SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing
www.soearth.com

Smith WWTP Headworks Replacement Project
Mobile, AL

Subsurface Investigation and

Geotechnical Data Report

Prepared for:
MOBILE AREA WATER AND SEWER SYSTEM
C\O JACOBS
Pensacola, Florida
SESI Project No: M19-179
June 28, 2019

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SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing

June 28, 2019

MOBILE AREA WATER AND SEWER SYSTEM
C\O JACOBS
25 West Cedar Street, Suite 560
Pensacola, FL 32502

ATTENTION: Mr. David Stejskal, P.E.

REFERENCE: Subsurface Investigation and Geotechnical Data Report
Smith WWTP Headworks Replacement Project
Mobile, AL
SESI Project No: M19-179

Dear Mr. Stejskal:

Southern Earth Sciences, Inc (SESI) has completed the authorized scope of drilling and laboratory testing services for the referenced project. This report presents a summary of our findings. We appreciate this opportunity to be of service. Please do not hesitate to contact us if you have any questions.

Sincerely,

SOUTHERN EARTH SCIENCES, INC.

Marcus Shekouh M.S.
Geotechnical Project Manager

Matt Coaker, P.E.
Vice President
Registered, Alabama 30835

ALABAMA LICENSED No. 30835 PROFESSIONAL 6/28/19 ENGINEER ROBERT MATTHEW COAKER

MS/MC

Attachments

MOBILE AREA WATER AND SEWER SYSTEM

C\O JACOBS

Subsurface Investigation and Geotechnical Data

Report Smith WWTP Headworks Replacement Project

SESI Project Number: M19-179

June 28, 2019

MOBILE AREA WATER AND SEWER SYSTEM

C\O JACOBS

Subsurface Investigation and Geotechnical Data Report
Smith WWTP Headworks Replacement Project
SESI Project Number: M19-179
June 28, 2019

1.0 GEOLOGIC SETTING

This project is located inside the alluvial, coastal and low terrace deposits of the Holocene. These deposits contain varicolored fine to coarse quartz sand containing clay lenses and gravel in places. Coastal deposits include fine to medium quartz sand with shell fragments.

2.0 FIELD INVESTIGATION

Two (2) soil borings with Standard Penetration Tests (SPT) were performed at locations specified in the provided scope of work. A Test Location Plan indicating the approximate test locations is included in **Appendix 1**.

Soil sampling and penetration testing were performed in general accordance with ASTM D 1586 using flight auger and mud rotary drilling techniques. SPT borings were advanced to depths of approximately 25 to 50 feet below existing ground surface. At regular intervals during the process the drill rods were removed and soil samples were obtained with a standard 2 inch split tube sampler. Representative portions of soil samples obtained during the investigation were transported to our laboratory where they were examined by an engineer and classified in accordance with the Unified Soil Classification System. Soil descriptions, boring depths and penetration resistances are shown on the appropriate Soil Boring Log sheets attached in **Appendix 2**.

3.0 SUBSURFACE CONDITIONS

The descriptions below are general in nature and provide an overview of the range of subsurface conditions encountered in the subsurface exploration. Soil descriptions, boring depths, and penetration resistances are shown on the appropriate Soil Boring Log sheets attached in **Appendix 2**.

Beneath a 3 inch layer of topsoil and a 1 foot layer of dense silty sand with shell, soils varied between the two test locations. Soils encountered at test location B-1 generally consisted of stiff silty clay down to a depth of about 7 feet, followed by medium dense to loose silty clayey sands down to a depth of about 12 feet below existing grade. Soil conditions below about 12 feet generally consisted of medium stiff to stiff clay down to a depth of about 8 feet, followed by medium dense silty clayey sands down to a depth of 23 feet, underlain by stiff silty clay to the test termination depth.

Soils encountered at test location B-2 generally consisted of very loose to loose silty clayey sands with intermittent clay and silt lenses down to a depth of about 30 feet. Soil conditions below about 30 feet consisted of medium dense to very dense sands with silt down to the test termination depth.

4.0 LABORATORY TESTING

Laboratory testing included physical examination and general classification testing of samples obtained during boring operations. Testing included Moisture Content Determination (ASTM D 2216), No. 200 Sieve Washes (ASTM D1140), Atterberg Limits Tests (ASTM D4318), Standard Proctor and Density Tests (ASTM D698). Laboratory test results are presented on the soil boring logs and on the Laboratory Test Data Summary Sheet in **Appendix 3**.

5.0 LABORATORY CHEMICAL ANALYSIS

Selected soil samples obtained from within the upper few feet of the site were forwarded to Pace Analytical Services, LLC. for analytical testing. Testing included pH (EPA 9045), Specific Conductance (EPA 9050), Sulfate (EPA 9038) and Chloride (EPA 9251). Test results are summarized in **Table 1** and are attached in **Appendix 3**.

TABLE 1

ANALYTICAL LABORATORY TEST RESULTS SUMMARY

Soil Test Location	Sample Depth (ft)	pH	Conductivity (µohms/cm)	Resistivity (ohms-cm)	Sulfate (mg/kg or ppm)	Chloride (mg/kg or ppm)
B-1	2.5 – 4.0	4.9	83.2	12,048	121	ND*
B-2	2.5 – 4.0	6.6	201	4,975	3630	1320

Not detected at or above adjusted reporting limit

6.0 GROUNDWATER

One (1) piezometer was installed at test location B-2 for obtaining delayed water level measurement. Table 2 below presents the date measured and depth for each respective piezometer location.

