CITY OF ALBANY
Public Works Department

ADDENDUM #1

TS-18-01
6TH & ELLSWORTH TRAFFIC SIGNAL

In order to clarify the intent of the Specifications and Drawings, the following provisions are provided and shall be considered part of the contract documents.

In order to ensure that all bidders are aware of these provisions, each bidder shall sign this addendum below and attach it to the proposal.

IMPORTANT: Failure to include a signed Addendum could result in the disqualification of your bid.

Temporary Traffic Control: At the Contractor's option, lane closures on Ellsworth Street may be avoided by temporarily posting no parking as needed to allow space to shift both lanes over to one side of the street. Lane shifts may be implemented during regular work hours.

Power Line Clearances: The Contractor shall assume that existing power lines within the project area will remain in place and energized during the work. Work will need to take place within the available vertical clearances while maintaining any required safety distance.

Geotechnical Report: A copy of the project geotechnical report has been attached to this addendum for the Contractor's use.

Contractor's Signature _____ Date _____

Company Name *(please type or print)* _____

Foundation Engineering, Inc.
Professional Geotechnical Services

Memorandum

Date: December 1, 2017

To: Cameron Grile, P.E., PTOE
David Evans and Associates, Inc.

From: Matt Mason, P.E., Project Engineer
Dave Running, P.E., G.E., Senior Engineer

Subject: Geotechnical Investigation

Project: SW 6th Avenue & SW Ellsworth Street Traffic Signals
Project 2171093

Expires: 12/31/18

We have completed the requested geotechnical investigation for the above-referenced project in Albany, Oregon. This memorandum includes a description of our work, a discussion of the site conditions, a summary of laboratory testing, and a discussion of engineering analyses. Recommendations for the design and construction of traffic signal pole foundations are enclosed.

BACKGROUND

The City of Albany is planning improvements at the 6th Avenue and Ellsworth Street intersection in Albany, Oregon. The improvements include construction of three traffic signal poles. The project location is shown on Figure 1A (Appendix A). Locations of the planned traffic signal poles are shown on Figure 2A (Appendix A).

The City of Albany (City) is the project owner. David Evans and Associates, Inc. (DEA) is the prime designer. Foundation Engineering, Inc. was retained by DEA as the geotechnical consultant. Our scope of work was outlined in a proposal dated October 4, 2017.

FIELD EXPLORATION

We drilled two exploratory boreholes (BH-1 and BH-2) at the site on October 18, 2017. The drilling was completed using a CME-75, truck-mounted drill rig with mud-rotary drilling techniques. The borings were located as close as practical to the foundations for the new signal poles. BH-1 was located near the northwest corner of the intersection on the north side of 6th Avenue, and BH-2 was located near the southeast corner of the intersection on the south side of 6th Avenue. Originally, a signal pole was planned at the southeast corner of the intersection near BH-2. Subsequent to the explorations, the pole was relocated to the northeast corner of the intersection. The approximate boring locations are shown on Figure 2A (Appendix A).

The borings extended to a maximum depth of ±21.5 feet. Samples were obtained at 2.5-foot intervals to a depth of ±10 to 15 feet and at 5-foot intervals thereafter. Disturbed samples were obtained with a split-spoon in conjunction with the Standard Penetration Test (SPT). The SPT provides an indication of the relative stiffness of the foundation soils.

The borings were continuously logged during drilling. The final logs (Appendix B) were prepared based on a review of the field logs, the laboratory test results, and an examination of the soil samples in our office. The sampling depths and SPT data are summarized on the boring logs.

DISCUSSION OF SUBSURFACE CONDITIONS

A general description of the soil conditions encountered in the borings is provided below. More detailed descriptions of the conditions in each borehole are provided in the appended logs (Appendix B).

Drilling at BH-1 encountered a pavement section consisting of ±3.5 inches of asphaltic concrete (AC) followed by dense sandy gravel (base rock) to ±2.5 feet. The pavement section is underlain by very stiff, low plasticity, gravelly silt (fill) to ±5 feet. Coarse-grained alluvium extends below the fill to ±21.5 feet, the limits of the explorations. The coarse alluvium includes medium dense grading to very dense silty gravel with some sand to ±20 feet and dense sandy gravel with some silt to ±21.5 feet.

Drilling at BH-2 encountered a pavement section consisting of ±3.5 inches of AC followed by dense sandy gravel (base rock) to ±2.5 feet. The pavement section is underlain by soft, low plasticity silt (alluvium) to ±5 feet. Coarse-grained alluvium extends below the silt to ±21.5 feet, the limits of the exploration. The coarse-grained alluvium includes dense to very dense silty gravel with some sand to ±10 feet, dense to very dense silty sand with some gravel to ±15 feet, and dense to very dense silty gravel with some sand to ±21.5 feet.

Ground Water

Mud-rotary drilling techniques precluded an accurate ground water measurement in the borings at the time of drilling. However, well log information in the project vicinity suggests the static water level ranges from ±7.5 to 18.5 feet. We anticipate ground water depths will fluctuate seasonally and may rise within ±10 feet of the ground surface in the wet winter and spring months.

