

MAJOR ROADWAY PROJECT

PRELIMINARY ENGINEERING REPORT

**W COLUMBUS DR. / E COLUMBUS DR.
FROM DALE MABRY HWY TO N 13TH ST**

HILLSBOROUGH COUNTY

CIP No. 69631.105

PREPARED FOR

Hillsborough County Public Works

601 E. Kennedy Boulevard
Tampa, Florida 33602

PREPARED BY

**Hillsborough County Public Works
Project Development**

Team Lead: Diana P. Ramirez, P.E
Project Manager: Jenny Benitez, MBA

AUGUST 2019



**Hillsborough
County Florida**

Project: CIP 69631.105 PER

Name: Diana P. Ramirez. P.E.

P.E. No. 77426

Signature: _____

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INTRODUCTION

Hillsborough County Public Works Department has tasked the Engineering Services Section - Technical Services Division – Project Development Team to coordinate and develop Preliminary Engineering Reports for the fiscal year’s resurfacing projects as part of a new process. The task included field review, data search, coordination with other departments and disciplines, and creation of a Preliminary Engineering Report with recommendations. Public Works intends to expand communication between departments and disciplines and coordinate efforts during project development. These efforts will generate projects which not only maintain the county’s infrastructure, but also update traffic and pedestrian safety, to fulfill today’s demands and look into future ones. The Project Development Team responded enthusiastically to the challenge and produced these reports.

The recommendations include but are not limited to: ADA compliance, pedestrian and bicycle safety, traffic safety, drainage needs and other field visible or public requested needs. W Columbus Dr. / E Columbus Dr. from Dale Mabry Hwy to N 13th St. is part of the 2020 Fiscal Year resurfacing list. Project length is 3.75 CL miles.

Project Location

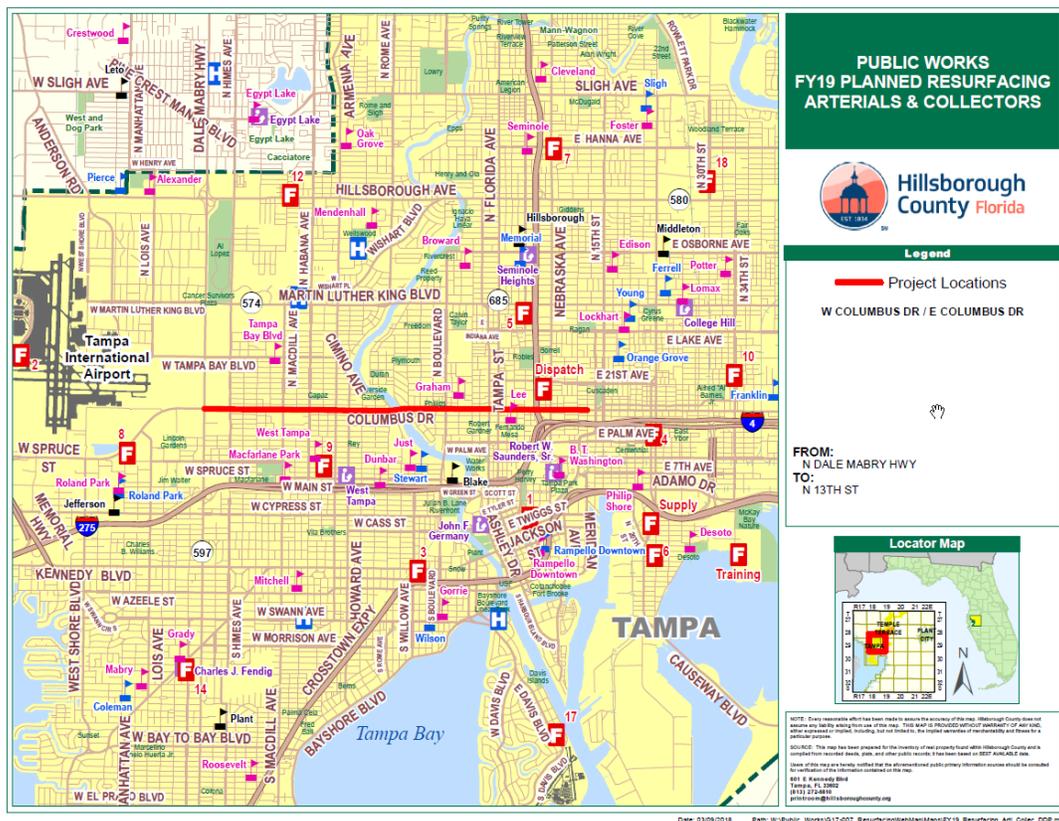


FIGURE 1

Current CIPs Under Design or Under Construction within Proposed Project Limits

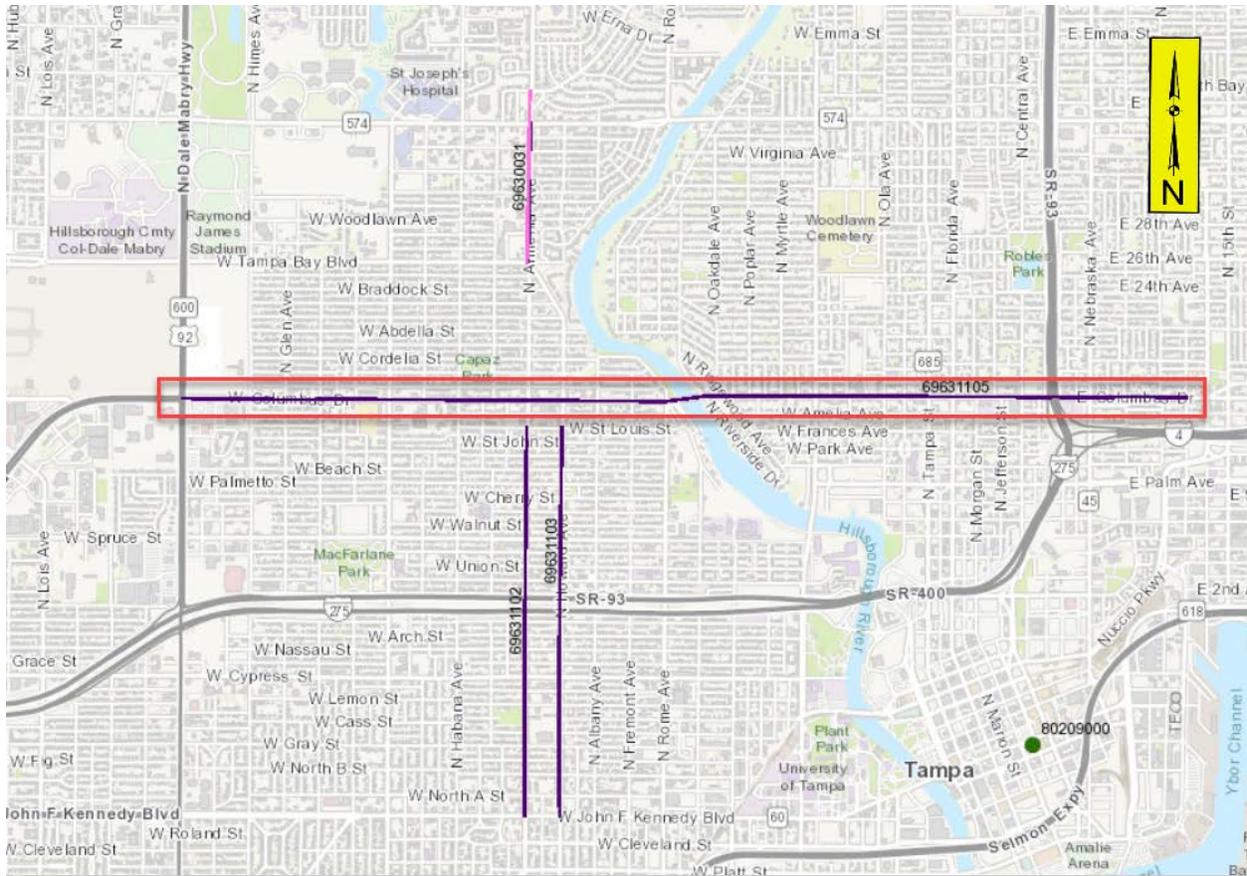


FIGURE 2

1. CIP #: 69631.103 / Roadway Pavement

Project Name: N. Howard Ave. from W. Kennedy Blvd. to Saint Louis St.

Project Description: Resurfacing along N. Howard Ave. from W. Kennedy Blvd. to Saint Louis St.; includes preliminary engineering report, identifying resurfacing limits, ADA improvements, sidewalk repairs and construction of recommended rehabilitation.

