

Memorandum

Date:	February 6, 2019	
То:	Lori Schumacher, P.E. Civil Engineer II City of Albany	Here and Andrews
From:	David L. Running, P.E., G.E. Senior Geotechnical Engineer	b
Subject:	Geotechnical Investigation	
Project:	Cox Creek Sewer Interceptor Project 2181105	Exp



We have completed the requested geotechnical investigation for the above-referenced project. This memorandum includes a description of our work, a discussion of the subsurface conditions, and a summary of laboratory testing.

BACKGROUND

The City of Albany (City) plans to construct a $\pm 6,300$ -foot long sewer line in three phases extending in its entirety from the City's wastewater treatment plant (WWTP) at 405 Davidson Street NE, south and east to the Albany Municipal Airport, located east of Interstate 5 (I-5). Phase 1 will extend from the City's WWTP to Cox Creek. Phase 2 will extend from Cox Creek to North Shore Drive. Phase 3 will extend from North Shore Drive to the Albany Municipal Airport. The project location and proposed sewer alignment for all phases is shown in Figure 1A (Appendix A).

The sewer line construction in its entirety will include five undercrossings beneath railroad tracks, Salem Avenue, Hwy. 99E/Pacific Blvd., Cox Creek, and I-5. The undercrossing locations are shown on Figure 1A. Pipe depths will range from ± 13 to 25 feet. The pipe diameter will be 30 inches from the WWTP to Cox Creek and 24 inches from Cox Creek to the Albany Municipal Airport.

The City is the project owner. The City retained Foundation Engineering, Inc. to complete the geotechnical investigation for the project. Our scope of work was summarized in a proposal dated September 21, 2018, and authorized by the City of Albany Purchase Order No. 0139418, dated October 3, 2018.

FIELD EXPLORATION

We drilled twelve exploratory borings along the planned sewer alignment to characterize the subsurface conditions. The general boring locations are shown on Figure 1A. More detailed boring locations and estimated pipe inlet depths are shown on Figures 2A through 6A (Appendix A). The boring locations shown on the figures are approximate and were based on field measurements using pacing and a steel tape.

BH-1, BH-2, and BH-7 through BH-12 were drilled between October 17 and 19, 2018. The other borings were drilled on December 4 and 5, 2018. The original drilling plan included thirteen borings. BH-6 was eliminated during the field exploration in consultation with the City, based on its close proximity to BH-5 and BH-7 and the similarity of the soil profiles in BH-5 and BH-7. The planned location for BH-6 is shown on Figures 1A and 4A. Table 1 summarizes the drilling locations, ground surface elevations, drilling depths, and drilling dates for each boring.

Boring	Boring Location	Surface Elevation (ft)	Estimated Pipe Inlet Depth (ft)	Boring Depth (ft)	Date Drilled
BH-1	At the WWTP	±El. 202.5	26	31.5	10/19/18
BH-2	East shoulder of Waverly Drive	±EI. 214.0	26	31.5	10/19/18
BH-3	South side of railroad undercrossing, at northeast corner of 3015 Salem Avenue	±El. 214.0	25	31.5	12/5/18
BH-4	South side of Salem Avenue undercrossing, next to the paved path, west of Waverly Lake	±El. 211.0	23	26.5	12/4/18
BH-5	On the paved path west of Waverly Lake, south of BH-4	±El. 210.0	20	26.5	12/4/18
BH-6	On the paved path west of Waverly Lake, south of BH-5 and north of 99E	-	18	0	n/a
BH-7	North side of the Hwy. 99E undercrossing, south of Waverly Lake	±El. 212.5	22	26.5	10/17/18
BH-8	South side of the Hwy. 99E undercrossing, west of Cox Creek	±El. 209.0	20	26.5	10/17/18
BH-9	West side of the Cox Creek undercrossing	±EI. 205.5	15	21.5	10/17/18
BH-10	East side of the Cox Creek undercrossing, adjacent to the paved path	±El. 213.5	24	31.5	10/18/18
BH-11	East shoulder of Bain Street, adjacent to 633 Bain Street	±El. 214.0	21	26.5	10/18/18
BH-12	West side of the I-5 undercrossing, on the north shoulder of North Shore Drive, west of Airport Road	±El. 218.0	22	26.5	10/18/18
BH-13	East side of the I-5 undercrossing, on the east shoulder of Aviation Way	±El. 218.5	20	26.5	12/5/18

Table 1.	Summary	of Borings
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The borings extended to depths of ± 21.5 to 31.5 feet. The drilling depths were selected by rounding up to the nearest 5-foot interval from the anticipated pipe invert depths provided by the City. The boring locations were not surveyed. Ground elevations at the boring locations were estimated based on topographic data provided by the City. The estimated ground elevations are shown on the logs and should be assumed approximate to the nearest ± 0.5 foot.

The borings were drilled using a CME-75 truck-mounted drill rig with hollow-stem auger drilling methods. Disturbed soil samples were obtained in each boring at 2.5-foot intervals. The sampling was completed using a split-spoon sampler in conjunction with the Standard Penetration Test (SPT). The SPT, which is performed each time the sampler is driven, provides an indication of the relative stiffness or density of the foundation soils.

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

Upon completion of drilling, the boreholes were backfilled with a combination bentonite chips and native cuttings. The ground surface at the boring locations was restored to match the original conditions as close as practical, including capping the boreholes with asphaltic concrete (AC) cold patch, Quikcrete Portland cement concrete (PCC), soil, gravel, or sod, as appropriate.

SITE CONDITIONS

Surface and Subsurface Conditions

The ground surface conditions along the proposed sewer line alignment varied at each boring location. Brief summaries of the surface and subsurface conditions at each boring location are provided below. More detailed soil descriptions are provided on the boring logs in Appendix B.

• BH-1 was drilled at the WWTP on an access road immediately south of a decommissioned clarifier. The ground surface at the drilling location was relatively flat and paved with AC.

The pavement consists of ± 5 inches of AC over ± 8 inches of 1-inch minus crushed rock. The pavement section is underlain by alluvium including medium dense silty gravel to ± 7.5 feet, followed by dense to very dense sandy gravel with some silt to ± 16.3 feet. Medium dense silty sand was encountered from ± 16.3 to 20.5 feet. Very stiff clayey silt with trace to some sand followed from ± 20.5 to 31.5 feet (the bottom of the boring).

• BH-2 was drilled on the un-paved east shoulder of Waverly Drive. The ground surface at this location was relatively flat and is surfaced with ±10 inches of loose silty gravel (fill).

The fill is underlain by alluvium including very stiff sandy silt to ± 7 feet, followed by very dense silty gravel to ± 10 feet and medium dense to very dense sandy gravel with some silt to ± 27 feet. Dense silty sand was encountered from ± 27 to 29.5 feet, followed by very dense sand to ± 31.5 feet (the bottom of the boring).

 BH-3 was drilled in an unpaved parking lot in the northeast corner of the property at 3015 Salem Avenue. This boring is at the south side of the proposed railroad undercrossing. The ground surface is relatively flat and covered with ±14 inches of granular fill comprised of predominantly 1½-inch minus crushed gravel with scattered cobbles.

The granular fill is underlain by fine-grained fill and topsoil to ± 4 feet consisting of medium stiff clay. The fine-grained soil is underlain by alluvium including medium dense silty gravel to ± 7.5 feet, followed by medium dense to very dense sandy gravel to ± 25 feet and alternating layers of very dense silty and sandy gravel to ± 31.5 feet (the bottom of the boring).

• BH-4 was drilled a few feet south of the PCC-paved path that extends along the west side of Waverly Lake, south of Salem Ave. This boring is at the south side of the proposed Salem Avenue undercrossing. The surface of the path is relatively flat. The ground east of the path slopes down to the lake and is vegetated with maintained grass.

The boring encountered fill and topsoil to ± 3.5 feet consisting of medium stiff clayey silt. The fine-grained soil is underlain by alluvium including medium dense to dense sandy gravel with some silt to ± 15 feet, followed by medium dense gravelly sand to ± 17.5 feet and dense to very dense sandy gravel to ± 22 feet. The gravel is underlain by hard clayey silt to ± 25.5 feet and hard sandy silt to ± 26.5 feet (the bottom of the boring).

 BH-5 was drilled through the PCC-paved path that extends along the west side of Waverly Lake between Salem Avenue and 99E. The surface of the path is relatively flat. The ground east of the path slopes down to the lake and is vegetated with maintained grass.

The pavement consists of ± 9 inches of PCC over a ± 1 -inch thick leveling course of $\frac{3}{4}$ -inch minus crushed rock. The pavement section is underlain by very stiff sandy silt to ± 3.5 feet. The sandy silt may be fill or alluvium or a combination of these materials. The sandy silt is underlain by coarse-grained alluvium including dense to very dense silty gravel to ± 10 feet, followed by dense to very dense sandy gravel with some silt to ± 22.5 . feet. Hard clayey silt with some sand followed from ± 26.5 feet (the bottom of the boring).

• BH-7 was drilled on grass immediately north of Hwy. 99E on the north side of the proposed Hwy. 99E undercrossing. The terrain at this location is relatively flat and vegetated with maintained grass.

The boring encountered alluvium including loose to dense sandy gravel with some silt to ± 12.5 feet, followed by soft sandy silt to ± 14.5 feet. Dense sandy gravel was encountered from ± 14.5 to 17 feet, followed by dense sand to ± 18.5 feet and dense to very dense sandy gravel to ± 26.4 feet (the bottom of the boring).

 BH-8 was drilled south of Hwy. 99E adjacent to a PCC-paved path on the south side of the proposed Hwy. 99E undercrossing. The ground surface at this location slopes down to the southwest and is vegetated with maintained grass.

The boring encountered fill consisting of very dense silty gravel with scattered organics and concrete debris to ± 4 feet and medium stiff to stiff clay with some gravel to ± 10.5 feet. The fill is underlain by alluvium including loose gravel and clayey gravel to ± 15 feet, followed by very dense sandy gravel to ± 17.5 feet and medium dense sandy gravel with some silt to ± 23 feet. Hard clayey silt followed to ± 26.5 feet (the bottom of the boring).

 BH-9 was drilled on the west side of the planned Cox Creek undercrossing, just downstream of the Swan Lake weir. The boring was located on an unpaved path. The ground surface is relatively flat at the boring location. The ground surface to the east slopes down to the creek and is vegetated with short grass and weeds.

The boring encountered fill to ± 6 feet consisting of medium dense gravel with some silt. The fill is underlain by alluvium including very dense sandy gravel to ± 20 feet, followed by dense sand with some silt to ± 21.5 feet (the bottom of the boring).

 BH-10 was drilled on the east side of the planned Cox Creek undercrossing, just downstream of the Swan Lake weir. The boring was located in a grassy area a few feet west of a PCC-paved path. The ground surface is relatively flat at the boring location. The ground surface to the west slopes down to the creek and is vegetated with maintained grass.