TABLE 2

PEIZOMETER READINGS

Piezometer Location	Date	Depth Below Existing Ground Surface (ft.)
B-2	6/4/19	8.5
	6/5/19	5.5

Fluctuation in the level of the groundwater table will occur due to variances in rainfall, drainage, types of soil present and other factors not evident at the time measurements were made. Detailed descriptions of soils encountered at each test location are shown on the appropriate Soil Boring Log attached in **Appendix 2**. All reference to depth has been made with respect to the existing ground surface. Groundwater levels should be verified prior to construction.

7.0 GENERAL COMMENTS

While the CPT soundings and SPT borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the subsurface materials of the region are anticipated and may be encountered. The delineation between soil types shown on the logs is approximate and the description represents our interpretation of subsurface conditions at the designated boring location and on the particular date drilled.

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APPENDIX 1

Test Location Plan

SMITH WWTP HEADWORKS
REPLACEMENT
MOBILE, AL

SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing
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TEST LOCATION PLAN
SESI JOB #: M19-179

APPENDIX 2

SPT Boring Logs

SOIL BORING LOG

BORING NO.: B-1
PROJECT: SMITH WWTP HEADWORKS REPLACEMENT **PROJECT NO.:** M19-179
PROJECT LOCATION: MOBILE, AL **METHOD:** FLIGHT AUGER
BORING LOCATION: SEE TEST LOCATION PLAN **BORING ELEVATION:** EXISTING GROUND
DATE DRILLED: 06/04/19 **DATE COMPLETED:** 06/04/19
WATER LEVEL: NOT ENCOUNTERED **WATER LEVEL DATE:** 06/04/19
GEOL / ENGR: M. SHEKOUH **DRILLER:** C. KIRSCHNER

Elevation / Depth	Soil Symbols Sampler Symbols and Field Test Data	USCS	Description	SPT N	NM %	LL %	200 %
0	7/6 24/6 11/6	SM	3" TOPSOIL / Dense Silty SAND with Shell	35			
	5/6 6/6 7/6	CL-ML	Stiff Tan, Gray and Red Silty CLAY P.P. = 4.5	13	17.0		57
5	4/6 6/6 9/6		P.P. = 2.5	15			
	4/6 12/6 9/6	SM	Medium Dense Orange, Red and Tan Silty SAND with Clay Balls	21			
10	4/6 5/6 5/6	SC-SM	Loose Tan and Gray Fine Silty Clayey SAND P.P. = 1.25	10			
	3/6 4/6 4/6	CL	Medium Stiff to Stiff Red and Tan CLAY P.P. = 0.75	8	23.5	30	67
15	4/6 4/6 5/6		P.P. = 0.75	9			
		SC-SM	Medium Dense Red, Brown and Tan Fine Clayey Silty SAND	12			
20	6/6 6/6 6/6						
		CL-ML	Stiff Gray and Orange Sandy Silty CLAY				
25	5/6 7/6 7/6			14			
30							

Remarks: N30.71821 W88.07101
POCKET PENETROMETER (P.P.) Measured in Ton per Square Feet

SOIL BORING LOG

BORING NO.: B-2
PROJECT: SMITH WWTP HEADWORKS REPLACEMENT **PROJECT NO.:** M19-179
PROJECT LOCATION: MOBILE, AL **METHOD:** FLIGHT/MUD
BORING LOCATION: SEE TEST LOCATION PLAN **BORING ELEVATION:** EXISTING GROUND
DATE DRILLED: 06/04/19 **DATE COMPLETED:** 06/04/19
WATER LEVEL: 8.5 ft **WATER LEVEL DATE:** 06/04/19
GEOL / ENGR: M. SHEKOUH **DRILLER:** C. KIRSCHNER

Elevation / Depth	Soil Symbols Sampler Symbols and Field Test Data	USCS	Description	SPT N	NM %	LL %	200 %
0	10/6 18/6 10/6	SP-SM	3" TOPSOIL	28			
		SC-SM	Medium Dense Brown SAND with Silt				
	2/6 4/6 3/6	SC	Loose Brown Silty Clayey Fine SAND with Glass Debris	7			
	2/6 3/6 4/6		Loose Tan and Brown Clayey SAND	7	19.9	25	41
	WOH/6 1/6 2/6	SC	P.P. = 0.75	3	22.5	32	45
10	1/6 2/6 4/6		Loose Gray and Brown Clayey SAND P.P. = 0.25				
		ML	P.P. = 1.25	6			
	2/6 2/6 3/6	SM	Medium Stiff Gray Sandy SILT P.P. = 0.5	5			
	WOH/6 0/6 1/6	SP-SM	Loose Gray and Orange Silty SAND	1	32.4		8
		CL-ML	Very Loose Gray SAND with Silt Soft Gray Silty CLAY				
20	3/6 3/6 2/6	SP-SM	Loose Gray SAND with Silt	5			
	5/6 3/6 3/6	CL-ML	Stiff Gray Silty CLAY P.P. = No Resistance	6			
30	5/6 10/6 11/6	SP-SM	P.P. = 0.25 Medium Dense Tan and Brown SAND with Silt	21			
	8/6 10/6 10/6			20			
40	5/6 6/6 6/6			12			
		SP-SM	Medium Dense Tan and Red SAND with Silt				
	6/6 18/6 18/6			36			
		SP	Very Dense Tan SAND				
50	17/6 25/6 27/6			52			
60							

Remarks: N30.71751 W88.07077
POCKET PENETROMETER (P.P.) Measured in Ton per Square Feet