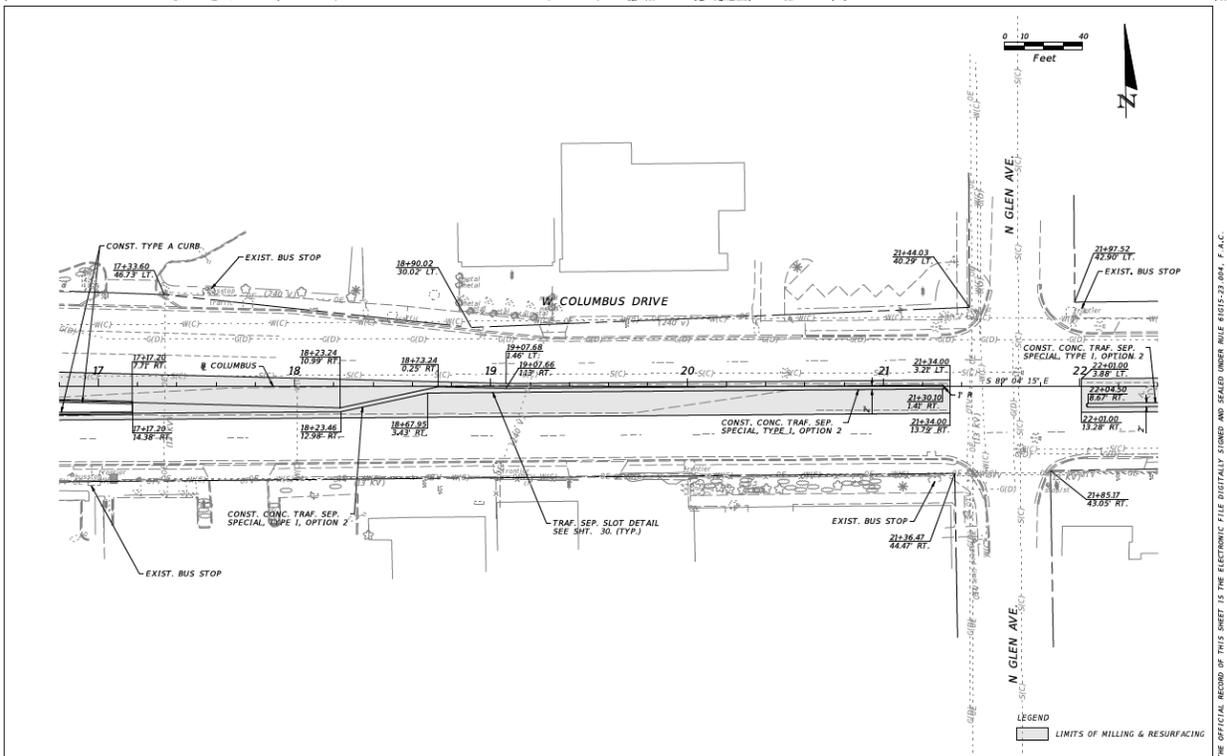
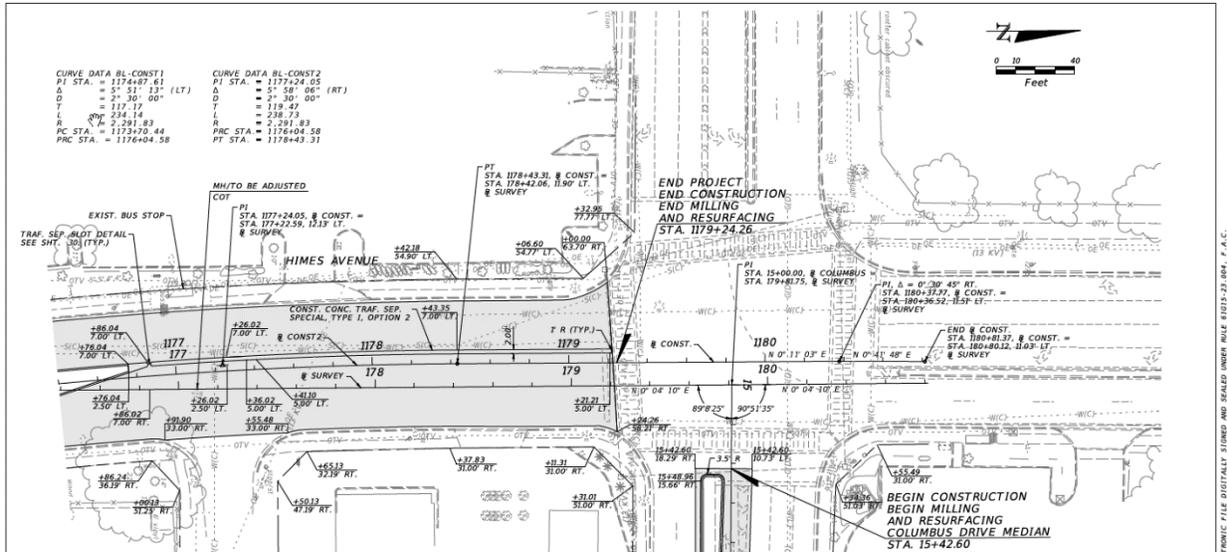
The current phase of this project is Planning / PD&E, which is projected to be completed on March 2019. Construction is scheduled to begin in January 2020. The total project budget is \$800,000.

4. FDOT FIP: 437647-1-58-01 / COT Projects

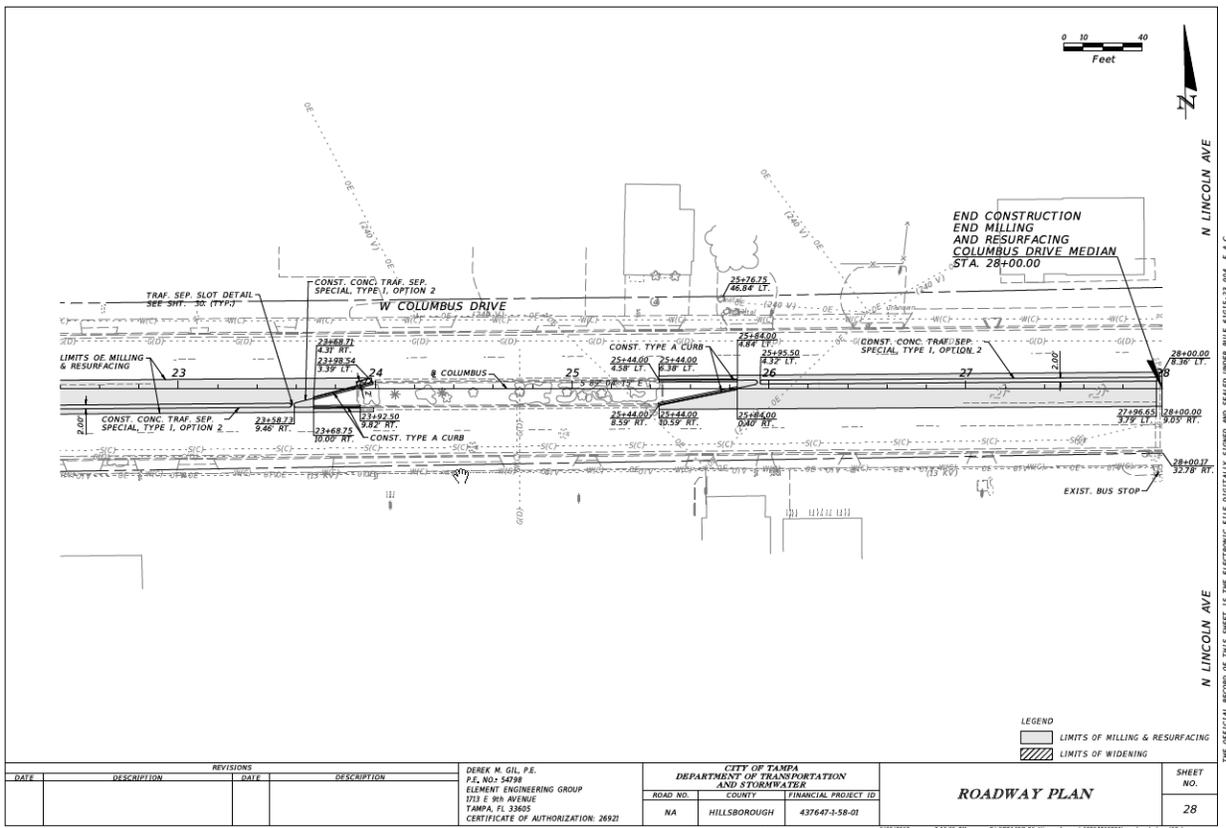
Project Name: N. Himes Ave. from W. Kennedy Blvd. to W. Columbus Dr.

Project Description: This project included the conversion of the median to turn lanes. The project also included the reconstruction of the medians along w. Columbus Dr. from N. Himes Ave. to N. Lincoln Ave. to provide turn lanes and traffic separators.

City of Tampa current projects under design



REVISIONS		DATE	DESCRIPTION	DEKER M. CIL, P.E. P.E. NO. 54798 ELEMENT ENGINEERING GROUP 373 E 9th AVENUE TAMPA, FL 33605 CERTIFICATE OF AUTHORIZATION: 26921	CITY OF TAMPA DEPARTMENT OF TRANSPORTATION AND STORMWATER			ROADWAY PLAN	SHEET NO. 27
DATE	DESCRIPTION				ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					NA	HILLSBOROUGH	437647-1-58-01		



- FPN 436639-1 LAP Project - COT – Columbus Drive Complete Street from Nebraska Ave. to 14th St. This project proposes to reconfigure the existing 2-lane undivided roadway to provide bicycle lanes on both side of the roadway and on-street parking aisle to one side.



February 3, 2016

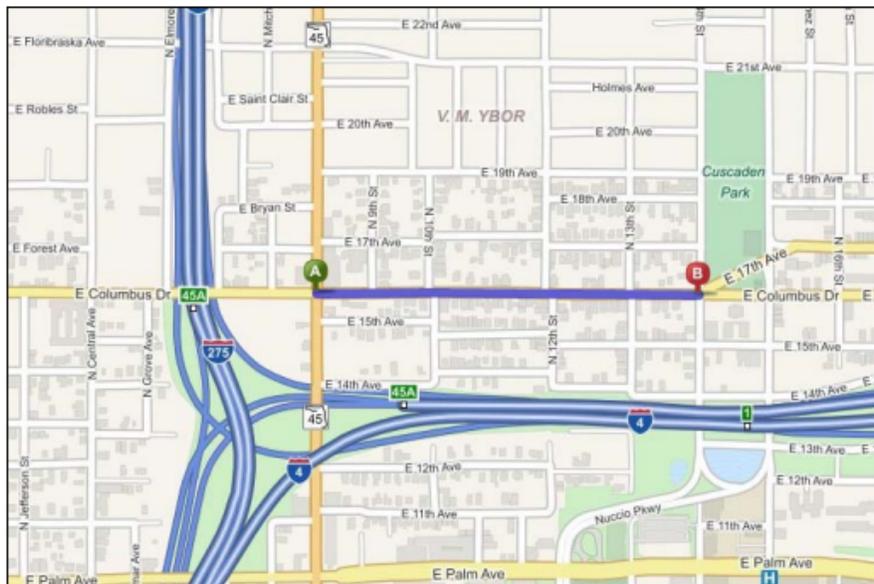
Columbus Drive Complete Street (From Nebraska Ave to 14th St) Project #TBD; FPN 436639-1

Project Description:

The 0.4 mile segment of Columbus Drive from Nebraska Avenue to 14th Street is a 2-lane (one travel lane in each direction) arterial roadway with a posted speed of 30 mph and has an average daily traffic volume of 10,210 vehicles per day. This project is supported as documented and prioritized as number four in the MPO-City of Tampa Walk-Bike Plan Phase I – Final Report.

