

June 29, 2018

HNTB Corporation
One Tampa City Center
201 North Franklin Street, Suite 1200
Tampa, Florida 33602

Attn: Mr. James E. Drapp, P.E.

**RE: Geotechnical Data Report for RFP Submittal
Twiggs Street from N. Meridian Avenue to Nebraska Avenue
Hillsborough County, Florida
Tierra Project No: 6511-16-107-013A**

Mr. Drapp:

Tierra, Inc. performed geotechnical data collection for the proposed project referenced above. This report is provided to support the RFP Submittal. The results of our field exploration program and laboratory testing completed for the subject project are presented in this data report.

Tierra, Inc. appreciates the opportunity to be of service to HNTB Corporation, Inc. (HNTB) and the Tampa Hillsborough Expressway Authority (THEA) on this project. If you have any questions or comments regarding this report, please contact our office at your earliest convenience.

Sincerely,

TIERRA, INC.



Daniel F. Hoeflich, E.I.
Geotechnical Engineer Intern



Kevin H. Scott, P.E.
Senior Geotechnical Engineer
Florida License No. 65514

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1.0 PROJECT INFORMATION

1.1 Project Authorization

Authorization to proceed with this project was issued by HNTB in accordance with the Subconsultant Agreement for the referenced project.

1.2 Project Description

The project consists of improving Twiggs Avenue from N. Meridian Avenue to Nebraska Avenue in Hillsborough County, Florida. The objective of this geotechnical study was to obtain information concerning the existing subsurface and pavement conditions along the roadway within the project limits. This *Geotechnical Data Report* will be included in the RFP package and will be provided to the design-build teams as a reference document.

1.3 General Site Conditions

The existing roadway section of Twiggs Street located within the project limits is a four-lane undivided urban roadway. Land use adjacent to the project area generally consists of urban land (commercial developments) in downtown Tampa.

2.0 PURPOSE AND SCOPE OF SERVICES

The geotechnical study was performed to obtain information on the existing subsurface and pavement conditions along the limits of the subject roadway. The following services were provided:

1. Conducted a visual reconnaissance of the project site, generated boring location plans, and coordinated utility clearances.
2. Performed a geotechnical field study for the project consisting of auger borings, pavement cores and subsurface sampling.
3. Visually classified the recovered soil samples in the laboratory to develop the soil legend for the project using the American Association of State Highway and Transportation Officials (AASHTO) Soil Classification System.
4. Measured observable groundwater levels at each boring location.
5. Prepared this Geotechnical Data Report for the project.

3.0 REVIEW OF PUBLISHED DATA

3.1 USGS Quadrangle Map

Based on a review of the USGS Quadrangle Map “Tampa, Florida”, it appears that the natural ground elevations along the project limits on the order of approximately +20 feet National Geodetic Vertical Datum of 1929 (NGVD 29). The **USGS Quadrangle Map** for the project area are illustrated in **Appendix A**.

3.2 USDA Soil Survey, Hillsborough County, Florida

Based on a review of the Hillsborough County Soil Survey published by the USDA, it appears that there is one (1) primary soil-mapping unit noted along the project limits. The **USDA Soil Survey Map** is illustrated in **Appendix A** and the soil mapping unit is summarized in **Appendix A**.

It should be noted that the information contained in the USDA Soil Survey may not be reflective of the current soil conditions since areas along the project alignment may have been modified, reworked and filled since the Soil Survey was conducted by the USDA.

Based on a review of the “Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida” map published by the USGS, the potentiometric surface elevation of the upper Floridan Aquifer in the project vicinity ranges from approximately +5 to +10 feet, NGVD 29.

4.0 SUBSURFACE EXPLORATION

4.1 Boring Location Plan, Utility Clearance and Traffic Control

Prior to beginning the subsurface explorations, a boring location plan for the proposed pavement coring and subsurface sampling was produced. This boring location plan was generated based on an understanding of the project limits, site access, and general guidance provided in the FDOT “Soils and Foundations Handbook”.

Tierra personnel staked/marked the proposed boring locations in the field. Utility clearances were then coordinated by Tierra and updated as required prior to performing the pavement coring and soil borings in order to reduce the potential for damage to the underground utilities during the boring process.

Subsurface explorations were performed in compliance with the applicable FDOT Roadway and Traffic Design Standard Indices.

4.2 Soil Borings and Pavement Cores

Hand auger and pavement core borings were completed along the project corridor in order to identify the subsurface conditions, pavement conditions and encountered groundwater table levels. The hand auger borings were performed by manually twisting and advancing a bucket auger into the ground, typically in 6-inch increments. The pavement core borings were performed

with the use of a 6-inch outside diameter core bit. The pavement was visually classified using standard FDOT nomenclature.

The locations of the hand auger and pavement core borings were estimated using GPS coordinates recorded in the field by a Tierra representative utilizing a hand-held GPS unit with a reported accuracy of 10 feet. Therefore, these locations should be considered approximate. If a more accurate location is needed, we recommend the boring locations be survey located. The boring locations are presented on the **Boring Location Plan** sheets in **Appendix B**. The Florida State Plane West coordinates recorded at the soil boring and pavement core locations are provided on the **Soil Profiles Sheet** in **Appendix B** and Pavement **Data Table** in **Appendix D**, respectively.