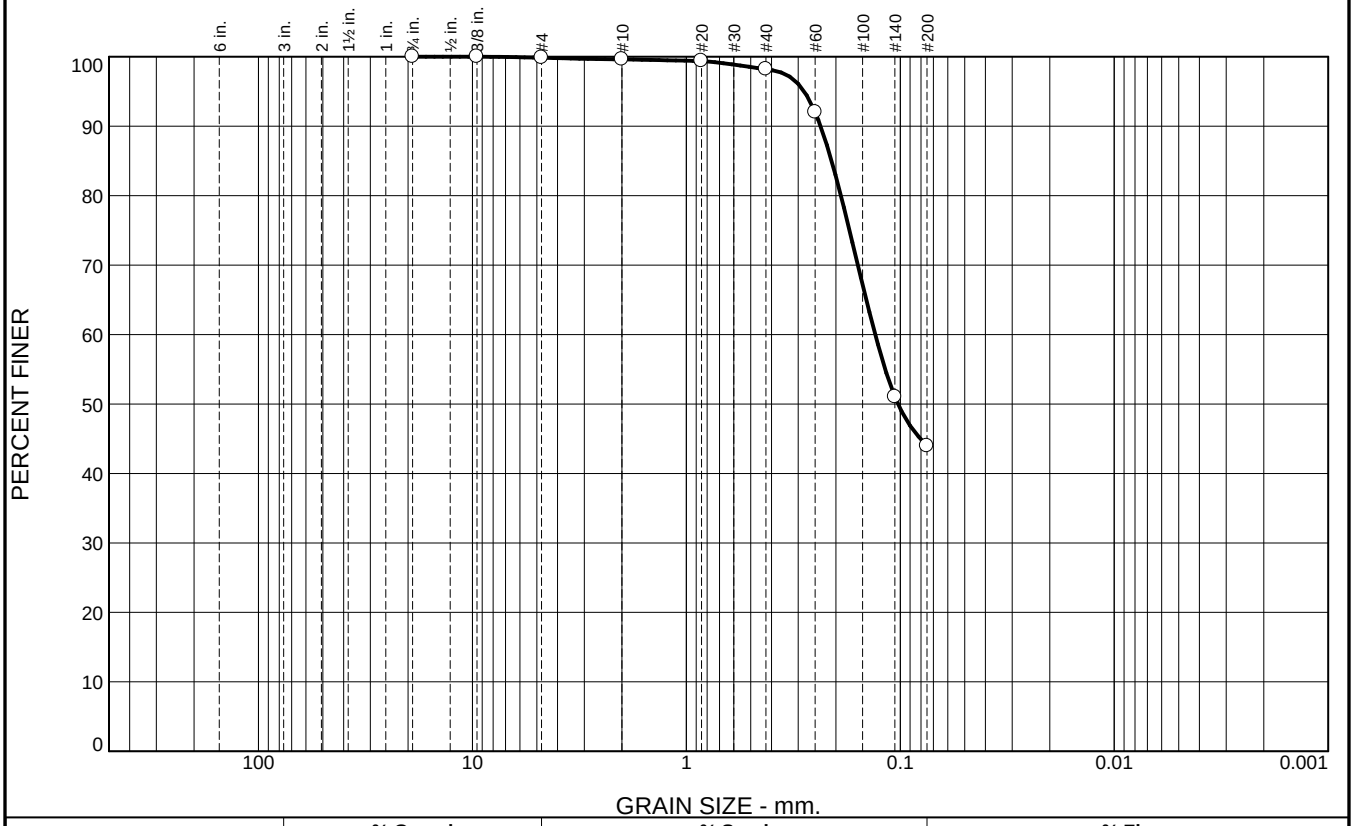
APPENDIX 3

Laboratory Test Data

Materials Testing Report	SOUTHERN EARTH SCIENCES, INC.	Tabulated Data Sheet
Client:	JACOBS ENGINEERING	**Date:** 06/10/19
Project:	SMITH WWTP HEADWORKS REPLACEMENT	**SESI Project No.** M19-179

Boring No.	*Sample No.*	*Sample Depth (ft)*	*AASHTO Symbol*	*USCS Symbol*	*Moisture Content (%)*	*Atterberg Limits*		*Passing No. 200 (%)*
						LL	*PI*	
B-1	S-2	2.5-4.0	A-4(0)	CL-ML	17.0	-	-	56.4
B-1	S-5	10.0-11.5	A-4(0)	SM	20.1	-	-	42.9
B-1	S-6	12.5-14.0	A-6(6)	CL	23.5	30	12	67.2
B-2	S-3	5.0-6.5	A-4(0)	SC	19.9	25	9	41.0
B-2	S-4	7.5-9.0	A-6(3)	SC	22.5	32	13	44.9
B-2	S-5	10.0-11.5	A-4(0)	SM	18.8	-	-	37.4
B-2	S-7	15.0-16.5	A-1-a	SP-SM	32.4	-	-	7.8

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.3	1.4	54.2	44.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	99.9		
#10	99.6		
#20	99.4		
#40	98.2		
#60	92.0		
#140	51.0		
#200	44.0		

* (no specification provided)

Material Description

TAN CLAYEY SAND

Atterberg Limits

PL= 19 LL= 32 PI= 13

Coefficients

D_{90}= 0.2358 D_{85}= 0.2096 D_{60}= 0.1310
D_{50}= 0.1025 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(2)