Based on the geometrics of this roadway, the crash patterns, and field reviews, the recommendation is to reconfigure the existing 2-lane undivided roadway to provide bicycle lanes on both sides of the roadway and on-street parking aisle to one side of the roadway.

Project Location Map:



Project Budget and Schedule:

Phase	Firm	Cost	Funding	Schedule	
				Start	Finish
Design	TBD	\$99,000	FDOT	FY18	FY20
Construction	TBD	\$378,000	City/FDOT	FY20	FY21
Contingency		\$114,000	City		
CEI	City	\$74,000	FDOT		

Consultant Action Items

Action items provided on this report are intended to aid in the development of consultant scope of services. Additional information provided is only for the convenience to inform County and Consultant PMs and do not imply to become action items.

Traffic Information

The crash data report, from the period extending between July 2013 and June 2018, shows a total of 862 crashes occurred along the project limits, 21 pedestrians crashes, 22 crashes involved bicyclists. The corridor has curb and gutter (urban typical section) and it is within the urban City of Tampa limits. Sidewalks are present within the project limits. No bicycle lanes exist to accommodate bicyclists. The posted speed limit varies from 40 MPH to 30 MPH, however vehicles currently drive at a higher speeds.

Facility Authority Information

This facility is own and maintained by Hillsborough County as per the 9/20/2018 Maintenance Agreement between HC and COT.

Action Items

1. ***Maintenance Milling & Resurfacing:*** is the main purpose of this project. The Pavement Design has been provided by the County, please refer to *Appendix D* for the Pavement Design Package.

2. ***Side Streets***

Within the project limits, if the side street is asphalt, patterned pavement or decorative brick pavers, use the following treatment guideline as stated below:

- **Asphalt:**
Milling and resurfacing from PC to PT of the return.
- **Patterned pavement:**
Milling and resurfacing from PC to PT, patterned pavement will not be replaced.
- **Brick pavers:** Remove brick pavers within the right-of-way up to the back of the pedestrian crossing to provide smooth safe passage (as shown below). Fill with asphalt base and match upper layers as per pavement design provided in Appendix D.



Side Street with decorative brick pavers



Side Street with asphalt pavement or patterned pavement

- 3. Side Street Return Radii** at the following intersection: N. Matanzas Ave., N. Tampania Ave., N. St. Peter Ave., N. Albany Ave., N. Poplar Ave., N. Massachusetts Ave., N. Highland Ave., N. Tampa St., N. Central Ave. and N. Grove Ave. Reconstruct turning radius to accommodate predominant vehicles using the intersection and push back ADA ramps. If the side street return radii has the following type of treatment asphalt, pattern pavement or decorative brick pavers, use the treatment guideline as stated above. Clearly show and label the applicable information on the plans.



Side streets radius

4. **Pavement Markings:** install all pavement markings per current FDOT standards.
5. **Reconstruct existing concrete driveways** (include apron per SI 515 for driveways) *with steep grades*, specifically sidewalks with cross slope steeper than 0.02, and/or rough surfaces making it difficult for the impaired or wheel chairs. Ensure the sidewalk transition at the driveway apron meets ADA criteria.



Driveway Apron Reconstruction



Southeast corner of N Boulevard and E Columbus Dr. Provide proper ADA transition from the sidewalk to the driveway.

6. **Abandoned Concrete Driveways:** evaluate the possibility to remove concrete within the right of way on all abandoned driveways and replace with 6" concrete sidewalk and type "D" curb throughout the corridor.
- If the driveway cannot be removed:
 - Ensure the cross slope is in compliance with ADA criteria; at 2% or less.
 - Apply for an ADA design exception with a compelling reason thru the County Engineer.



Northwest corner of N 10th St. and E Columbus Dr.

7. **Coordination with HART:** Coordinate with HART and all Bus Stops along project limits to provide for ADA compliance.



Coordinate with HART to provide ADA compliance

8. Mid-Block Crossings at:

- *Between N. Morgan St. and N. Jefferson St. and*
- *Between N. Massachusetts Ave. and Nevada Ave.:*

Bring midblock crossings up to current standards (signs and markings), add ADA curb ramps and connectivity to sidewalks.



Midblock crossing between Massachousett Ave and Nevada Ave



Midblock crossing between N Morgan St and N Jefferson St

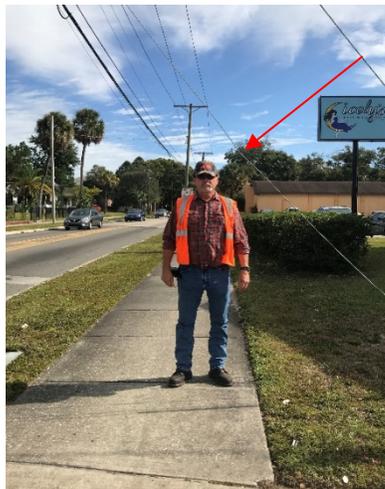
9. Sidewalk gap:

On the south side of W. Columbus Dr. from N Fremont Ave going east, there is approximately 300' of sidewalk gap. Construct sidewalk to provide pedestrian's connectivity,



10. Utility poles along the corridor, consultant to coordinate with TECO to bring sidewalk width to ADA compliance and site distance per Standards. Provide propose solution to County PM and Project Development Team for discussion and approval.

- a. Evaluate safety hazard for the items listed below and provide recommendations.
 - i. The location of guy wires within the sidewalk is creating a safety hazard for the pedestrians.



Guy wire



Guy wire

- ii. Poles are located within the sidewalk, some area have as little as 30" in width, which does not meet the minimum 36" at a point for ADA access.



Minimum sidewalk width < 3'



Sidewalk width 2'6"

- iii. Sight Distance: Evaluate the sight distance at the intersection of N. Royal Ave. and W. Columbus Dr. provide recommendations.



11. Sidewalk Width:

- **Sidewalk width along the entire corridor:** existing sidewalk width varies from 22" to 6'. The *minimum width* for sidewalk per ADA criteria is 4'; with allowance of 3' min. at a given point for passage. Coordinate with the COT and the utility company to remove obstructions within the sidewalk where the ADA minimum criteria is not met, or propose an acceptable solution, to provide proper sidewalk widths for ADA and pedestrian safety.



- **Along the Cemetery frontage property:** the sidewalk in front of Marti Colon Cemetery is narrow and unsafe. The cemetery retaining wall (+/- 350') is located within the sidewalk path and have less than 30" in width, which does not meet the minimum 36". Based on the Hillsborough County GIS data, the headwall appears to be on County Right-of-way. Coordinate with the COT to provide option for a safer passage. Following are possible options to considered:
 - i. Allow pedestrian and bicycle to walk and ride along the cemetery pathway (coordination with the cemetery will be required)
 - ii. Reduce lane width to provide wider sidewalk; proper transition must be provided.
 - iii. Provide pedestrian crossing before and after the cemetery.



Sidewalk width less than 3'



Sidewalk width along the cemetery wall - 1'10"



Sidewalk width less than 3'

- 12. Tripping hazards & Utility tops:** throughout the project limits, several manholes and valves within the sidewalk are creating tripping hazard for the pedestrians. Adjust the utilities to eliminate the hazard.



- 13. Curb Ramps:** Reconstruct and/or add curb ramps as needed to bring to current standards. Refer to the 2013 DOJ/DOT Joint Technical Assistance on the Title II of the ADA and its subsequent Supplement Questions & Answers. Provide curb ramps as needed throughout the project limits.



Provide appropriate curb ramp

14. Detectable Warnings: Provide detectable warnings were missing and replace worn out ones throughout the project limits.



Detectable Warnings

Recommendations from other Departments and Disciplines

Recommendations from other departments and disciplines were reviewed. Not all recommendations were included as action items under the resurfacing project. Funds under the resurfacing project are limited for asphalt only. Additional funds for safety maintenance items, such curb ramps and shoulder treatment, were added. For all other recommended or requested items, from other departments and disciplines, if no additional funds were provided by the department or discipline, the items were not added to the resurfacing project.

Dept. Requested	Request Date	Due Date	Response	Response Date
Construction	05/16/2018	07/20/2018	No Provided	
	Recommendations:			
Environmental Permits	05/16/2018	07/20/2018	Not Provided	
	Recommendations:			
Geotechnical & Pavement Design	05/16/2018	07/20/2018	Provided	09/21/2018
	Recommendations: Pavement Design Package provided, refer to Appendix D.			
ITS	05/16/2018	07/20/2018	Not Provided	
	Recommendations:			

Dept. Requested	Request Date	Due Date	Response	Response Date
Landscaping	05/16/2018	07/20/2018	Not Provided	
	Recommendations:			
Maintenance East Service Unit	05/16/2018	07/20/2018	Provided	06/29/2018
	Recommendations: Project is not within the ESU service area.			
Maintenance West Service Unit	05/16/2018	07/20/2018	Provided	06/13/2018
	Recommendations: No issues or recommendations provided. Roadway segment is under COT Maintenance Agreement.			
Maintenance South Service Unit	05/16/2018	07/20/2018	Provided	06/13/2018
	Recommendations: Project is not within the SSU service area.			
PD&E Hazmat	05/16/2018	07/20/2018	Not Provided	
	Recommendations:			
PUD Utilities	05/16/2018	07/20/2018	Not Provided	
	Recommendations:			
Roadway- Reviews	05/16/2018	07/20/2018	Provided	07/18/2018
	Recommendations: Recommend resurface only <ol style="list-style-type: none"> 1. WB CVS ponding east of Lincoln 2. A. milling limit west of 13th B. Design exceptions for power poles Orientation/slope/DW/Flares/too narrow/top landing/cracked/trip hazard <ol style="list-style-type: none"> 3. WB Howard to Armenia – sidewalk cracked 4. Coordinate with new construction project that is redoing the medians 5. Should we stripe for parking lane? 6. Check narrow sidewalks to have minimum ADA width 13th to 9th 44', 30 MPH, Transition to Nebraska 2 Lane undivided with on street parking, fair left West of Nebraska to Taliafarro transition out turn lane 2 lane divided Taliafarro to N Blvd 28', 30 MPH, 2 lane undivided School zone within corridor 9' lanes (Tampa to Florida, for left turn lanes)			

