May 5, 2022

Chuck Green, PE
OTAK, Inc.
808 SW 3rd Avenue
Portland, Oregon 97204

RE: GEOTECHNICAL SUBSURFACE EXPLORATIONS AND GROUNDWATER MONITORING REPORT, WARRENTON MAIN AVENUE AT 9TH STREET SRTS PROJECT WARRENTON, OREGON

Dear Mr. Green:

This report presents the results of our geotechnical subsurface explorations, laboratory testing, and groundwater monitoring to support the Warrenton Main Avenue at 9th Street SRTS Project in Warrenton, Oregon. The location of the project site is shown on the Vicinity Map, Figure 1.

Shannon & Wilson, Inc. (Shannon & Wilson) prepared this report and participated in this project as a subconsultant to OTAK, Inc. (OTAK). Our scope of services was specified in the Subconsultant Agreement, dated August 4, 2021.

PROJECT UNDERSTANDING

We understand that the City of Warrenton plans to improve pedestrian routes along S. Main Avenue between SW 8th Street and SW 11th Street. The pedestrian improvements include ADA/pedestrian ramps and crosswalks, sidewalks, streetlights, and storm drainage improvements.

SCOPE OF SERVICES

The completed geotechnical services for the project consisted of the following tasks:

- Review available existing information and visit the site to observe existing site conditions, site access for the field exploration, and mark proposed boring;
- Explore subsurface conditions by completing one (1) boring to a depth of 25 feet below ground surface;
- Install a vibrating wire pressure transducer piezometer in the borehole;
- Conduct laboratory testing on selected soil samples to characterize soils;

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▪ www.shannonwilson.com ▪

- Make two site visits to obtain groundwater level readings; and
- Providing this report.

GEOLOGY AND USDA SOIL SURVEY

Geology

Geologic mapping by Niem and Niem (1985) indicates the project area is located along the margin of surficial units of Quaternary Dune Sand and Quaternary Alluvium. The Quaternary Dune Sand is generally composed of moderately well-sorted, fine to medium-grained sand. The Quaternary Alluvium is generally composed of flood-plain deposits of clay, silt, sand, and basalt gravel deposited along the margins of rivers and streams (Niem and Niem, 1985). Boring B-1 is interpreted to have encountered Quaternary Dune Sand below asphalt and base aggregate Fill.

USDA Soil Survey

Based on the Soil Survey of Clatsop County (USDA 2020), the upper 5 feet of the site are underlain by Gearhart Fine Sandy Loam, 3 to 15 percent. This unit characterizes as somewhat excessive drainage and rapid permeability. The permeability ranges between 6 and 20 inches per hour.

FIELD EXPLORATIONS AND LABORATORY TESTING

Field Explorations

Subsurface exploration within SW 10th Pl. was performed on August 27, 2021, by drilling one (1) boring designated B-1. The boring was advanced to a depth of 25 feet below ground surface. The approximate location of the boring is shown on the Site and Exploration Plan, Figure 2.

The drilling was performed by Western States Soil Conservation, Inc. of Hubbard, Oregon, using a CME-55 track-mounted rig. A combination of hollow stem auger and mud-rotary drilling techniques was used to advance the borehole. Samples were taken at 2.5-foot intervals to a depth of 10 feet and 5-foot intervals to the final depth of the borehole by driving a split-spoon sampler. Sampling followed the ASTM D1586 procedures for the Standard Penetration Test (SPT), which yields an in situ driving resistance index value (N-value), measured in blows per foot (bpf). The soil samples were transported to our laboratory for further examination and testing.

A vibrating wire piezometer (VWP) was installed in the boring at a depth of 20 feet bgs and a data logger was installed inside the surface monument to record measurements of groundwater levels every two hours. Based on discussions with OTAK, the groundwater levels were measured between August 27, 2021, and January 4, 2022.

Boring B-1 was backfilled with bentonite chips, in accordance with Oregon Water Resources Department regulations. Depth of installation is indicated on the boring log. The cable leading up from the transducer was protected at the surface using flush-mount monuments set in concrete.

The VWP was pulled out of the hole and the cover monument was left in place.

A Shannon & Wilson geologist was on-site throughout the exploration program to locate the boring, observe the drilling, collect samples, and log the materials encountered. A Soil Description and Log Key are included in Figure 3. The Log of Boring B-1 is presented in Figure 4.

Laboratory Testing

The soil samples we obtained during our field explorations were transported to our laboratory for further examination. We then selected representative samples for laboratory tests. The laboratory testing program included moisture contents and grain size analyses. All laboratory testing was performed by Shannon & Wilson in accordance with applicable ASTM International (ASTM) standard test procedures. Results of the laboratory testing are presented in Figure 5 and graphically on the boring logs.