5.0 LABORATORY TESTING

5.1 General

Representative soil samples collected from the borings performed along the project alignment were classified and stratified in general accordance with the AASHTO Soil Classification System. Our classification was based on visual observations, using the results from the laboratory testing as confirmation. These tests included grain-size analyses, fines content analysis, organic content, Atterberg Limits, and natural moisture content determination. Environmental corrosion tests were performed on selected soil samples to evaluate the corrosive nature of the subsurface soils encountered.

5.2 Test Designation

The following list summarizes the laboratory tests performed and respective test methods.

- Grain-Size Analysis. The grain-size analysis tests were conducted in general accordance with the AASHTO test designation T-088 (ASTM test designation D-422).
- Fines Content Analyses – The fines content analyses were conducted in general accordance with AASHTO test designation T-088 (ASTM test designation D-1140).
- Atterberg Limits - The liquid limit and the plastic limit tests ("Atterberg Limits") were conducted in general accordance with the AASHTO test designations T-089 and T-090, respectively (ASTM test designation D-4318).
- Organic Content - The organic content tests were conducted in general accordance with the AASHTO test designation T-267.
- Natural Moisture Content - The moisture content tests were conducted in general accordance with the AASHTO test designation T-265 (ASTM test designation D-2216).
- Environmental Corrosion – The environmental corrosion tests were conducted in general accordance with the FDOT test designations FM 5-550, FM 5-551, FM 5-552 and FM 5-553.

A summary of the laboratory test results for each soil stratum is presented on the **Roadway Soil Survey Sheet** in **Appendix B**. This sheet includes ranges of laboratory test results for different stratum soil samples collected from borings included in this report. A detailed summary of the laboratory tests with the corresponding results is also presented in **Appendix C**.

6.0 RESULTS OF SUBSURFACE EXPLORATION

6.1 General Soil Conditions

The soil types encountered during exploration have been assigned a stratum number. The stratum descriptions and soil types associated with this project are listed in the following table.

Stratum No.	Typical Soil Description	AASHTO Classification
1	Light Gray to Brown SAND to SAND with Silt	A-3
2	Brown to Orange-Brown SAND to SAND with Silt with Rock Fragments and/or Cemented Sands and/or Asphalt Fragments	A-3
3	Light Brown Silty Sand	A-2-4

The soil stratification was based on a visual review of the recovered samples, laboratory testing, and interpretation of the field boring logs. The boring stratification lines represent the approximate boundaries between soil types of significantly different engineering properties; however, the actual transition may be gradual. In some cases, small variations in properties not considered pertinent to our engineering evaluation may have been abbreviated or omitted for clarity. The boring profiles represent the conditions at the particular boring location and variations do occur among the borings. The results of the borings performed for this investigation are presented on the **Roadway Soil Profiles** sheets in **Appendix B**.

6.2 Pavement Cores

The **Pavement Data Table** in **Appendix D** should be reviewed for specific information regarding the existing asphalt pavement and base materials encountered at each core location. Photographs of the pavement cores retrieved along the alignment are included in the attached **Representative Photographs of Pavement Cores** in **Appendix D**. It is important to note the base material thickness reported in the **Pavement Data Table** may not be reflected in the sample photographs due to sample break-up during recovery.

6.3 Groundwater

The groundwater table was measured at the boring locations during our field exploration. The depths to the groundwater table, when encountered, were found at an approximate depth of 5 feet below the existing ground surface. The groundwater table was not encountered within many of the auger borings performed during our field exploration. As a result, GNE (Groundwater Not Encountered) is shown adjacent to these soil profiles.

Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences (i.e. existing water management canals, swales, drainage ponds, underdrains and areas of covered soils, such as paved parking lots and sidewalks).

7.0 REPORT LIMITATIONS

Our services have been performed and our findings obtained in accordance with generally accepted geotechnical engineering principles and practices at the time of this report. This company is not responsible for the conclusions, opinions or recommendations made by others based on these data.