Dept. Requested	Request Date	Due Date	Response	Response Date
			<p>Pavement – Fair, some cracks and patches Road Condition – 13th – Fair School signage – Villa Madonna and Robert E Lee – Update per speed zone manual, needs flasher</p> <p>N. Blvd to Habana 40 MPH, 38', 4 lane undivided 9' outside, 10' middle Pavement cracked, not many patches Exclude Howard to west of Armenia – Project by COT</p> <p>West of Habana to East Lincoln 40 MPH, 48', 12' lanes, 4 lanes undivided</p> <p>Lincoln to Himes MPH not designated, make 40 MPH post 4 lane undivided, Coordinate with _____ WB pavement is in bad shape</p> <p>Himes to Dale Mabry 6 lane divided Omit resurfacing on bridge</p> <p>Bridge to N. Blvd Bad pavement in outside lane</p> <p>Dale Mabry to west of Armenia Pavement in poor condition</p> <p><u>SIGNALIZED INTERSECTIONS</u></p> <p>Columbus @ Nebraska NW Strain pole has been hit many times NW Signal pole – need design exception Detectable warning surfaces – replace all Replace texture – coordinate with COT SE curb ramp – cracked Separate ped buttons, new all around Need Reflectorized back plates all around Check ownership of signal diagonal span wire</p> <p>Columbus @ Tampa Push buttons facing wrong direction Reflectorized back plates all around</p> <p>Columbus @ N. Blvd Already has reflectorized back plates Push buttons and crossing signs backwards all corners</p>	

Dept. Requested	Request Date	Due Date	Response	Response Date
	Look into separate buttons, provide reason cannot be done Columbus @ N Ridgewood Push buttons only available to cross Columbus Push buttons not oriented correctly at top of ramp Columbus @ Howard Check push button orientation on NE and SW corners Separate push buttons 10' apart, ie move off signal pole (NE & SW corners) Back plates need reflectorized all around Columbus @ Armenia Separate push buttons 10' apart, ie move off signal pole Back plates need reflectorized all around Make new ramps work with existing crosswalks Columbus @ Habana Separate push buttons 10' apart, ie move off signal pole Back plates need reflectorized all around Bus bench hazard access – report to Cabrera Columbus @ MacDill Separate push buttons 10' apart, ie move off signal pole Back plates need reflectorized all around Replace all detectable warning surfaces Bus bench hazard – NE Corner SW Corner Bus Bench within R/W? Columbus @ Lincoln Separate push buttons 10' apart, ie move off signal pole Back plates need reflectorized all around Bus bench hazard access – SW Corner Columbus @ Himes Separate push buttons 10' apart, ie move off signal pole Back plates need reflectorized all around Push buttons not accessible			
Scheduling	05/16/2018	07/20/2018	Not Provided	
	Recommendations:			
Stormwater	05/16/2018	07/20/2018	Provided	06/14/2018
	Recommendations: No recommendations or planned projects from stormwater unit.			
Structures Bridge	05/16/2018	07/20/2018	Provided	7/20/2018
	Recommendations: No Structures/Bridge involvement.			

Dept. Requested	Request Date	Due Date	Response	Response Date
Survey Geomatics	05/16/2018	07/20/2018	Not Provided	
	Recommendations:			
Traffic Design	05/16/2018	07/20/2018	Provided	12/19/18
Traffic Ops	05/16/2018	07/20/2018	Provided	05/17/2018
	Recommendations: Recommendations: Provided a list of general recommendations, not for specific locations just general and to be used as needed. Refer to Appendix A.			
Transp. Planning Trails	05/16/2018	07/20/2018	Provided	05/24/2018
	Recommendations: No recommendations or trail planned projects at this time.			
TTC	05/16/2018	07/20/2018	Not Provided	
	Recommendations:			

APPENDIX A

Traffic Operations

Traffic Operations' Recommended Scope Items for

Future Resurfacing Projects

The below provides suggestions for scope of work on resurfacing projects that may need to be incorporated in the future plans:

- I. Signs:
 - All signs effected by the project will replaced in kind and/or up graded to current FDOT standard
- II. Markings
 - All markings within scope of the project will replaced per latest FDOT standard.
 - Note that the school markings within a school zone may change due to the FDOT Speed Zoning manual.
- III. Traffic Signals
 - All loops at signalized intersections will be replaced per the below note.
 - To meet current standards, new loop windows, conduit, pull boxes and, perhaps, directional bores may be necessary.
660-2-101, 660-2-102, 660-2-106. These pay items shall include labor and materials to furnish and install either a Type A (660-2-101) 6' X 30', Type B (660-2-102) 6' X 6', or Type F (660-2-106) 6' X 30' loop. Placement of the Type A or Type F loops will normally be where the front of the loop is placed three feet in front of the stop bar. Type B loops will be in the main street through lanes located 50' behind stop bar.
 - Type F loops are typically installed in left turn or through lanes that are adjacent to the opposing lane line (no separator or raised median).
 - Pedestrian signals and detectors:
 - If sidewalk and ramp work is anticipated at a signalized intersection, the pedestrian detectors will have to be modified/moved/installed to ensure compliance with ADA (example document provided separately).

These to include:

- Level Landing Area
 - Pedestrian detector center over a 30" by 48" level landing
- Separation of Pedestrian Detectors on same corner
 - If sufficient right of way exists and two pedestrian detectors are located on the same corner, the pedestrian detectors will be separated by a minimum of 10'
- Alignment of pedestrian detector and associated sign.
 - The pedestrian detector will be mounted on the pedestrian pole in such a way that the raised arrow on the pedestrian detector is pointing in the same direction as the corresponding crosswalk

- Pedestrian Detector Maximum Offset to Crossing
 - The pedestrian detector offset no more than five feet from the crosswalk.

**Traffic Operations' Recommended Scope Items for
Future Resurfacing Projects (continued)**

- Pedestrian Detector Maximum Distance from Pavement
 - The pedestrian detector will be installed 1'6" to 6' from the edge of pavement or entry into the crosswalk. Up to 10' distance is allowed due to onsite constraints.
- Pedestrian Detector Reach to Button
 - The reach to button will be 10 inches maximum per ADA since the pedestrian button will be an "unobstructed side reach".
- All modifications to pedestrian buttons will require new cabling to the controller cabinet. Each button will have its own cable (considered low voltage) with a low voltage conduit path to the controller cabinet.
 - This may require core drilling additional conduits into the controller foundation base.
 - Any new pedestrian detectors will be ADA piezo style pushbutton detector with raised arrow and audible indication.
- Should the project require relocation of the pedestrian signals, the pedestrian signals will be mounted on the traffic signal strain pole or mast arm whenever feasible. Otherwise, the pedestrian signal will be mounted on a 4-1/2" OD aluminum pole with transformer base (T-base) for breakaway purposes.
- Pull Boxes.
 - Any pull boxes installed as part of a resurfacing project will be:
 - 17" X 30" X 18" unless
 - 12" X 24" X 12" at locations where the pull box is only for a loop window and the only conduits and cables support the associated loops.

APPENDIX B

Additional Safety Improvements Preliminary Cost Estimate

**Preliminary Engineer's Estimate
Additional Safety Improvements**

Hillsborough County

Project Name: **W COLUMBUS DR / E COLUMBUS DR**

CIP

69631.105

ID NUM	HC Ref #	FDOT Ref Num	BID ITEM DESCRIPTION	UNIT	AVG HC (\$)	Quantity	TOTAL (\$)
	NPI		ASPHALT AND MILLING (SIDE STREET)	EA	\$ 2,500.00	68.00	\$ 204,000
	NPI		ASPHALT (DRIVEWAY APRON 5' MAINTENANCE)	EA	\$ 95.00		\$ -
	NPI		CURB RAMP	EA	\$ 4,500.00	54.00	\$ 291,600
	NPI		IMPROVING SIDE STREET RADIUS	EA	\$ 2,700.00	10.00	\$ 32,400
	NPI		SHOULDER TREATMENT 1	LF	\$ 5.00		\$ -
	NPI		SHOULDER REGRADING	LF	\$ 7.00		\$ -
	NPI		DROP OFF BEHIND THE SIDEWALK	LF	\$ 7.00		\$ -
	NPI		SPECIAL MARKING FOR SHOULDERS AND OTHERS	LS	\$ 8,000.00	3.00	\$ 28,800
	NPI		GUARDRAIL DOUBLE BEAM	LS	\$ 25.00		\$ -
	NPI		GUARDRAIL TRI BEAM	LS	\$ 30.00		\$ -
	NPI		END TREATMENTS	LS	\$ 5,000.00		\$ -
	NPI		SIDEWALK 4"	LF	\$ 40.00	300.00	\$ 14,400
	NPI		SIDEWALK 6"	LF	\$ 45.00	30.00	\$ 1,620
	NPI		DETECTABLE WARNING (RURAL AREA / RAMP)	EA	\$ 30.00	61.00	\$ 2,196
	NPI		ADDITIONAL M/O	SY	\$ 24.00		\$ -
	NPI		ROOT BARRIER PRUNING	LF	\$ 10.00		\$ -
	NPI		UPDATE PEDESTRIAN SIGNAL	EA	\$ 9,000.00		\$ -
	NPI		ADDING PEDESTRIAN SIGNAL	EA	\$ 12,750.00		\$ -
	NPI		DRAINAGE TOP	EA	\$ 3,500.00		\$ -
	NPI		UTILITY RELOCATION	EA	\$ 7,500.00		\$ -
	NPI		STREET SIGNS	EA	\$ 350.00		\$ -
	NPI		TREE REMOVAL	EA	\$ 4,000.00		\$ -
	NPI		RETAINING WALL	CY	\$ 1,300.00		\$ -

*** Contingency included

TOTAL ESTIMATED COST FOR ADDITIONAL SAFETY IMPROVEMENTS	\$ 575,016.00
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APPENDIX C

Existing Conditions

EXISTING CONDITIONS

Functional Classification

W. Columbus Dr. / E. Columbus Dr. is designated as an Arterial facility in City of Tampa 2015 Level of Service Report. This segment of the road is in the Urban Service Area and services the COT. The 2015 AADT is 31,788 (Dale Mabry Hwy. to Himes Ave.), 26,052 (Himes Ave to Armenia Ave) and 21,500 (Armenia Ave. to N. Boulevard Ave.) with a current LOS “D” and classified Low Volume as per FDOT AADT Thresholds. This area is comprised of residential and commercial development. There is on-street parallel parking on both sides from Nebraska Ave. to N. 13th St. The recommendations provided in this report adhere to current roadway, pedestrian and bicycle safety standards and the observed needs from an engineering view for an Urban Arterial Facility.