LABORATORY TESTING

The laboratory work was limited to natural water content tests. The results of these tests are summarized in Table 1. The water contents are also included on the boring logs (Appendix B).

Table 1C. Natural Water Contents

Sample Number	Sample Depth (ft)	Natural Water Content (percent)
SS-1-1	2.5 – 4.0	20.1
SS-1-2	5.0 – 6.5	15.2
SS-1-3	7.5 – 9.0	13.2
SS-1-4	10.0 – 11.5	13.8
SS-1-5	15.0 – 15.8	13.9
SS-1-6	20.0 – 21.5	13.6
SS-2-2	5.0 – 6.5	12.5
SS-2-3	7.5 – 9.0	15.8
SS-2-4	10.0 – 11.5	18.7
SS-2-5	12.5 – 14.0	14.4
SS-2-6	15.0 – 16.5	14.1
SS-2-7	20.0 – 21.5	15.3

FOUNDATION DESIGN

New traffic signal poles will be located at the southwest, northwest, and northeast corners of the intersection. DEA identifies these poles as Pole Nos.1, 4, and 6. Each signal pole will be supported on a drilled shaft foundation designed in accordance with the ODOT Geotechnical Design Manual (GDM) (ODOT GDM 2017) and the ODOT Traffic Structures Design Manual (ODOT TSD 2016). The standard base reactions and additional signal pole data were obtained from the ODOT Standard Drawings TM650 through TM653.

Foundation Loads

We understand the signal poles will be a Type SM3 or a Type SM3L, if luminaires are added. Table 1 summarizes the minimum drilled shaft diameter and standard maximum base reactions for these pole types, based on the ODOT Standard Drawings.

Table 1. Summary of Pole Type, Foundation Diameter and Standard Maximum Base Reactions

Signal Pole Type	Foundation Diameter (in)	Axial (kips)	Shear (kips)	Moment (kip-ft)	Torque (kip-ft)
SM3	36	3.49	7.77	138.43	82.87
SM3L	42	4.39	8.80	176.51	87.88

Notes: 1. Foundation diameter is based on the signal pole type and ODOT Standard Drawing TM653.
2. Standard maximum base reactions are based on the signal pole type and Wind Load Case II provided in ODOT Standard Drawing TM651.

Analysis

The ODOT TSD requires drilled shaft foundations for mast arm signal poles be designed to limit the deflection at the top of the shaft to less than 0.5 inches. We completed the lateral analysis using the computer program LPILE (2016), to determine the minimum shaft lengths that will meet the design criteria. We also calculated the torsional resistance of the drilled shafts.

For our analysis, we used a generalized soil profile consisting of silt to 5 feet, followed by dense silty gravel with some sand to 20 feet. The assumed soil parameters used in the LPILE analyses are summarized in Table 2.

Table 2. LPILE Input Soil Parameters

Depth (ft)	Soil Description	LPILE p-y Criteria	γ' (pcf)	k (pci)	ϕ' (°)	ε_{50}	S_u (psf)
0	Soft SILT (alluvium)	Stiff Clay w/o Free Water	110	-	-	0.012	500
5.0			110	-	-	0.012	500
5.0	Dense silty GRAVEL, some sand	SAND (Reese)	62.6	125	38	-	-
20.0			62.6	125	38	-	-

Notes: 1. Subsurface profile based on conditions encountered in BH-1 and BH-2.
2. Zero depth corresponds to the ground surface.
3. Assumes a nominal ground water depth of 5 feet.

Table 3 summarizes the required minimum shaft lengths and the deflection results calculated using LPILE with the assumed soil strength parameters. The minimum drilled shaft lengths developed from the lateral analysis are sufficient to limit deflection at the top of the drilled shaft to 0.5 inches or less. Deflection plots are provided in Figure 3A (SM3) and Figure 4A (SM3L).

Table 3. Summary of Drilled Shaft Dimensions

Signal Pole Type	Foundation Diameter (in)	Minimum Drilled Shaft Length (ft)	Top Deflection (in)
SM3	36	12	0.37
SM3L	42	12	0.44

We calculated the torsional resistance by multiplying the nominal side resistance (i.e. skin friction) by the shaft radius for the minimum drilled shaft length determined by the lateral analysis. A summary of the torsional resistance for the signal poles is provided in Table 4. The torsional resistance in the upper 5 feet of the shaft was neglected to account for possible softening in the fine-grained soil. The results indicate factors of safety ranging from ±1.8 to 2.3.

Table 4. Summary of Torsional Resistance

Pole Type	Torque (kip-ft)	Nominal Side Resistance (kips)	Nominal Torsional Resistance (kip-ft)	Minimum Shaft Length (ft)	Resistance/Demand Ratio (FS)
SM3	82.9	100	151	12	1.8
SM3L	87.9	117	205	12	2.3

Note: Torsional resistance based on shaft resistance beginning 5 feet below the top of shaft.