SUBSURFACE CONDITIONS

Subsurface Conditions

We grouped the materials encountered in our field explorations at the project site into two geotechnical units. Our interpretation of the subsurface conditions is based on the explorations and regional geologic information from published sources. The geotechnical units are as follows:

- **Fill:** includes pavement section and base aggregate; and
- **Quaternary Dune Sand:** loose to dense, Poorly Graded Sand (SP).

These geotechnical units were grouped based on their engineering properties, geologic origins, and their distribution in the subsurface. The SPT N-values are counted in the field (uncorrected). The sections below describe the geotechnical unit characteristics in greater detail.

Fill

The Fill consisted of the pavement section which was encountered at the ground surface in the boring. This included an 18-inch-thick section of asphalt concrete and base aggregate. The asphalt concrete was approximately 5 inches thick, and the base aggregate was approximately 13 inches thick.

Quaternary Dune Sand

Quaternary Dune Sand was encountered below the Fill in the boring and extended to the total depth of 26.5 feet below ground surface. The unit generally consists of loose to dense, Poorly Graded Sand (SP). The sand was generally fine to medium-grained and micaceous, with trace to few nonplastic fines.

SPT N-values ranged from 9 to 40 bpf and averaged 21 bpf. The natural moisture content of one selected specimen was 29 percent.

Groundwater

Groundwater in boring B-1 was measured at a depth of 4.5 feet below ground surface (bgs) during drilling on August 27, 2021, using a hollow stem auger. A summary of the groundwater levels collected from the VWP in boring B-1 is shown in Exhibit 1. Groundwater elevations recorded in two-hour intervals from the datalogger between August 27, 2021, and January 4, 2022, are shown in the Hydrograph, Figure 6. The ground surface of boring B-1 was estimated at an elevation of 12 feet from 2014 LiDAR data.

Groundwater levels at the boring site appear to be influenced by both daily tidal cycles and seasonal variations in precipitation. Locally, groundwater highs typically occur in the late fall to spring and groundwater lows typically occur in the late summer and early fall.

Exhibit 1: Summary of Recorded Groundwater Levels in Boring B-1

Exploration ID	Minimum Recorded Groundwater Elevation (ft)	Maximum Recorded Groundwater Elevation (ft)
B-1	7.6 (9/17/2021)	12.0 (12/5/2021)

Note: Ground surface elevation of boring B-1 was estimated using 2014 LiDAR data.

LIMITATIONS

The analyses, conclusions, and recommendations contained in this report are based on site conditions as they presently exist. If there is a substantial lapse of time between the submission of this report and the start of construction at the site, or if conditions have changed because of natural forces or construction operations at or adjacent to the site, we recommend that we review our report to determine the applicability of the conclusions and recommendations.

Within the limitations of scope, schedule, and budget, the analyses, conclusions, and recommendations presented in this report were prepared in accordance with generally accepted professional geotechnical engineering principles and practice in this area at the time this report was prepared. We make no other warranty, either express or implied. These conclusions and recommendations were based on our understanding of the project as described in this report and the site conditions as observed at the time of our explorations.

Unanticipated soil conditions are commonly encountered and cannot be fully determined by merely taking soil samples from test borings. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

This report was prepared for the exclusive use of OTAK and the City of Warrenton in the design and construction of the Warrenton Main Avenue at 9th Street SRTS Project. The data and report should be provided to the contractors for their information, but our report, conclusions, and interpretations should not be construed as a warranty of subsurface conditions included in this report.

The scope of our present work did not include environmental assessments or evaluations regarding the presence or absence of wetlands, or hazardous or toxic substances in the soil, surface water, groundwater, or air, on or below or around this site, or for the evaluation or disposal of contaminated soils or groundwater should any be encountered.

Please read the Important Information section at the back of this report to reduce your project risks.

