April 17, 2020

Mr. Chris Hardesty
Director – University Planning & Construction
Embry-Riddle Aeronautical University
1 Aerospace Blvd.
Daytona Beach, Florida 32114

ECS Project No. 56:1251

Reference: Addendum to Report of Geotechnical Exploration
Fitness Center
600 S Clyde Morris Blvd
Daytona Beach, Florida

Dear Mr. Hardesty:

As requested, ECS Florida, LLC (ECS) has completed the requested additional exploration for the subject site. Our services were performed in general accordance with our Change Order, dated March 27, 2020. We have previously performed the subsurface exploration and geotechnical report for the project as outlined in our proposal, and the results from that exploration were presented in our revised report dated January 07, 2020 (ECS Project Nos. 56:1250 & 56:1251). The current exploration was conducted to perform additional borings in the proposed Fitness Center area to evaluate the subsurface conditions in previously unexplored areas.

FIELD EXPLORATION

We performed a field exploration on April 6, 2020. The approximate boring locations are indicated on the Boring Location Diagram in Attachment A. Our personnel determined the boring locations using taped measurements from existing site features. The boring locations on the referenced Boring Location Diagram should be considered accurate only to the degree implied by the method of measurement used.

We located and performed two Standard Penetration Tests (SPT) borings, drilled to a depth of approximately 20 feet below the existing ground surface in general accordance with the methodology outlined in ASTM D 1586 to explore the subsurface conditions at the requested areas of proposed fitness center. Representative soil samples also were recovered from the SPT borings and returned to our laboratory for further evaluation.

General Subsurface Conditions

The subsurface conditions encountered were generally consistent with published geological mapping. The following table provides generalized characterizations of the soil and rock strata encountered during our subsurface exploration. For subsurface information at a specific location, refer to the Boring Logs in Appendix B.

Subsurface Stratigraphy

Approximate Depth Range (ft)	Elevation (ft)	Stratum	Description	Ranges of SPT(1) N-values (bpf)
0 to 20	El 23 to 3	I	Loose to Medium Dense SP,SP-SM, SM (Fine Sands, Fine SAND with silt, Silty sand)	8 to 29

Notes: (1) Standard Penetration Test.

Groundwater levels were measured at a depth of 6 feet in our borings as noted on the soil boring logs in Appendix B. Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors.

LABORATORY TESTING

The laboratory testing performed by ECS for this project consisted of selected tests performed on samples obtained during our field exploration operations. Selected samples of the soils encountered during the field exploration were subjected to quantitative laboratory testing to better define the composition of the soils encountered and to provide data for correlation to their anticipated strength and compressibility characteristics. The laboratory testing determined the moisture contents and fine contents of selected soil samples. The results of the laboratory testing are shown in the Laboratory Testing Summary included in Appendix C.

RECOMMENDATIONS

Based on the boring results it is our opinion the proposed fitness center can be supported by conventional shallow foundations. The proposed design and construction recommendations presented in our previous geotechnical report for the project (dated January 07, 2020) may be used for the Fitness Center.

CLOSING

We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Very truly yours,

ECS FLORIDA, LLC

Vinay K Arebelli
Staff Project Manager
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David W. Spangler, State of Florida, Professional Engineer, License No. 58770

This item has been digitally signed and sealed by David W. Spangler on the date indicated here.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