Remarks

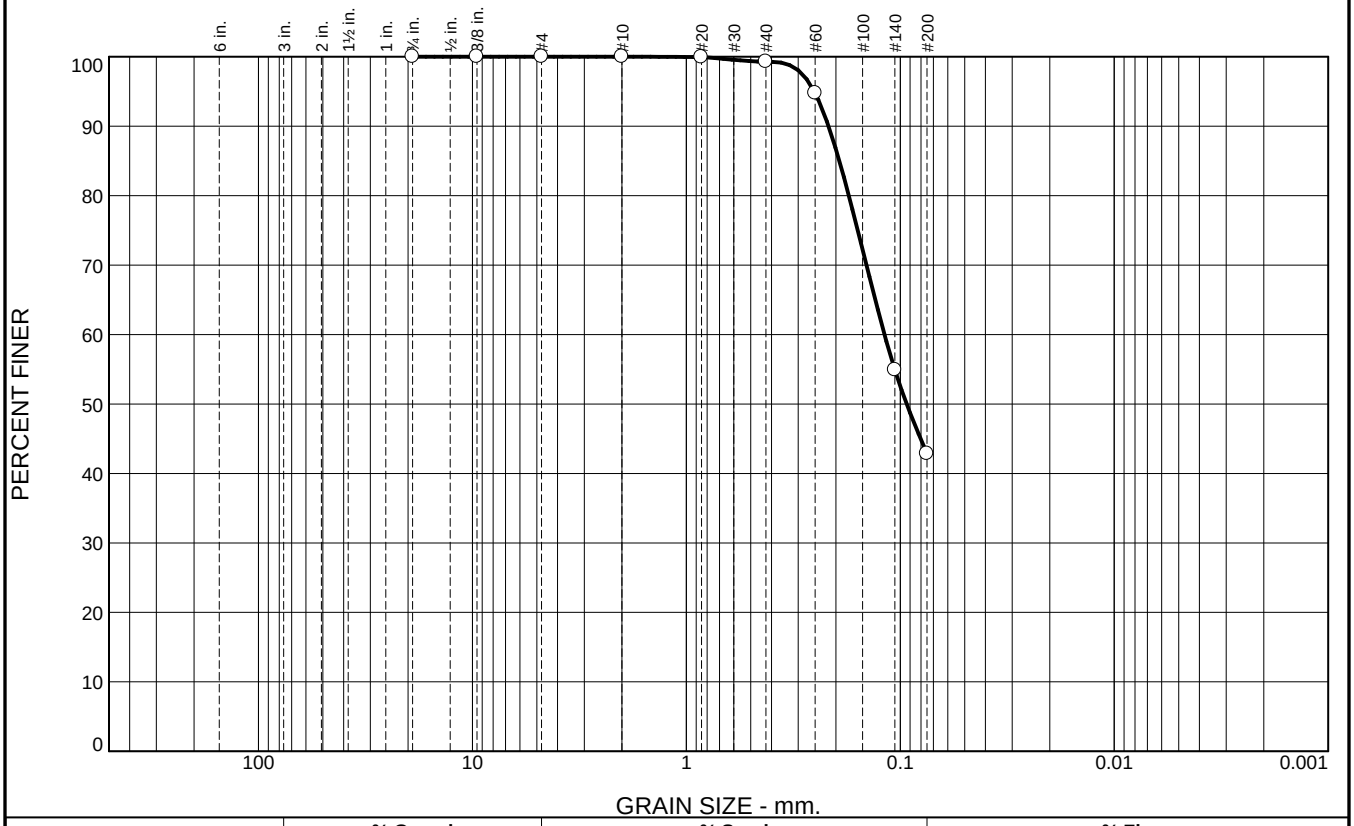
Location: B-2
Sample Number: S-4 **Depth:** 7.5'-9' **Date:** 6/21/2019

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: JACOBS ENGINEERING
Project: SMITH WWTP HEADWORKS REPLACEMENT

Project No: M19-179 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.7	56.4	42.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.3		
#60	94.7		
#140	54.9		
#200	42.9		

* (no specification provided)

Material Description

ORANGE SAND W/ CLAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2166 D_{85}= 0.1928 D_{60}= 0.1185
D_{50}= 0.0934 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