Typical Section

W. Columbus / Dr. E. Columbus Dr. transition from a 4-Lane divided to a 2-Lane undivided section beginning just before N. Boulevard.

The segment has curb and gutter on both sides of the road. The entire segment has existing 22” to 6’ sidewalk on both sides. The posted speed is at 40 MPH (Dale Mabry Hwy to N. Boulevard) and 30 MPH (N. Boulevard to N. 13th St.).



FIGURE 1 TYPICAL SECTION



FIGURE 2 TYPICAL SECTION



FIGURE 3 TYPICAL SECTION

Pedestrian and Bicycle Facilities

Sidewalk is present along both sides of this segment and varies between 22” and 6’ wide. There are no bicycle facility within the corridor. There are two schools within the project limits: Villa Madonna Private School and Robert E. Lee Elementary School.

Right-of-Way

The existing right-of-way for W. Columbus Dr. / E. Columbus Dr. is not available in the GIS system. This segment is within the COT.

Drainage

W. Columbus Dr. and E. Columbus Dr. roadway runoff is collected by a closed system of curb inlets.

Crash Data

Crash data was obtained from the Crash Data Management System (CDMS) for the period extending between July 2013 and June 2018. The collision data is summarized in Table 1.

According to the collision data, there have been a total of 862 crashes within the corridor limits. From these crashes there were 21 *pedestrian crashes*, 22 *bicycle crashes*, 268 rear end crashes, and 283 angle crashes reported along the corridor during this time period.

Columbus Dr from Dale Mabry Hwy to 13th St

	07/01/2013 12/31/2013	01/01/2014 12/31/2014	01/01/2015 12/31/2015	01/01/2016 12/31/2016	01/01/2017 12/31/2017	01/01/2018 06/30/2018	Total
	2013	2014	2015	2016	2017	2018	Total
Total Of All Crashes	45	130	157	168	229	133	862
Type of Crashes	2013	2014	2015	2016	2017	2018	Total
Pedestrian	2	4	7	4	3	1	21
Bicycle	3	6	2	6	2	3	22
Angle (LT and RT)	21	38	58	53	74	39	283
Rear End	7	37	45	48	87	44	268
Head On	4	5	4	6	4	3	26
Severity Crashes	2013	2014	2015	2016	2017	2018	Total
Fatal	0	0	0	0	0	0	0
Injury	18	39	36	42	29	23	187
Property Damage Only	27	91	121	126	200	110	675

Property Damage = Total of all Crashes - (Fatality + Injury Crashes)

TABLE 1

Utilities

There are numerous existing utilities within the project corridor. Underground and aboveground utilities run along both sides of the roadway.

Land Use

Land uses along this segment is primarily commercial, with some residential buildings.

APPENDIX D

Pavement Design



PUBLIC WORKS

PO Box 1110 Tampa, FL 33601-1110
(813) 272-5912 | Fax: (813) 272-5811

DATE: 08/28/2018
 FROM: Pavement Management Team (PavMT), Public Works
 PHASE: Final Pavement Design
 PROJECT NO/CIP: 69631.105
 PROJECT DESCRIPTION: W&E COLUMBUS DR. N. DALE MABRY HWY TO N. 13th ST.

Hillsborough County is planning to evaluate and improve various roadways throughout the County. Geotechnical evaluation of roadway conditions is anticipated to be part of the roadway improvement design process. This project will be limited to roadway repair, with no pavement widening or storm water improvements. The intent of this project is to extend the service life of the roadway by rehabilitating/resurfacing the existing asphalt pavement. W&E Columbus Dr. is Urban Collector. This project is inside the Hillsborough County Urban Boundary.

This pavement design package has been prepared in general accordance with the Hillsborough County’s Public Work Department, Transportation Technical Manual 2017, the FDOT “Flexible Pavement Design Manual”, dated January 2018 and applicable addenda and directives.

W&E COLUMBUS DR.

FLEXIBELE PAVEMENT DESIGN SUMMARY SHEET			
Prepared By:	Abdul AL-Rawashdeh P.E.	Date:	August 28 th , 2018
City:	Tampa	County	Hillsborough
County Road	W&E COLUMBUS DR	From:	N. DALE MABRY HWY
Road Classification:	Urban Collector	To:	N. 13th ST.
CIP No.:	C69631105	Fiscal Year	2019
Project Length:	13.17 Lane Miles	Project Area:	94,552 SY

W&E COLUMBUS DR FROM N DALE MABRY HWY TO N BOULEVARD RD.

ADDITIONAL DATA			
Opening Year: 2019, Design Year: 2039		Calculated CBR (LBR): 28 (72)	
18 kip (ESALD) X 1000 (From AADT):	4,500	Traffic Level (FPDM, Page 5-28):	C
Resilient Modulus (MR) (FPDM, Table 5.1):	16,000	Reliability % (FPDM, Table 5.2):	90%
Mainline SN _R (FPDM, Table A.4B):	3.33	Design Speed (mph)	40

W&E COLUMBUS DR FROM N BOULEVARD RD TO N 13TH ST.

ADDITIONAL DATA			
Opening Year: 2019, Design Year: 2039		Calculated CBR (LBR): 28 (72)	
18 kip (ESALD) X 1000 (ASSUMED):	4,000	Traffic Level (FPDM, Page 5-28):	C
Resilient Modulus (MR) (FPDM, Table 5.1):	16,000	Reliability % (FPDM, Table 5.2):	90%
Mainline SN _R (FPDM, Table A.4B):	3.27	Design Speed (mph)	30

1- W&E COLUMBUS DR FROM N DALE MABRY HWY TO N BOULEVARD RD.

SUMMARY OF PROPOSED PAVEMENT DESIGN SECTIONS
Mill 3.0 inches of asphalt.
1.5 inches of Frictional Course Type FC 12.5 (Traffic Level C, PG 76-22).
1.5 inches of Structural Course Type SP 12.5 (Traffic Level C, PG 76-22).
Place Leveling Course if Needed (SP-9.5).

2- W&E COLUMBUS DR FROM N BOULEVARD RD TO N 13TH ST.

SUMMARY OF PROPOSED PAVEMENT DESIGN SECTIONS
Mill 2.0 inches of asphalt.
2.0 inches of Structural Course Type SP 12.5 (Traffic Level C, PG 76-22).
Place Leveling Course if Needed (SP-9.5).

EXISTING PAVEMENT SECTIONS

Based on Geotechnical Reports, the following represents average existing pavement sections. The existing pavement is in a Fair to Poor Condition. The pavement layer thicknesses encountered are presented in the following Table:

W&E COLUMBUS DR FROM N DALE MABRY HWY TO N BOULEVARD RD.

Core ID	Asphalt Thick (in)	SC _{AC}	Base Thick (in)	SC _{Base}	Subgrade Thick (in)	SC _{Subgrade}	SN _c
C-1	3	0.15	9	0.18	12	0.08	3.03
C-2	10	0.15	0	0.18	12	0.08	2.46
C-3	3.75	0.15	8.25	0.18	12	0.08	3.01
C-4	3.5	0.15	10.5	0.18	12	0.08	3.38
C-5	3.75	0.15	8.25	0.18	12	0.08	3.01
C-6	3.5	0.15	9.5	0.18	12	0.08	3.20
C-7	9	0.15	3	0.18	12	0.08	2.85
C-8	5	0.15	3.5	0.18	12	0.08	2.34
C-9	6.5	0.15	0	0.18	12	0.08	1.94
C-10	4	0.15	0	0.18	12	0.08	1.56
C-11	4.5	0.15	9.5	0.18	12	0.08	3.35
Average	5.14	0.15	5.6	0.18	12	0.08	2.74

SC_{AC}: Structural Coefficient for Asphalt.

SC_{Base}: Structural Coefficient for Base.

SC_{Subgrade}: Structural Coefficient for Subgrade.

W&E COLUMBUS DR FROM N BOULEVARD RD TO N 13TH ST.

Core ID	Asphalt Thick (in)	SC _{AC}	Base Thick (in)	SC _{Base}	Subgrade Thick (in)	SC _{Subgrade}	SN _C
C-12	3	0.15	12.5	0.18	12	0.08	3.66
C-13	4	0.15	3.5	0.18	12	0.08	2.19
C-14	5	0.15	3	0.18	12	0.08	2.25
C-15	4.25	0.15	3.25	0.18	12	0.08	2.18
C-16	7	0.15	6	0.18	12	0.08	3.09
C-17	3.75	0.15	3.25	0.18	12	0.08	2.11
C-18	5.5	0.15	10.5	0.18	12	0.08	3.68
C-19	4.25	0.15	9.75	0.18	12	0.08	3.35
Average	4.6	0.15	6.47	0.18	12	0.08	2.81

U.S. Army Corps of Engineers (USACE) Dynamic Cone Penetrometer (DCP) tests were performed after coring and prior to subgrade sampling at the test hole locations. The USACE DCP is used to estimate the California Bearing Ratio (CBR) of the upper subgrade soils. CBR is an index commonly used in pavement design that gives an indication of subgrade support characteristics. The USACE has developed relationships to estimate the CBR value from the results of the DCP test. Soil strength with depth profiles were developed for each DCP test location and are included on the attached Test Hole Logs and USACE DCP Data Sheets. The CBR values are used to estimate a Resilient Modulus (MR) to be used for pavement design. The following Table summarizes the PavMT opinion of the typical support conditions of aggregate base and subgrade soils.