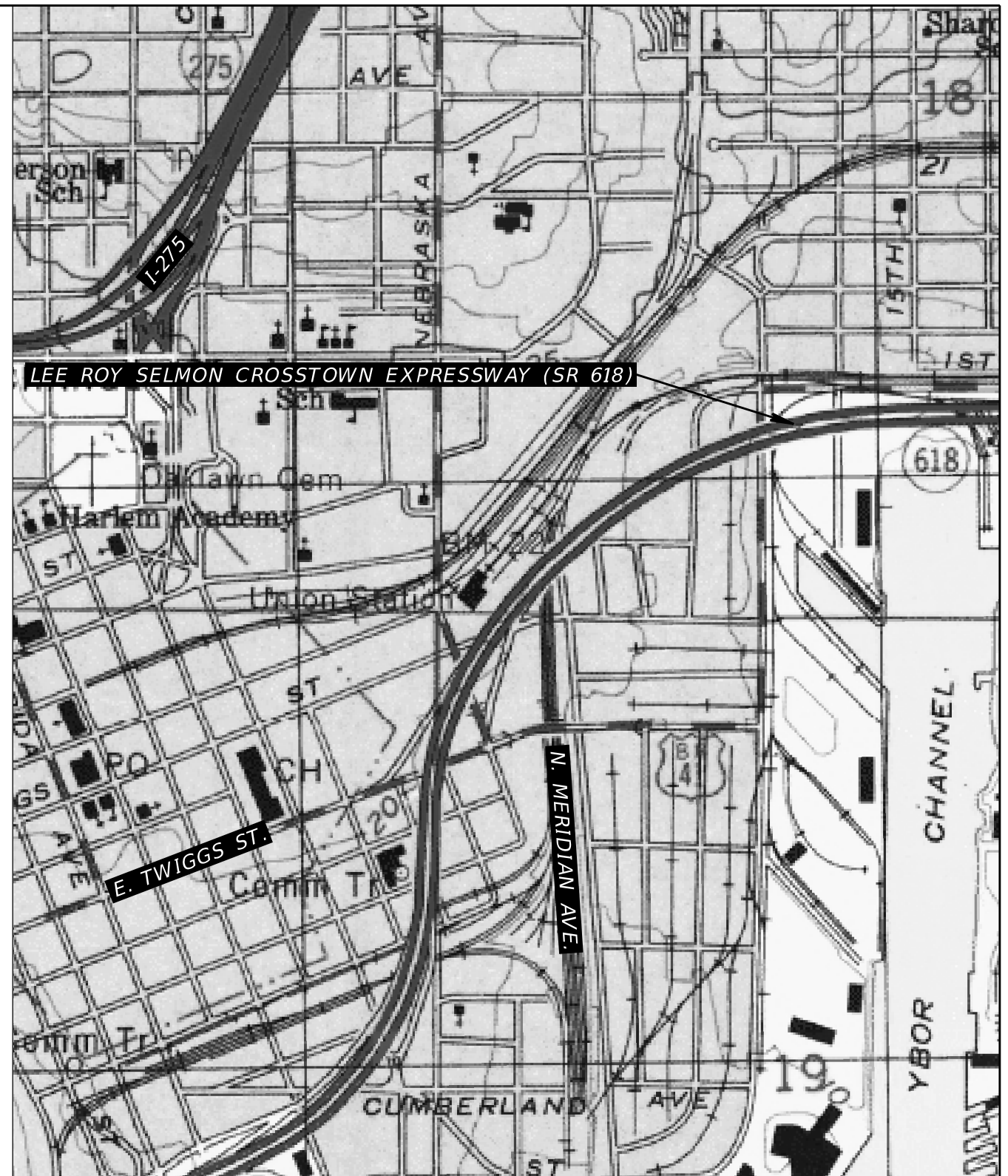
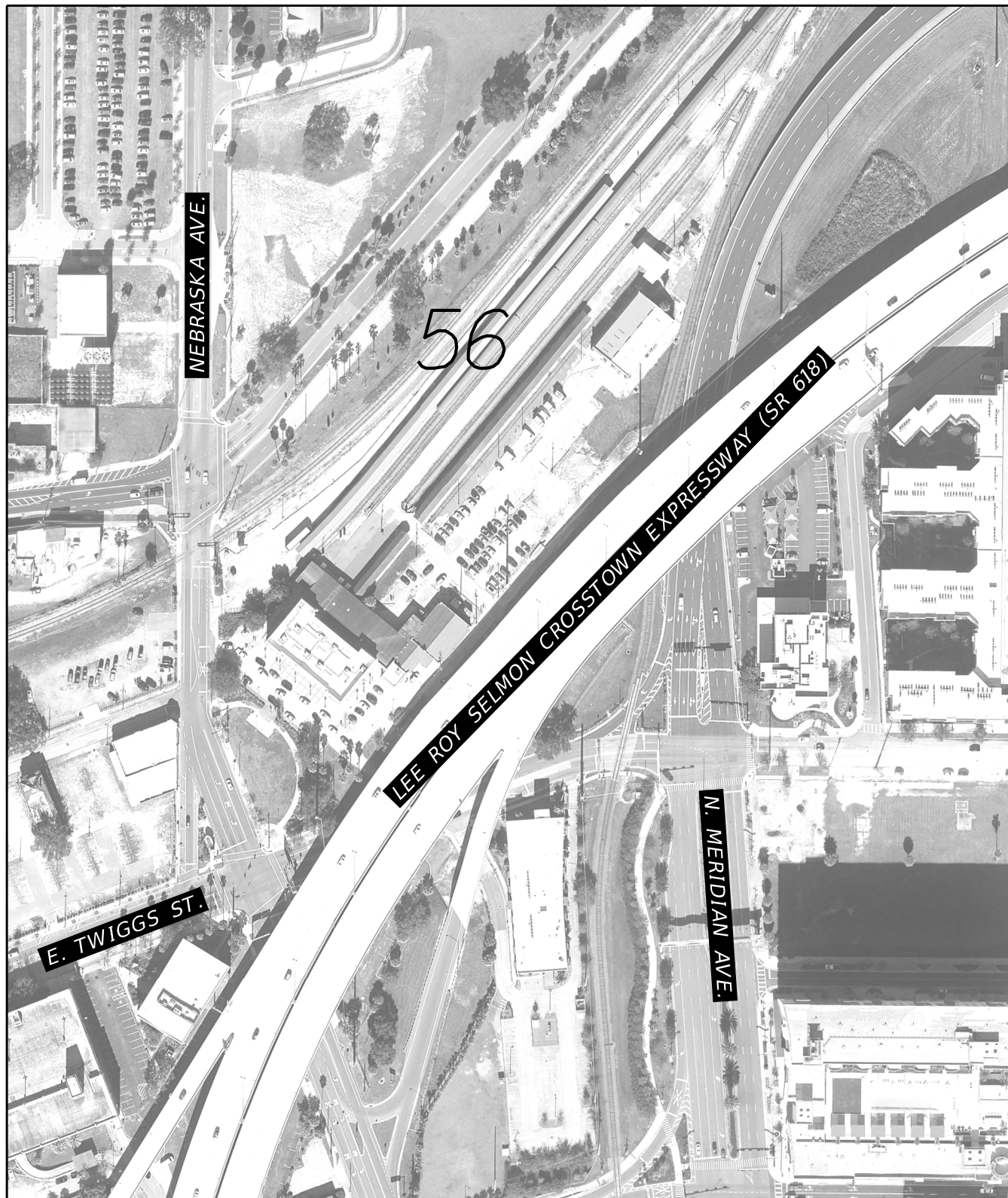
The scope of the exploration was intended to provide information related to the soil conditions within the influence of the proposed roadway design by others. This report presents the geotechnical conditions based on the data obtained from the soil borings performed at the locations indicated in this report and does not reflect any variations which may occur between these borings. If any variations become evident during the course of design and/or construction, a re-evaluation of the conditions contained in this report is the responsibility of the design-build team.

