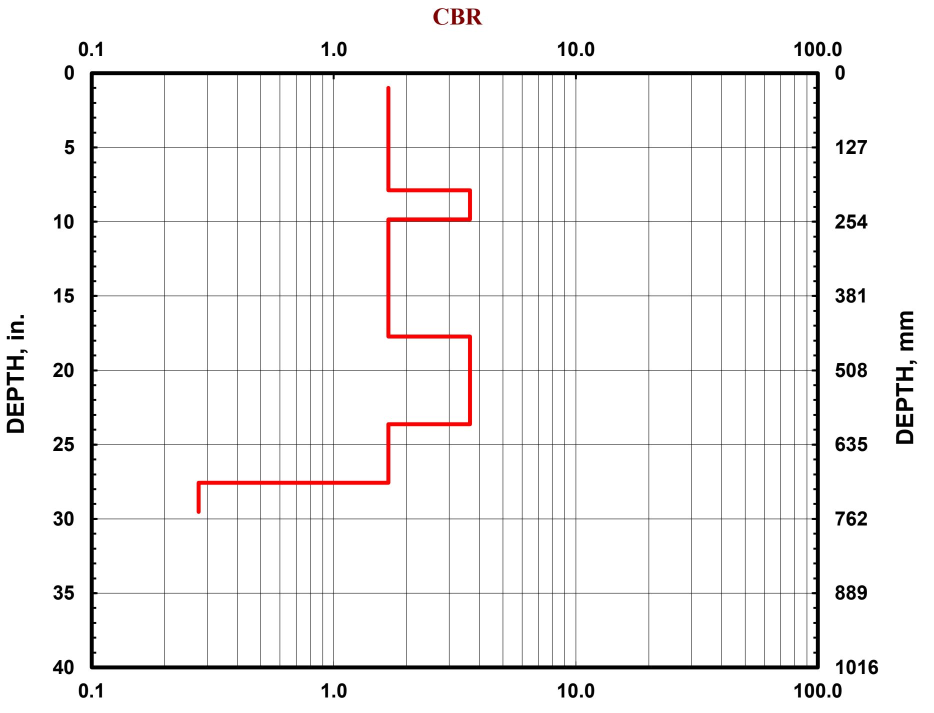
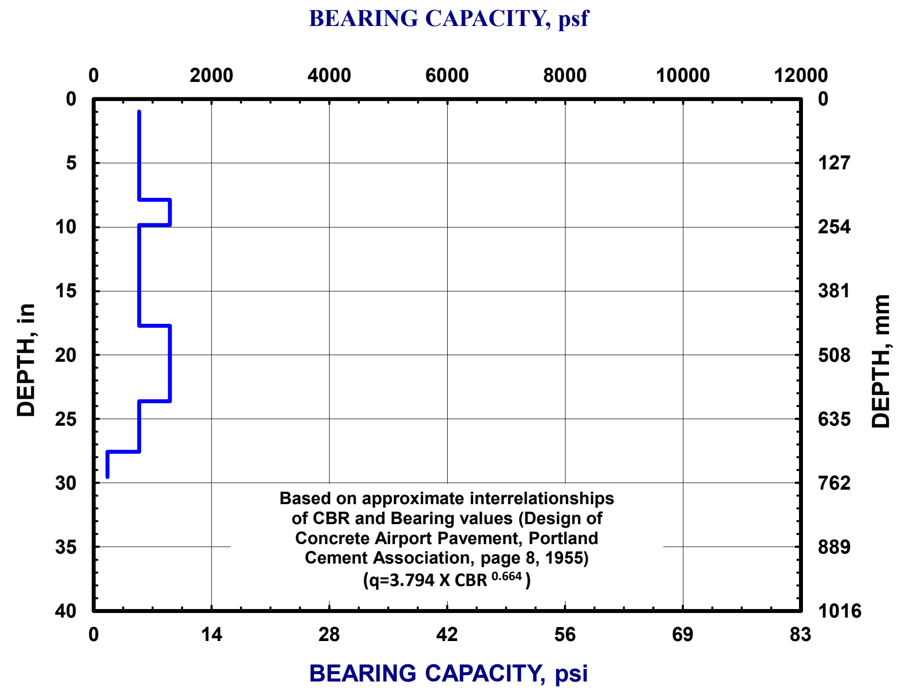
		2
		2
		2





Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955) ($q=3.794 \times CBR^{0.664}$)

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Figure 5-13

DCP TEST DATA

Project: *21st Ave. - Westridge to Grandview*
Date: 22-Mar-22
Location: TP-6
Soil Type(s): Silt & Sand