The boring encountered fill and fine-grained alluvium to ± 6 feet consisting of stiff silt with trace gravel. The fine-grained soil is underlain by coarse-grained alluvium including medium dense to very dense silty gravel to ± 15 feet, followed by dense to very dense sandy gravel with trace silt to ± 25.5 feet. Very dense silty sand was encountered from ± 25.5 to 27.5 feet, followed by very dense sandy gravel to ± 30.5 feet. The sandy gravel is underlain by very stiff silt to ± 31.5 feet (the bottom of the boring).

• BH-11 was drilled through the AC pavement on the east side of Bain Street, just south of the intersection with Oakwood Avenue.

The pavement consists of ± 3 inches of AC over ± 4 inches of 1½-inch minus crushed rock. The pavement section is underlain by alluvium including very dense silty gravel with some sand to ± 7.5 feet, followed by medium dense to very dense sandy gravel with trace to some silt to ± 25.9 feet (the bottom of the boring).

• BH-12 was drilled through AC pavement on the north side of North Shore Drive, just west of the intersection with Airport Road. This boring is on the west side of the proposed I-5 undercrossing.

The pavement consists of ± 4 inches of AC over ± 8 inches of $1\frac{1}{2}$ -inch minus crushed rock. The pavement section is underlain by alluvium including very stiff silt to ± 5 feet. The silt is underlain by medium dense silty sand to ± 7.5 feet and medium dense gravelly sand to ± 10 feet. Medium dense sandy gravel was encountered from ± 10 to 15 feet, followed by medium dense gravelly sand from ± 15 to 17.5 feet, and very dense sandy gravel with trace silt to ± 26.5 feet (the bottom of the boring).

 BH-13 was drilled a few feet east of Aviation Way, just south of the entrance gate to the Albany Municipal Airport. This boring is on the east side of the proposed I-5 undercrossing. The ground surface at the boring location was covered in short grass and sloped gently down to the east toward a shallow ditch.

The boring encountered alluvium including medium stiff silty clay to ± 4.5 feet. The fine-grained soil is underlain by medium dense to very dense sandy gravel to ± 12.5 feet, followed by medium dense silty gravel to ± 15 feet, and medium dense to very dense sandy gravel with some silt to ± 26.5 feet (the bottom of the boring).

Ground Water

The use of hollow-stem auger drilling methods allowed measurement of ground water levels at the time of drilling. Ground water was encountered in the borings at depths ranging from ± 6 to 20 feet. The measured ground water depths and approximate ground water elevations are summarized in Table 2.

The ground water measurements in October 2018 followed a period of more than 4 months with little or no rain. The measurements in December also followed an extended period of relatively dry weather with notable rainfall limited to an accumulation of ± 3 to 4 inches in the two weeks prior to drilling. The weather was dry at the time of the exploration. We anticipate the ground water levels will fluctuate seasonally and will be higher during the wet winter and spring months. The water levels near Cox Creek, Waverly Lake, and Swan Lakes will likely match the water levels in these water bodies because the bottoms of the lakes and the creek bed lie within the gravel stratum.

The measurements indicate relatively uniform ground water levels in the flat terrain between BH-2 and BH-10. The ground water level was lower in BH-1, which was drilled in the lower-lying terrain at the WWTP. The ground water levels were higher in the higher terrain between BH-11 and BH-13. The general trend is ground water levels dipping to the northwest toward the Willamette River. This trend is consistent with our previous observations in the area. We anticipate the local ground water and runoff from seasonal rainfall drains toward the Willamette River.

Boring	Date	Depth to Water (ft)	Water Elevation (ft)
BH-1	10/19/18	±19.5	±El. 183.0
BH-2	10/19/18	±20.0	±El. 194.0
BH-3	12/5/18	±18.0	±El. 196.0
BH-4	12/4/18	±12.5	±El. 198.5
BH-5	12/4/18	±12.5	±El. 197.5
BH-6	n/a	-	-
BH-7	10/17/18	±15.0	±El. 197.5
BH-8	10/17/18	±12.0	±El. 197.0
BH-9	10/17/18	±6.0	±El. 199.5
BH-10	10/18/18	±17.0	±El. 196.5
BH-11	10/18/18	±14.0	±El. 200.0
BH-12	10/18/18	±12.0	±El. 206.0
BH-13	12/5/18	±10.0	±EI. 208.5

Table 2. Summary of Ground Water Levels

Note: Ground elevations are based on topographic maps provided by the City of Albany and are approximate only. BH-6 was not drilled so no ground water information is provided for that location.

LABORATORY TESTING

The laboratory testing included moisture contents (ASTM D 2216), Atterberg limits (ASTM D4318), and percent fines determinations (ASTM D 1140). The test results were used to classify the soils and estimate their engineering properties. The moisture contents, Atterberg limits, and percent fines results are summarized in Table 1C (Appendix C). The moisture contents are also included on the boring logs.

DISCUSSION

The field exploration indicates construction of the new sewer line will be in predominantly gravelly soils. The gravelly soils will be highly susceptible to sloughing and caving, particularly where ground water is encountered. Therefore, the contractor will need to take these conditions in account when planning the work.

In our borings, ground water was typically encountered ± 7 to 11 feet above the planned pipe invert elevations. Therefore, dewatering should be anticipated along the entire length of the project.

Trenchless undercrossings are planned at five locations. The locations, lengths, and depths are summarized in Table 3. Cross-sections for each of the proposed undercrossing locations are shown on Figures 7A through 12A (Appendix A).

Location	Undercrossing Length (ft)	Pipe Depths (ft)
Railroad Undercrossing	137.5	±19 to 27
Salem Avenue Undercrossing	97.5	±22 to 25
Hwy. 99E/Pacific Blvd. Undercrossing	121.5	±23 to 26
Cox Creek Undercrossing	104.0	±6 to 23
I-5 Undercrossing	334.0	±18 to 25

Table 3. Summary of Planned Trenchless Undercrossings

Note: Pipe depths are approximate and are based on the distance from the ground surface to the bottom of the pipe along the length of the undercrossing.

At all of the undercrossing locations, the soil in the drilling zone is anticipated to consist of predominantly sandy or silty gravel. The gravel stratum also likely includes cobbles and sand lenses. Cobbles are not noted on the boring logs because hollow-stem auger drilling did not allow identification of cobbles based on drilling action. Also, the diameter of the split-spoon sampler did not allow for sampling of cobble-sized materials. With any trenchless method, the drilling will likely be difficult due to the presence of coarse granular soils and ground water.

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

This memorandum was prepared for the City of Albany and their design consultants for the Cox Creek Sewer Interceptor project in Albany, Oregon. Information contained herein should not be used for other sites or for unanticipated construction without our written consent.

This memorandum is intended as a data report for the planning and design (by others) of trenching and trenchless construction. Contractors using this information to estimate construction quantities, select equipment, materials, means and methods, and 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.

It is assumed contractors bidding on this project or using this information to plan, design and construct directional bores are familiar with local soil and ground water conditions. The subsurface profiles should be considered accurate only at individual boring locations. Contractors should clearly understand the discussion of subsurface conditions along the planned sewer line alignment requires extrapolation from widely-spaced borings and the subsurface profiles at the boring locations vary. Therefore, the contractor should expect varying subsurface conditions between borings and along the alignment. In particular, the contractor should anticipate the presence of cobbles within the gravel stratum and be aware of the risks and construction difficulties the cobbles and ground water pose.

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

It has been a pleasure assisting you with this phase of your project. Please do not hesitate to contact us if you have any questions or require further assistance.