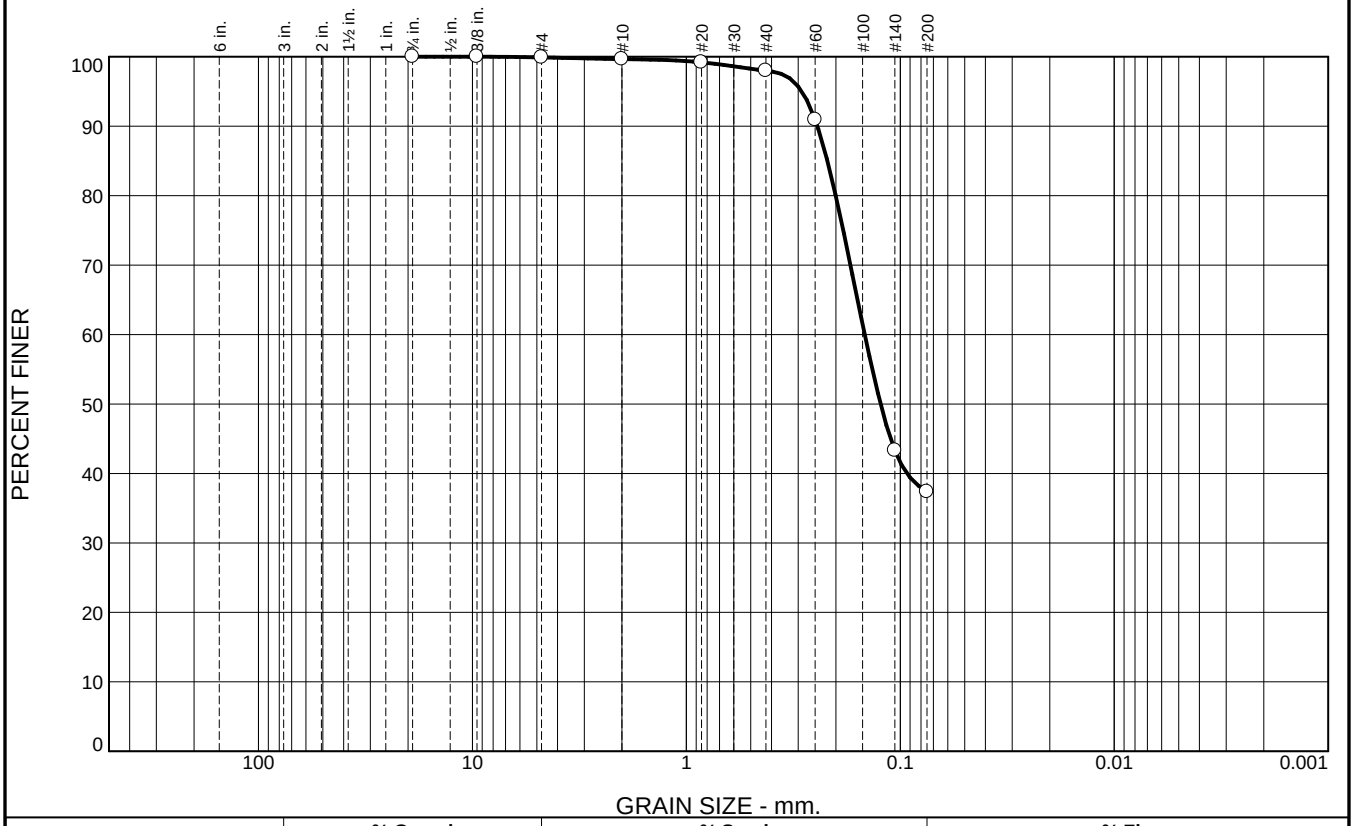
Location: B-1
Sample Number: S-5 **Depth:** 10'-11.5' **Date:** 6/21/2019

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: JACOBS ENGINEERING
Project: SMITH WWTP HEADWORKS REPLACEMENT

Project No: M19-179 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.3	1.6	60.6	37.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	99.9		
#10	99.6		
#20	99.2		
#40	98.0		
#60	90.9		
#140	43.3		
#200	37.4		

* (no specification provided)

Material Description

BROWN SAND W/ CLAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2441 D_{85}= 0.2193 D_{60}= 0.1467
D_{50}= 0.1236 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

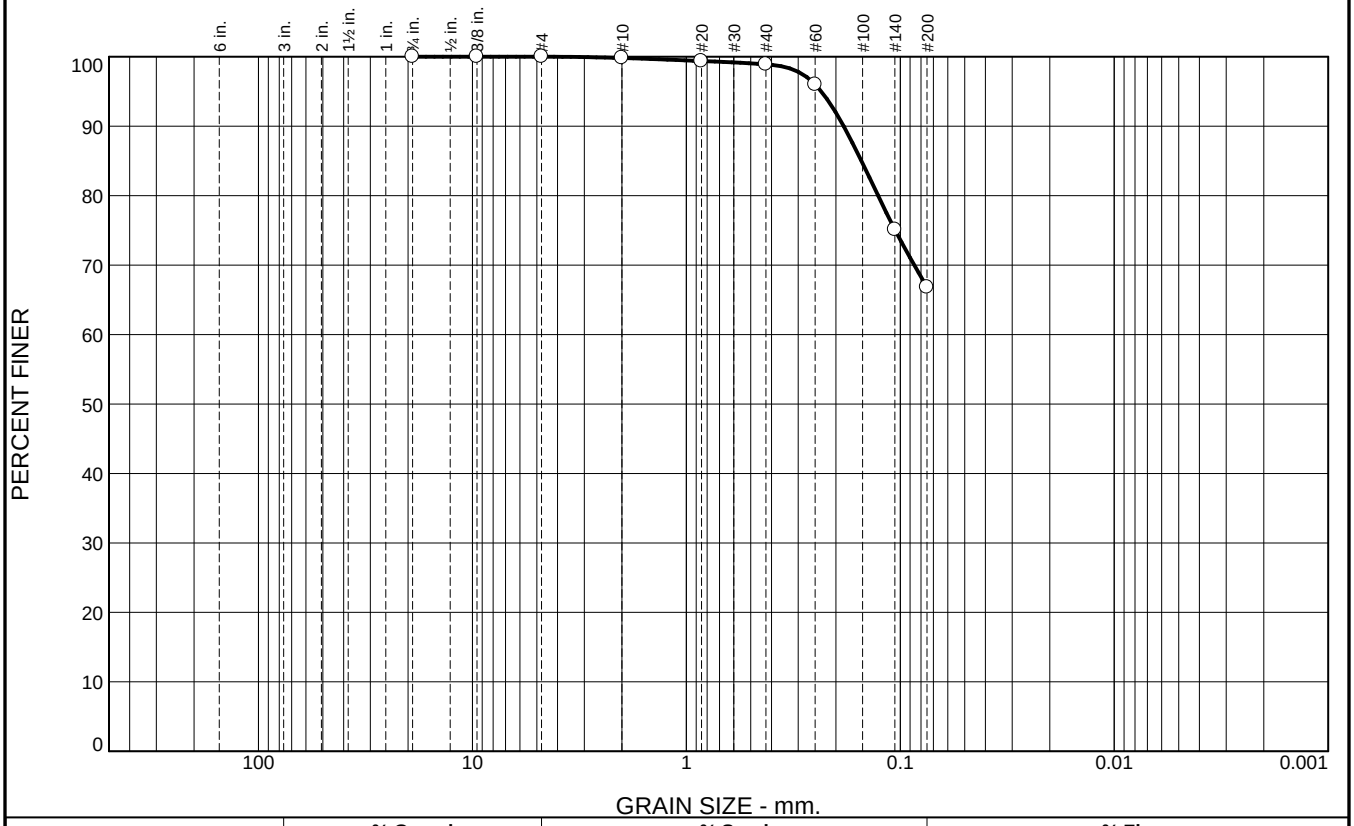
Location: B-2
Sample Number: S-5 **Depth:** 10'-11.5' **Date:** 6/21/2019