Hammer
● 10.1 lbs.
○ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
1	25	2
1	50	2
0.5	75	2
0.5	100	2
1.5	125	2
1.5	150	2
6.5	175	2
6.5	200	2
1	225	2
1	250	2
1	275	2
1	300	2
1	325	2
1	350	2
3	375	2
3	400	2
11	425	2
11	450	2
9	475	2
9	500	2
7	525	2
7	550	2
4.5	575	2
4.5	600	2
1.5	625	2
1.5	650	2
1.5	675	2
1.5	700	2
2	725	2
2	750	2
		2
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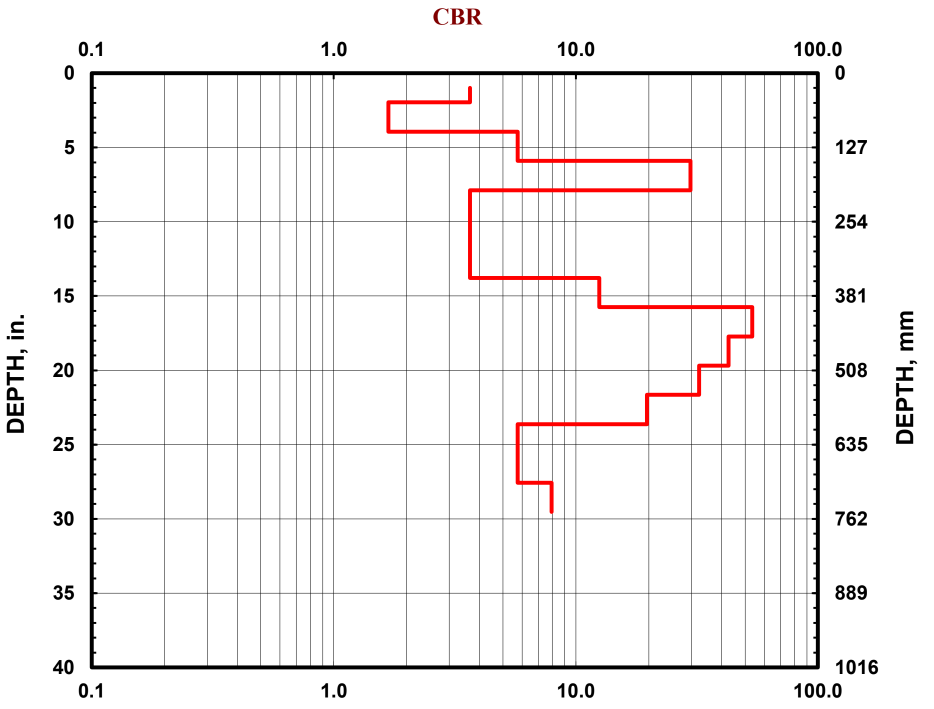
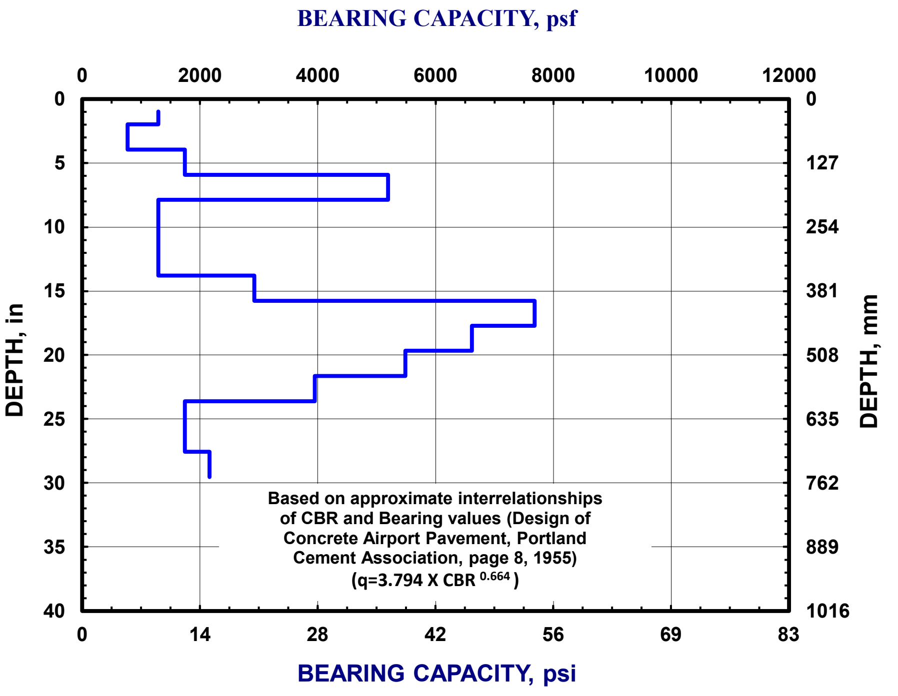
		2
		2
		2





Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955) ($q=3.794 \times CBR^{0.664}$)

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Construction Materials Testing & Special Inspection

Figure 5-14

DCP TEST DATA

Project: *21st Ave. - Westridge to Grandview*
Location: TP-7
Date: 22-Mar-22
Soil Type(s): Silt & Sand

Hammer
● 10.1 lbs.
○ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0.5	25	2
0.5	50	2
1	75	2
1	100	2
3	125	2
3	150	2
2.5	175	2
2.5	200	2
14	225	2
14	250	2
20.5	275	2
20.5	300	2
50	325	2
50	350	2
		2
		2
		2
		2
		2
		2
		2
		2
		2
		2
		2
		2
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		2
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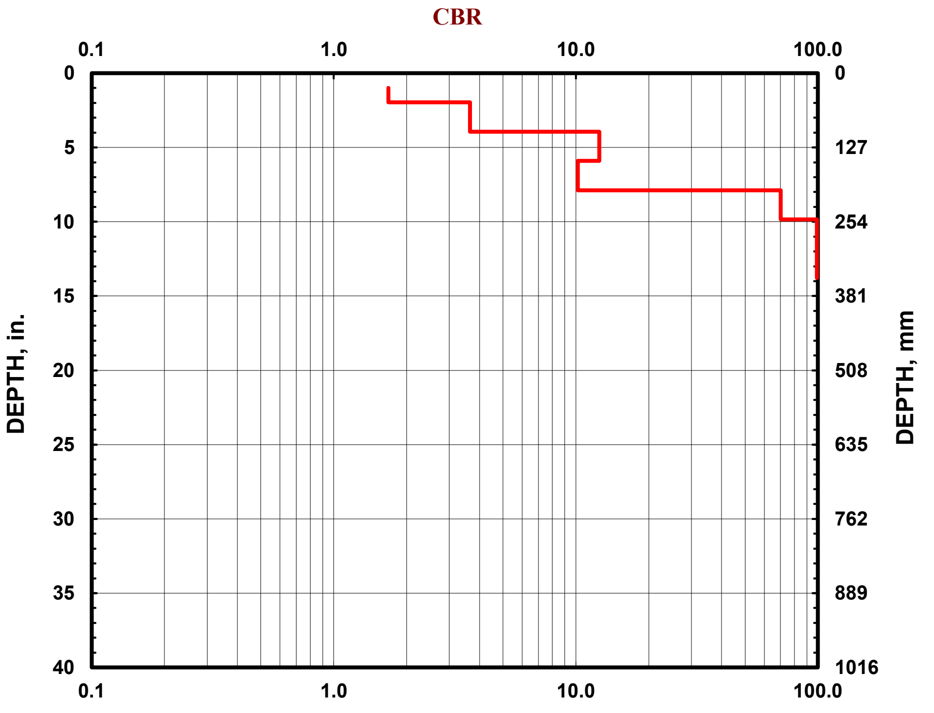
		2
		2
		2
		2
		2
		2
		2
		2
		2
		2
		2