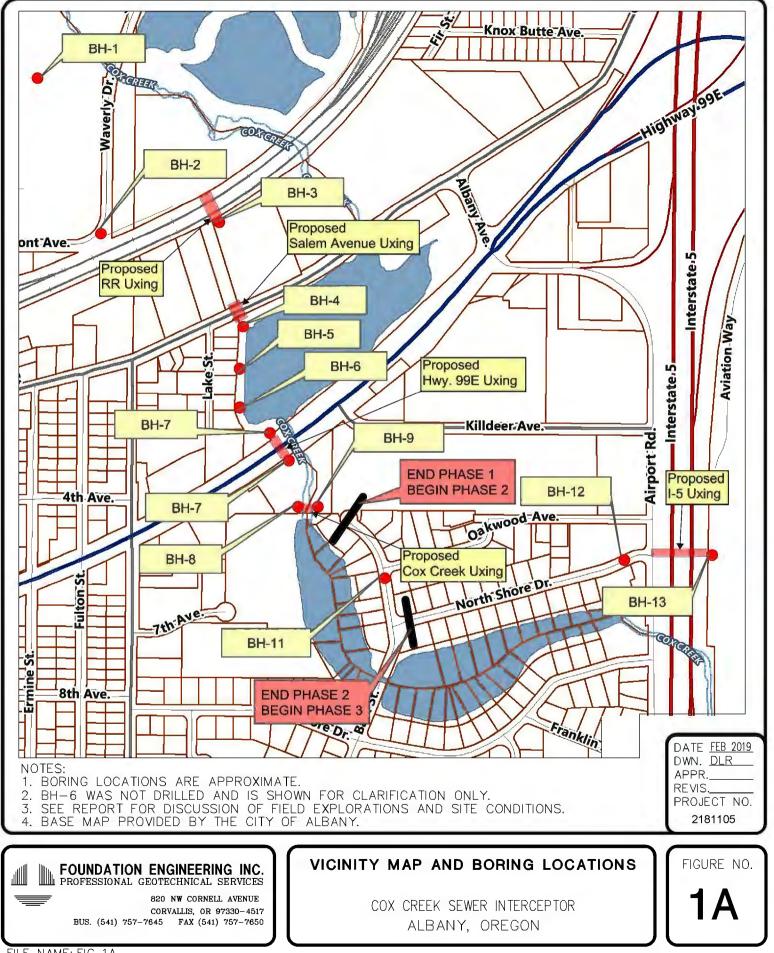
Attachments



Appendix A

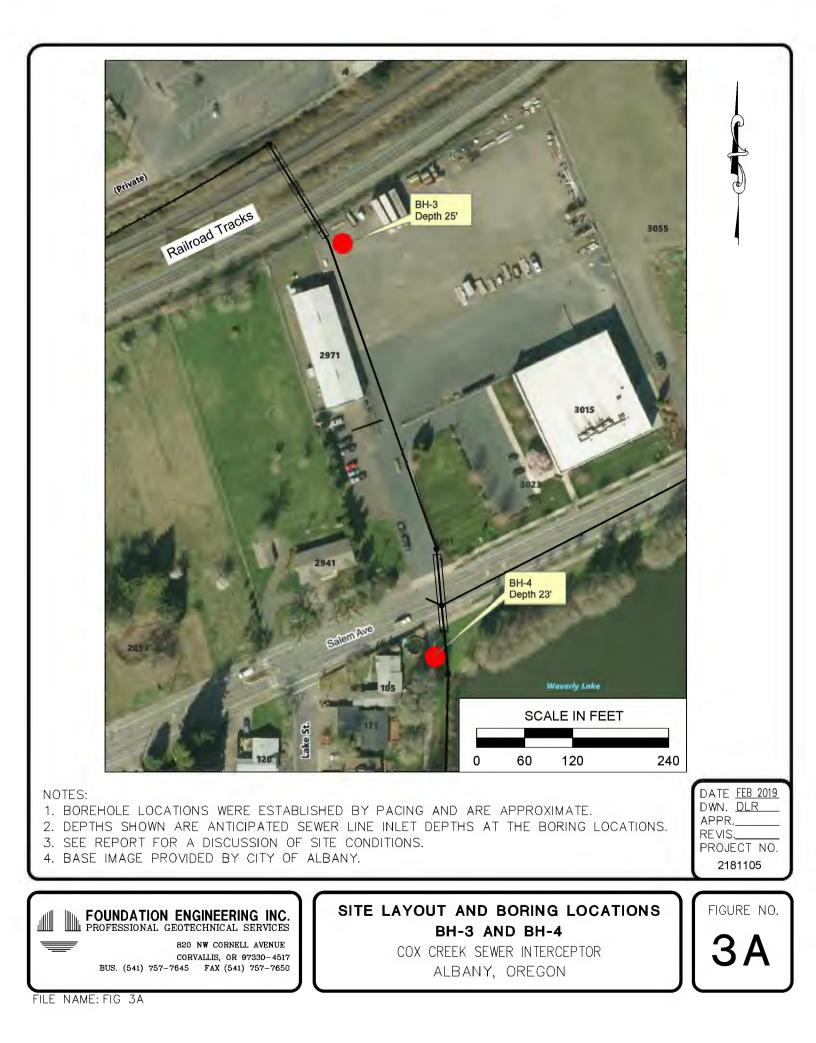
Figures

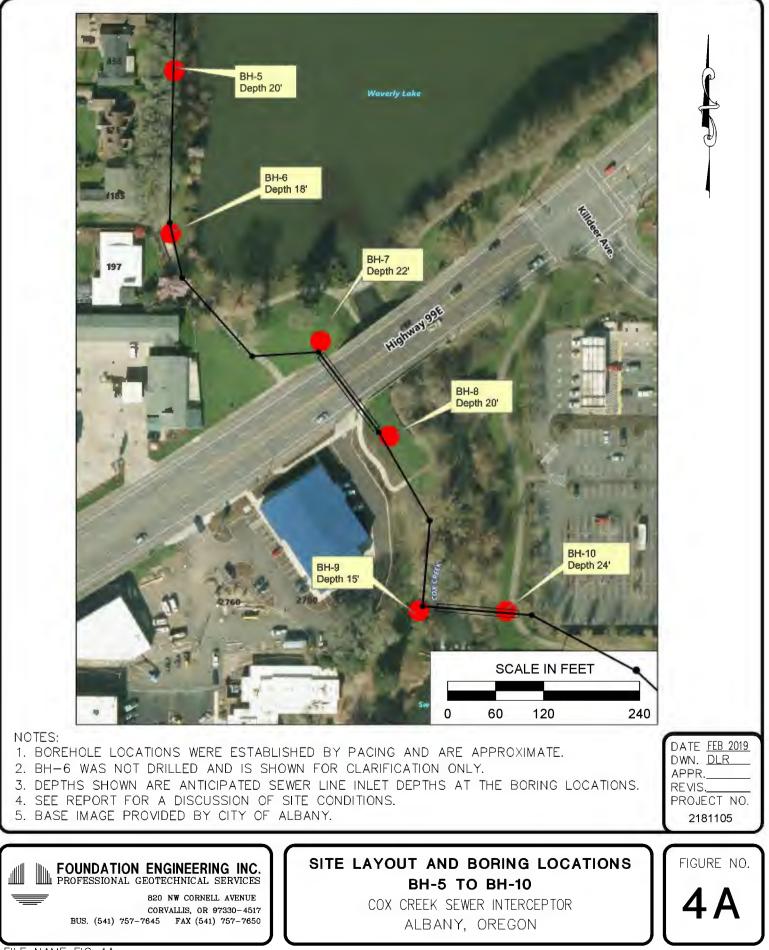
Foundation Engineering, Inc. Professional Geotechnical Services



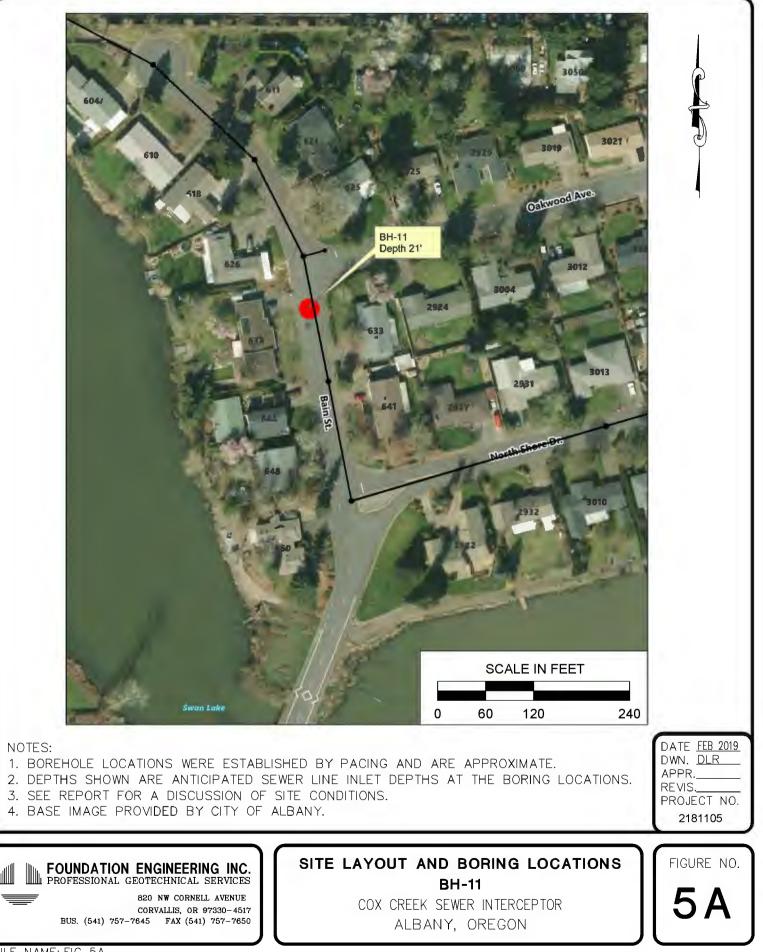
FILE NAME: FIG 1A

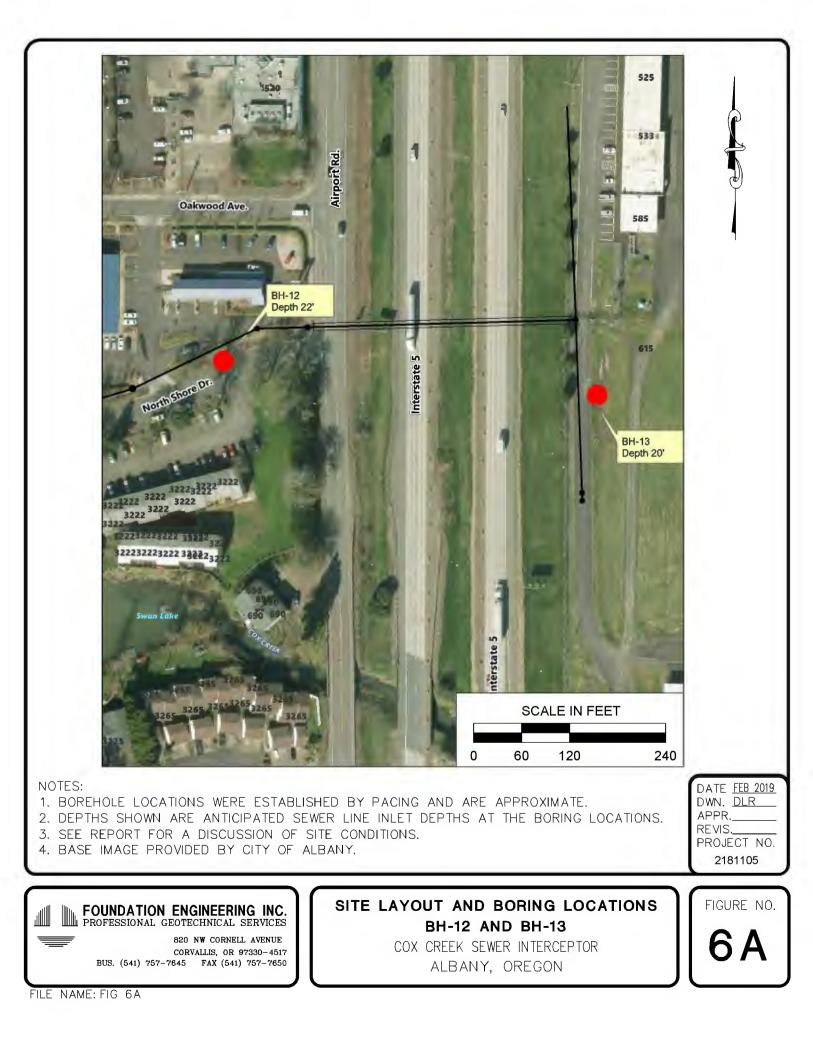
NOTES: 1. BOREHOLE LOCATIONS WERE ESTABLISHED BY PACING AND ARE APPROXIMATE. 2. DEPTHS SHOWN ARE ANTICIPATED SEWER LINE INLET DEPTHS AT THE BORING LOCATIONS. 3. SEE REPORT FOR A DISCUSSION OF SITE CONDITIONS. 4. BASE IMAGE PROVIDED BY CITY OF ALBANY.	DATE <u>FEB 2019</u> DWN. <u>DLR</u> APPR REVIS PROJECT NO. 2181105
FOUNDATION ENGINEERING INC. PROFESSIONAL GEOTECHNICAL SERVICES B20 NW CORNELL AVENUE CORVALLIS, OR 97330-4517 BUS. (541) 757-7645 FILE NAME: FIG 2A	FIGURE NO. 2A