SHANNON & WILSON

Sincerely,

SHANNON & WILSON

REGISTERED PROFESSIONAL ENGINEER
19263PE
OREGON
JULY 15, 1997
TRAVIS T. NGUYEN
Expires: 12/31/2022

Travis Nguyen, PE, GE
Senior Associate | Geotechnical Engineer

Seth Sonnier, RG
Senior Geologist

SCS:TTN/las:mmb

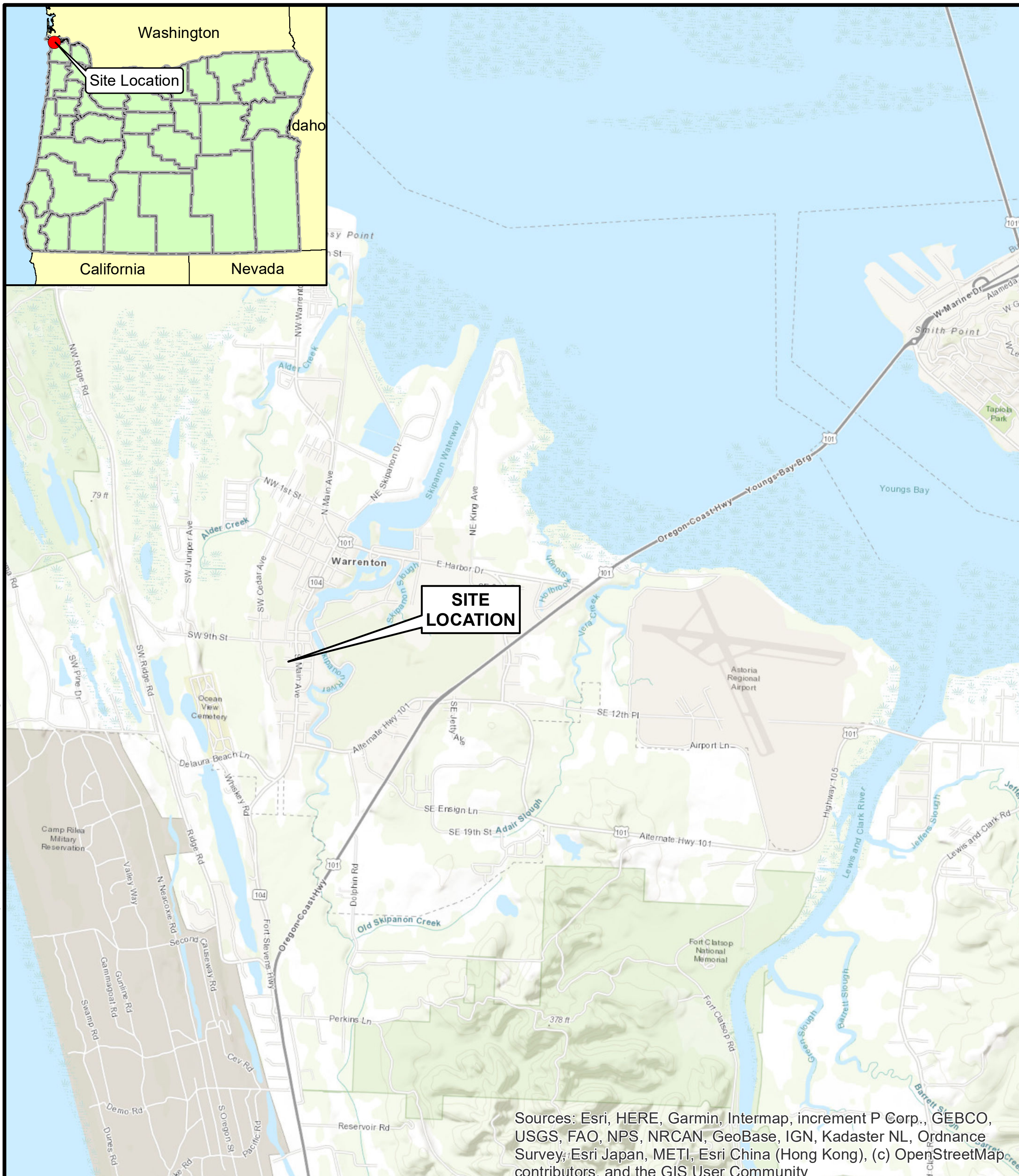
Enc. Figure 1: Vicinity Map
Figure 2: Site and Exploration Plan
Figure 3: Soil Description and Log Key
Figure 4: Log of Boring B-1
Figure 5: Grain Size Distribution
Figure 6: Hydrograph – Boring B-1
Important Information About Your Geotechnical/Environmental Report

REFERENCES

United States Department of Agriculture, Natural Resources Conservation Service, Soil Survey of Clatsop County, Oregon, February 1988.

United States Department of Agriculture, Natural Resources Conservation Service, Clatsop County Oregon, OR007, June 22, 2020: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

Niem, A.R. and Niem, W.A., 1985, Geologic Map of the Astoria Basin, Clatsop and Northernmost Tillamook Counties, Northwest Oregon: OGI-14, Oregon Department of Geology and Mineral Industries, Oil and Gas Investigations.



0 0.375 0.75 1.5

Scale in Miles

Warrenton Main Avenue at 9th Street
SRTS Project
Warrenton, Oregon

VICINITY MAP

May 2022 107238

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FIG. 1

Filename: T:\Projects\PDX107000s\107238 - Warrenton Safe Pedestrian Roads\VicinityMap.mxd Date: 3/2/2022 Login: SCS

LEGEND

B-1
Location of Boring with Vibrating Wire Piezometer

0 50 100 200
Scale in Feet

Warrenton Main Avenue at 9th Street
SRTS Project
Warrenton, Oregon

SITE AND EXPLORATION PLAN

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FIG. 2

Filename: T:\Projects\PDX\107000s\107238 - Warrenton Safe Pedestrian Roads\Site Plan.mxd Date: 3/2/2022 Login: SCS

Shannon & Wilson, Inc. (S&W), uses a soil identification system modified from the Unified Soil Classification System (USCS). Elements of the USCS and other definitions are provided on this and the following pages. Soil descriptions are based on visual-manual procedures (ASTM D2488) and laboratory testing procedures (ASTM D2487), if performed.