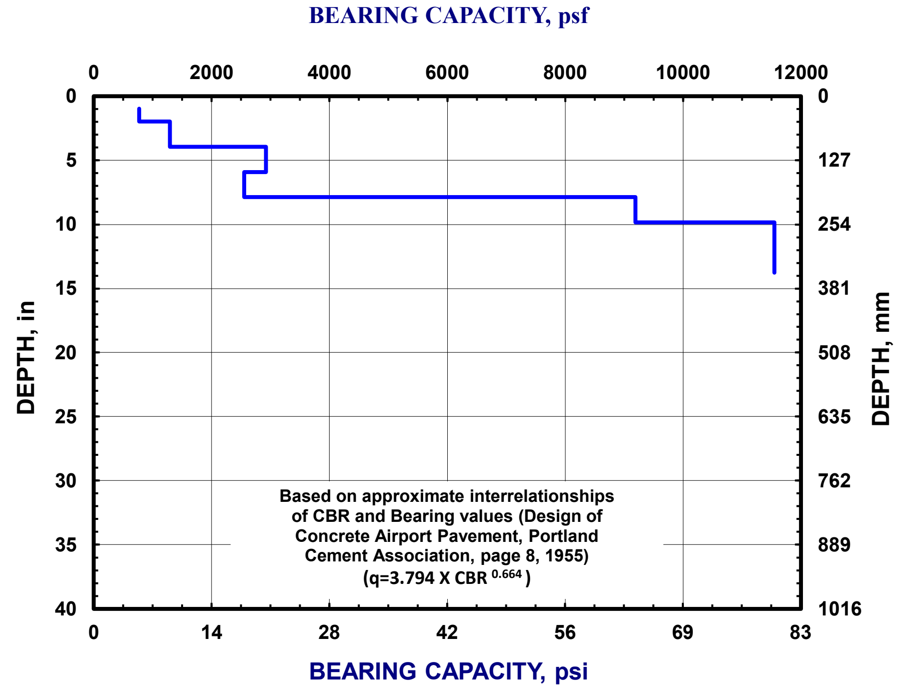


Figure 5-15

DCP TEST DATA

Project: *21st Ave. - Westridge to Grandview*
Location: TP-8
Date: 22-Mar-22
Soil Type(s): Silt & Sand