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APPENDICES

Appendix A – Drawings & Reports

- Boring Location Diagram

Appendix B – Field Operations

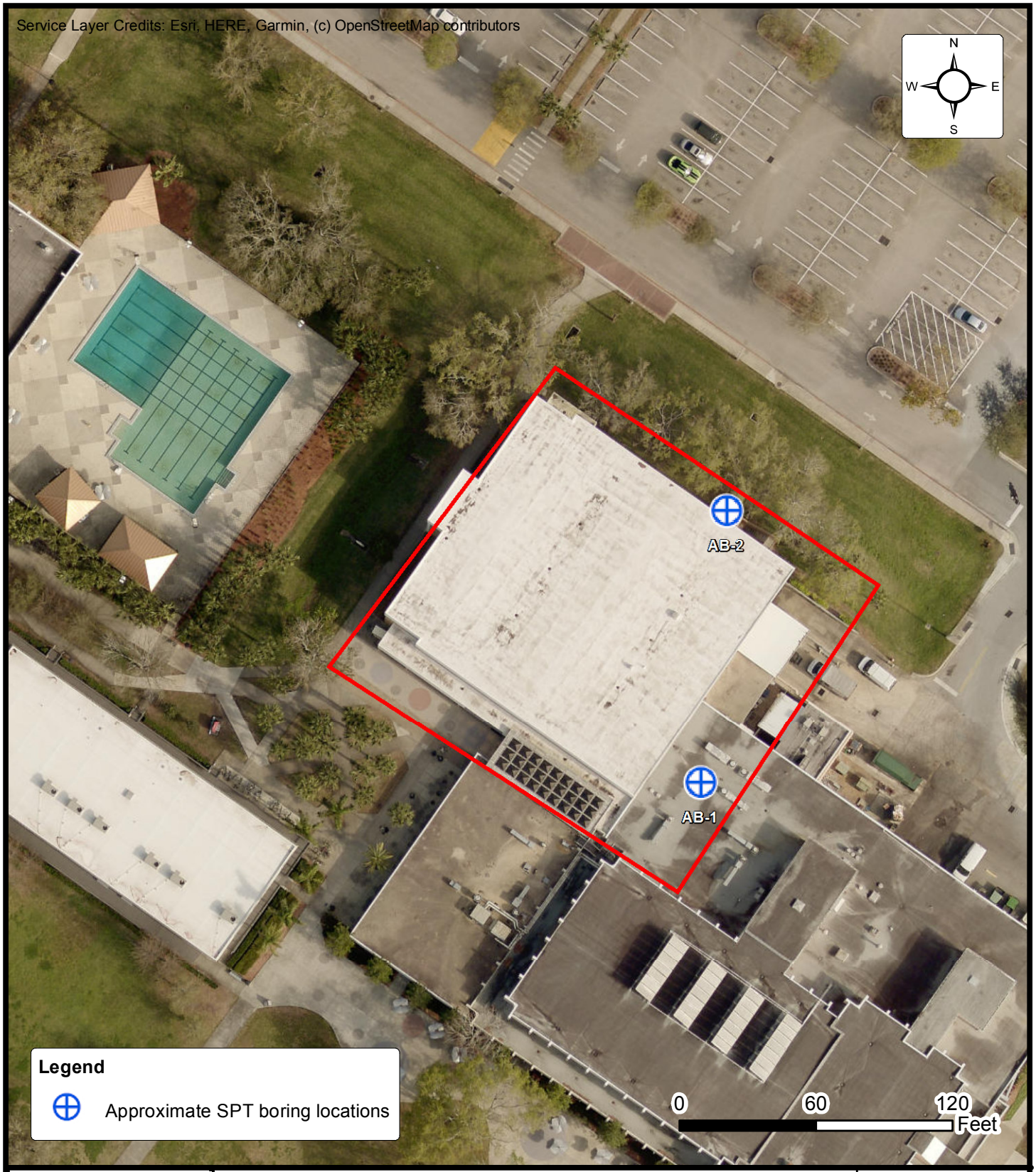
- Soil Classification Index
- Boring Logs AB-1 through AB-2