CONSTRUCTION RECOMMENDATIONS

We assume the specifications will follow the ODOT's Oregon Standard Specifications for Construction (2018). It is also assumed these specifications will be referred to for general or specific items not addressed in this report.

Construction of the traffic signal pole foundations should be completed in accordance with Section 00963 (Signal Support Drilled Shafts).

Depending on the time of year, the drilled shaft excavations may extend below the ground water level, requiring wet shaft concrete placement or dewatering to facilitate dry shaft concrete placement. Temporary casing (Section 00512.43(c)) may also be required to support the shaft sidewalls while drilling to reduce caving.

Permanent casing will significantly reduce the torsional resistance of the foundation elements and would require longer drilled shafts. Therefore, permanent casing will not be allowed.

The shafts should be monitored throughout construction by a Foundation Engineering representative to provide QA/QC during drilling and concreting, and to confirm the subsurface conditions are consistent with the design assumptions.

DESIGN REVIEW AND CONSTRUCTION OBSERVATIONS

We should be provided the opportunity to review all drawings and specifications that pertain to drilled shaft construction. Foundation construction will require field confirmation of the soil conditions. We recommend we be retained to evaluate the suitability of the foundation soils and provide alternate recommendations, if needed.

VARIATION OF SUBSURFACE CONDITIONS, USE OF THIS REPORT, AND WARRANTY

The analysis, conclusions and recommendations contained herein assume the soil profiles observed in the borings are representative of the site conditions. The above recommendations assume we will have the opportunity to review final drawings and be present during construction to confirm the assumed foundation conditions. No changes in the enclosed recommendations should be made without our approval. We will assume no responsibility or liability for any engineering judgment, inspection or testing performed by others.

This memorandum was prepared for the exclusive use of David Evans and Associates, Inc. and their design consultants for the SW 6th Avenue & SW Ellsworth Street Traffic Signals project in Albany, Oregon. Information contained herein should not be used for other sites or for other sites or for unanticipated construction without our written consent. This report is intended for planning and design purposes. Contractors using this information to estimate construction quantities or costs do so at their own risk. Our services do not include any survey or assessment of potential surface contamination or contamination of the soil or ground water by hazardous or toxic materials. We assume those services, if needed, have been completed by others.

Our work was done in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

We trust this information meets your present needs. Please do not hesitate to call if you have questions.

REFERENCES

Oregon Department of Transportation (2018); Oregon Standard Specifications for Construction, Highway Division.

Oregon Department of Transportation (2017); Geotechnical Design Manual (GDM), Geo-Environmental Section, November 2017.

Oregon Department of Transportation (2017); ODOT Traffic Structures Design Manual, Traffic Standards and Asset Management Unit.

Appendix A

Figures

Professional
Geotechnical
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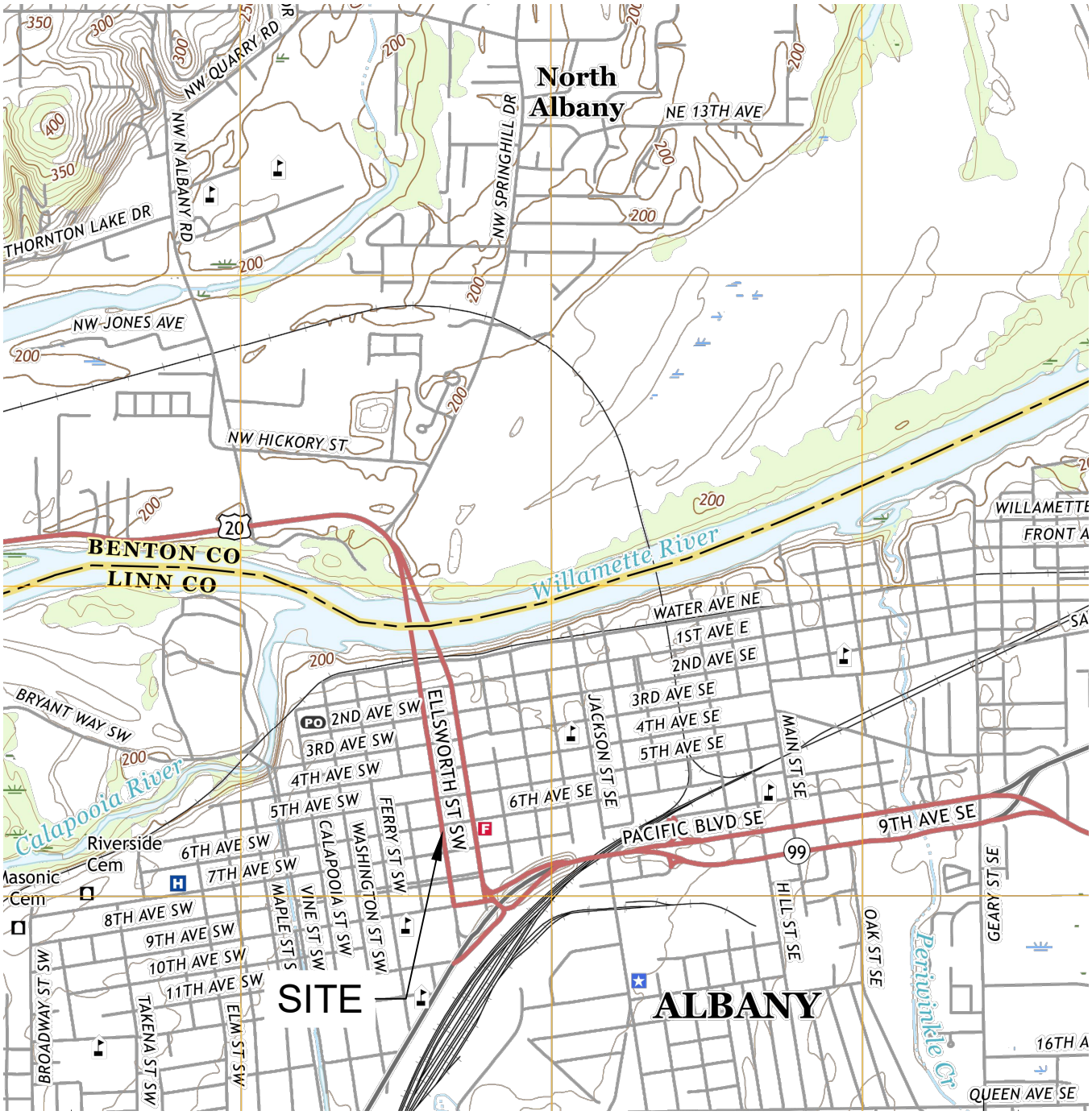
Foundation Engineering, Inc.