S&W INORGANIC SOIL CONSTITUENT DEFINITIONS

CONSTITUENT[2]	FINE-GRAINED SOILS (50% or more fines)[1]	COARSE-GRAINED SOILS (less than 50% fines)[1]
Major	***Silt, Lean Clay, Elastic Silt,*** or ***Fat Clay***[3]	***Sand*** or ***Gravel***[4]
Modifying (Secondary) Precedes major constituent	30% or more coarse-grained: ***Sandy*** or ***Gravelly***[4]	More than 12% fine-grained: ***Silty*** or ***Clayey***[3]
Minor Follows major constituent	15% to 30% coarse-grained: ***with Sand*** or ***with Gravel***[4]	5% to 12% fine-grained: ***with Silt*** or ***with Clay***[3]
	30% or more total coarse-grained *and* lesser coarse-grained constituent is 15% or more: ***with Sand*** or ***with Gravel***[5]	15% or more of a second coarse-grained constituent: ***with Sand*** or ***with Gravel***[5]

[1]All percentages are by weight of total specimen passing a 3-inch sieve.
[2]The order of terms is: *Modifying Major with Minor*.
[3]Determined based on behavior.
[4]Determined based on which constituent comprises a larger percentage.
[5]Whichever is the lesser constituent.

MOISTURE CONTENT TERMS

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, from below water table

STANDARD PENETRATION TEST (SPT) SPECIFICATIONS

Hammer:	140 pounds with a 30-inch free fall. Rope on 6- to 10-inch-diam. cathead 2-1/4 rope turns, > 100 rpm
Sampler:	10 to 30 inches long Shoe I.D. = 1.375 inches Barrel I.D. = 1.5 inches Barrel O.D. = 2 inches
N-Value:	Sum blow counts for second and third 6-inch increments. Refusal: 50 blows for 6 inches or less; 10 blows for 0 inches.

NOTE: Penetration resistances (N-values) shown on boring logs are as recorded in the field and have not been corrected for hammer efficiency, overburden, or other factors.

PARTICLE SIZE DEFINITIONS

DESCRIPTION	SIEVE NUMBER AND/OR APPROXIMATE SIZE
FINES	< #200 (0.075 mm = 0.003 in.)
SAND	
Fine	#200 to #40 (0.075 to 0.4 mm; 0.003 to 0.02 in.)
Medium	#40 to #10 (0.4 to 2 mm; 0.02 to 0.08 in.)
Coarse	#10 to #4 (2 to 4.75 mm; 0.08 to 0.187 in.)
GRAVEL	
Fine	#4 to 3/4 in. (4.75 to 19 mm; 0.187 to 0.75 in.)
Coarse	3/4 to 3 in. (19 to 76 mm)
COBBLES	3 to 12 in. (76 to 305 mm)
BOULDERS	> 12 in. (305 mm)

RELATIVE DENSITY / CONSISTENCY

COHESIONLESS SOILS		COHESIVE SOILS	
N, SPT, BLOWS/FT.	RELATIVE DENSITY	N, SPT, BLOWS/FT.	RELATIVE CONSISTENCY
< 4	Very loose	< 2	Very soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium dense	4 - 8	Medium stiff
30 - 50	Dense	8 - 15	Stiff
> 50	Very dense	15 - 30	Very stiff
		> 30	Hard

WELL AND BACKFILL SYMBOLS

Bentonite Cement Grout	Surface Cement Seal
Bentonite Grout	Asphalt or Cap
Bentonite Chips	Slough
Silica Sand	Inclinometer or Non-perforated Casing
Gravel	Vibrating Wire Piezometer
Perforated or Screened Casing	

PERCENTAGES TERMS[1, 2]

Trace	< 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

[1]Gravel, sand, and fines estimated by mass. Other constituents, such as organics, cobbles, and boulders, estimated by volume.