Appendix C – Laboratory Testing

- Laboratory Test Results

APPENDIX A – Drawings & Reports

Boring Location Diagram



Boring Location Diagram
FITNESS CENTER

600 S CLYDE MORRIS BLVD., DAYTONA BEACH

EMBRY-RIDDLE AERONAUTICAL UNIVERSITY

ENGINEER	DS05
SCALE	1 " = 60 '
PROJECT NO.	56:1251
SHEET	1 OF 1
DATE	4/15/2020

APPENDIX B – Field Operations

Soil Classification Index

Boring Logs AB-1 through AB-2

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]	
	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
	FILL[3] MAN-PLACED SOILS
	GW **WELL-GRADED GRAVEL** gravel-sand mixtures, little or no fines
	GP **POORLY-GRADED GRAVEL** gravel-sand mixtures, little or no fines
	GM **SILTY GRAVEL** gravel-sand-silt mixtures
	GC **CLAYEY GRAVEL** gravel-sand-clay mixtures
	SW **WELL-GRADED SAND** gravelly sand, little or no fines
	SP **POORLY-GRADED SAND** gravelly sand, little or no fines
	SM **SILTY SAND** sand-silt mixtures
	SC **CLAYEY SAND** sand-clay mixtures
	ML **SILT** non-plastic to medium plasticity
	MH **ELASTIC SILT** high plasticity
	CL **LEAN CLAY** low to medium plasticity
	CH **FAT CLAY** high plasticity
	OL **ORGANIC SILT or CLAY** non-plastic to low plasticity
	OH **ORGANIC SILT or CLAY** high plasticity
	PT **PEAT** highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS			
SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION		
DESIGNATION		**PARTICLE SIZES**
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS		
UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	**SPT[5] (BPF)**	**CONSISTENCY[7] (COHESIVE)**
<0.25	<3	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS	
SPT[5]	**DENSITY**
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
Dual Symbol *(ex: SW-SM)*	10	10
With	15 - 20	15 - 25
Adjective *(ex: "Silty")*	≥25	≥30

WATER LEVELS[6]		
	WL	Water Level (WS)(WD)
		(WS) While Sampling
		(WD) While Drilling
	SHW	Seasonal High WT
	ACR	After Casing Removal
	SWT	Stabilized Water Table
	DCI	Dry Cave-In
	WCI	Wet Cave-In

[1] *Classifications and symbols per ASTM D 2488-09 (Visual-Manual Procedure) unless noted otherwise.*

[2] *To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.*

[3] *Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-**FILL**)].*

[4] *Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).*

[5] *Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf).*

[6] *The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.*

[7] *Minor deviation from ASTM D 2488-09 Note 16.*

[8] *Percentages are estimated to the nearest 5% per ASTM D 2488-09.*

CLIENT	Job #:	BORING #	SHEET
Embry-Riddle Aeronautical University	56:1251	AB-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Fitness Center C 37082	

SITE LOCATION

600 S Clyde Morris Blvd., Daytona Beach, Volusia County, FL

NORTHING	EASTING	STATION

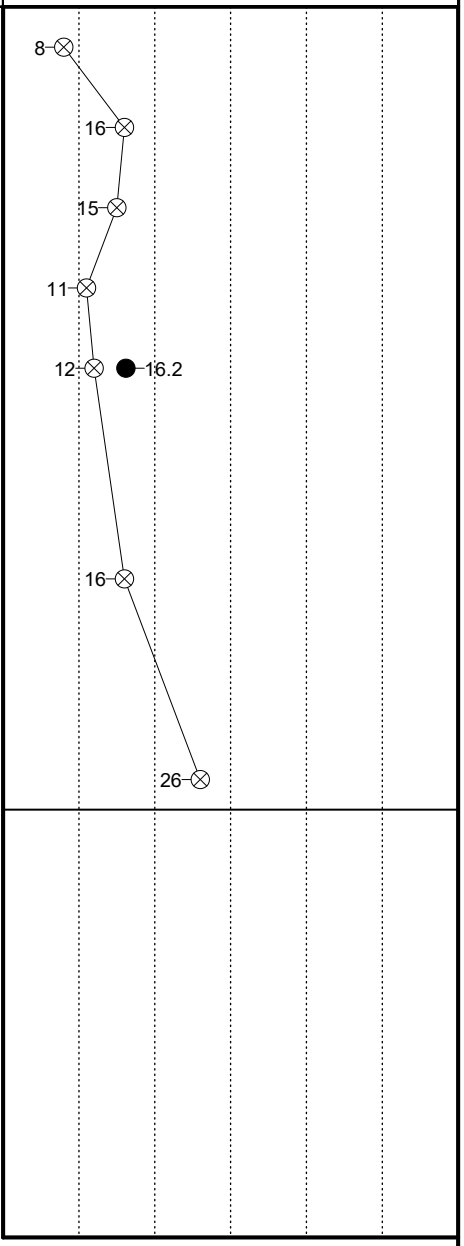
CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24	(SP) SAND, brown and gray, moist to saturated, loose to medium dense			3 4 4 4 6 8 8 8 10
	S-2	SS	24	24				
5	S-3	SS	24	24				8 7 8 6 5 6 6 8
	S-4	SS	24	24				
	S-5	SS	24	24	(SP-SM) SAND WITH SILT, dark brown, saturated, medium dense			5 7 7
10								
	S-6	SS	18	18				6 8 8
15								
	S-7	SS	18	18	(SP) SAND, brown, saturated, medium dense			6 12 14
20					END OF BORING @ 20'			
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 6 WS ☐ WD ☒	BORING STARTED 04/06/20	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 04/06/20	HAMMER TYPE Manual
WL	RIG Truck FOREMAN Francisco	DRILLING METHOD Mud-Rotary