The data presented in this report is for informational purposes only. Once the design has been established, project-specific geotechnical evaluations and design analyses should be completed by the design-build team for the construction of the project. It should be noted that the design-build team will be responsible for the final design and their own interpretation of the data presented in this report.

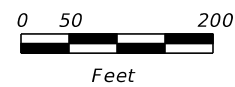
The scope of services, included herein, did not include any environmental assessment for the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater, air, on the site, below, and around the site. Any statements in this report or on the boring logs regarding odors, colors, unusual or suspicious items and conditions are strictly for the information of HNTB Corporation and the Tampa Hillsborough Expressway Authority.

APPENDIX A

- USDA Soil Survey Map and USGS Quadrangle Map
- Summary of USDA Hillsborough County Soil Survey

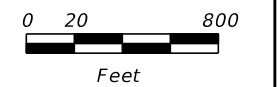


REFERENCE: USDA SOIL SURVEY OF HILLSBOROUGH COUNTY, FLORIDA



REFERENCE: USGS QUADRANGLE MAP OF "TAMPA, FLORIDA"

TOWNSHIP: 29 S
 RANGE: 18 E
 SECTION: 19



REVISIONS				TAMPA HILLSBOROUGH EXPRESSWAY AUTHORITY		USDA SOIL SURVEY & USGS QUADRANGLE MAPS	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	ROAD NO.	COUNTY		
					HILLSBOROUGH		
				KEVIN H. SCOTT, P.E. P.E. LICENSE NUMBER 65514 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637 CERTIFICATE OF AUTHORIZATION NO. 6486			

Summary of USDA Hillsborough County Soil Survey Soil Descriptions

SUMMARY OF USDA SOIL SURVEY HILLSBOROUGH COUNTY, FLORIDA							
USDA Map Symbol and Soil Name	Depth (in)	Soil Classification		Permeability (in/hr)	pH	Seasonal High Water Table	
		USCS	AASHTO			Depth (feet)	Months
(56) Urban Land	No Information is provided for Urban Land						

Urban Land consists of areas where most of the soil surface is covered with impervious materials, such as buildings and paved areas. This land type consists of areas where the original soil has been modified through cutting, grading, filling, and shaping or has been generally altered for urban development.

APPENDIX B

- Roadway Soil Survey
- Boring Location Plan
- Roadway Soil Profiles

DATE OF SURVEY: APRIL 2018 TO JUNE 2018
 SURVEY MADE BY: TIERRA, INC.
 SUBMITTED BY: KEVIN H. SCOTT, P.E.

**TAMPA HILLSBOROUGH
 EXPRESSWAY AUTHORITY**

DISTRICT: THEA
 COUNTY: HILLSBOROUGH

PROJECT NAME: TWIGGS STREET FROM N. MERIDIAN TO NEBRASKA AVE.