SCALE IN FEET

0 500 1,000 2,000

DATE OCT. 2017
DWN. mdm
APPR.
REVIS.
PROJECT NO.
2171093

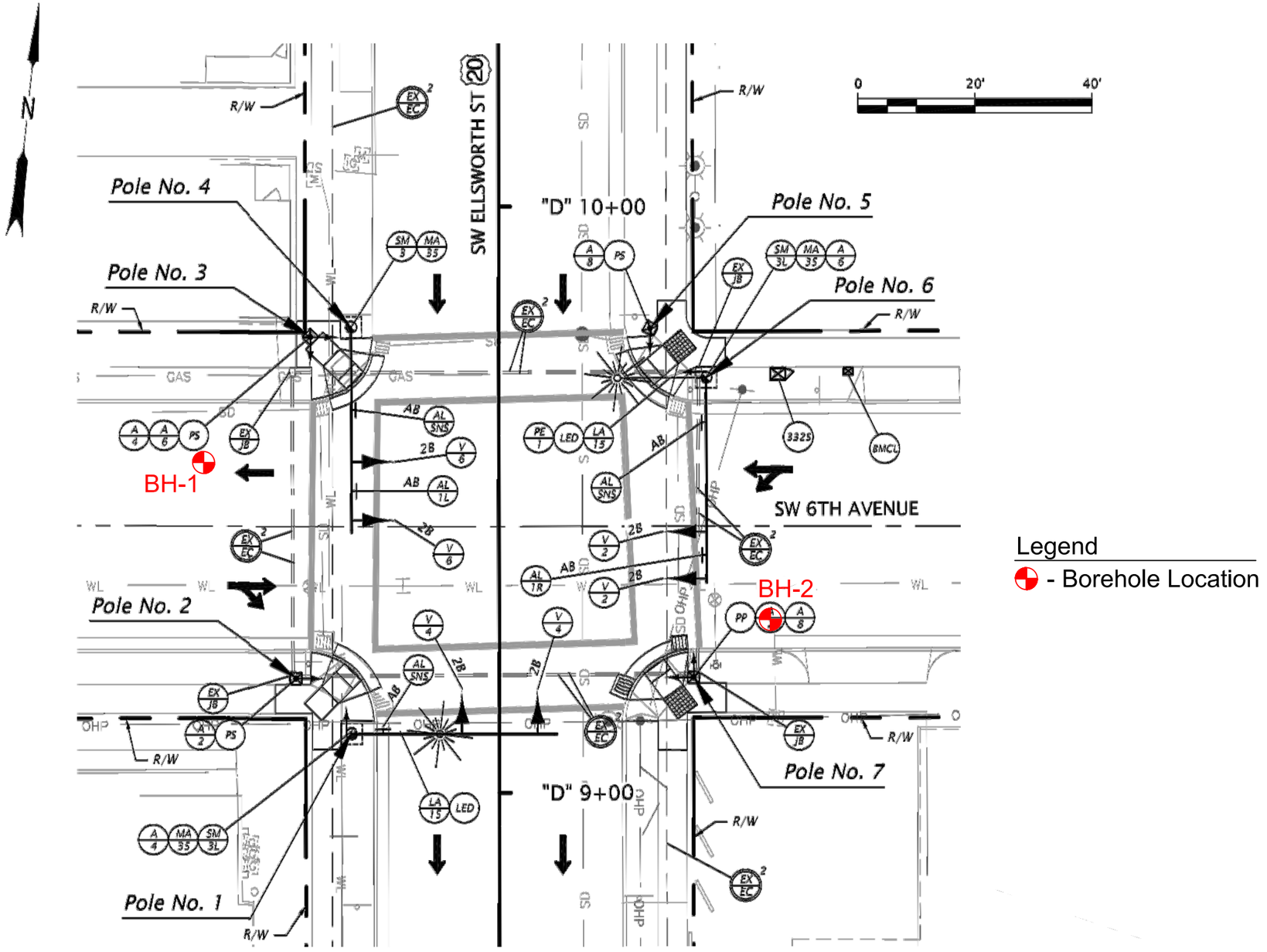
FOUNDATION ENGINEERING INC.
PROFESSIONAL GEOTECHNICAL SERVICES
820 NW CORNELL AVENUE
CORVALLIS, OR 97330-4517
BUS. (541) 757-7645 FAX (541) 757-7650