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: JACOBS ENGINEERING
Project: SMITH WWTP HEADWORKS REPLACEMENT

Project No: M19-179 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.9	32.1	66.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.8		
#20	99.4		
#40	98.9		
#60	96.0		
#140	75.1		
#200	66.8		

* (no specification provided)

Material Description

ORANGE CLAY

Atterberg Limits

PL= 18 LL= 30 PI= 12

Coefficients

D_{90}= 0.1841 D_{85}= 0.1520 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(6)

Remarks

Location: B-1
Sample Number: S-6 **Depth:** 12.5'-14' **Date:** 6/21/2019

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: JACOBS ENGINEERING
Project: SMITH WWTP HEADWORKS REPLACEMENT

Project No: M19-179 **Figure**

COMPACTION TEST REPORT

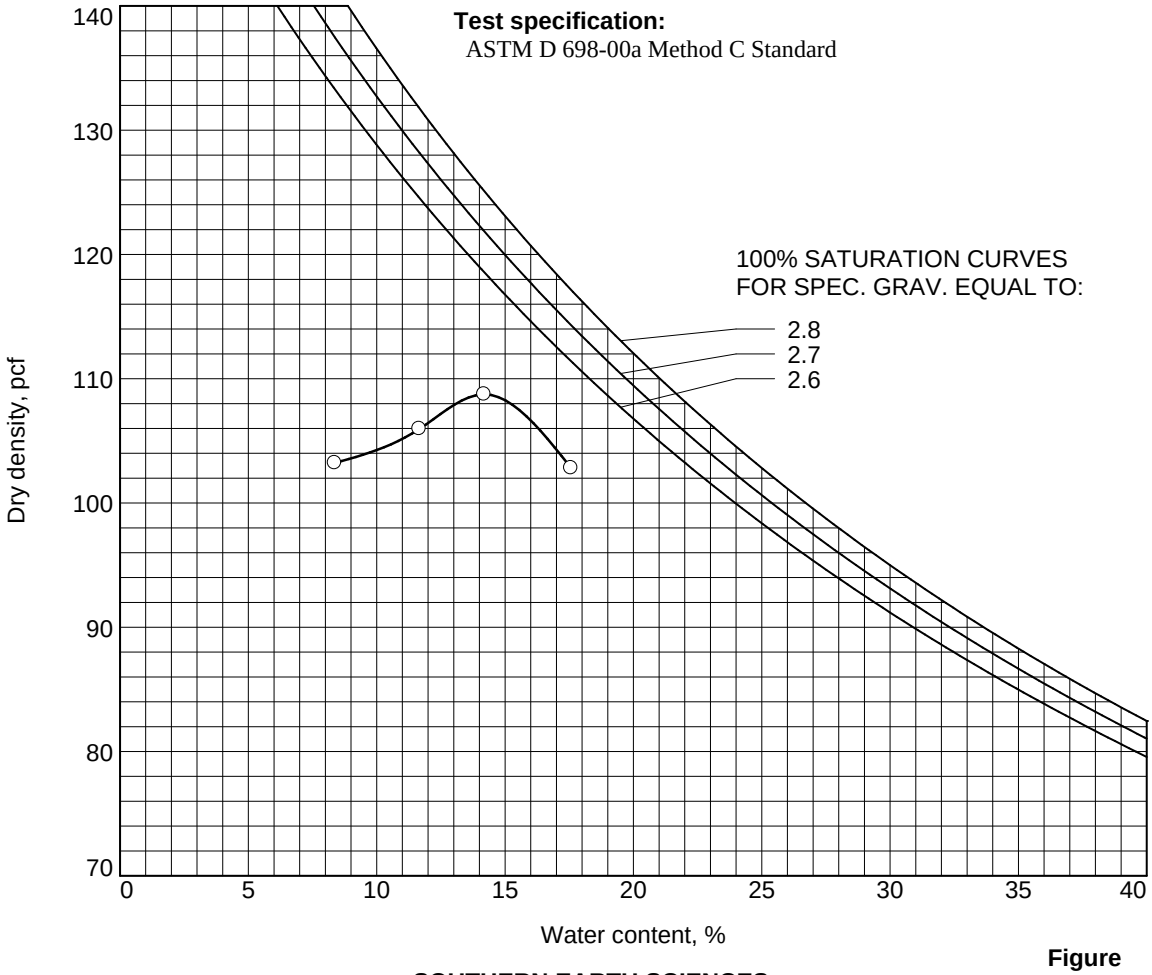
Project No.: M19-179 **Date:** 06/17/19
Project: SMITH WWTP
Client:
Location: B-1
Sample Number: 4095 **Depth:** FILL
Remarks:

MATERIAL DESCRIPTION

Description: GREY SILTY SAND W/GRAVEL

Classifications - **USCS:** **AASHTO:**
Nat. Moist. = **Sp.G. =**
Liquid Limit = **Plasticity Index =**
% < No.200 =