CROSS SECTION SOIL SURVEY FOR THE DESIGN OF ROADS

STRATUM NO.	ORGANIC CONTENT		MOISTURE CONTENT		SIEVE ANALYSIS RESULTS					ATTERBERG LIMITS (%)				DESCRIPTION	CORROSION TEST RESULTS					
	NO. OF TESTS	% ORGANIC	NO. OF TESTS	MOISTURE CONTENT	NO. OF TESTS	10 MESH	40 MESH	60 MESH	100 MESH	200 MESH	NO. OF TESTS	LIQUID LIMIT	PLASTIC INDEX		AASHTO GROUP	NO. OF TESTS	RESISTIVITY ohm-cm	CHLORIDE ppm	SULFATES ppm	pH
1	--	--	--	--	5	100	91	68	31	3-7	--	--	--	A-3	LIGHT BROWN TO BROWN SAND TO SAND WITH SILT	1	19,000	15	42	8.9
2	1	3	1	11	3	58-100	54-93	43-73	23-37	5-9	--	--	--	A-3	BROWN TO ORANGE-BROWN SAND TO SAND WITH SILT WITH ROCK FRAGMENTS AND/OR CEMENTED SANDS AND/OR ASPHALT FRAGMENTS	--	--	--	--	--
3	--	--	1	17	1	100	94	75	43	20	1	NP	NP	A-2-4	LIGHT BROWN SILTY SAND	--	--	--	--	--

EMBANKMENT AND SUBGRADE MATERIAL

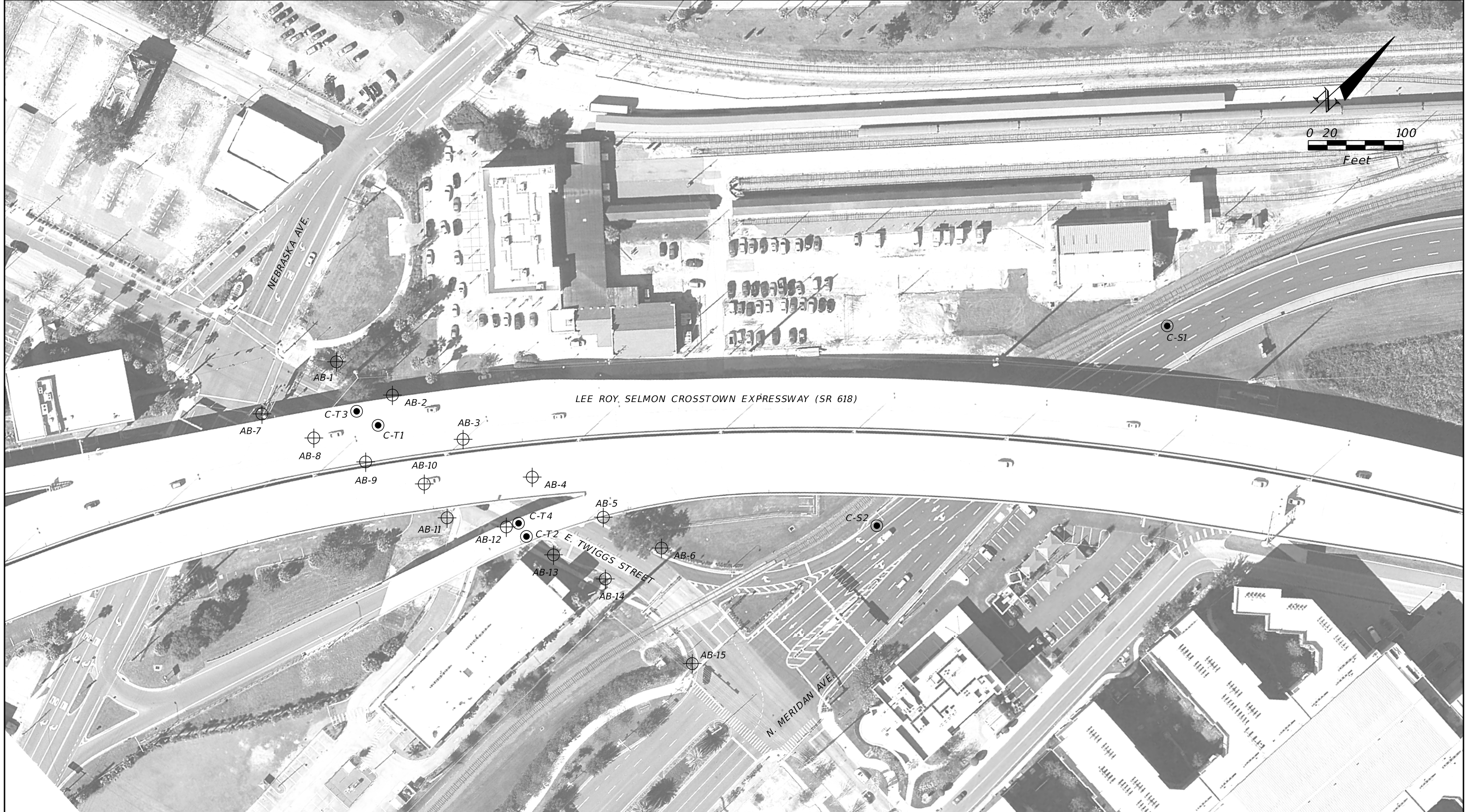
STRATA BOUNDARIES ARE APPROXIMATE. MAKE FINAL CHECK AFTER GRADING.