[2]Reprinted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

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SRTS Project
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SOIL DESCRIPTION AND LOG KEY

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FIG. 3
Sheet 1 of 3

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
(Modified From USACE Tech Memo 3-357, ASTM D2487, and ASTM D2488)

MAJOR DIVISIONS			GROUP/GRAPHIC SYMBOL	TYPICAL IDENTIFICATIONS
COARSE-GRAINED SOILS *(more than 50% retained on No. 200 sieve)*	Gravels *(more than 50% of coarse fraction retained on No. 4 sieve)*	Gravel *(less than 5% fines)*	GW	Well-Graded Gravel; Well-Graded Gravel with Sand
			GP	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Silty or Clayey Gravel *(more than 12% fines)*	GM	Silty Gravel; Silty Gravel with Sand
			GC	Clayey Gravel; Clayey Gravel with Sand
	Sands *(50% or more of coarse fraction passes the No. 4 sieve)*	Sand *(less than 5% fines)*	SW	Well-Graded Sand; Well-Graded Sand with Gravel
			SP	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Silty or Clayey Sand *(more than 12% fines)*	SM	Silty Sand; Silty Sand with Gravel
			SC	Clayey Sand; Clayey Sand with Gravel
FINE-GRAINED SOILS *(50% or more passes the No. 200 sieve)*	Silts and Clays *(liquid limit less than 50)*	Inorganic	ML	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
			CL	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
		Organic	OL	Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
	Silts and Clays *(liquid limit 50 or more)*	Inorganic	MH	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
			CH	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
		Organic	OH	Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
HIGHLY-ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor		PT	Peat or other highly organic soils (see ASTM D4427)

FILL	Placed by humans, both engineered and nonengineered. May include various soil materials and debris.		The Fill graphic symbol is combined with the soil graphic that best represents the observed material

NOTE: No. 4 size = 4.75 mm = 0.187 in.; No. 200 size = 0.075 mm = 0.003 in.

NOTES

1. Dual symbols *(symbols separated by a hyphen, i.e., SP-SM, Sand with Silt)* are used for soils with between 5% and 12% fines or when the liquid limit and plasticity index values plot in the *CL-ML* area of the plasticity chart.
2. Borderline symbols *(symbols separated by a slash, i.e., CL/ML, Lean Clay to Silt; SP-SM/SM, Sand with Silt to Silty Sand)* indicate that the soil properties are close to the defining boundary between two groups.
3. The soil graphics above represent the various USCS identifications (i.e., *GP*, *SM*, etc.) and may be augmented with additional symbology to represent differences within USCS designations. *Sandy Silt (ML)*, for example, may be accompanied by the *ML* soil graphic with sand grains added. Non-USCS materials may be represented by other graphic symbols; see log for descriptions.

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SRTS Project
Warrenton, Oregon

SOIL DESCRIPTION AND LOG KEY

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FIG. 3
Sheet 2 of 3

2013 BORING CLASS2 107238.GPJ SW2013LIBRARYPDX.GLB SWNEW.GDT 3/28/22

GRADATION TERMS

Poorly Graded	Narrow range of grain sizes present or, within the range of grain sizes present, one or more sizes are missing (Gap Graded). Meets criteria in ASTM D2487, if tested.
Well-Graded	Full range and even distribution of grain sizes present. Meets criteria in ASTM D2487, if tested.

CEMENTATION TERMS[1]

Weak	Crumbles or breaks with handling or slight finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

PLASTICITY[2]

DESCRIPTION	VISUAL-MANUAL CRITERIA	APPROX. PLASITICTY INDEX RANGE
Nonplastic	A 1/8-in. thread cannot be rolled at any water content.	< 4%
Low	A thread can barely be rolled and a lump cannot be formed when drier than the plastic limit.	4 to 10%
Medium	A thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. A lump crumbles when drier than the plastic limit.	10 to 20%
High	It take considerable time rolling and kneading to reach the plastic limit. A thread can be rerolled several times after reaching the plastic limit. A lump can be formed without crumbling when drier than the plastic limit.	> 20%

ADDITIONAL TERMS

Mottled	Irregular patches of different colors.
Bioturbated	Soil disturbance or mixing by plants or animals.
Diamict	Nonsorted sediment; sand and gravel in silt and/or clay matrix.
Cuttings	Material brought to surface by drilling.
Slough	Material that caved from sides of borehole.
Sheared	Disturbed texture, mix of strengths.

PARTICLE ANGULARITY AND SHAPE TERMS[1]

Angular	Sharp edges and unpolished planar surfaces.
Subangular	Similar to angular, but with rounded edges.
Subrounded	Nearly planar sides with well-rounded edges.
Rounded	Smoothly curved sides with no edges.
Flat	Width/thickness ratio > 3.
Elongated	Length/width ratio > 3.