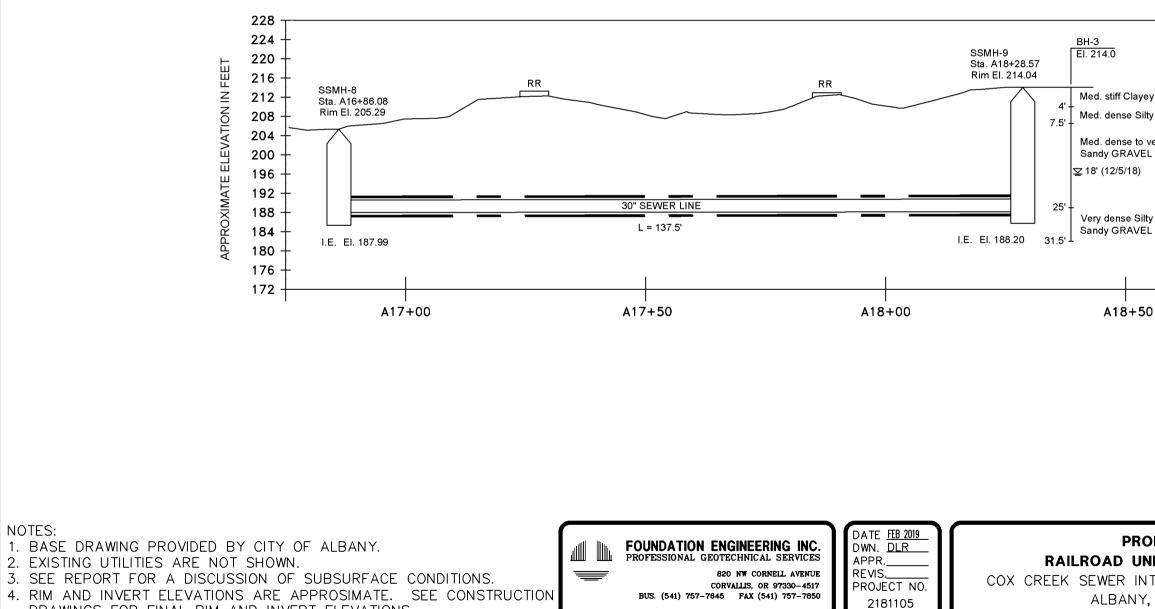




FILE NAME: FIG 4A



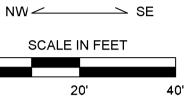


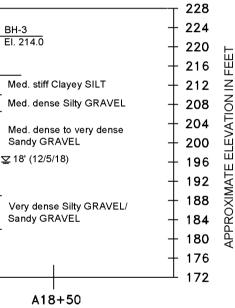


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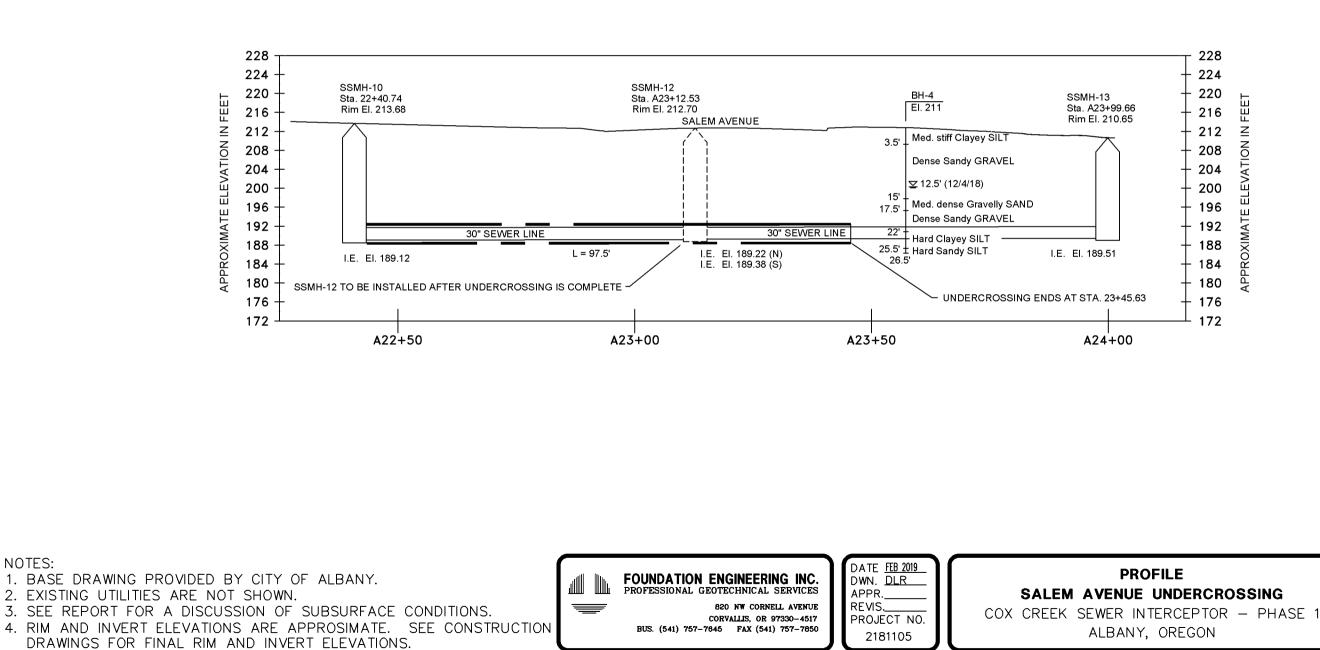
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DRAWINGS FOR FINAL RIM AND INVERT ELEVATIONS.





PROFILE FIGURE NO. RAILROAD UNDERCROSSING 7 A COX CREEK SEWER INTERCEPTOR - PHASE 1 ALBANY, OREGON



FILE NAME: FIG 8A

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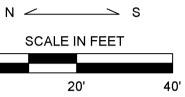
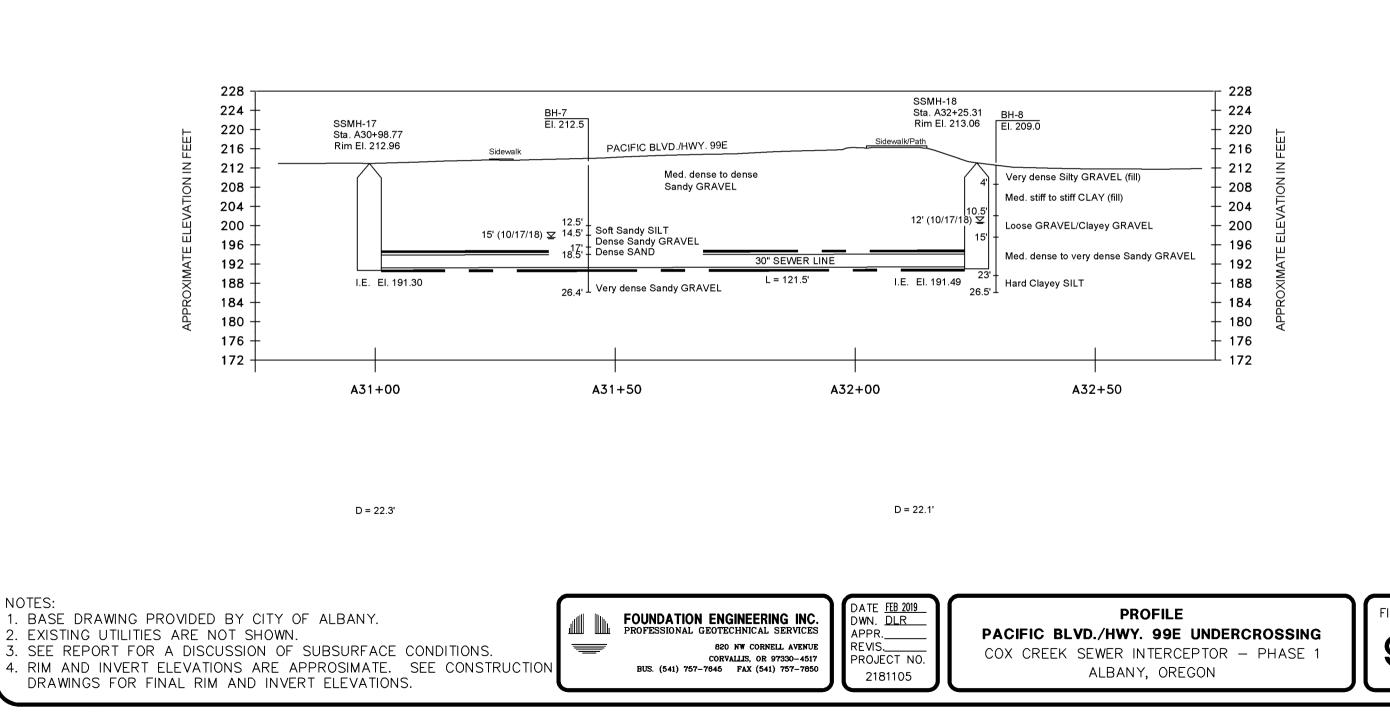
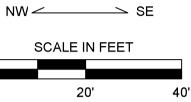


FIGURE NO. **8**A



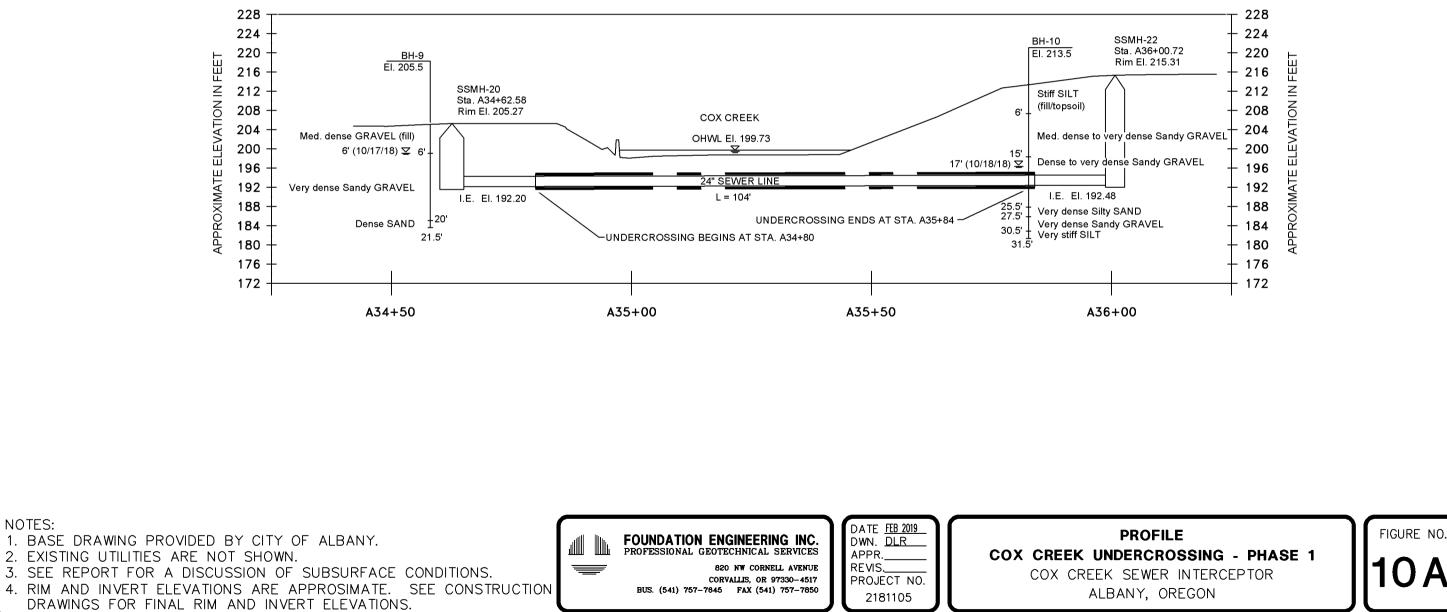
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FILE NAME:FIG 9A