▼ - WATER TABLE ENCOUNTERED

GNE - GROUNDWATER NOT ENCOUNTERED

NP - NON PLASTIC

REVISIONS				KEVIN H. SCOTT, P.E. P.E. LICENSE NUMBER 65514 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637 CERTIFICATE OF AUTHORIZATION NO. 6486	TAMPA HILLSBOROUGH EXPRESSWAY AUTHORITY			ROADWAY SOIL SURVEY	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					HILLSBOROUGH				



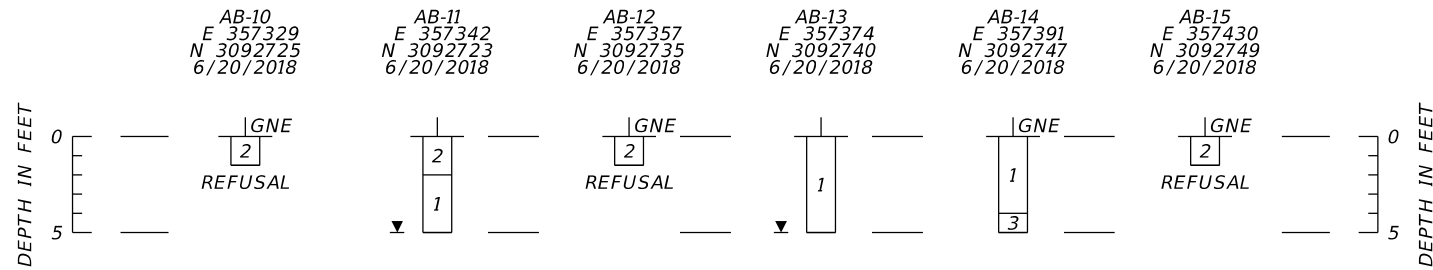
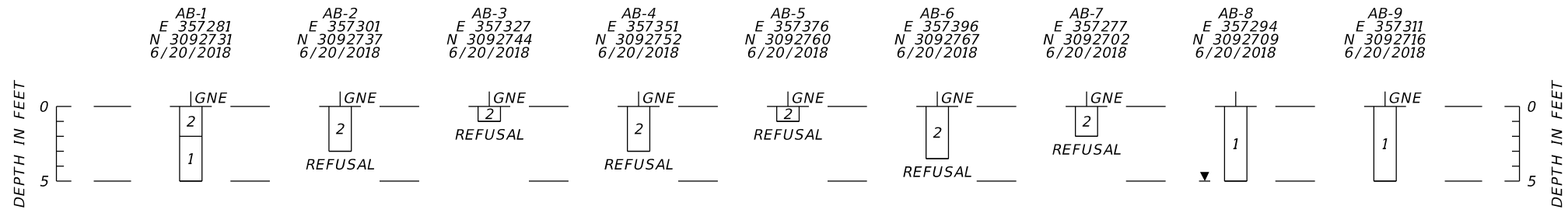
LEGEND

- APPROXIMATE CORE SAMPLE LOCATION
- ⊕ APPROXIMATE AUGER BORING LOCATION

REVISIONS				KEVIN H. SCOTT, P.E. P.E. LICENSE NUMBER 65514 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637 CERTIFICATE OF AUTHORIZATION NO. 6486	TAMPA HILLSBOROUGH EXPRESSWAY AUTHORITY		BORING LOCATION PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY		

LEGEND

1. LIGHT BROWN TO BROWN SAND TO SAND WITH SILT (A-3)
 2. BROWN TO ORANGE-BROWN SAND TO SAND WITH SILT WITH ROCK FRAGMENTS AND/OR CEMENTED SANDS AND/OR ASPHALT FRAGMENTS (A-3)
 3. LIGHT BROWN SILTY SAND (A-2-4)
- A-3 AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
- ▼ GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
- GNE GROUNDWATER NOT ENCOUNTERED
- REFUSAL HAND AUGER REFUSAL DUE TO OBSTRUCTION



REVISIONS				KEVIN H. SCOTT, P.E. P.E. LICENSE NUMBER 65514 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637 CERTIFICATE OF AUTHORIZATION NO. 6486	TAMPA HILLSBOROUGH EXPRESSWAY AUTHORITY			SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID	
					HILLSBOROUGH		ROADWAY SOIL PROFILES	

APPENDIX C

- Summary of Laboratory Classification Test Results
- Summary of Environmental Classification Test Results

Summary of Laboratory Test Results for Soil Classification
Twiggs Street from N. Meridian Avenue to Nebraska Avenue
Hillsborough County, Florida
Tierra Project No.: 6511-16-107-013A