SUPPORT CONDITIONS	CBR RANGE FOR AGGREGATE BASE MATERIALS (%)	CBR RANGE FOR SUBGRADE SOILS (%)
Good	>80	>10
Marginal	60 to 80	5 to 10
Poor	30 to 60	3 to 5
Very Poor	<30	<3

The pavement evaluated is generally in a fair (Figure 1) to poor condition (Figure 2). The pavement surface is exhibiting Alligator cracking, longitudinal and transverse cracking, and patched potholes.



Figure 1: Fair Pavement Condition.



Figure 2: Poor Pavement Condition.

Core ID	Base Type	Base CBR (%)	Subgrade Type	Subgrade CBR (%)	Subgrade Mr (psi)
C-1	Limerock	100	Silty Sand (SM)	31	23007.1
C-2	-	-	Silty Sand (SM)	26.1	20608.2
C-3	Limerock	100	Sand w/Silt (SP,SM)	47.9	30395.2
C-4	Limerock	100	Fine Sand (SP)	25.9	20507
C-5	Limerock	100	Fine Sand (SP)	31.6	23291.1
C-6	Limerock	100	Sand w/Silt (SP,SM)	36.3	25452.5
C-7	Shell Base	100	Sand w/Silt (SP,SM)	23	19006.3
C-8	Brick	-	Sand w/Silt (SP,SM)	7.6	9356.46
C-9	-	-	Sand w/Silt (SP,SM)	31.9	23432.4
C-10	-	-	Sand w/Silt (SP,SM)	19.3	16988.2
C-11	Limerock	100	Silty Sand (SM)	33	23946.4
C-12	Limerock	100	Sand w/Silt (SP,SM)	31.1	23054.6
C-13	Brick	-	Sand w/Silt (SP,SM)	16	15067
C-14	Brick	-	Sand w/Silt (SP,SM)	19.8	17268.6
C-15	Brick	-	Sand w/Silt (SP,SM)	35	24865.3
C-16	Shell Base	100	Sand w/Silt (SP,SM)	33.3	24085.5
C-17	Brick	-	Sand w/Silt (SP,SM)	16.7	15485.7
C-18	Limerock	100	Sand w/Silt (SP,SM)	37.1	25810.1
C-19	Limerock	100	Sand w/Silt (SP,SM)	22.2	18580.5
AVERAGE				27.6	21,064

BASE AND SUBGRADE DATA

Based on Geotechnical Reports, the following subgrade conditions were encountered:

- 1- Groundwater was encountered below surface at 3.5 feet or deeper. It is concluded that there is no base clearance issue due to groundwater in the vicinity.

- 2- Sand with silt materials below the Limerock Base or Bricks was encountered at all test holes.
- 3- Subgrade materials having projected California Bearing Ratio (CBR) ranging from 8 to 48 based on typical conversion from Dynamic Cone Penetration tests. An average CBR value of 28 is calculated (equivalent to Limerock Bearing Ratio (LBR) value of 72) for pavement design. An equivalent subgrade modulus of 21,000 psi is used for pavement calculations. Due to the high standard deviation of the measured modulus values, a reduced subgrade modulus of 16,000 psi is used for pavement calculations.
- 4- Per Hillsborough County Technical Manual for Subdivision and Site Development Projects (2016). It was assumed the stabilized subgrade was used in the original pavement design for the roads.

FLEXIBLE PAVEMENT DESIGN

- 1- A Reliability Factor of 90% was selected for the pavement milling and resurfacing design. This range is within the allowable ranges of the FDOT Flexible Pavement Design Manual for rehabilitation of urban highways.
- 2- The Design Speed for the urban highway is 30 to 40 miles-per-hour (MPH).
- 3- Structural Numbers from Table A.4A of the FDOT Flexible Pavement Design Manual, the required structural number for W&E Columbus Dr from N Dale Mabry Hwy to N Boulevard Rd. 3.33. The required structural number for W&E Columbus Dr from N Boulevard Rd to N 13th St. 3.27.

From the information presented, the existing structural numbers are less than the required structural numbers for both segments of the road. The required thickness of the existing asphalt to be milled and replaced with new asphalt to be within the allowable limits of the required structural number is computed as follow:

Structural Coefficient of New Asphalt = 0.44

Structural Coefficient of Existing Asphalt (Fair to Poor Conditions) = 0.15

Replacement Value (RV) = 0.44 – 0.15 = 0.29

Thickness of mill and overlay asphalt layer for W&E Columbus Dr from N Dale Mabry Hwy to N Boulevard Rd = $(SN_R - SN_C)/RV = (3.33 - 2.74)/0.29 = 2.0$ in

Thickness of mill and overlay asphalt layer for W&E Columbus Dr from N Boulevard Rd to N 13th St = $(SN_R - SN_C)/RV = (3.27 - 2.81)/0.29 = 1.6$ in

The goal of milling is to remove as much surficial distress while maintaining asphalt on top of the existing base to support temporary traffic loads and protect the existing roadway base.

1- W&E COLUMBUS DR FROM N DALE MABRY HWY TO N BOULEVARD RD.

PAVEMENT ITEM	THICKNESS (IN)	STRUCTURAL COEFFICIENT	SN _C
Asphalt Concrete	5.14	0.15	0.77
Limerock Base	5.6	0.18	1.01
Stabilized Subgrade	12.0	0.08	0.96
CALCULATED SN_C			2.74

PAVEMENT ITEM	THICKNESS (IN)	STRUCTURAL COEFFICIENT	SN _N
Mill 3.0" Avg. Depth	-	-	-
Overlay FC-12.5	1.5	0.44	0.66
Overlay SP-12.5	1.5	0.44	0.66
Asphalt Concrete	2.14	0.15	0.32
Limerock Base	5.6	0.18	1.37
Stabilized Subgrade	12.0	0.08	0.96
NEW SN_N			3.61

2- W&E COLUMBUS DR FROM N BOULEVARD RD TO N 13TH ST.

PAVEMENT ITEM	THICKNESS (IN)	STRUCTURAL COEFFICIENT	SN _C
Asphalt Concrete	4.6	0.15	0.69
Limerock Base	6.47	0.18	1.16
Stabilized Subgrade	12.0	0.08	0.96
CALCULATED SN_C			2.81

PAVEMENT ITEM	THICKNESS (IN)	STRUCTURAL COEFFICIENT	SN _N
Mill 2.0" Avg. Depth	-	-	-
Overlay SP-12.5	2.0	0.44	0.88
Asphalt Concrete	2.6	0.15	0.39
Limerock Base	6.47	0.18	1.16
Stabilized Subgrade	12.0	0.08	0.96
NEW SN_N			3.39

New structural numbers are greater than the required structural number and the County minimum requirements of a SN of 2.5.

PAVEMENT DESIGN NOTES

- 1- **Friction Course Selection (W&E Columbus Dr from N Dale Mabry Hwy to N Boulevard Rd):** The friction course selected is FC-12.5 for a design speed of 40 mph, Two and Multi-Lane roads (Table 4.1, Page 4-3, Flexible Pavement Design Manual). Due to the high traffic volumes on W&E Columbus Dr. and Section 5.4 in the Flexible Pavement Design Manual, the use of a polymer modified binder has been selected (PG 76-22).
- 2- **Structural Course Selection (W&E Columbus Dr from N Boulevard Rd to N 13th St):** The structural course selected is SP-12.5 for a design speed of 30 mph, Two Lane roads (Table 4.1, Page 4-3, Flexible Pavement Design Manual). Due to the high traffic volumes on W&E Columbus Dr. and Section 5.4 in the Flexible Pavement Design Manual, the use of a polymer modified binder has been selected (PG 76-22).
- 3- **Milling Depth and Purpose:** Due to potential milling into the base, the following plans notes are recommended:
 - a. Anticipate that the base could be exposed during the milling operation and will require a prime cover prior to paving.
 - b. Pavement depression or base failure: Place Leveling Course if Needed (SP-9.5).



Abdul S. AL-Rawashdeh, PE
Engineer, Public Works

CC: Marcello Tavernari, PE
CC: Leland Dicus, PE

APPENDIX
EQUIVALENT SINGLE AXLE LOADS (ESAL_d) CALCULATIONS
CALCULATION SUPPORTING DATA (FLEXIBLE PAVEMENT DESIGN
MANUAL, FDOT)
REPORT OF PAVEMENT ROADWAY CORES AND SUBSURFACE
EXPLORATION

18 kip EQUIVALENT SINGLE AXLE LOAD ANALYSIS

PROJECT TRAFFIC FOR PD&E and DESIGN ANALYSIS INFO / FACTORS

PIN #: C69631105
 COUNTY: Hillsborough
 ROADWAYID: C69631.105
 PROJECT DESCRIPTION: W&E COLUMBUS DR

LOCATION DESCRIPTION: _____ **LOCATION #:** 1
 TAMPA, FL

GROWTH RATE FORMULA

A: Interpolation
 B: Enter Growth Rate
 C: Enter All AADTs
 D: New Facility

Choose A, B, C, or D here: B

Linear Growth Rate 2 %
 Compounded Growth Rate _____ %
 Decaying Growth Rate _____ %
 (select one)

If "A" select an interpolation function
 If "B" enter rate as decimals (1%=1.01)
 If ""C", or "D" continue to next section

DESIGN INFORMATION

	AADT		Daily Direction Split (50% or 100%)
Existing Year <u>2015</u>	<u>26834</u>		<u>50%</u>
Opening Year <u>2019</u>	<u>28900</u>		Lanes in One Direction <u>2</u>
Mid-Design Year <u>2029</u>	<u>34300</u>		T24 values
Design Year <u>2039</u>	<u>39700</u>		Existing to Opening Year <u>5.00%</u>
			Opening to Mid-Year <u>5.00%</u>
			Mid-Year to Design-Year <u>5.00%</u>

Note: AADT values have been rounded to the nearest 100

1995 EQUIVALENCY FACTORS [u(1)]

(selected with an X)	FLEXIBLE PAVEMENT SN = 5/THICK	RIGID PAVEMENT SN = 12/THICK
RURAL FREEWAY:	1.050	1.600
URBAN FREEWAY:	0.900	1.270
RURAL HIGHWAY:	0.960	1.350
URBAN HIGHWAY:	0.890	1.220
OTHER (Enter Factor and X):	_____	_____

(1) Equivalency Factors are based on Updated Pavement Damage Factors Memorandum, dated July 2, 1998.