CLIENT	Job #:	BORING #	SHEET
Embry-Riddle Aeronautical University	56:1251	AB-2	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Fitness Center C 37082	

SITE LOCATION

600 S Clyde Morris Blvd., Daytona Beach, Volusia County, FL

NORTHING	EASTING	STATION

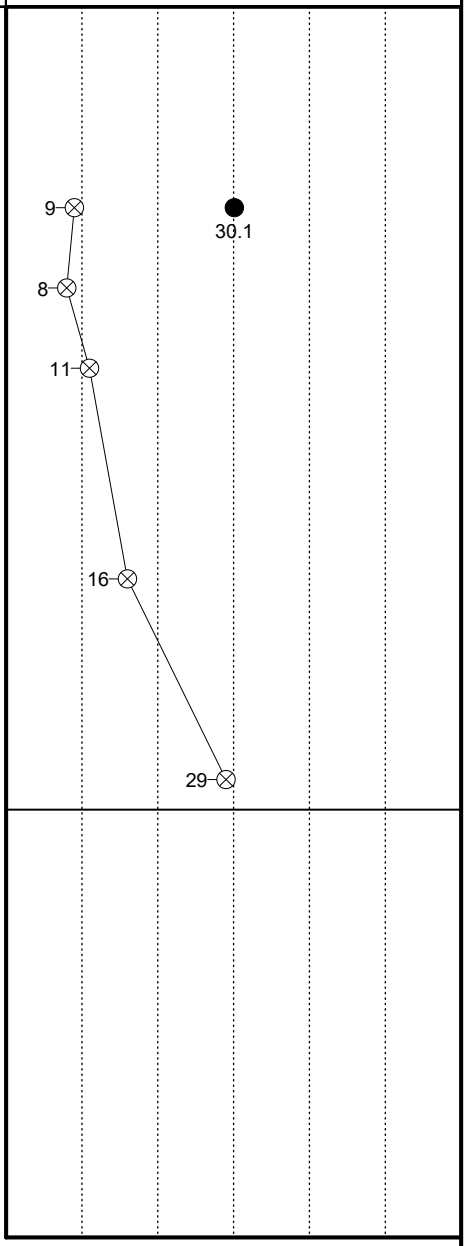
CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24	(SP) SAND, contains roots, gray, moist.			4 4 5
	S-2	SS	24	24				4 5 6
5	S-3	SS	24	24	(SM) SILTY SAND, dark brown, moist to saturated, loose to medium dense	▽		4 4 4
	S-4	SS	24	24				4 8 8
	S-5	SS	24	24				6 5 5
10					(SP) SAND, brown, saturated, medium dense			
	S-6	SS	18	18				6 8 8
15								
	S-7	SS	18	18				8 16 13
20					END OF BORING @ 20'			
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 6 WS ☐ WD ☒	BORING STARTED 04/06/20	CAVE IN DEPTH
▽ WL(SHW) ▼ WL(ACR)	BORING COMPLETED 04/06/20	HAMMER TYPE Manual
▽ WL	RIG Truck FOREMAN	DRILLING METHOD Mud-Rotary

APPENDIX C– Laboratory Testing

Laboratory Test Results

Laboratory Testing Summary

Sample Source	Sample Number	Start Depth (feet)	End Depth (feet)	Sample Distance (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5]		CBR Value[6]	Other
							LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
AB-1	S-5	8.0	10.0	2.0	16.2	SP-SM				9.2				
AB-2	S-3	4.0	6.0	2.0	30.1	SM				14.5				

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No.	**56:1251**
Project Name:	**Fitness Center C 37082**
PM:	**Victor Faltas**
PE:	**David W. Spangler**
Printed On:	**Wednesday, April 8, 2020**

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