Boring Name	Depth (ft)	Stratum	AASHTO	Seive Analysis					Atterberg Limits			Organic Content (%)	Moisture Content (%)
				#10	#40	#60	#100	#200	Liquid Limit	Plastic Limit	Plasticity Index		
AB-1	2.0 - 5.0	1	A-3	-	-	-	-	5	-	-	-	-	-
AB-8	0.0 - 5.0	1	A-3	-	-	-	-	4	-	-	-	-	-
AB-9	0.0 - 5.0	1	A-3	100	91	68	31	5	-	-	-	-	-
AB-11	2.0 - 5.0	1	A-3	-	-	-	-	3	-	-	-	-	-
AB-14	0.0 - 4.0	1	A-3	-	-	-	-	7	-	-	-	-	-
AB-1	0.0 - 2.0	2	A-3	100	93	73	37	9	-	-	-	3	11
AB-4	0.0 - 3.0	2	A-3	58	54	43	23	5	-	-	-	-	-
AB-7	0.0 - 2.0	2	A-3	-	-	-	-	6	-	-	-	-	-
AB-14	4.0 - 5.0	3	A-2-4	100	94	75	43	20	NP	NP	NP	-	17

**Summary of Laboratory Test Results for Environmental Classification
 Twiggs Street from N. Meridian Avenue to Nebraska Avenue
 Hillsborough County, Florida
 Tierra Project No.: 6511-16-107-013A**

Boring Name	Depth (ft)	Stratum	pH (FM 5-550)	Resistivity (ohm-cm) (FM 5-551)	Chlorides (ppm) (FM 5-552)	Sulfates (ppm) (FM 5-553)	Environmental Classification (Soil)	
							Steel	Concrete
AB-8	2.0 - 5.0	1	8.9	19,000	15	42	Slightly Aggressive	Slightly Aggressive

APPENDIX D

- Pavement Data Table
- Representative Photographs of Pavement Cores

Pavement Data Table
Twiggs Street from N. Meridian Avenue to Nebraska Avenue
Hillsborough County, Florida
Tierra Project No.: 6511-16-107-013A

Core No.	Location		Asphalt Layer						Base for Paved Roadway		Subgrade		Crack Depth (inches)	Pavement Condition ⁽³⁾	Rut Depth (inches)	Cross Slope (%)	Groundwater Depth (feet)	
	State Plane Coordinates ⁽¹⁾ (FL West NAD 83)		Thickness (inches)			Type ⁽²⁾			Total Asphalt Thickness (inches)	Type	Thickness (inches)	Type						Depth ⁽⁴⁾ (feet)
	Easting	Northing	1 st Layer	2 nd Layer	3 rd Layer	1 st Layer	2 nd Layer	3 rd Layer										
C-S1	511173	1316142	0.8	1.7	3.0	FC-9.5	SP-9.5	SP-12.5	5.5	Limerock	17.5	A-3 (Sand with Cemented Sands)	2.0	2.5	Good	N/A ⁽⁵⁾	8.2	GNE
C-S2	511136	1315817	0.9	2.1	3.0	FC-9.5	SP-9.5	SP-12.5	6.0	Limerock	18.0	A-2-4 (Silty Sand Stabilizer with Limerock Fragments)	2.0	---	Good	N/A ⁽⁵⁾	3.8	GNE
												A-3 (Sand)	3.0					
C-T1	510689	1315485	2.0	1.9	---	S-1	Type III Leveling	---	3.9	Limerock	8.4	A-3 (Sand)	2.0	3.6	Poor	N/A ⁽⁵⁾	2.5	GNE
C-T2	510895	1315549	0.9	1.2	2.7	S-1	Type III Leveling	S-3	4.8	Limerock	10.3	A-3 (Sand with Shell)	2.0	---	Fair	N/A ⁽⁵⁾	1.5	GNE
C-T3	510728	1315528	1.5	2.1	---	S-1	Type III Leveling	---	3.6	Limerock	10.0	A-3 (Sand with Shell)	2.0	---	Poor	0.25	4.7	GNE
C-T4	510862	1315562	1.0	1.2	1.8	FC-9.5	SP-12.5	S-1	4.0	Limerock	9.5	A-3 (Sand with Shell)	2.0	4.0	Fair	N/A ⁽⁵⁾	1.4	GNE