VICINITY MAP

SW 6th AVENUE & SW ELLSWORTH STREET TRAFFIC SIGNALS
ALBANY, OREGON

FIGURE NO.
1A

FILE NAME: Fig1A



NOTES:
1. BOREHOLE LOCATIONS WERE NOT SURVEYED AND WERE ESTABLISHED USING A METAL TAPE MEASURE REFERENCING EXISTING LANDMARKS. LOCATIONS ARE APPROXIMATE ONLY.
2. SEE MEMORANDUM FOR A DISCUSSION OF SUBSURFACE CONDITIONS.
3. BASE MAP WAS PROVIDED BY DAVID EVANS AND ASSOCIATES, INC.

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DATE NOV. 2017
DWN. mdm
APPR.
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PROJECT NO. 2171093

SITE LAYOUT AND BOREHOLE LOCATIONS

SW 6TH AVENUE & SW ELLSWORTH STREET TRAFFIC SIGNALS
ALBANY, OREGON

FIGURE NO. **2A**

FILE NAME:FIG 2A

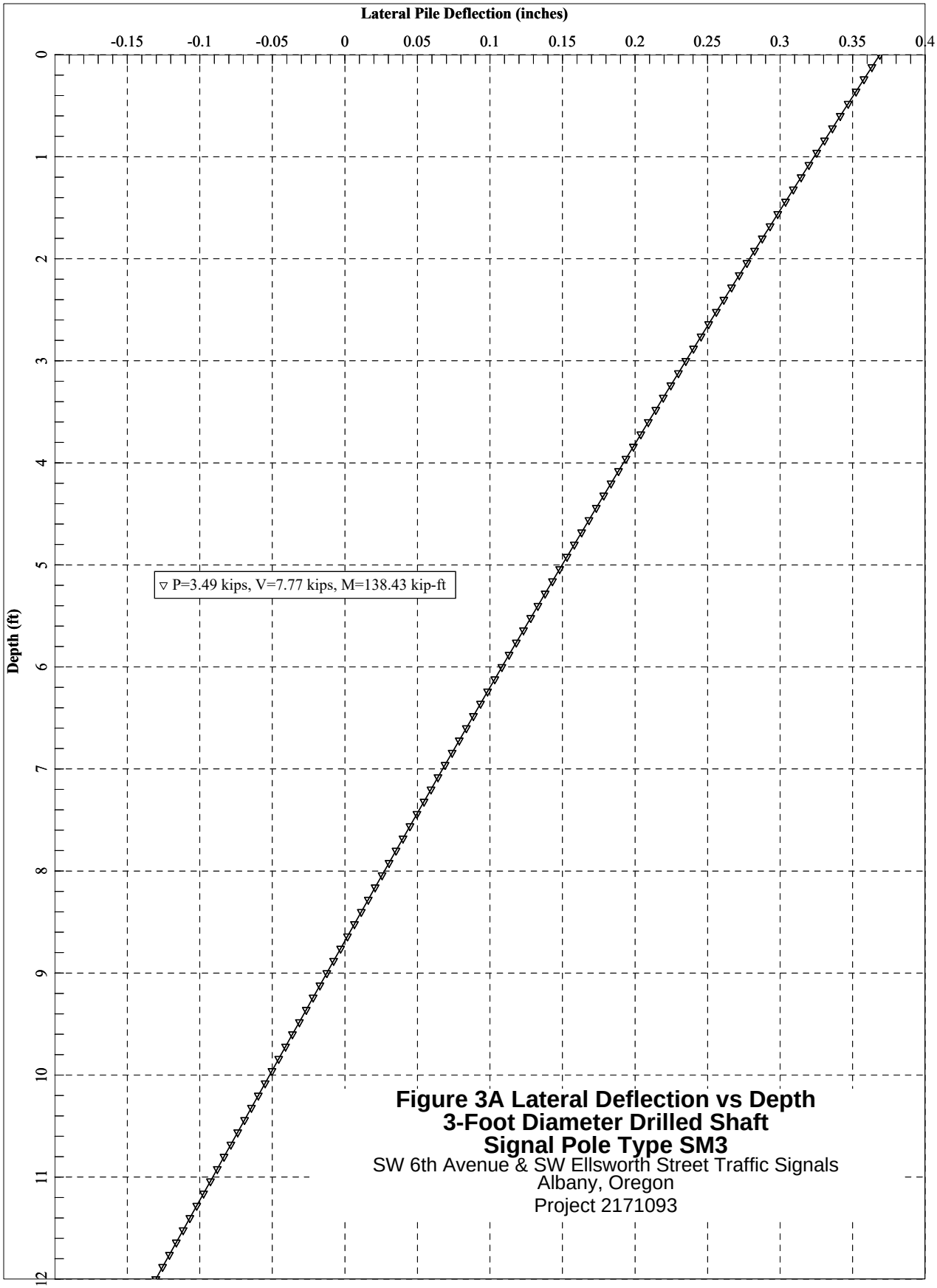

Figure 3A Lateral Deflection vs Depth
3-Foot Diameter Drilled Shaft
Signal Pole Type SM3
SW 6th Avenue & SW Ellsworth Street Traffic Signals
Albany, Oregon
Project 2171093

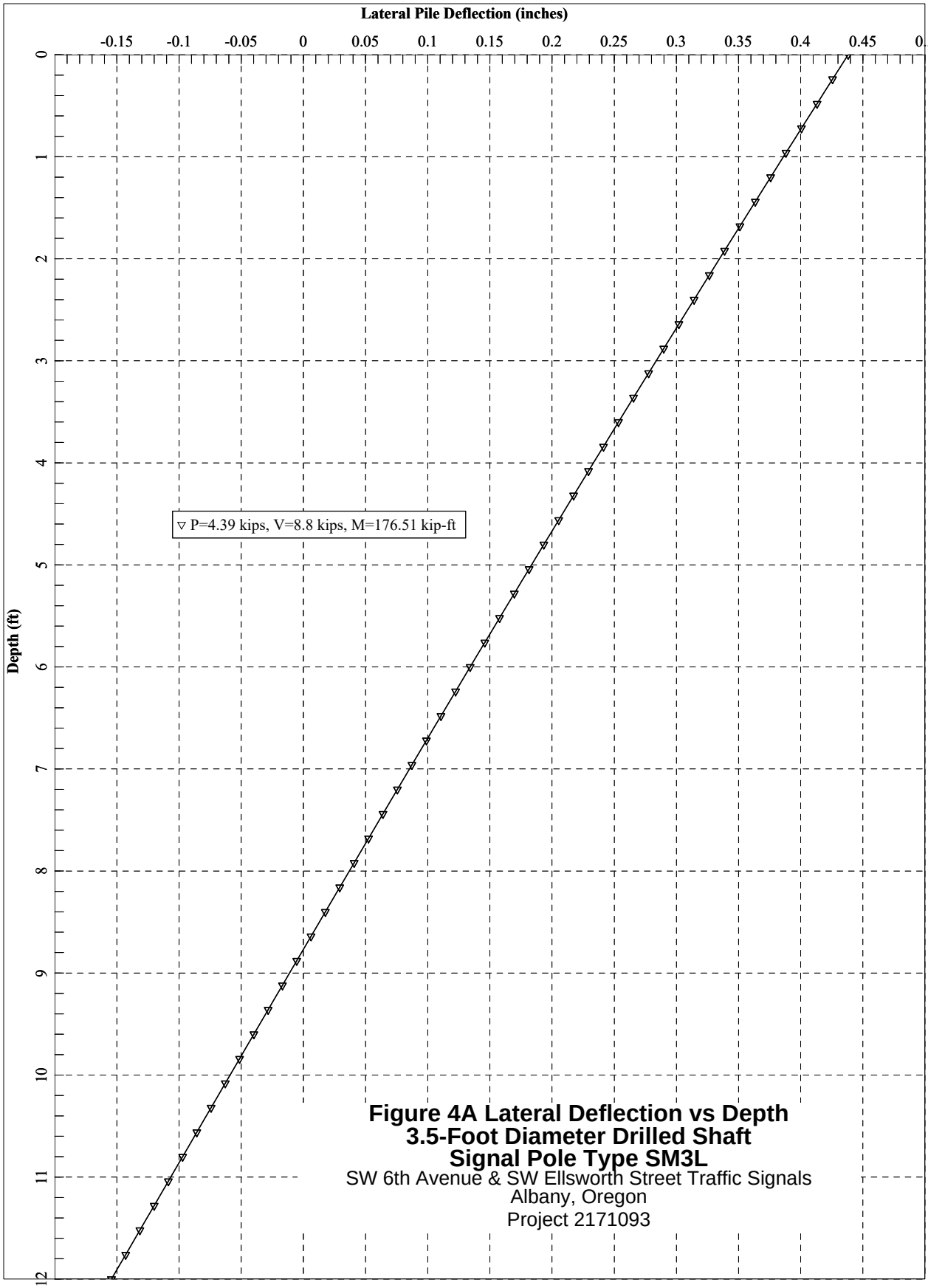

Figure 4A Lateral Deflection vs Depth
3.5-Foot Diameter Drilled Shaft
Signal Pole Type SM3L
SW 6th Avenue & SW Ellsworth Street Traffic Signals
Albany, Oregon
Project 2171093

Appendix B

Boring Logs

Professional
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Services

Foundation Engineering, Inc.