ACRONYMS AND ABBREVIATIONS

ATD	At Time of Drilling
approx.	Approximate/Approximately
Diam.	Diameter
Elev.	Elevation
ft.	Feet
FeO	Iron Oxide
gal.	Gallons
Horiz.	Horizontal
HSA	Hollow Stem Auger
I.D.	Inside Diameter
in.	Inches
lbs.	Pounds
MgO	Magnesium Oxide
mm	Millimeter
MnO	Manganese Oxide
NA	Not Applicable or Not Available
NP	Nonplastic
O.D.	Outside Diameter
OW	Observation Well
pcf	Pounds per Cubic Foot
PID	Photo-Ionization Detector
PMT	Pressuremeter Test
ppm	Parts per Million
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
rpm	Rotations per Minute
SPT	Standard Penetration Test
USCS	Unified Soil Classification System
q_u	Unconfined Compressive Strength
VWP	Vibrating Wire Piezometer
Vert.	Vertical
WOH	Weight of Hammer
WOR	Weight of Rods
Wt.	Weight

STRUCTURE TERMS[1]

Interbedded	Alternating layers of varying material or color with layers at least 1/4-inch thick; singular: bed.
Laminated	Alternating layers of varying material or color with layers less than 1/4-inch thick; singular: lamination.
Fissured	Breaks along definite planes or fractures with little resistance.
Slickensided	Fracture planes appear polished or glossy; sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps that resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay.
Homogeneous	Same color and appearance throughout.

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[2]Adapted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

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SRTS Project
Warrenton, Oregon

SOIL DESCRIPTION AND LOG KEY

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FIG. 3
Sheet 3 of 3

Total Depth:	26.5 ft.	Northing:	~	Drilling Method:	HSA and Mud Rotary
Top Elevation:	~ 13 ft.	Easting:	~	Drilling Company:	Western States
Vert. Datum:	NAVD88	Station:	~	Drill Rig Equipment:	CME-55 Track Rig
Horiz. Datum:		Offset:	~	Other Comments:	Hammer Efficiency = 73.7%

Hole Diam.:	5 in.
Rod Type:	NWJ
Hammer Type:	Automatic

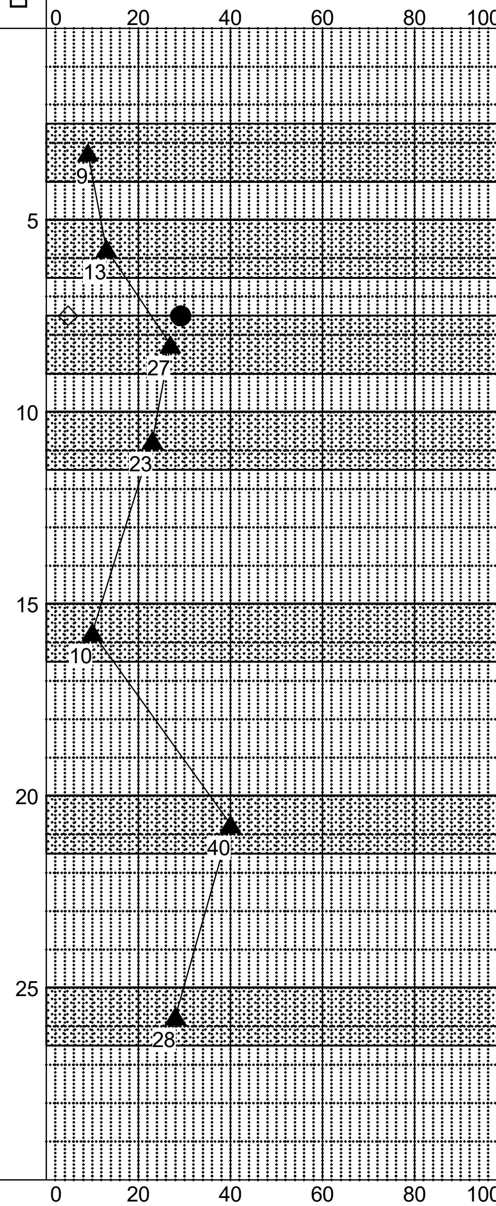
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. / Depth (ft.)	Samples	Ground Water
Asphalt Concrete	12.6 / 0.4		∇ 12/5/2021
Base Aggregate	11.5 / 1.5		
Medium dense, brown, *Poorly Graded Sand (SP)*; moist; fine to medium sand; trace to few, nonplastic fines.		S-1	
QUATERNARY DUNE SAND	8.5 / 4.5		
Medium dense, brown, *Poorly Graded Sand (SP)*; wet; fine to medium sand; trace to few, nonplastic fines. *Switched from hollow stem auger to mud rotary drilling at 7.5 feet.*		S-2, S-3, S-4	
Loose to medium dense, gray, *Poorly Graded Sand (SP)*; wet; fine to medium sand; trace to few, nonplastic fines; micaceous.	0.5 / 12.5	S-5	
Medium dense to dense, gray, *Poorly Graded Sand (SP)*; wet; fine to medium sand; trace to few, nonplastic fines; micaceous.	-4.5 / 17.5	S-6, S-7	
Completed: August 27, 2021	-13.5 / 26.5		

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



Recovery (%)

◇ % Fines (<0.075mm)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

⌶ Standard Penetration Test

∇ Groundwater Level on Date Shown

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations, and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