TEST RESULTS
Maximum dry density = 108.7 pcf
Optimum moisture = 14.2 %



Figure

SOUTHERN EARTH SCIENCES

COMPACTION TEST REPORT

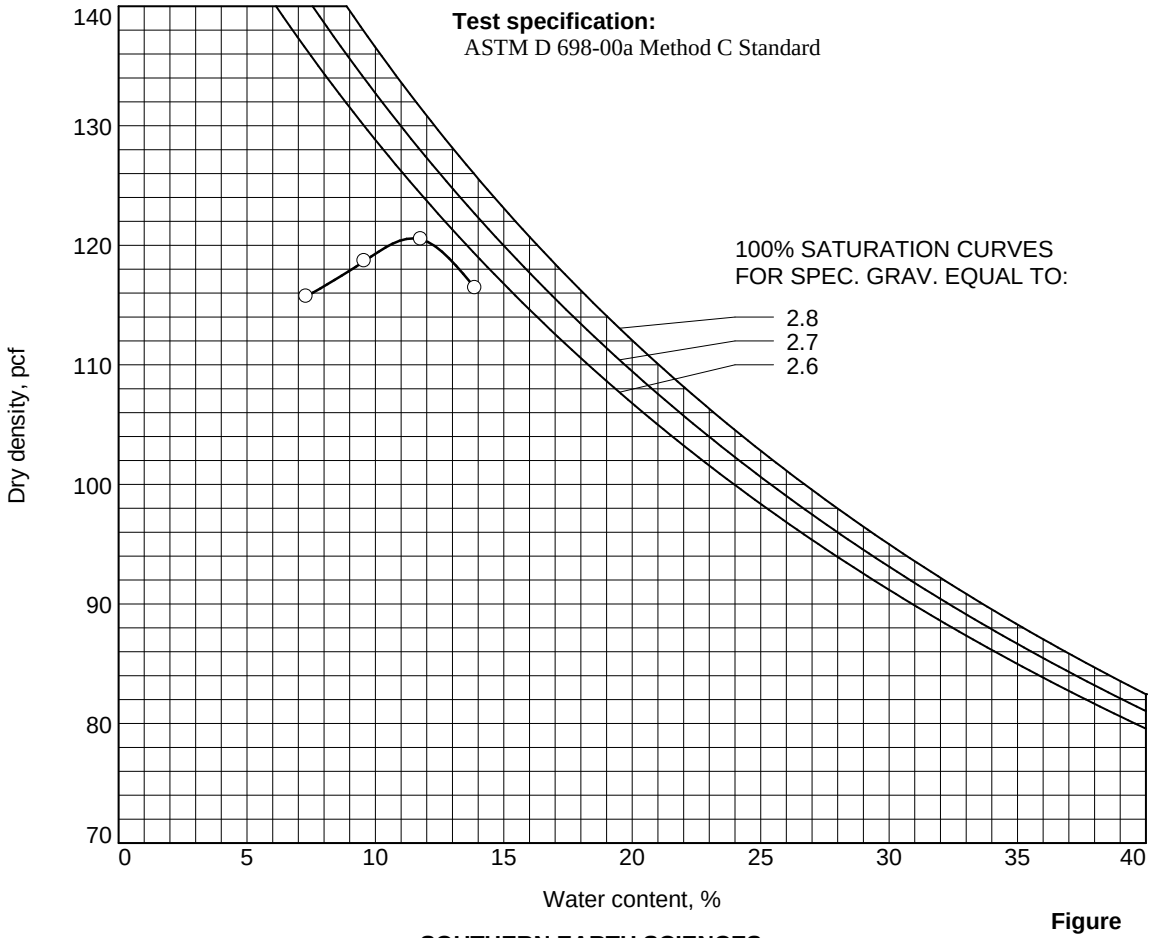
Project No.: M19-179 **Date:** 06/17/19
Project: SMITH WWTP
Client:
Location: B-2
Sample Number: 4096 **Depth:** FILL
Remarks:

MATERIAL DESCRIPTION

Description: GREY SILTY SAND W/GRAVEL

Classifications - **USCS:** **AASHTO:**
Nat. Moist. = **Sp.G. =**
Liquid Limit = **Plasticity Index =**
% < No.200 =

TEST RESULTS
Maximum dry density = 120.6 pcf
Optimum moisture = 11.5 %



Figure

SOUTHERN EARTH SCIENCES

Tested By: J.R.

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 336609
251-344-9106

CERTIFICATIONS

Project: M19-179
Pace Project No.: 20108117

New Orleans Certification IDs

California Env. Lab Accreditation Program Branch: 11277CA
Florida Department of Health (NELAC): E87595
Illinois Environmental Protection Agency: 0025721
Kansas Department of Health and Environment (NELAC): E-10266
Louisiana Dept. of Environmental Quality (NELAC/LELAP): 02006
Pennsylvania Dept. of Env Protection (NELAC): 68-04202
Texas Commission on Env. Quality (NELAC): T104704405-09-TX
U.S. Dept. of Agriculture Foreign Soil Import: P330-10-00119
Commonwealth of Virginia (TNI): 480246

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 336609
251-344-9106

SAMPLE SUMMARY

Project: M19-179
Pace Project No.: 20108117

Lab ID	Sample ID	Matrix	Date Collected	Date Received
20108117001	**B-1 S-2**	Solid	06/13/19 08:00	06/13/19 11:28
20108117002	**B-2 S-2**	Solid	06/13/19 08:00	06/13/19 11:28

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 336609
251-344-9106

SAMPLE ANALYTE COUNT

Project: M19-179
Pace Project No.: 20108117

Lab ID	Sample ID	Method	Analysts	Analytes Reported
20108117001	**B-1 S-2**	EPA 9045	CAR	1
		EPA 9050	CAR	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20108117002	**B-2 S-2**	EPA 9045	CAR	1
		EPA 9050	CAR	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 336609
251-344-9106