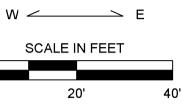
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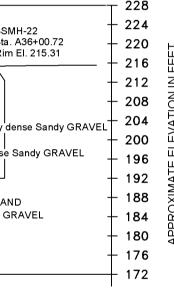
FIGURE NO. **9**A

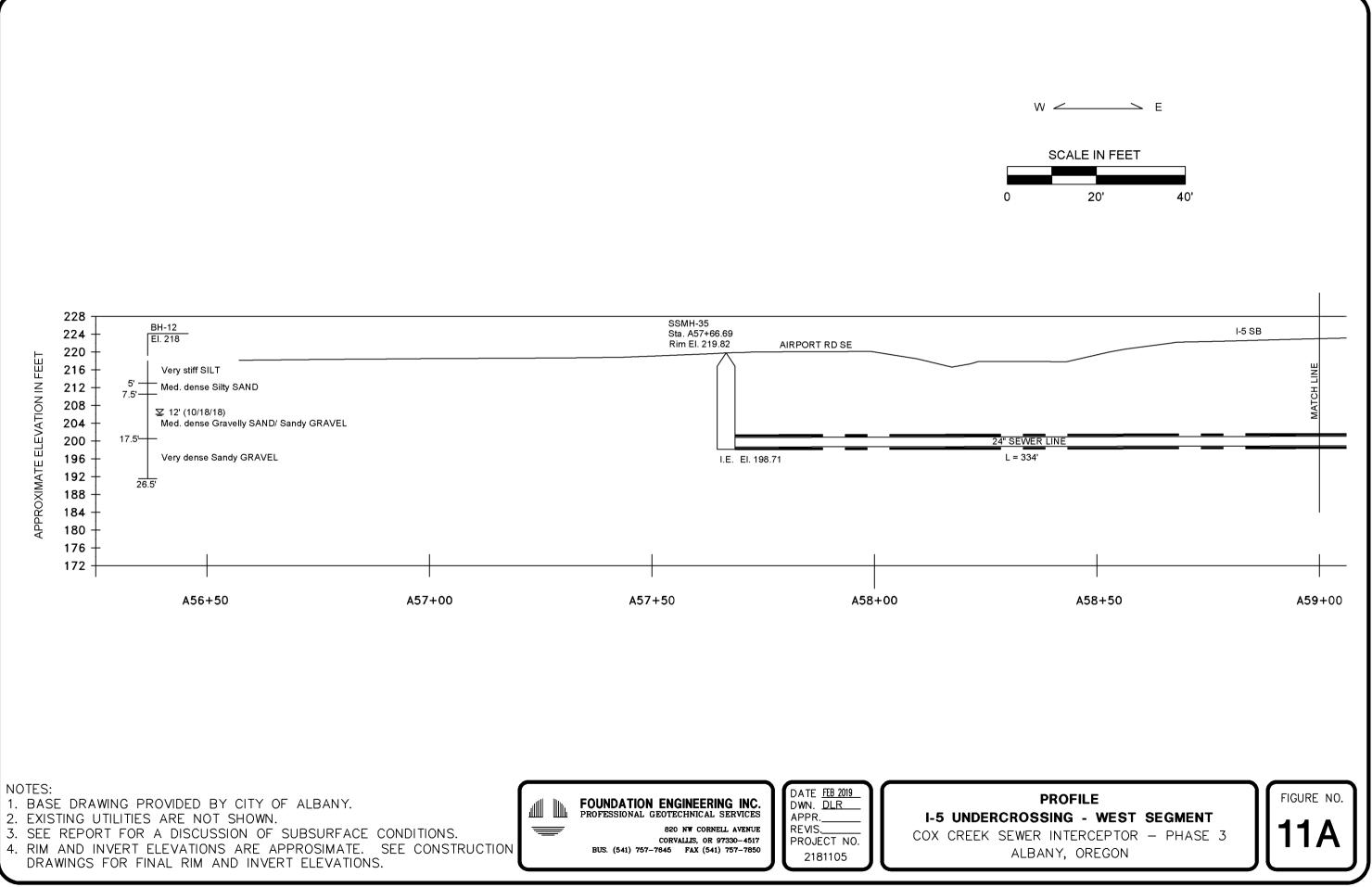


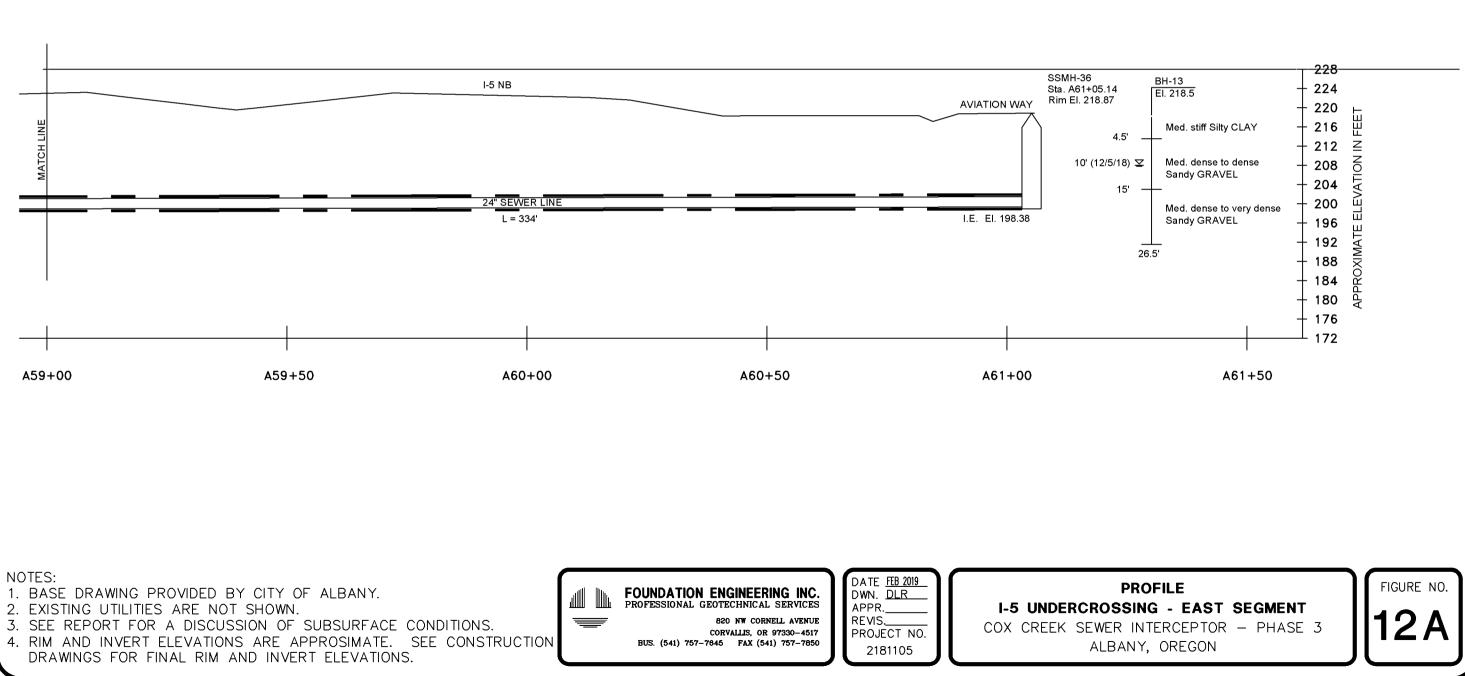
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FILE NAME: FIG 10A

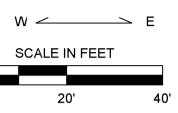








FILE NAME: FIG 12A



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Appendix B

Boring Logs

Foundation Engineering, Inc. Professional Geotechnical Services

DISTINCTION BETWEEN FIELD LOGS AND FINAL LOGS

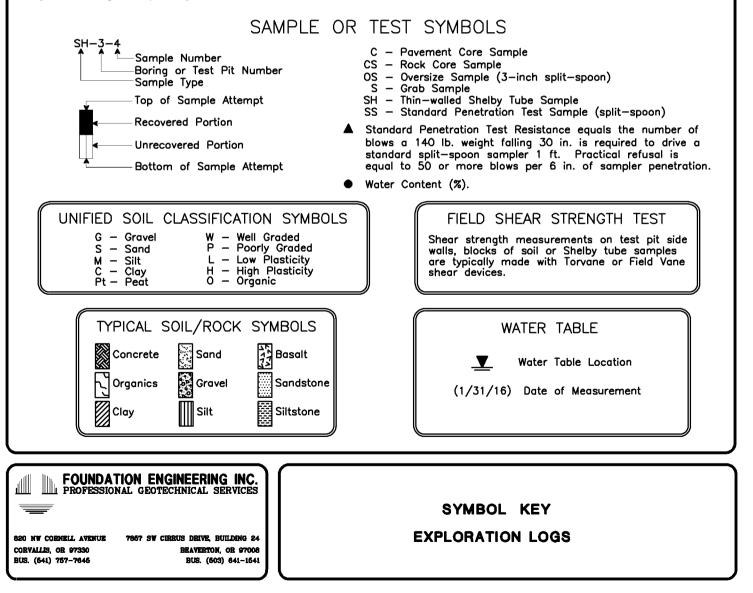
A field log is prepared for each boring or test pit by our field representative. The log contains information concerning sampling depths and the presence of various materials such as gravel, cobbles, and fill, and observations of ground water. It also contains our interpretation of the soil conditions 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.



Explanation of Common Terms Used in Soil Descriptions

Field Identification	Cohesive Soils			Granular Soils	
rield identifieddon	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.