Lane Factors developed by Copes equation

I have reviewed the 18 kip Equivalent Single Axle Loads (ESAL's) to be used for pavement design on this project. I hereby attest that these have been developed in accordance with the FDOT Project Traffic Forecasting Procedure using historical traffic data and other available information.

Prepared by: _____

Name	Title	Org. Unit or Firm	Date
------	-------	-------------------	------

Signature _____

Reviewed by: Name _____ Title _____ Org. Unit or Firm _____ Date _____

Signature _____

18 kip EQUIVALENT SINGLE AXLE LOAD ANALYSIS - LOCATION 1

PROJECT TRAFFIC FOR PD&E and DESIGN ANALYSIS INFO / FACTORS

YEARS: 2015 to 2039

SECTION #: C69631.105

COUNTY: Hillsborough

PIN #: C69631105

FLEXIBLE PAVEMENT URBAN HIGHWAY 0.890

SN=5/THICK W&E COLUMBUS DR

B

YEAR	AADT	ESAL (1000S)	ACCUM (1000s)	D	T	LF	EF
2015	26800	171	0	0.5	5.00%	0.782	0.890
2016	27300	174	0	0.5	5.00%	0.781	0.890
2017	27900	177	0	0.5	5.00%	0.779	0.890
2018	28400	180	0	0.5	5.00%	0.777	0.890
2019	28900	183	183	0.5	5.00%	0.776	0.890
2020	29500	186	369	0.5	5.00%	0.774	0.890
2021	30000	189	558	0.5	5.00%	0.773	0.890
2022	30500	192	750	0.5	5.00%	0.771	0.890
2023	31100	195	945	0.5	5.00%	0.770	0.890
2024	31600	198	1143	0.5	5.00%	0.768	0.890
2025	32200	201	1344	0.5	5.00%	0.767	0.890
2026	32700	204	1548	0.5	5.00%	0.766	0.890
2027	33200	207	1755	0.5	5.00%	0.764	0.890
2028	33800	210	1965	0.5	5.00%	0.763	0.890
2029	34300	213	2178	0.5	5.00%	0.762	0.890
2030	34800	215	2393	0.5	5.00%	0.760	0.890
2031	35400	219	2612	0.5	5.00%	0.759	0.890
2032	35900	221	2833	0.5	5.00%	0.758	0.890
2033	36400	224	3057	0.5	5.00%	0.757	0.890
2034	37000	227	3284	0.5	5.00%	0.755	0.890
2035	37500	230	3514	0.5	5.00%	0.754	0.890
2036	38100	233	3747	0.5	5.00%	0.753	0.890
2037	38600	236	3983	0.5	5.00%	0.752	0.890
2038	39100	239	4222	0.5	5.00%	0.751	0.890
2039	39700	242	4464	0.5	5.00%	0.750	0.890

Opening to Mid-Design Year ESAL Accumulation (1000s): 1995

Opening to Design Year ESAL Accumulation (1000s): 4281

I have reviewed the 18 kip Equivalent Single Axle Loads (ESAL's) to be used for pavement design on this project. I hereby attest that these have been developed in accordance with the FDOT Project Traffic Forecasting Procedure using historical traffic data and other available information.

Prepared by:

Name	Title	Org.Unit or F	Date
------	-------	---------------	------

Signature

Reviewed By:

Name	Title	Org.Unit or F	Date
------	-------	---------------	------

Signature



FLEXIBLE PAVEMENT DESIGN MANUAL

**OFFICE OF DESIGN, PAVEMENT MANAGEMENT SECTION
JANUARY 2018
TALLAHASSEE, FLORIDA
Topic #625-010-002**

TABLE 5.2
RELIABILITY (%R) FOR DIFFERENT ROADWAY FACILITIES

<u>Facility</u>	<u>New</u>	<u>Rehabilitation</u>
Limited Access	80 - 95	95 - 99
Urban Arterials	80 - 90	90 - 97
Rural Arterials	75 - 90	90 - 95
Collectors	75 - 85	90 - 95

Notes

The type of roadway is determined by the Transportation Statistics Office and can be obtained from the Roadway Characteristics Inventory (RCI).

The designer has some flexibility in selecting values that best fits the project when choosing the Reliability (%R).

Considerations for selecting a reliability level include projected traffic volumes and the consequences involved with early rehabilitation, if actual traffic loadings are greater than anticipated. A detailed discussion of reliability concepts can be found in the AASHTO Guide For Design Of Pavement Structures.

TABLE 5.3 - Example Design Table (From Appendix A, Table A.4A)

**REQUIRED STRUCTURAL NUMBER (SN_R)
90% RELIABILITY (%R)
RESILIENT MODULUS (M_R) RANGE 4,000 PSI TO 18,000 PSI
RESILIENT MODULUS (M_R), (PSI x 1000)**

ESAL _D		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
100	000	3.02	2.77	2.59	2.44	2.31	2.21	2.12	2.04	1.97	1.91	1.86	1.81	1.76	1.72	1.68
150	000	3.23	2.97	2.77	2.61	2.47	2.36	2.27	2.19	2.11	2.05	1.99	1.94	1.89	1.84	1.80
200	000	3.39	3.11	2.90	2.73	2.60	2.48	2.38	2.30	2.22	2.15	2.09	2.03	1.98	1.94	1.89
250	000	3.52	3.23	3.01	2.84	2.69	2.57	2.47	2.38	2.30	2.23	2.17	2.11	2.06	2.01	1.97
300	000	3.62	3.33	3.10	2.92	2.78	2.65	2.55	2.46	2.37	2.30	2.24	2.18	2.12	2.07	2.03
350	000	3.71	3.41	3.18	3.00	2.85	2.72	2.61	2.52	2.44	2.36	2.30	2.23	2.18	2.13	2.08
400	000	3.79	3.49	3.25	3.07	2.91	2.78	2.67	2.58	2.49	2.42	2.35	2.29	2.23	2.18	2.13
450	000	3.87	3.56	3.32	3.13	2.97	2.84	2.73	2.63	2.54	2.46	2.39	2.33	2.27	2.22	2.17
500	000	3.93	3.62	3.38	3.18	3.02	2.89	2.77	2.67	2.59	2.51	2.44	2.37	2.31	2.26	2.21
600	000	4.05	3.73	3.48	3.28	3.12	2.98	2.86	2.76	2.67	2.58	2.51	2.45	2.39	2.33	2.28
700	000	4.14	3.82	3.57	3.36	3.20	3.05	2.93	2.83	2.73	2.65	2.58	2.51	2.45	2.39	2.34
800	000	4.23	3.90	3.64	3.44	3.27	3.12	3.00	2.89	2.80	2.71	2.63	2.57	2.50	2.44	2.39
900	000	4.31	3.97	3.71	3.51	3.33	3.18	3.06	2.95	2.85	2.76	2.69	2.62	2.55	2.49	2.44
1	000	4.38	4.04	3.78	3.57	3.39	3.24	3.11	3.00	2.90	2.81	2.73	2.66	2.60	2.54	2.48
1	500	4.65	4.30	4.03	3.81	3.62	3.46	3.33	3.21	3.10	3.01	2.92	2.85	2.78	2.71	2.65
2	000	4.85	4.50	4.21	3.99	3.79	3.63	3.49	3.36	3.25	3.16	3.07	2.99	2.91	2.85	2.78
2	500	5.01	4.65	4.36	4.13	3.93	3.76	3.62	3.49	3.38	3.27	3.18	3.10	3.02	2.95	2.89
3	000	5.14	4.77	4.48	4.25	4.05	3.88	3.73	3.60	3.48	3.37	3.28	3.19	3.12	3.04	2.98
3	500	5.25	4.88	4.59	4.35	4.14	3.97	3.82	3.69	3.57	3.46	3.36	3.28	3.20	3.12	3.06
4	000	5.35	4.98	4.68	4.44	4.23	4.06	3.90	3.77	3.65	3.54	3.44	3.35	3.27	3.19	3.12
4	500	5.44	5.06	4.76	4.52	4.31	4.13	3.98	3.84	3.72	3.61	3.51	3.42	3.33	3.26	3.19
5	000	5.52	5.14	4.83	4.59	4.38	4.20	4.04	3.90	3.78	3.67	3.57	3.47	3.39	3.31	3.24
6	000	5.66	5.27	4.96	4.71	4.50	4.32	4.16	4.02	3.89	3.78	3.67	3.58	3.49	3.41	3.34
7	000	5.78	5.38	5.07	4.82	4.61	4.42	4.26	4.12	3.99	3.87	3.77	3.67	3.58	3.50	3.43
8	000	5.88	5.48	5.17	4.91	4.70	4.51	4.35	4.20	4.07	3.95	3.85	3.75	3.66	3.58	3.50
9	000	5.97	5.57	5.26	5.00	4.78	4.59	4.43	4.28	4.15	4.03	3.92	3.82	3.73	3.65	3.57
10	000	6.06	5.65	5.33	5.07	4.85	4.66	4.50	4.35	4.22	4.10	3.99	3.89	3.79	3.71	3.63
15	000	6.39	5.97	5.64	5.37	5.14	4.95	4.77	4.62	4.48	4.36	4.25	4.14	4.05	3.96	3.88
20	000	6.63	6.20	5.86	5.59	5.35	5.15	4.98	4.82	4.68	4.55	4.44	4.33	4.23	4.14	4.06
25	000	6.82	6.38	6.04	5.76	5.52	5.32	5.14	4.98	4.84	4.71	4.59	4.48	4.38	4.29	4.20
30	000	6.98	6.53	6.18	5.90	5.66	5.45	5.27	5.11	4.96	4.83	4.71	4.60	4.50	4.41	4.32
35	000	7.12	6.66	6.31	6.02	5.78	5.57	5.38	5.22	5.07	4.94	4.82	4.71	4.61	4.51	4.42
40	000	7.24	6.78	6.42	6.13	5.88	5.67	5.48	5.32	5.17	5.04	4.91	4.80	4.70	4.60	4.51
45	000	7.34	6.88	6.52	6.22	5.97	5.76	5.57	5.41	5.26	5.12	5.00	4.88	4.78	4.68	4.59
50	000	7.44	6.97	6.61	6.31	6.06	5.84	5.65	5.49	5.34	5.20	5.07	4.96	4.85	4.76	4.66
60	000	7.61	7.13	6.76	6.46	6.21	5.99	5.79	5.62	5.47	5.33	5.21	5.09	4.98	4.88	4.79
70	000	7.76	7.27	6.90	6.59	6.33	6.11	5.91	5.74	5.59	5.45	5.32	5.20	5.09	4.99	4.90
80	000	7.88	7.40	7.01	6.70	6.44	6.22	6.02	5.85	5.69	5.55	5.42	5.30	5.19	5.09	4.99
90	000	8.00	7.51	7.12	6.80	6.54	6.31	6.11	5.94	5.78	5.64	5.51	5.39	5.28	5.17	5.08
100	000	8.10	7.60	7.21	6.90	6.63	6.40	6.20	6.02	5.86	5.72	5.59	5.47	5.35	5.25	5.15