Warrenton Main Avenue at 9th Street
SRTS Project
Warrenton, Oregon

LOG OF BORING B-1

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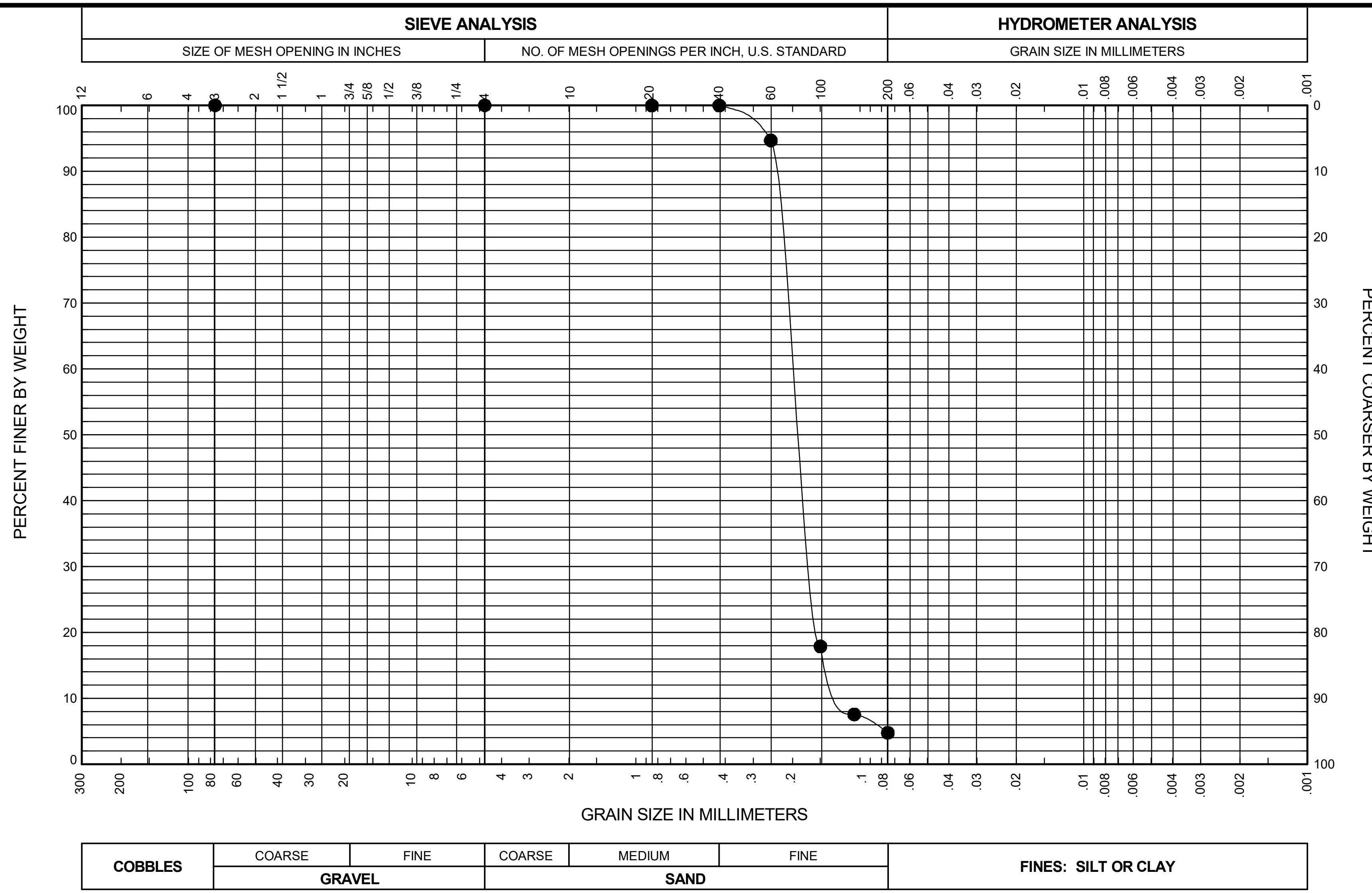
FIG. 4

REV 3



NOTES:
1) Sieve analyses were performed in general accordance with ASTM D6913, sieve with hydrometer analyses were performed in general accordance with ASTM D422, and amount finer than #200 sieve analyses were performed in general accordance with ASTM D1140 unless otherwise noted in the report.
2) Group Name and Group Symbol are in accordance with ASTM D2488 and are refined in accordance with ASTM D2487 where appropriate laboratory tests are performed.