ANALYTICAL RESULTS

Project: M19-179
Pace Project No.: 20108117

Sample: B-1 S-2 **Lab ID: 20108117001** Collected: 06/13/19 08:00 Received: 06/13/19 11:28 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045							
pH at 25 Degrees C	**4.9**	Std. Units	0.010	1		06/18/19 18:05		
9050 Specific Conductance	Analytical Method: EPA 9050							
Specific Conductance	**83.2**	umhos/cm	1.0	1		06/24/19 15:27		
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038	Preparation Method: EPA 9038						
Sulfate	**121**	mg/kg	45.5	1	06/14/19 11:10	06/14/19 14:55	14808-79-8	
9251 Chloride	Analytical Method: EPA 9251	Preparation Method: EPA 9251						
Chloride	ND	mg/kg	9.1	1	06/14/19 11:10	06/14/19 14:47	16887-00-6	

Sample: B-2 S-2 **Lab ID: 20108117002** Collected: 06/13/19 08:00 Received: 06/13/19 11:28 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045							
pH at 25 Degrees C	**6.6**	Std. Units	0.010	1		06/18/19 18:05		
9050 Specific Conductance	Analytical Method: EPA 9050							
Specific Conductance	**201**	umhos/cm	1.0	1		06/24/19 15:28		
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038	Preparation Method: EPA 9038						
Sulfate	**3630**	mg/kg	925	20	06/14/19 11:10	06/14/19 14:55	14808-79-8	
9251 Chloride	Analytical Method: EPA 9251	Preparation Method: EPA 9251						
Chloride	**1320**	mg/kg	185	20	06/14/19 11:10	06/14/19 14:47	16887-00-6	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 336609
251-344-9106

QUALITY CONTROL DATA

Project: M19-179
Pace Project No.: 20108117

QC Batch: 146239 Analysis Method: EPA 9045
QC Batch Method: EPA 9045 Analysis Description: 9045 pH
Associated Lab Samples: 20108117001, 20108117002

LABORATORY CONTROL SAMPLE: 644891

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
pH at 25 Degrees C	Std. Units	6	6.0	100	97-103	

SAMPLE DUPLICATE: 644892

Parameter	Units	20108450001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	8.0	8.0	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 336609
251-344-9106

QUALITY CONTROL DATA

Project: M19-179
Pace Project No.: 20108117

QC Batch: 146896 Analysis Method: EPA 9050
QC Batch Method: EPA 9050 Analysis Description: 9050 Specific Conductance
Associated Lab Samples: 20108117001, 20108117002

METHOD BLANK: 648219 Matrix: Solid
Associated Lab Samples: 20108117001, 20108117002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Specific Conductance	umhos/cm	ND	1.0	06/24/19 15:25	

LABORATORY CONTROL SAMPLE: 648220

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Specific Conductance	umhos/cm	1410	1440	102	95-105	

SAMPLE DUPLICATE: 648221

Parameter	Units	20108750001 Result	Dup Result	RPD	Max RPD	Qualifiers
Specific Conductance	umhos/cm	274	241	13	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 336609
251-344-9106

QUALITY CONTROL DATA

Project: M19-179
Pace Project No.: 20108117

QC Batch: 145762 Analysis Method: EPA 9038
QC Batch Method: EPA 9038 Analysis Description: 9038 Sulfate, Turbidimetric
Associated Lab Samples: 20108117001, 20108117002

METHOD BLANK: 642169 Matrix: Solid
Associated Lab Samples: 20108117001, 20108117002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/kg	ND	50.0	06/14/19 14:55	

LABORATORY CONTROL SAMPLE: 642170

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	200	218	109	90-110	

MATRIX SPIKE SAMPLE: 642176

Parameter	Units	20108117002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	3630	1880	5650	107	75-125	

SAMPLE DUPLICATE: 642175

Parameter	Units	20108117002 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfate	mg/kg	3630	3410	6	20	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: M19-179
Pace Project No.: 20108117

QC Batch: 145760 Analysis Method: EPA 9251
QC Batch Method: EPA 9251 Analysis Description: 9251 Chloride
Associated Lab Samples: 20108117001, 20108117002

METHOD BLANK: 642157 Matrix: Solid
Associated Lab Samples: 20108117001, 20108117002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/kg	ND	10.0	06/14/19 14:47	

LABORATORY CONTROL SAMPLE: 642158

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	829	867	105	90-110	

MATRIX SPIKE SAMPLE: 642160

Parameter	Units	20107422002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	1250	19100	22100	109	75-125	

SAMPLE DUPLICATE: 642159

Parameter	Units	20107422002 Result	Dup Result	RPD	Max RPD	Qualifiers
Chloride	mg/kg	1250	1330	6	20	

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REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: M19-179
Pace Project No.: 20108117

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The Nelac Institute

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: M19-179
Pace Project No.: 20108117

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
20108117001	**B-1 S-2**	EPA 9045	146239		
20108117002	**B-2 S-2**	EPA 9045	146239		
20108117001	**B-1 S-2**	EPA 9050	146896		
20108117002	**B-2 S-2**	EPA 9050	146896		
20108117001	**B-1 S-2**	EPA 9038	145762	EPA 9038	145799
20108117002	**B-2 S-2**	EPA 9038	145762	EPA 9038	145799
20108117001	**B-1 S-2**	EPA 9251	145760	EPA 9251	145798
20108117002	**B-2 S-2**	EPA 9251	145760	EPA 9251	145798