Hammer
● 10.1 lbs.
○ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0.5	25	2
0.5	50	2
1	75	2
1	100	2
1	125	2
1	150	2
1.5	175	2
1.5	200	2
2	225	2
2	250	2
2	275	2
2	300	2
5	325	2
5	350	2
8.5	375	2
8.5	400	2
18.5	425	2
18.5	450	2
19.5	475	2
19.5	500	2
50	525	2
50	550	2
		2
		2
		2
		2
		2
		2
		2
		2
		2
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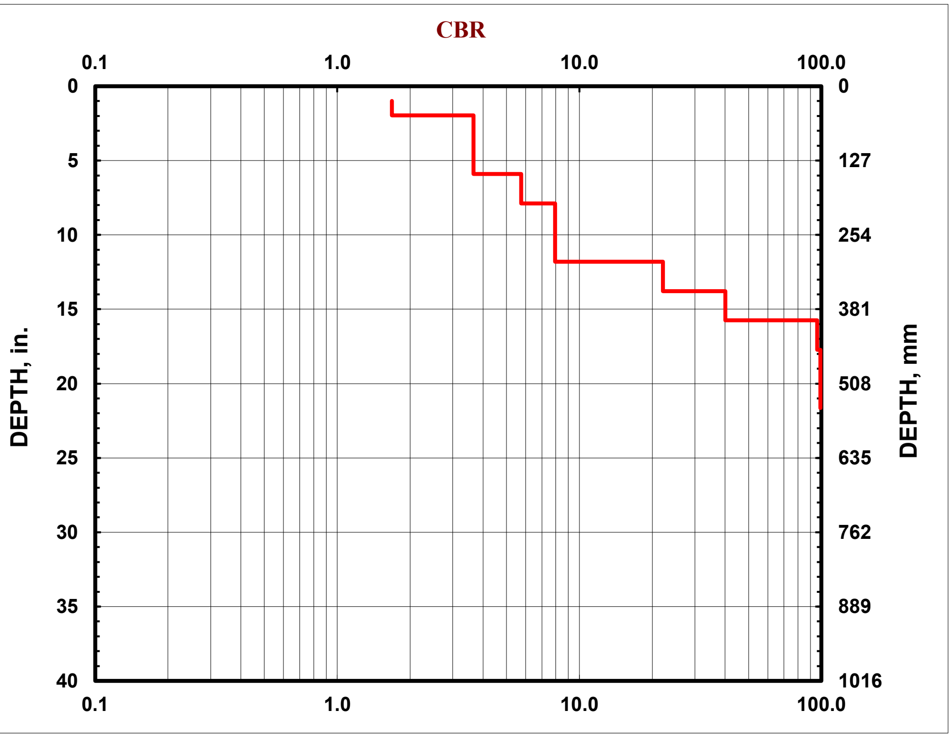
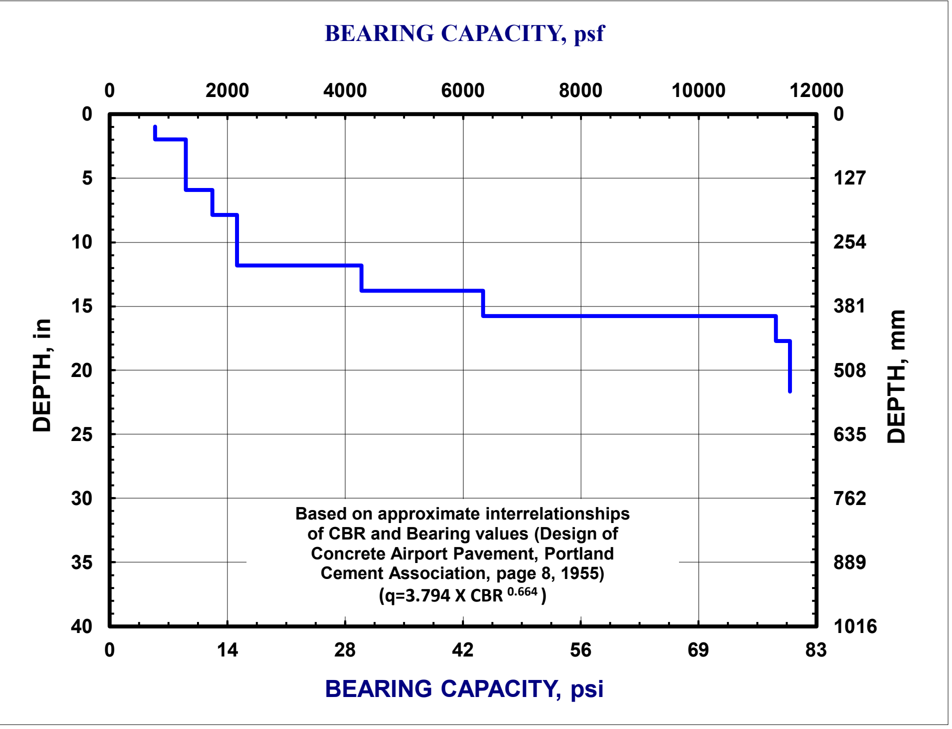
		2
		2
		2





Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955) ($q=3.794 \times CBR^{0.664}$)

DCP TEST DATA

Project: *21st Ave. - Westridge to Grandview*
Date: 22-Mar-22
Location: TP-12
Soil Type(s): Silt & Sand

Hammer
● 10.1 lbs.
○ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0.5	25	2
0.5	50	2
0.1	75	2
0.1	100	2
0.5	125	2
0.5	150	2
0.5	175	2
0.5	200	2
0.5	225	2
0.5	250	2
0.5	275	2
0.5	300	2
0.1	325	2
0.1	350	2
0.5	375	2
0.5	400	2
1	425	2
1	450	2
1.5	475	2
1.5	500	2
1.5	525	2
1.5	550	2
1.5	575	2
1.5	600	2
1	625	2
1	650	2
1.5	675	2
1.5	700	2
1.5	725	2
1.5	750	2
		2
		2
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		2
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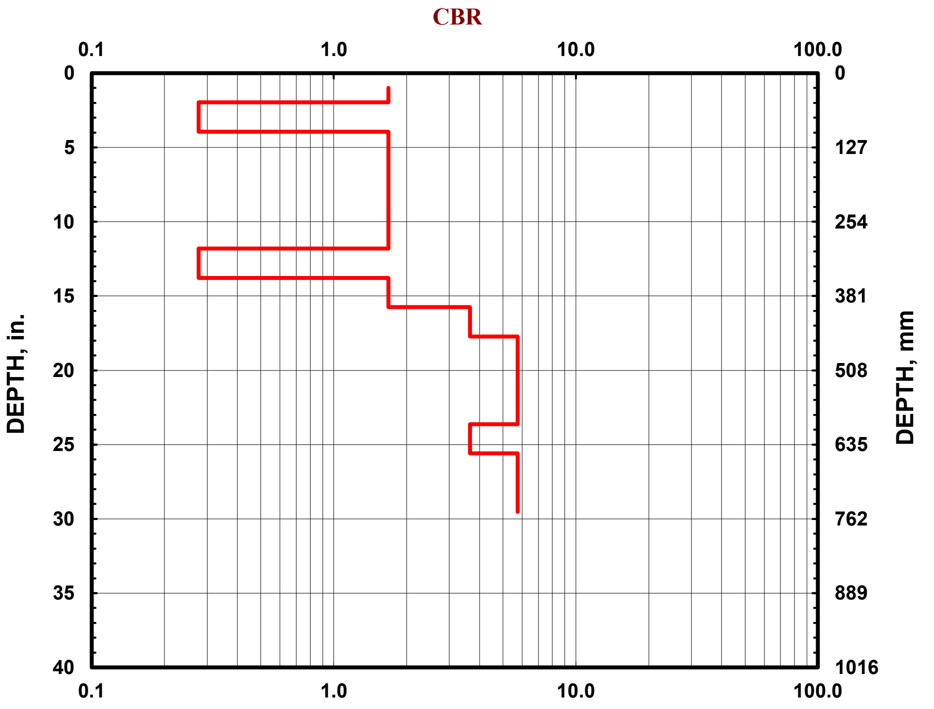
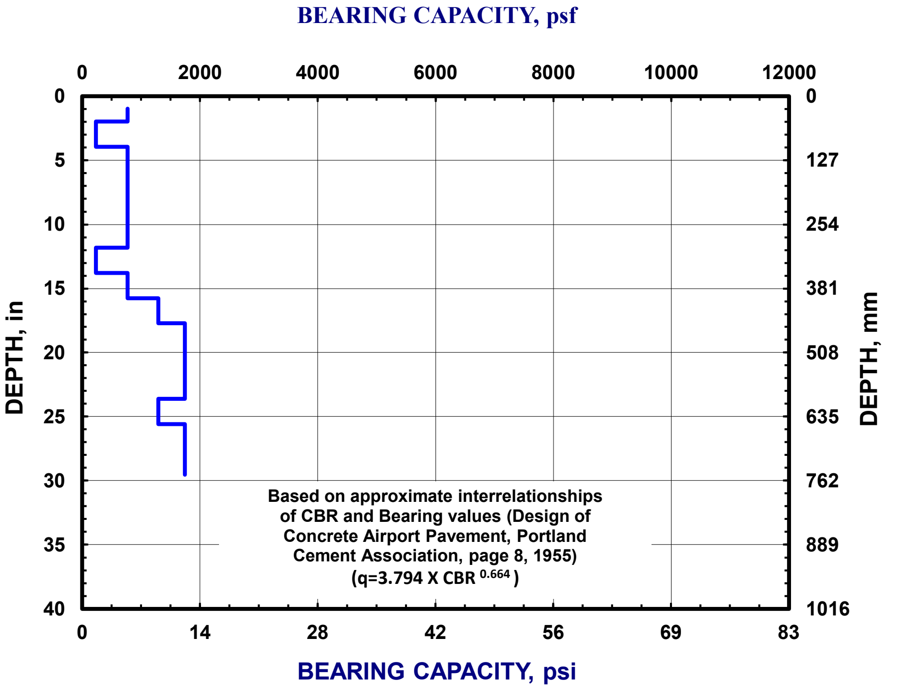
		2
		2
		2





Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955) ($q=3.794 \times CBR^{0.664}$)

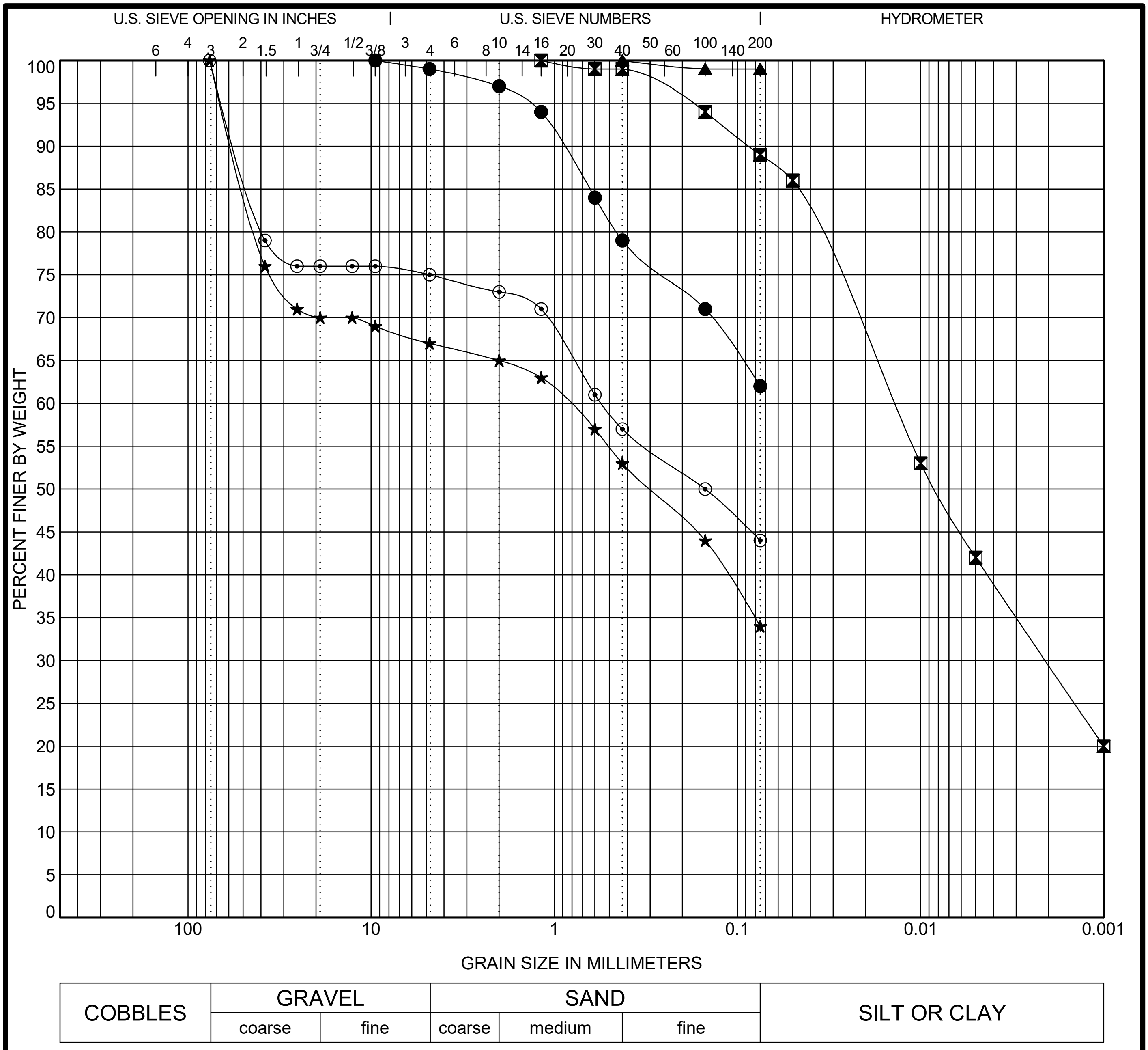
Figure 5-17

SOIL MECHANICS
LABORATORY SUMMARY

		UNITS	METHOD						
LABORATORY NUMBER				22-5819	22-5821	22-5822	22-5823	22-5831	22-5820
SAMPLE SOURCE				**1**	**4**	**9**	**12**	**3**	**3**
STRATUM				*topsoil*	*sand*		*silt*		
DEPTH	TOP	feet		0	4	1	2	2 1/2	8
	BOTTOM	feet		1	5	2	2 1/2	3	9
MOISTURE CONTENT		%	ASTM D2216	25.9	13.8	17.7	65.9	41.6	36.2
pH			AASHTO T289	7.2	7.7	7.4	8.0	8.0	7.9
DRY DENSITY		pcf	ASTM D7263				55		
ATTERBERG LIMITS			ASTM 4318						
	Liquid Limit	%						41	37
	Plastic Limit	%						29	25
	Plasticity Index	%		NP*	NP	NP	NP	12	12
UNIFIED CLASSIFICATION			ASTM D2487	ML	SM	SM	ML	ML	ML
SIEVE ANALYSIS			ASTM D6913						
	3"				100	100			
S	1 1/2"	%			76	79			
I	1"				71	76			
E	3/4"	P			70	76			
V	1/2"	A		100	70	76			
E	3/8"	S		-100	69	76			
	#4	S		99	67	75		100	
S	#10	I		97	65	73	100	-100	100
I	#16	N		94	63	71	-100	-100	-100
Z	#30	G		84	57	61	-100	99	-100