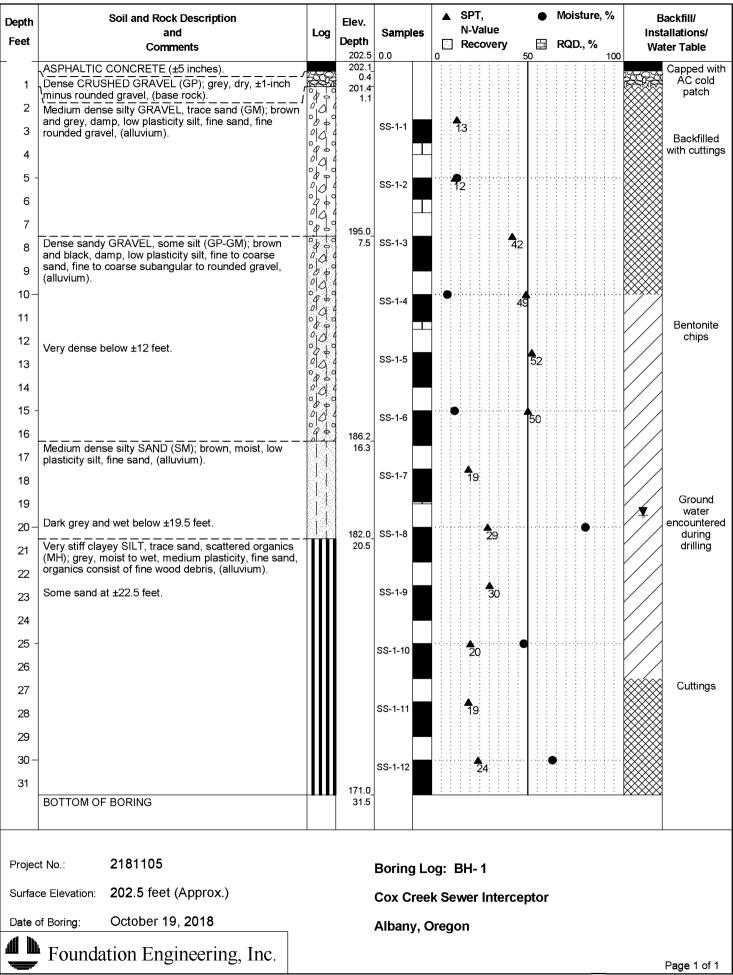
Term	Soil Structure Criteria
Stratified	Alternating layers at least ¼ inch thick.
Laminated	Alternating layers less than ¼ inch thick.
Fissured	Contains shears and partings along planes of weakness.
Slickensided	Partings appear glossy or striated.
Blocky	Breaks into small lumps that resist further breakdown.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

	ION ENGINEERING INC. JAL GEOTECHNICAL SERVICES	
820 NW CORNELL AVENUE Corvalles, or 97330 BUS. (541) 757-7645	7857 SW CIRRUS DRIVE, BUILDING 24 BEAVERTON, OR 97008 BUS. (503) 641–1541	

COMMON TERMS

SOIL DESCRIPTIONS



Depth	Soil and Rock Description	Log Samples N-Value							Backfill/ nstallations/		
Feet	and Comments	LOG	Depth 214	Samples	0	Recovery	io 🖽	RQD., %	100	Wat	er Table
	Loose silty GRAVEL (GM); brown and black, dry, low plasticity silt, fine angular to rounded gravel, (fill).		0.0 213.3 0.8								Capped with gravel
2	Very stiff sandy SILT (ML); brown, dry, low plasticity, fine sand, (alluvium).										
3				SS-2-1	9				: :		Backfilled
4					· · ·						with cuttings
5 -				SS-2-2	••••••	• 74	•••••		•••		
6											
7	Very dense silty GRAVEL (GM); brown and black, dry,		207.0_ 7.0		· · · · · · · · · · · · · · · · · · ·						
8	low plasticity silt, fine to coarse subangular to rounded gravel, (alluvium).	000		SS-2-3	· · ·			67			
9					· · ·						
10-	Very dense sandy GRAVEL, some silt (GP-GM);		204.0_ 10.0	SS-2-4	•	·····		Å 66	•••••••		
11	brown and black, damp, low plasticity silt, fine to coarse sand, fine subangular to rounded gravel,				· · · · · · · · · · · · · · · · · · ·						Bentonite
12	(alluvium).	000									chips
13				SS-2-5				<u> </u>			
14					· · · · · · · · · · · · · · · · · · ·	· ·					
15 -	Medium dense and moist to wet at ±15 feet.	000		SS-2-6		27					
16	Trace silt and fine to coarse gravel below ±15 feet.	000									
17		000			· · · · · · · · · · · · · · · · · · ·						
18	Dense from ±17.5 to 20 feet.	900		SS-2-7	· · · · · · · · · · · · · · · · · · ·	37					
19		000			· · · · · · · · · · · · · · · · · · ·						Ground
20-	Wet below ±20 feet.			SS-2-8		45			• • • • • • •		water encountered
21		0000			· · ·						during drilling
22		040		SS-2-9							
23				33-2-9				64			
24		000			· · · · · · · · · · · · · · · · · · ·						
25 -		0000		SS-2-10	•••••••••			62	••••••••		
26			187.0		· · ·						Cuttings
27	Dense silty SAND (SM); dark grey, wet, low plasticity silt, fine sand, (alluvium).		27.0	SS-2-11		•					outtingo
28					· · · · · · · · · · · · · · · · · · ·						
29 30-	Very dense SAND (SP); black, wet, fine sand,		184.5_ 29.5		· · · · · · · · · · · · · · · · · · ·						
31	(alluvium).			SS-2-12				64			
	BOTTOM OF BORING		182.5_ 31.5						::		
Projec	et No.: 2181105			Boring Lo	og: I	BH- 2					
Surfac	ce Elevation: 214.0 feet (Approx.)			Cox Cree	k Se	wer Interce	otor				
Date o	of Boring: October 19, 2018			Albany, C	rego	on					
1 h	Foundation Engineering, Inc.			, , -							
	roundation Engineering, me.							astedited	1/23		Page 1 of 1

Depth Feet	Soil and Rock Description and	Log	Elev. Depth	Samples		SPT, N-Value	Moisture, %	Backfill/ Installations/
	Comments		214		0	Recovery E	RQD., %	
2 3 4	Loose to dense CRUSHED GRAVEL, scattered cobbles (GP); grey, moist, ±1½-inch minus subangular to subrounded gravel, cobbles up to ±4 inch diameter, (fill). Medium stiff CLAY, scattered organics (CL); grey, moist, medium plasticity, organics consist of fine roots, (topsoil/fill). Medium dense silty GRAVEL (GM); brown and black, moist, low plasticity silt, fine to coarse subangular to		0.0 212.8_ 1.2 210.0_ 4.0	SS-3-1	7.			Backfilled with cuttings
5 - 6 7	rounded gravel, (alluvium).		206.5_	SS-3-2		15		Bentonite
8 9 10-	Dense sandy GRAVEL, some silt (GP-GM); brown and black, moist, low plasticity silt, medium sand, fine to coarse subangular to rounded gravel, (alluvium).		7.5	SS-3-3		46		chips
11 12 13 14	Fine to coarse sand below ±12.5 feet.			SS-3-5		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
15 - 16 17	Medium dense at ±15 feet.			SS-3-6	•	22		
18 19	Wet below ±18 feet.	000000		SS-3-7		37		Ground water encountered during drilling
20- 21 22	Very dense below ±20 feet.			SS-3-8		55	•	
23 24 25 -	Very dense silty GRAVEL, some sand (GM); brown		189.0_ 25.0	SS-3-9		•		
26 27 28	and black and iron stained, low plasticity, fine to		186.5_	SS-3-11			50/5	
28 29 30-	brown and black, wet, low plasticity silt, fine to medium sand, fine to coarse subangular to rounded gravel, (alluvium). Very dense silty GRAVEL, some sand (GM); grey,		184.0_			•	83	Cuttings
31	wet, low plasticity silt, fine to medium sand, fine to coarse subangular to rounded gravel, (alluvium). BOTTOM OF BORING		182.5_ 31.5				ο	
Projec				Boring Lo	og: E	BH- 3		
Surfac	e Elevation: 214.0 feet (Approx.)			Cox Cree	k Se	wer Interceptor		
Date	of Boring: December 5, 2018			Albany, C	rego	on		
	Foundation Engineering, Inc.							Page 1 of 1

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Last edited 1/23/19 mmw

Depth	Soil and Rock Description and	Log	Elev.	Samples		SPT, INTRODUCTION SPT, INTRODUCTION SPT, INTRODUCTION SPACE	Moisture, %	Backfi Installati	
Feet	Comments		Depth 211	campiee	, 🖸	Recovery	RQD., %	Water Ta	
 1 2 3	Medium stiff clayey SILT, trace gravel, scattered organics (MH); brown, damp, medium plasticity, fine subangular gravel, organics consist of fine roots, (topsoil/fill).		0.0	SS-4-1		1 6		sod	ped with (0-±0.5 feet)
4 5 - 6	Dense sandy GRAVEL, some silt (GP-GM); brown and black, moist, low plasticity silt, medium sand, fine to coarse subangular to rounded gravel, (alluvium).		207.5_ 3.5	SS-4-2				with (±C	ickfiled cuttings).5 to 6 feet)
7 8 9	Medium dense below ±7.5 feet.			SS-4-3		28			ntonite chips
10- 11 12 13 14	Fine to medium sand, wet, and iron-stained below ± 12.5 feet.			SS-4-4		1 8 2 4		v v enco d	round water ountered luring Irilling
15 - 16 17 18	Medium dense gravelly SAND, trace silt (SP); brown and black, wet, low plasticity silt, fine to medium sand, fine subangular to rounded gravel, (alluvium).	000	196.0_ 15.0 193.5_ 17.5	SS-4-6		21 45			
19 20 <i>-</i> 21	black, wet, lów plasticity silt, fine to coarse sand, fine to coarse subangular to rounded gravel, (alluvium). Very dense at ±20 feet.			SS-4-8		•	77		
22 23 24	Hard clayey SILT (MH); grey, moist to wet, medium plasticity, (alluvium).	0 / 1	189.0_ 22.0	SS-4-9		32		Cı	uttings
25 - 26	Hard sandy SILT (ML); grey, wet, low plasticity silt, fine sand, (alluvium). BOTTOM OF BORING		185.5_ 25.5 184.5_ 26.5	SS-4-10		37			
Projec	rt No.: 2181105			Boring Lo	og: I	BH- 4			
Surfac	e Elevation: 211.0 feet (Approx.)			Cox Cree	k Se	wer Intercepto	r		

Date of Boring: December 4, 2018

Foundation Engineering, Inc.