GSA MAIN 107238.GPJ SHAN_WIL.GDT 3/28/22

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL[2]	GROUP NAME[2]	GRAVEL %	SAND %	FINES %	NAT. W.C. %	DRY DENSITY PCF
● B-1, S-3	7.5	*SP*	*Poorly Graded Sand*	0	95	5	29	

Warrenton Main Avenue at 9th Street
SRTS Project
Warrenton, Oregon

GRAIN SIZE DISTRIBUTION

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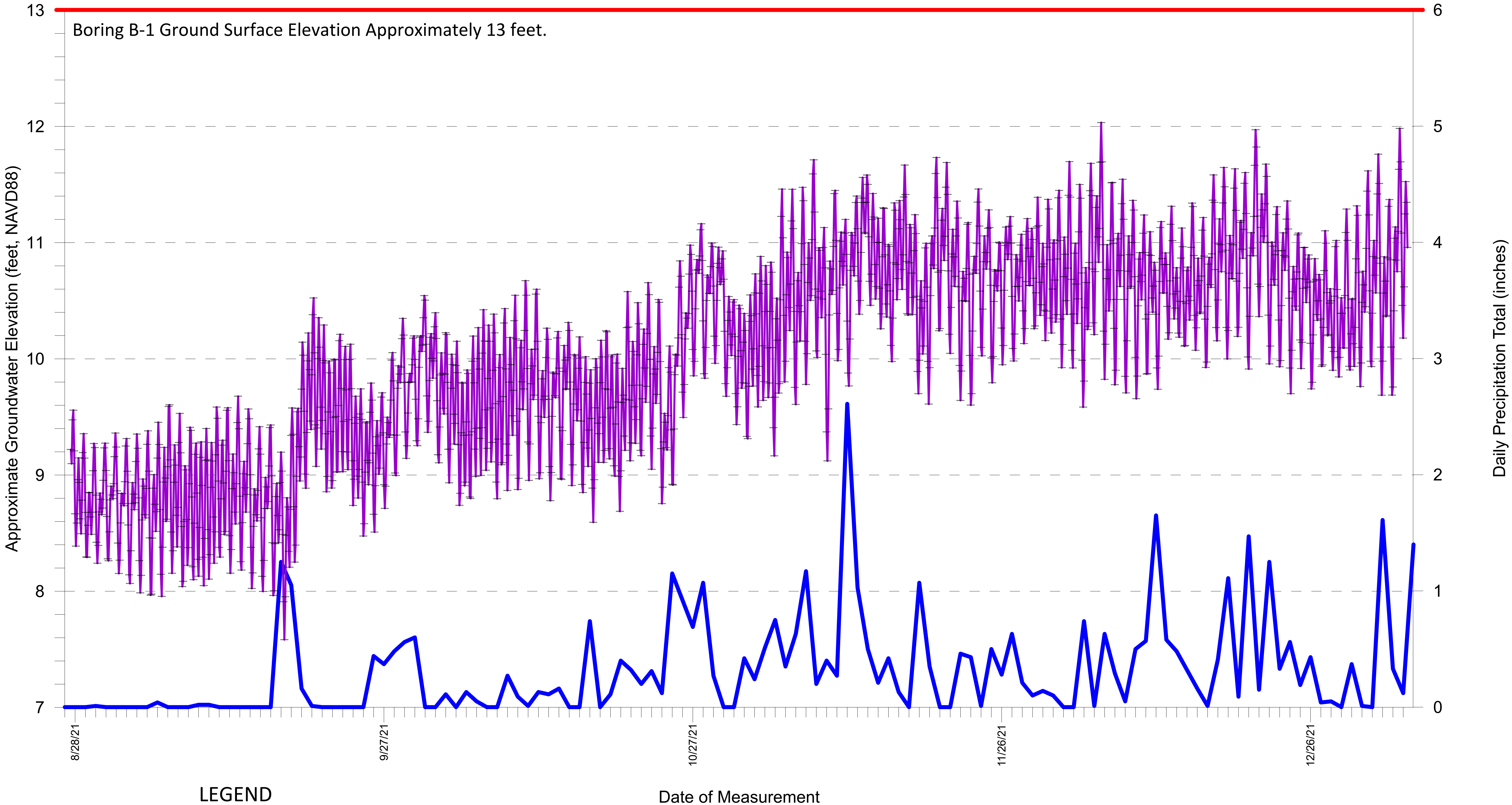
FIG. 5

FIG. 5



LEGEND

B-1 Groundwater Elevation

Daily Precipitation

Notes:
1. The VWP for boring B-1 was installed on August 27, 2021.
2. Precipitation data from the National Weather Service, Astoria Regional Airport Station.
3. Elevation of boring B-1 was estimated using 2014 LiDAR data.

Warrenton Main Avenue at 9th Street SRTS Project Warrenton, Oregon
HYDROGRAPH - BORING B-1 May 2022 107238
SHANNON & WILSON, INC. Geotechnical and Environmental Consultants — **FIG. 6**

SHANNON & WILSON
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Attachment to and part of Report: 107238-001
Date: May 5, 2022
To: Otak Inc.
Attn: Chuck Green, PE

Important Information About Your Geotechnical/Environmental Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the GBA, Silver Spring, Maryland