E	#40			79	53	57	-100	99	-100
	#100			71	44	50	95	94	99
	#200			62	34	44	78	89	99
SILT	.05mm		ASTM D422					86	
	.01mm							53	
CLAY	.005mm							42	
	.001mm							20	

NP* = Non Plastic

Figure 6



Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	1	0.0	**SANDY SILT(ML)**	**NP**	**NP**	**NP**		
⧗	3	2.5	**SILT(ML)**	**41**	**29**	**12**		
▲	3	8.0	**SILT(ML)**	**37**	**25**	**12**		
★	4	4.0	**SILTY SAND with GRAVEL(SM)**	**NP**	**NP**	**NP**		
⊙	9	1.0	**SILTY SAND with GRAVEL(SM)**	**NP**	**NP**	**NP**		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	1	0.0	**9.5**				**1.0**	**37.0**	**62.0**	
⧗	3	2.5	**1.18**	**0.014**	**0.002**		**0.0**	**11.0**	**89.0**	
▲	3	8.0	**0.425**				**0.0**	**1.0**	**99.0**	
★	4	4.0	**76.2**	**0.841**			**32.5**	**33.0**	**34.0**	
⊙	9	1.0	**76.2**	**0.55**			**24.5**	**31.0**	**44.0**	

Budinger
& Associates
1101 North Fancher Road
Spokane Valley, WA 99212

GRAIN SIZE DISTRIBUTION

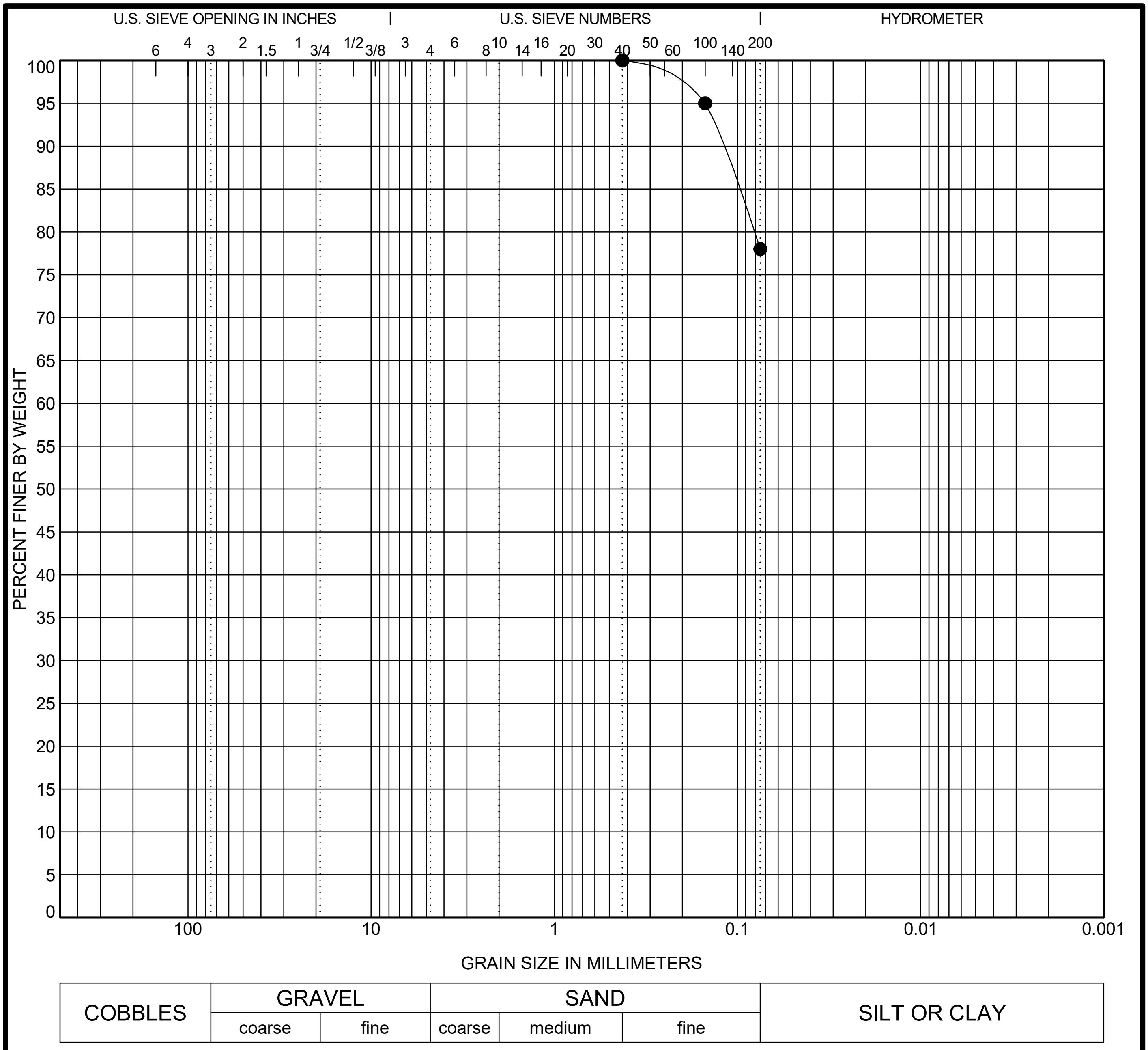
Project: 21st Ave. - Westridge to Grandview