Albany, Oregon

Depth Feet	Soil and Rock Description and Comments	Log	Elev. Depth	Samples		SPT, N-Value Recovery			Inst	ackfill/ allations/ ter Table
	PORTLAND CEMENT CONCRETE (±9 inches).	0, 6, 4 9, 4	210 0.0 209.3		0			<u>100</u>		Capped with
1	Dense CRUSHED ROCK (GP); grey, dry, ±¾-inch		0.8							Quikrete PCC
2	Iminus angular rock (fill/leveling layer). Very stiff sandy SILT (ML); brown, dry, low plasticity,		209.1 0.9							
3	fine sand, (topsoil/possible fill).			SS-5-1		38				
4	Dense silty GRAVEL, trace sand (GM); brown and		206.5_ 3.5			· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·		Backfilled with cuttings
5 -	black, dry, low plasticity silt, fine to medium sand, fine to coarse subangular to rounded gravel, (alluvium).									
6		000		SS-5-2		48				
		000								
7	Very dense below ±7.5 feet.			SS-5-3			▲ . 52			Bentonite chips
8							J <u>z</u>			ompo
9		000	200.0							
10-	Very dense sandy GRAVEL, some silt (GP-GM);		200.0_ 10.0	SS-5-4		· · · · · · · · · · · · · · · · · · ·	≜			
11	brown and black and iron-stained, moist, low plasticity silt, fine to coarse sand, fine to coarse subangular to									
12	rounded gravel, (alluvium).	00								Ground water
13	Wet below ±12.5 feet.	a d		SS-5-5			57			encountered during
14										drilling
15 -	Dense from ±15 to 20 feet.	000		SS-5-6		46				
16		000		00-0-0		40				
17		000								
18		000		SS-5-7		44				
19		olg c								
20 -										
21				SS-5-8				70		
 22		000								
23	Hard clayey SILT, some sand (MH); grey, moist to	01010	187.5_ 22.5	SS-5-9		• A 38				
23	wet, low plasticity, fine sand, (alluvium).									Cuttings
										C C
25 -				SS-5-10		35				
26	BOTTOM OF BORING		183.5_ 26.5							
			20.0							
Projec	t No.: 2181105			Boring L	og: I	BH- 5				
Surfac	e Elevation: 210.0 feet (Approx.)			Cox Cree	ek Se	wer Interce	otor			
Date o	of Boring: December 4, 2018			Albany, (Drege	on				
1 T	Foundation Engineering, Inc.				-					P age 1 of 1

Depth Feet	Soil and Rock Description and Comments	Log	Elev. Depth	Samples	_	SPT, • N-Value Recovery	Moisture, % RQD., %	Backfill/ Installations/ Water Table
- - 1 2 3 4 5 - 6 7 8 9 10- 11 12 13 14 15 16 17 18 19 20- 21 21 23 24 25 26 -	Comments Medium stiff SILT, some sand, scattered organics (ML); brown, damp to moist, low plasticity, fine to Imedium sand, organics consist of fine roots (topsoil/fill). Medium dense sandy GRAVEL, some silt (GP-GM); brown, damp, low plasticity silt, fine to coarse sand, fine subangular to rounded gravel, (alluvium). Loose at ±7.5 feet. Trace silt and moist below ±7.5 feet. Dense at ±10 feet. Soft sandy SILT, some gravel (ML); brown, wet, low plasticity, fine to medium sand, fine subangular to rounded gravel, (alluvium). Dense sandy GRAVEL, trace silt (GP); brown and black, wet, low plasticity silt, fine to coarse sand, fine to coarse subangular to rounded gravel, (alluvium). Dense SAND (SP); black, wet, fine to medium sand, (alluvium). Very dense sandy GRAVEL (GP); brown and black, wet, medium to coarse sand, fine to coarse subangular to rounded gravel, (alluvium). Dense below ±20 feet. Very dense sandy GRAVEL, some silt (GP-GM); black and brown and iron-stained, wet, low plasticity silt, fine to coarse sand, fine to coarse subangular to subrounded gravel, (alluvium). BOTTOM OF BORING		212.5 0.0 212.0 0.5 200.0 12.5 198.0 14.5 195.5 17.0 194.0 18.5	SS-7-1		Recovery 50 23 19 36 40 40	RQD., % 100 89711" 89711"	Water Table Capped with sod (0 to ±0.5 feet) Backfilled with cuttings Bentonite chips Ground water encountered during drilling Cuttings
Surfac	t No.: 2181105 ce Elevation: 212.5 feet (Approx.) of Boring: October 17, 2018 Foundation Engineering, Inc.			Boring Lo Cox Cree Albany, C	k Se	wer Interceptor		
							act adited 1/22	Page 1 of 1

Depth	Soil and Rock Description and	Elev.▲SPT,●Moisture, %Backfill/LogSamplesN-ValueInstallation									
Feet	Comments	209	Depth 209	Callbea	0	Recovery	, 🖽	RQD., %	6 100	Wat	ter Table
 1 2 3 4 5 -	Very dense silty GRAVEL, scattered organics (GM); brown, dry, low plasticity silt, fine to coarse angular to rounded gravel, organics consist of fine roots and grasses, (fill). Concrete debris (±8 inches thick) at ±1 foot. Medium stiff CLAY, some gravel, trace sand (CL); brown, damp, low plasticity, medium to coarse sand, fine rounded gravel, (fill).		0.0 205.0_ 4.0	SS-8-1				* 70			Capped with gravel Backfilled with cuttings
6 7 8 9 10-	Stiff and iron-stained and glass debris at ±7.5 feet.			SS-8-3	99						
11 12 13 14	Loose clayey GRAVEL (GC); brown, wet, medium plasticity clay, fine rounded gravel, (alluvium). Loose GRAVEL (GP); grey, wet, fine to coarse angular to rounded gravel, (alluvium).		198.5_ 10.5 196.5_ 12.5	SS-8-4	1 7. ▲.4.						Ground water encountered during drilling
15 - 16 17 18	Very dense sandy GRAVEL (GP); grey, wet, medium sand, fine to coarse subangular to rounded gravel, (alluvium). Medium dense sandy GRAVEL, some silt (GP-GM); light brown, wet, low plasticity silt, fine to medium		194.0_ 15.0 191.5_ 17.5	SS-8-6		1	57				Bentonite chips
19 20- 21 22 23	sand, fine subangular to rounded gravel, (alluvium).		186.0_ 23.0	SS-8-8		● 3 0					Cuttings
24 25 - 26	BOTTOM OF BORING		182.5_ 26.5	SS-8-10		•	51				
Projec	t No.: 2181105			Boring Lo	og: I	3H- 8					
Surfac	e Elevation: 209.0 feet (Approx.)			Cox Cree	k Se	wer Interce	otor				
Date o	of Boring: October 17, 2018			Albany, C	rego	on					
	Foundation Engineering, Inc.							astedite	_		P age 1 of 1

Depth Feet	Soil and Rock Description and Comments	Log	Elev. Depth	Samples		SPT, N-Value Recovery	•	Moisture, % RQD., %	Inst Wa	ackfill/ allations/ ter Table
 1 2 3 4 5 - 6 7 8 9 10- 11 12 13 14 15 - 16 17 18 19 20- 21	Wedium dense GRAVEL, some silt (GP-GM); grey and brown, dry to moist, low plasticity silt, fine to coarse subangular to rounded gravel, (fill). Very dense sandy GRAVEL, some silt (GP-GM); brown, wet, low plasticity silt, medium to coarse sand, fine to coarse subangular to rounded gravel, (alluvium). Trace silt below ±12.5 feet. Dense SAND, some silt (SP-SM); brown and iron-stained, wet, fine sand, (alluvium). BOTTOM OF BORING		205.5	SS-9-3 SS-9-4 SS-9-5 SS-9-6 SS-9-7 SS-9-7			5 7	100 65 65		Ground water encountered during drilling Bentonite chips
Projec				Boring Lo	og: E	3H- 9				
	ce Elevation: 205.5 feet (Approx.)					wer Interce	otor			
Date o	of Boring: October 17, 2018			Albany, C	Drego	on				
	Foundation Engineering, Inc.									P age 1 of 1

Page 1 of 1

Depth	Soil and Rock Description and	Log	Elev.	Samples N-Value Inst				Backfill/ tallations/				
Feet	Comments	Log	Depth 213.5		0	Recovery 50		RQ	D., 9	% 100	Wat	ter Table
 1 2	Stiff SILT, trace gravel, scattered organics (ML); brown, damp, low plasticity, fine rounded gravel, organics consist of fine roots, (topsoil/fill).		0.0									Capped with sod (0 to ±0.5 feet)
3 4				SS-10-1		2	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·			Backfilled with cuttings
5 -				SS-10-2		15	······································	•••••••••••••••••••••••••••••••••••••••				
6 7	Medium dense silty GRAVEL, scattered organics (GM); brown, damp, low plasticity silt, fine to coarse		207.5 6.0				· · · · · · · · · · · · · · · · · · ·					
8	rounded gravel, organics consist of fine roots, (alluvium).			SS-10-3		17	· · · · · · · · · · · · · · · · · · ·					
9												
10- 11				SS-10-4	1	1	•••••••••••••••••••••••••••••••••••••••					
12		000	4									Bentonite chips
13	Very dense below ±12.5 feet.			SS-10-5		4	53		· · · · · · · · · · · · · · · · · · ·			
14		000	3									
15 -	Very dense sandy GRAVEL, trace silt (GP); brown	000	198.5 15.0	SS-10-6	•		6	Ø				
16 17	and black, moist, low plasticity silt, medium to coarse sand, fine to coarse subangular to rounded gravel, (alluvium).	000					· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·			Ground water
18		000		SS-10-7			52					encountered during
19		000					· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·			drilling
20-	Dense at ±20 feet.	000		SS-10-8		• 40						
21		000					· · · · · · · · · · · · · · · · · · ·					
22 23	Some silt and iron-stained at ±22.5 feet.	000		SS-10-9			· · · · · · · · · · · · · · · · · · ·	▲ 66				
24		000					· · ·					
25 -			188.0	SS-10-10	· · · · · · · ·	•	0			·		
26	Very dense silty SAND (SM); grey, wet, low plasticity silt, fine sand, (alluvium).		25.5				· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·			Cuttings
27 28	Very dense sandy GRAVEL, trace silt (GP); brown	000	186.0 27.5	SS-10-11						83/11		Cuttings
20	and black, wet, low plasticity silt, fine to coarse sand, fine to coarse subangular to rounded gravel, (alluvium).	000					· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·			
30-	·	000	183.0	SS-10-12		• 26						
31	Very stiff SILT (ML); brown, wet, low plasticity, (alluvium).	ļIII	30.5 182.0 31.5		· · ·							
	BOTTOM OF BORING											
	0101105											
Projec	et No.: 2181105			Boring Lo	-							
	of Boring: October 18, 2018					wer Intercept	or					
	_			Albany, C	vrego	on						
	Foundation Engineering, Inc.										3/19 mmw	P age 1 of 1