DISTINCTION BETWEEN FIELD LOGS AND FINAL LOGS

A field log is prepared for each boring or test pit by our field representative. The log contains information concerning sampling depths and the presence of various materials such as gravel, cobbles, and fill, and observations of ground water. It also contains our interpretation of the soil conditions between samples. The final logs presented in this report represent our interpretation of the contents of the field logs and the results of the sample examinations and laboratory test results. Our recommendations are based on the contents of the final logs and the information contained therein and not on the field logs.

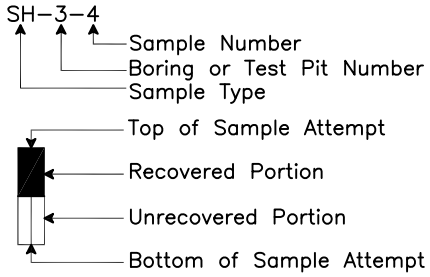
VARIATION IN SOILS BETWEEN TEST PITS AND BORINGS

The final log and related information depict subsurface conditions only at the specific location and on the date indicated. Those using the information contained herein should be aware that soil conditions at other locations or on other dates may differ. Actual foundation or subgrade conditions should be confirmed by us during construction.

TRANSITION BETWEEN SOIL OR ROCK TYPES

The lines designating the interface between soil, fill or rock on the final logs and on subsurface profiles presented in the report are determined by interpolation and are therefore approximate. The transition between the materials may be abrupt or gradual. Only at boring or test pit locations should profiles be considered as reasonably accurate and then only to the degree implied by the notes thereon.

SAMPLE OR TEST SYMBOLS



S – Grab Sample
SS – Standard Penetration Test Sample (split–spoon)
SH – Thin–walled Shelby Tube Sample
C – Pavement Core Sample
CS – Rock Core Sample

▲ Standard Penetration Test Resistance equals the number of blows a 140 lb. weight falling 30 in. is required to drive a standard split–spoon sampler 1 ft. Practical refusal is equal to 50 or more blows per 6 in. of sampler penetration.

● Water Content (%).

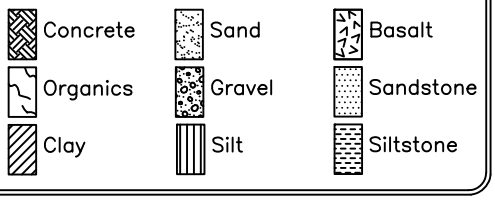
UNIFIED SOIL CLASSIFICATION SYMBOLS

G – Gravel	W – Well Graded
S – Sand	P – Poorly Graded
M – Silt	L – Low Plasticity
C – Clay	H – High Plasticity
Pt – Peat	O – Organic

FIELD SHEAR STRENGTH TEST

Shear strength measurements on test pit side walls, blocks of soil or Shelby tube samples are typically made with Torvane or Field Vane shear devices.

TYPICAL SOIL/ROCK SYMBOLS



WATER TABLE


Water Table Location

(1/31/16) Date of Measurement

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7857 SW CIRRUS DRIVE, BUILDING 24
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SYMBOL KEY

BORING AND TEST PIT LOGS

Explanation of Common Terms Used in Soil Descriptions

Field Identification	Cohesive Soils			Granular Soils	
	SPT*	S_u** (tsf)	Term	SPT*	Term
Easily penetrated several inches by fist.	0 – 2	< 0.125	Very Soft	0 – 4	Very Loose
Easily penetrated several inches by thumb.	2 – 4	0.125–0.25	Soft	4 – 10	Loose
Can be penetrated several inches by thumb with moderate effort.	4 – 8	0.25 – 0.50	Medium Stiff	10 – 30	Medium Dense
Readily indented by thumb but penetrated only with great effort.	8 – 15	0.50 – 1.0	Stiff	30 – 50	Dense
Readily indented by thumbnail.	15 – 30	1.0 – 2.0	Very Stiff	> 50	Very Dense
Indented with difficulty by thumbnail.	>30	> 2.0	Hard		

* SPT N–value in blows per foot (bpf)
** Undrained shear strength

Term	Soil Moisture Field Description
Dry	Absence of moisture. Dusty. Dry to the touch.
Damp	Soil has moisture. Cohesive soils are below plastic limit and usually moldable.
Moist	Grains appear darkened, but no visible water. Silt/clay will clump. Sand will bulk. Soils are often at or near plastic limit.
Wet	Visible water on larger grain surfaces. Sand and cohesionless silt exhibit dilatancy. Cohesive soil can be readily remolded. Soil leaves wetness on the hand when squeezed. Soil is wetter than the optimum moisture content and above the plastic limit.