Location: Spokane, WA

Number: S22083

Figure 7-1

GRAINSIZE WO FIGURE # S22083.GPJ GINT STD US.GDT 4/12/22



Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	**12**	**2.0**	**SILT with SAND(ML)**	**NP**	**NP**	**NP**		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**12**	**2.0**	**0.425**				**0.0**	**22.0**	**78.0**	

Budinger
& Associates
1101 North Fancher Road
Spokane Valley, WA 99212

GRAIN SIZE DISTRIBUTION

Project: 21st Ave. - Westridge to Grandview
Location: Spokane, WA
Number: S22083

Figure 7-2

Infiltration Test Results

Test Pit 3 (NE corner of proposed "Tract A")

Total Depth (ft) 2.75

Date/Time	Time (min)	meter 1 (gal)	Cumulative Volume (gal)	Rate (gpm)	Head
3/18/2022 15:12	0	793	0	0	0.00
3/18/2022 15:15	3	870	77	25.7	0.79
3/18/2022 15:20	8	889	96	3.8	0.86
3/18/2022 15:25	13	895	102	1.2	0.92
3/18/2022 15:35	23	900	107	0.5	0.92
3/18/2022 15:45	33	905	112	0.5	0.86
3/18/2022 15:55	43	910	117	0.5	0.86
3/18/2022 16:05	53	915	122	0.5	0.86
3/18/2022 16:15	63	920	127	0.5	0.86
3/18/2022 16:25	73	925	132	0.5	0.86
3/18/2022 16:35	83	930	137	0.5	0.86
3/18/2022 16:45	93	935	142	0.5	0.86
3/18/2022 16:55	103	940	147	0.5	0.86
3/18/2022 17:05	113	945	152	0.5	0.86
3/18/2022 17:15	123	950	157	0.5	0.86
3/18/2022 17:25	133	955	162	0.5	0.86
3/18/2022 17:35	143	965	172	1.0	0.92
3/18/2022 17:45	153	970	177	0.5	0.86
3/18/2022 17:50	158				0.83
3/18/2022 17:55	163				0.81
3/18/2022 18:00	168				0.81
3/18/2022 18:05	173				0.79
3/18/2022 18:10	178				0.77
3/18/2022 18:15	183				0.75
3/18/2022 18:20	188				0.73