Depth	Soil and Rock Description		Elev.			SPT,	٠	Moisture, %	В	ackfill/
Feet	and Comments	Log	Depth	Samples		N-Value Recovery		RQD., %		allations/ ter Table
	ASPHALTIC CONCRETE (±3 inches).	10000	214 213.8		0		 	100		Capped with
1	Dense CRUSHED ROCK (GP); grey, dry, ±1 1/2-inch minus angular rock, (base rock).		0.3 ⁻ 213.4							AC cold patch and
2	Very dense silty GRAVEL, some sand (GM); black and brown, dry to damp, low plasticity silt, medium to		0.6							gravel
3	coarse sand, fine to coarse subangular to rounded gravel, (alluvium).	000		SS-11-1			56			Backfilled
4										with cuttings
5 -				SS-11-2				72		
6 7										
7 8	Dense sandy GRAVEL, some silt (GP-GM); black and	L M	206.5 7.5	SS-11-3		30				
9	brown, moist, low plasticity silt, medium to coarse sand, fine to coarse subangular to rounded gravel,	000								
10-	(alluvium).	0000		00.44.4						
11				SS-11-4			42			Bentonite
12										chips
13	Very dense and iron-stained below ±12.5 feet.	000		SS-11-5			55			Ground
14		000							Y	water encountered
15 -		000		SS-11-6				52		during drilling
16		00								
17			196.5	SS-11-7						
18	Medium dense sandy GRAVEL, trace silt (GP); grey and brown, wet, low plasticity silt, fine to coarse sand, fine to coarse subangular to rounded gravel,	000	17.5	55-11-7		26				
19	(alluvium).	000								
20- 21	Dense at ±20 feet.	0000		SS-11-8			44			
21		000								
23	Very dense below ±22.5 feet.	000		SS-11-9				52		Cuttings
24		000								
25 -		000		SS-11-10			· · · · · · · · · · · · · · · · · · ·	50/5		
	BOTTOM OF BORING	0,20	188.1_ 25.9					30/3		
1										
Projec	t No.: 2181105			Boring L	og: I	BH-11				
Surfac	e Elevation: 214.0 feet (Approx.)			Cox Cree	ek Se	wer Inter	ceptor			
Date o	of Boring: October 18, 2018			Albany, G	Drege	on				
1 U	Foundation Engineering, Inc.				-					P age 1 of 1

Depth Feet	Soil and Rock Description and	Log	Elev. Depth	Samples		SPT, N-Value Recovery	•	Moisture, % RQD., %	Backfill/ Installations/
L			218	0.3	0	Recovery	50 	100	
1 2 3	ASPHALTIC CONCRETE (±4 inches). Dense CRUSHED ROCK (GP); grey, dry, ±1 1/2-inch minus rock, (base rock). Very stiff SILT, scattered organics (ML); light brown and iron-stained, dry to damp, low plasticity, organics consist of fine roots, (alluvium).		217.7 0.3 217.0 [−] 1.0	SS-12-1		19			AC cold AC cold patch and gravel
4									Backfilled
5 -	Medium dense silty SAND (SM); brown, dry to damp, low plasticity silt, fine sand, (alluvium).		213.0_ 5.0	SS-12-2		17			with cuttings
7 8 9	Medium dense gravelly SAND, some silt (SP-SM); brown and grey, dry to damp, low plasticity silt, fine to medium sand, fine to coarse rounded gravel, (alluvium).	d 0	210.5_ 7.5	SS-12-3		19			
10- 11 12	Medium dense sandy GRAVEL, trace silt (GP); brown and black, wet, low plasticity silt, fine to medium sand, fine to coarse subangular to rounded gravel, (alluvium).		208.0_ 10.0	SS-12-4		2			Ground water encountered
13 14 15 -			203.0_	SS-12-5		30			during drilling
15 - 16 17	Medium dense gravelly SAND (SP); brown and black, wet, fine to medium sand, fine rounded gravel, (alluvium).	0 0	15.0 200.5	SS-12-6		20			Bentonite chips
18 19 20 <i>-</i>	Very dense sandy GRAVEL, trace silt (GP); brown and black, wet, low plasticity silt, medium to coarse sand, fine to coarse subangular to rounded gravel, (alluvium).			SS-12-7			56		
21 22				SS-12-8				71	Cuttings
23				SS-12-9			51		
24		000							
25 - 26	Some silt below ±25 feet. BOTTOM OF BORING		1	SS-12-10			· · · · · · · · · · · · · · · · · · ·	\$1	
Projec	st No.: 2181105	<u> </u>		Boring L	00.	BH_12			
-	e Elevation: 218.0 feet (Approx.)			-	-	wer Interce	otor		
	of Boring: October 18, 2018			Albany, (μUI		
	Foundation Engineering, Inc.			Albally, V	Sieg			act edited 1/22	Page 1 of 1

Depth	Soil and Rock Description		Elev. A SPT, Moisture, % Backfill							
Feet	and Comments	Log	Depth	Samples		N-Value Recovery		RQD., %		allations/ ter Table
	Medium stiff silty CLAY, some sand (CL); grey and	1.1.1	218.5 0.0		0	-	<u>50</u>	100 : : : : : : :		Capped with
1	brown and iron-stained, moist, low plasticity, fine sand, (alluvium).									sod (0 to ±0.5 feet)
2										10.0 1000)
3				SS-13-1	8					Backfilled
4			214.0							with cuttings
5 -	Dense sandy GRAVEL, some silt (GP-GM); brown and black, moist, low plasticity silt, fine to coarse		4.5	SS-13-2						
6	sand, fine to coarse subangular to rounded gravel, (alluvium).	000	1	00-10-2			43			
7		000								Bentonite
8		0000		SS-13-3		38	3			chips
9										Ground
10-	Medium dense and wet below ±10 feet.	000		SS-13-4	(28			. X	water encountered
11	Weduin dense and wet below 110 leet.	000				20				during drilling
12			206.0							arining
13	Medium dense silty GRAVEL, some sand (GM), brown and black, wet, low plasticity silt, fine sand, fine to	0000		SS-13-5		19				
14	coarse subangular to rounded gravel, (alluvium).	0 pc								
15 -	 Very dense sandy GRAVEL, some silt (GP-GM);		203.5_	SS-13-6		•		, , , , , , , , , , , , , , , , , , , ,		
16	brown and black, wet, low plasticity silt, fine to coarse sand, fine to coarse subangular to rounded gravel,		10.0	00-10-0			57			
17	(alluvium).	000								
18		00		SS-13-7				6 7		
19										
20 -		000		SS-13-8						
21										
22										
23		000		SS-13-9				76		
24										Cuttings
25 -	Medium dense at ±25 feet.			SS-13-10		● ▲ 28				
26		000	192.0_							
	BOTTOM OF BORING		26.5							
Projec	ot No.: 2181105			Boring L	.og:	BH-13				
Surfac	e Elevation: 218.5 feet (Approx.)			Cox Cre	ek Se	wer Inter	ceptor			
Date o	of Boring: December 5, 2018			Albany,	Orea	on				
	Foundation Engineering, Inc.			- 3)						P age 1 of 1



Appendix C

Laboratory Testing

Foundation Engineering, Inc. Professional Geotechnical Services

Sample Number	Sample Depth (ft)	Moisture Content (percent)	% Fines	ш	PL	PI	USCS Classification
SS-1-2	5.0 - 6.5	13.1					-
SS-1-4	10.0 - 11.5	8.1					
SS-1-6	15.0 - 16.5	11.9					
SS-1-8	20.0 - 21.5	80.0		_			
SS-1-10	25.0 - 26.5	47.9		79	53	26	МН
SS-1-12	30.0 - 31.5	62.8					
SS-2-2	5.0 - 6.5	19.5					
SS-2-4	10.0 - 11.5	9.0					
SS-2-5	12.5 - 14.0	6.3					
SS-2-8	20.0 - 21.5	12.6					
SS-2-10	25.0 - 26.5	15.3					
SS-2-11	27.5 - 29.0	30.7	17.4				
SS-2-12	30.0 - 31.5	23.9					
SS-3-2	5.0 - 6.5	13.4					
SS-3-4	10.0 - 11.5	7.5					
SS-3-6	15.0 - 16.5	10.0					
SS-3-8	20.0 - 21.5	16.2					
SS-3-10	25.0 - 26.5	16.7	15.8				
SS-3-12	30.0 - 31.5	20.7					
SS-4-2	5.0 - 6.5	12.3					
SS-4-4	10.0 - 11.5	8.9					
SS-4-6	15.0 - 16.5	19.2					
SS-4-8	20.0 - 21.5	13.7					
SS-4-9	22.5 - 24.0	32.7		59	38	21	MH
SS-4-10	25.0 - 26.5	40.4	60.9				
SS-5-2	5.0 - 6.5	5.2					
SS-5-4	10.0 - 11.5	6.9					
SS-5-6	15.0 - 16.5	11.4					
SS-5-8	20.0 - 21.5	11.1					
SS-5-9	22.5 - 24.0	25.1	49.9				
SS-5-10	25.0 - 26.5	28.7					

 Table 1C.
 Moisture Contents, Percent Fines, & Atterberg Limits

Sample Number	Sample Depth (ft)	Moisture Content (percent)	% Fines	L	PL	PI	USCS Classification
SS-7-2	5.0 - 6.5	11.8					
SS-7-4	10.0 – 11.5	13.5					
SS-7-6	15.0 - 16.5	11.3					
SS-7-8	20.0 - 21.5	16.1					
SS-7-10	25.0 - 26.5	12.6					
SS-8-2	5.0 - 6.5	12.2					
SS-8-4	10.0 – 11.5	17.6					
SS-8-6	15.0 – 16.5	13.1					
SS-8-8	20.0 - 21.5	21.3					
SS-8-10	25.0 - 26.5	45.9					
SS-9-2	5.0 - 6.5	10.9					
SS-9-4	10.0 - 11.5	11.9					
SS-9-6	15.0 - 16.5	10.9					
SS-9-8	20.0 - 21.5	30.2					
SS-10-2	5.0 - 6.5	11.7					
SS-10-4	10.0 - 11.5	9.0					
SS-10-6	15.0 - 16.5	9.4					
SS-10-8	20.0 - 21.5	32.7					
SS-10-10	25.0 - 26.5	27.2	20.9				
SS-10-12	30.0 - 31.5	14.7					
SS-11-2	5.0 - 6.5	6.9					
SS-11-4	10.0 - 11.5	11.3					
SS-11-6	15.0 - 16.5	12.8					
SS-11-8	20.0 - 21.5	15.3					
SS-11-10	25.0 - 26.5	13.5					
SS-12-2	5.0 - 6.5	14.7					
SS-12-4	10.0 - 11.5	11.1					
SS-12-6	15.0 - 16.5	17.9					
SS-12-8	20.0 - 21.5	11.5					
SS-12-10	25.0 - 26.5	13.0					

Table 1C. Moisture Contents, Percent Fines, & Atterberg Limits (Cont.)

Sample Number	Sample Depth (ft)	Moisture Content (percent)	% Fines	ш	PL	PI	USCS Classification
SS-13-2	5.0 - 6.5	10.2					
SS-13-4	10.0 - 11.5	11.6					
SS-13-6	15.0 - 16.5	14.1					
SS-13-8	20.0 - 21.5	12.1					
SS-13-10	25.0 - 26.5	15.9					

Table 1C. Moisture Contents, Percent Fines, & Atterberg Limits (Cont.)