Term	PI	Plasticity Field Test
Non–plastic	0 – 3	Cannot be rolled into a thread at any moisture.
Low Plasticity	3 – 15	Can be rolled into a thread with some difficulty.
Medium Plasticity	15 – 30	Easily rolled into thread.
High Plasticity	> 30	Easily rolled and re–rolled into thread.

Term	Soil Structure Criteria
Stratified	Alternating layers at least ¼ inch thick.
Laminated	Alternating layers less than ¼ inch thick.
Fissured	Contains shears and partings along planes of weakness.
Slickensided	Partings appear glossy or striated.
Blocky	Breaks into small lumps that resist further breakdown.
Lensed	Contains pockets of different soils.

Term	Soil Cementation Criteria
Weak	Breaks under light finger pressure.
Moderate	Breaks under hard finger pressure.
Strong	Will not break with finger pressure.

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COMMON TERMS

SOIL DESCRIPTIONS

Depth Feet	Soil and Rock Description and Comments	Log	Elev. Depth	Samples	SPT, N-Value / Recovery / Moisture, % / RQD., % (0 – 50 – 100)	Backfill/ Installations/ Water Table
	ASPHALTIC CONCRETE (±3.5 inches).		0.0			Capped with AC cold patch and gravel
1	Dense sandy GRAVEL, trace silt (GP); grey-brown, moist, fine to coarse sand, fine to coarse subrounded to rounded gravel, (base rock).		0.3			
2						
3	Very stiff gravelly SILT, some sand (ML); grey-brown and iron-stained, moist, low to medium plasticity, fine to coarse sand, fine subrounded to rounded gravel, (alluvium).		2.5	SS-1-1	17	
4						Backfilled with bentonite chips
5	Medium dense silty GRAVEL, some sand (GM); brown and iron-stained, wet, low plasticity silt, fine to coarse sand, fine to coarse subrounded to rounded gravel, (alluvium).		5.0	SS-1-2	26	
6						
7						
8	Very dense below ±7.5 feet.			SS-1-3	76	
9						
10				SS-1-4	69	
11						
12						
13						
14						
15				SS-1-5	50/4"	
16						
17						
18						
19						
20	Dense sandy GRAVEL, some silt (GP); grey, wet, low plasticity silt, fine to medium sand, fine to coarse subrounded to rounded gravel, (alluvium).		20.0	SS-1-6	34	
21						
	BOTTOM OF BORING		21.5			

Project No.: 2171093

Surface Elevation: N/A

Date of Boring: October 18, 2017

Boring Log: BH-1

SW 6th Avenue & SW Ellsworth Street Traffic Signals

Albany, Oregon

Foundation Engineering, Inc.

Depth Feet	Soil and Rock Description and Comments	Elev. Depth	Samples	SPT, N-Value / Moisture, % / Recovery / RQD., % (0 – 50 – 100)	Backfill/ Installations/ Water Table
	ASPHALTIC CONCRETE (±3.5 inches).	0.0			Capped with AC cold patch and gravel
1	Dense sandy GRAVEL, trace silt (GP); grey-brown, moist, fine to coarse sand, fine to coarse subrounded to rounded gravel, (base rock).	0.3			
2					
3	Soft SILT (ML); brown, moist, low plasticity, (alluvium).	2.5	SS-2-1	2	
4					Backfilled with bentonite chips
5	Dense to very dense silty GRAVEL, some sand (GM); brown and iron-stained, wet, low plasticity silt, fine to coarse sand, fine to coarse subrounded to rounded gravel, (alluvium),	5.0	SS-2-2	46	
6					
7					
8			SS-2-3	65	
9					
10	Dense to very dense silty SAND, some gravel (SM); brown and iron-stained, wet, low plasticity silt, fine to coarse sand, fine subrounded to rounded gravel, (alluvium).	10.0	SS-2-4	38	
11					
12					
13			SS-2-5	54	
14					
15	Dense to very dense silty GRAVEL, some sand (GM); brown and iron-stained, wet, low plasticity silt, fine to coarse sand, fine to coarse subrounded to rounded gravel, (alluvium).	15.0	SS-2-6	65	
16					
17					
18	Grey below ±17.5 feet.				
19					
20	Sandy silt with some gravel lens (±9-inch thick) at ±20 feet.		SS-2-7	28	
21					
	BOTTOM OF BORING	21.5			

Project No.: 2171093

Surface Elevation: N/A

Date of Boring: October 18, 2017

Boring Log: BH-2

SW 6th Avenue & SW Ellsworth Street Traffic Signals

Albany, Oregon

Foundation Engineering, Inc.