Figure 8-1

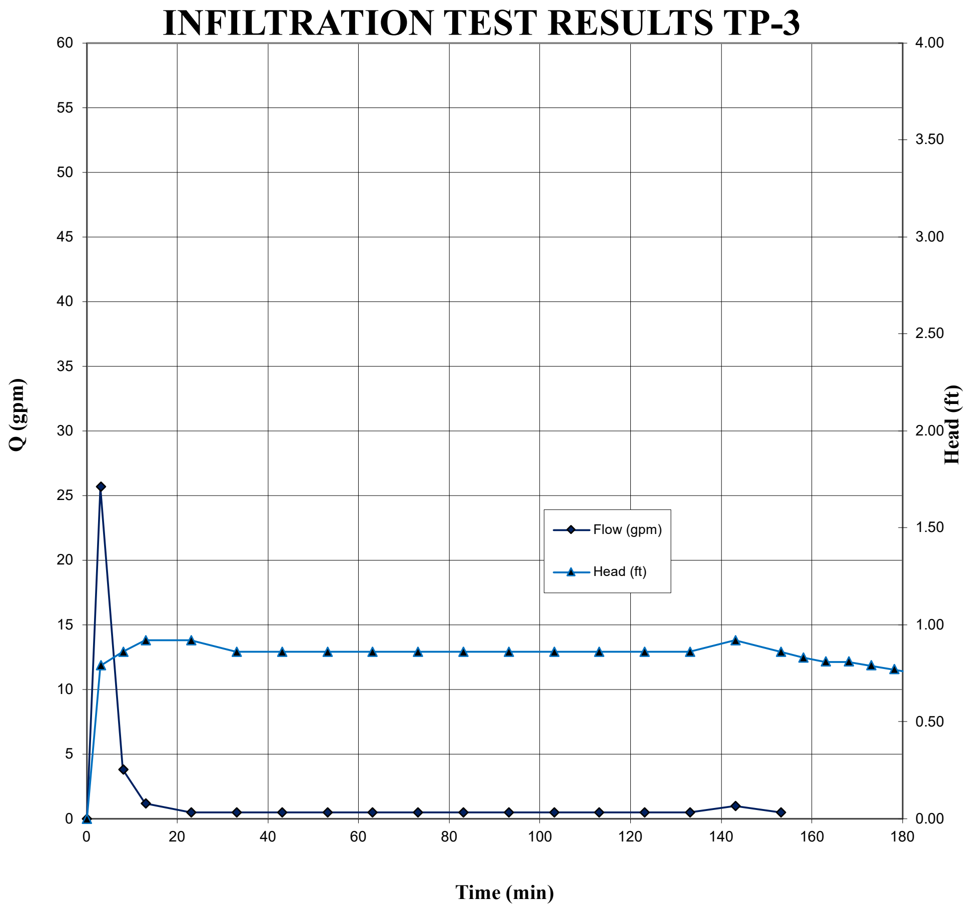

INFILTRATION TEST RESULTS TP-3
Q (gpm)
60
55
50
45
40
35
30
25
20
15
10
5
0
Head (ft)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
20
40
60
80
100
120
140
160
180
Time (min)
Flow (gpm)
Head (ft)

Figure 8-2

Infiltration Test Results

Test Pit 9 (north end of proposed "Tract C")

Total Depth (ft) 3.58

Date/Time	Time (min)	meter 1 (gal)	Cumulative Volume (gal)	Rate (gpm)	Head
3/22/2022 9:08	0	20918	0	0	0.00
3/22/2022 9:35	27	22485	1567	58.0	3.25
3/22/2022 9:45	37	22597	1679	11.2	3.25
3/22/2022 9:55	47	22709	1791	11.2	3.25
3/22/2022 10:05	57	22821	1903	11.2	3.25
3/22/2022 10:15	67	22934	2016	11.3	3.25
3/22/2022 10:25	77	23046	2128	11.2	3.21
3/22/2022 10:35	87	23158	2240	11.2	3.21
3/22/2022 10:45	97	23270	2352	11.2	3.21
3/22/2022 10:55	107	23382	2464	11.2	3.21
3/22/2022 11:05	117	23495	2577	11.3	3.21
3/22/2022 11:15	127	23607	2689	11.2	3.17
3/22/2022 11:25	137	23719	2801	11.2	3.17
3/22/2022 11:35	147	23831	2913	11.2	3.13
3/22/2022 11:40	152				3.10
3/22/2022 11:45	157				3.07
3/22/2022 11:50	162				3.05
3/22/2022 11:55	167				3.04
3/22/2022 12:00	172				3.04
3/22/2022 12:05	177				3.03

Figure 8-3

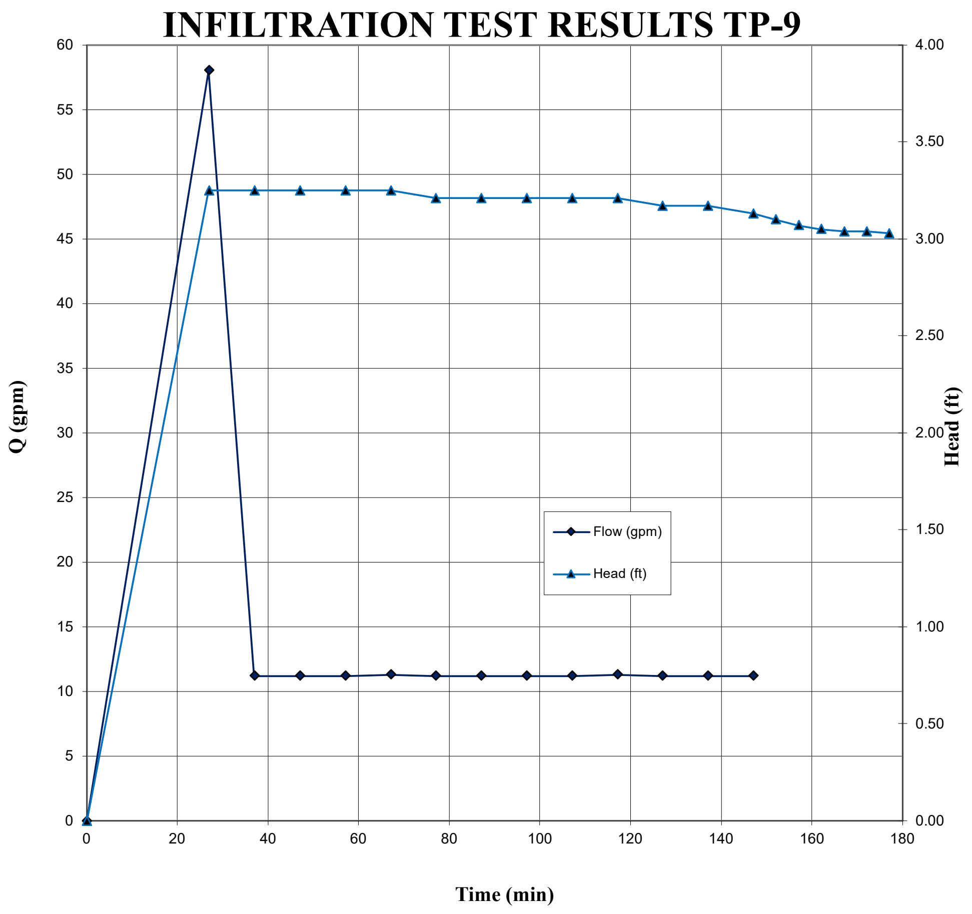

INFILTRATION TEST RESULTS TP-9
Q (gpm)
60
55
50
45
40
35
30
25
20
15
10
5
0
Head (ft)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Time (min)
0
20
40
60
80
100
120
140
160
180
Flow (gpm)
Head (ft)

Figure 8-4

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

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