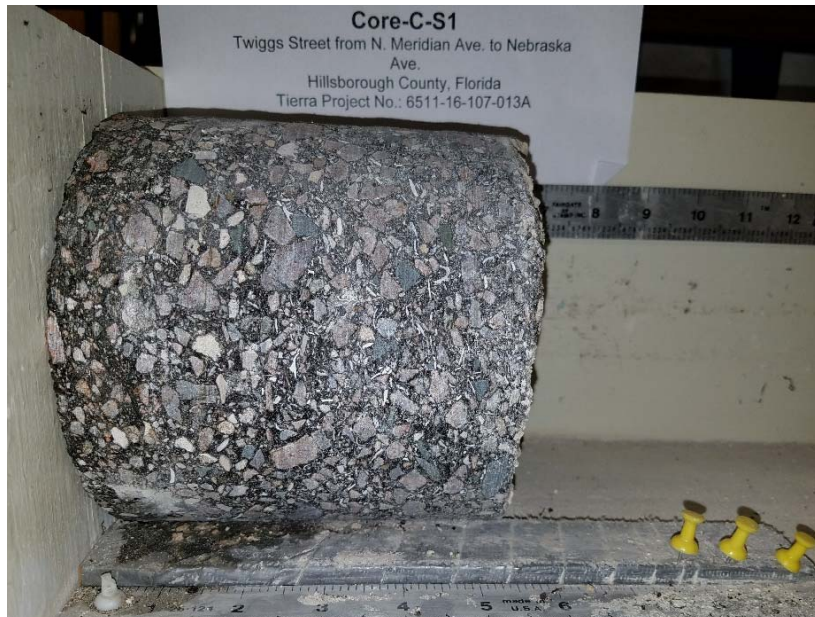
Notes:

- ⁽¹⁾ Pavement core locations were estimated in the field by a representative of Tierra using a non-survey grade GPS unit with a reported accuracy of ±10 feet. The pavement core locations should therefore be considered approximate.
 - ⁽²⁾ Pavement layer identification based on visual review using FDOT Mixture nomenclature. Actual pavement may be a local mix. Pavement layer is classified in descending order from the top of the core sample to the bottom.
 - ⁽³⁾ Pavement condition based on visual observation only: Good, Fair or Poor.
 - ⁽⁴⁾ The subgrade depth reported is the minimum depth the material was encountered below the bottom of the Limerock base.
 - ⁽⁵⁾ No measurable ruts observed.
- N/A - Not Applicable
GNE - Groundwater Not Encountered

**Representative Photographs of Pavement Cores
Twiggs Street from N. Meridian Avenue to Nebraska Avenue
Hillsborough County, Florida
Tierra Project No.: 6511-16-107-013A**



C-S1 Top View



C-S1 Side View

**Representative Photographs of Pavement Cores
Twiggs Street from N. Meridian Avenue to Nebraska Avenue
Hillsborough County, Florida
Tierra Project No.: 6511-16-107-013A**



C-S2 Top View



C-S2 Side View

**Representative Photographs of Pavement Cores
Twiggs Street from N. Meridian Avenue to Nebraska Avenue
Hillsborough County, Florida
Tierra Project No.: 6511-16-107-013A**



C-T1 Top View



C-T1 Side View

**Representative Photographs of Pavement Cores
Twiggs Street from N. Meridian Avenue to Nebraska Avenue
Hillsborough County, Florida
Tierra Project No.: 6511-16-107-013A**



C-T2 Top View

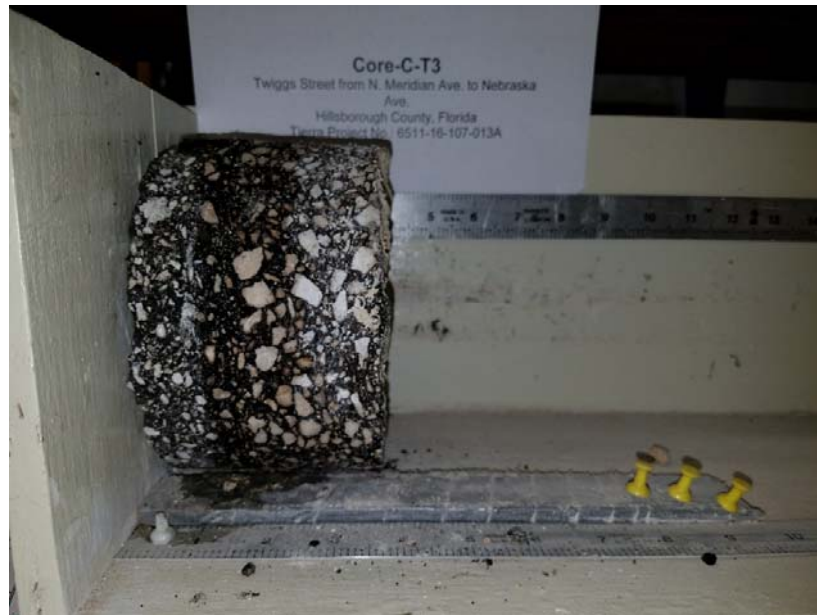


C-T2 Side View

**Representative Photographs of Pavement Cores
Twiggs Street from N. Meridian Avenue to Nebraska Avenue
Hillsborough County, Florida
Tierra Project No.: 6511-16-107-013A**



C-T3 Top View



C-T3 Side View

**Representative Photographs of Pavement Cores
Twiggs Street from N. Meridian Avenue to Nebraska Avenue
Hillsborough County, Florida
Tierra Project No.: 6511-16-107-013A**



C-T4 Top View



C-T4 Side View