TABLE 5.4

**STRUCTURAL COEFFICIENTS FOR DIFFERENT PAVEMENT LAYERS
 (New Construction or Reconstruction)**

Layer Type	Layer Coeff. per inch	Spec. Sec.
FC-5	0.00	337
FC-12.5, FC-9.5	0.44	337
Superpave Type SP (SP-9.5, SP-12.5, SP-19.0)	0.44	334
Limerock (LBR 100)	0.18	200
Cemented Coquina (LBR 100)	0.18	911
Shell Rock (LBR 100)	0.18	200
Bank Run Shell (LBR 100)	0.18	200
Graded Aggregate (LBR 100)	0.15	204
Recycled Concrete Aggregate (LBR 150)	0.18	911
Type B-12.5	0.30	234
Limerock Stab. (LBR 70)	0.12	230
Shell Stab. (LBR 70)	0.10	
Sand Clay (LBR 75)	0.12	
Soil Cement (500 psi)	0.20	
Soil Cement (300 psi)	0.15	
Type B Stab. (LBR 40)	0.08	
Type B Stab. (LBR 30)	0.06	
Type C Stab.	0.06	
Cement Treated (300 psi)	0.12	
Lime Treated	0.08	

As a practical matter, Superpave mixes for crossroads and other small sections with quantities less than 1000 tons can be designed with the same mix (i.e. Traffic Level) as the mainline. This should be discussed on a project by project basis with the District Bituminous Engineer.

5.6.5 TRAFFIC LEVELS

TRAFFIC LEVELS FOR DESIGN EQUIVALENT SINGLE AXLE LOADS (ESAL_D) RANGE FOR SUPERPAVE ASPHALT CONCRETE STRUCTURAL COURSES

The following are the Traffic Levels for the Design Equivalent Single Axle Loads (ESAL_D) ranges for Superpave Asphalt Concrete Structural Courses

<u>AASHTO DESIGN ESAL_D RANGE (MILLION)</u>	<u>TRAFFIC LEVEL</u>
< 0.3	A
0.3 to < 3	B
3 to < 10	C
10 to < 30	D
>= 30	E

5.6.6 LAYER THICKNESS

SPECIFICATION REQUIREMENTS ON LAYER THICKNESS FOR TYPE SP STRUCTURAL COURSES

The layer thickness must be consistent with the following thickness ranges:

<u>Type Mix</u>	<u>Minimum</u>	<u>Maximum</u>
SP-9.5	1"	1-½-in
SP-12.5	1-½"	2-½-in
SP-19.0	2"	4-in

TABLE 7.1

REDUCED STRUCTURAL COEFFICIENTS OF ASPHALT MATERIALS PER INCH

**Recommended Criteria
(based on the Pavement Condition Survey ratings)**

Good - No Cracking, minor rutting/distortion

Fair - Crack Rated 8 or higher, minor rutting and / or distortion

Poor - Cracking or Rutting rated 7 or less

Layer coefficients for granular base, subbase, and stabilization are not reduced. Use the values shown in Table 5.4.

<u>Layer</u>	<u>Original Design</u>	<u>Pavement Condition</u>		
		<u>Good</u>	<u>Fair</u>	<u>Poor</u>
FC-2 or FC-5	0			
FC-1 or FC-4	0.20	0.17	0.15	0.12
FC-3	0.22	0.20	0.17	0.15
FC-6	0.44	0.34	0.25	0.15
FC-12.5 or FC-9.5	0.44	0.34	0.25	0.15
Type S or SP	0.44	0.34	0.25	0.15
Type I	0.37	0.30	0.23	0.15
Type II	0.20	0.17	0.15	0.12
Type III	0.30	0.25	0.20	0.15
Binder	0.30	0.25	0.20	0.15
ABC-1	0.20	0.17	0.14	0.10
ABC-2	0.25	0.20	0.16	0.12
ABC-3	0.30	0.25	0.20	0.15
Type B-12.5	0.30	0.25	0.20	0.15
SAHM ¹	0.15	0.13	0.11	0.08
SBRM ²	0.15	0.13	0.11	0.08

¹Sand Asphalt Hot Mix

²Sand Bituminous Road Mix

Geotechnical Engineering Services Report

Hillsborough County Major Roads Resurfacing FY 19
Columbus Dr. from N. Dale Mabry Hwy. to N. 13th St.
Hillsborough County, Florida
CIP 69631-090

Prepared for: **Hillsborough County Public Works**
601 E. Kennedy Blvd.
Tampa, FL 33602

Prepared by: **MC Squared, Inc.**
5808-A Breckenridge Parkway
Tampa, Florida 33610

Project No. T051812.101

August 10, 2018





August 10, 2018

Dr. Abdul S. Al-Rawashdeh, P.E.
Roadway Engineer
Hillsborough County Public Works
601 E. Kennedy Blvd.
Tampa, FL 33602

Subject: Geotechnical Engineering Services Report
Hillsborough County Major Roads Resurfacing FY 19
Columbus Dr. from N. Dale Mabry Hwy. to N. 13th St.
Hillsborough County, Florida
MC² Project No. T051812.101

Dear Dr. Al-Rawashdeh:

MC Squared, Inc. (MC²) has completed the geotechnical engineering services for the referenced project. The services were performed in general accordance with **MC²** Proposal No. T051812.101, dated May 22, 2018. The accompanying report contains the results of field explorations and laboratory testing, as well as our recommendations derived from the data.

We trust that this report will assist you in the design and construction of the proposed project. We appreciate the opportunity to be of service to you on this project. Should you have any questions, please do not hesitate to contact us.

Respectfully submitted,
MC²

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APPENDIX

- Pavement Core Summary (19 Pages)
- Project Location Map – Sheet 1
- Boring Location Map – Sheet 2
- USDA Soil Survey and USGS Topographic Map – Sheet 3
- Subsurface Boring Profiles – Sheets 4 through 7
- Individual Boring Logs (19 Pages)
- Test Procedures

1 PROJECT INFORMATION

1.1 Project Authorization

Our geotechnical engineering services were authorized through a Work Order for Miscellaneous Consulting Services Contract between **Hillsborough County** and **MC²** dated June 18, 2018. Our services were performed in general accordance with **MC²** proposal number T051812.101, dated May 22, 2018.

1.2 Project Description

Project information has been provided by Ms. Irina Aubain, E.I. and Dr. Abdul S. Al-Rawashdeh, P.E., both of **Hillsborough County Public Works (County)** through an e-mailed Request for Proposal (RFP) and phone conversations. Further information on the project was obtained during a meeting called by the County at its offices on May 21, 2018. The requested pavement core locations were provided by the County in their RFP. Based on our understanding, the project consists of pavement evaluations of a major roadway in Hillsborough County, Florida (Columbus Dr. from N. Dale Mabry Hwy. to N. 13th St.) that is planned for resurfacing. Our geotechnical services generally included a subsurface exploration, including in-situ testing, laboratory testing, and subsequent evaluation of the data collected. In addition, the completed fieldwork included collection of pavement cores and drilling of hand auger borings with concurrent dynamic cone penetrometer (DCP) testing. These services were completed to support the design for the planned resurfacing of the subject roadway.

Figure 1: Project Alignment (Google Earth, photographed March 15, 2018)



If any of this project’s description is incorrect or has changed, please inform **MC²** so that we may amend, if appropriate, the information represented in this report.

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Columbus Dr. from N. Dale Mabry Hwy. to N. 13th St.

Hillsborough County, Florida

MC² Project No. T051812.101

1.3 Scope of Work and Services

Our scope of services consisted of the following:

1. Conducted a visual reconnaissance of the project roadway to gauge any access issues.
2. Reviewed the USDA Soil Survey for Hillsborough County and the USGS topographic maps to acquire an initial understanding of the near-surface soil characteristics.
3. Coordinated the clearing of utilities with Sunshine 811 in the vicinity of the proposed coring/boring locations. Procured Hillsborough County and City of Tampa permits to work within the Right-of-Way and for Temporary Traffic Control, as necessary. Notified the **County** 48-hours prior to performing any pavement coring.
4. Performed nineteen (19) pavement cores and associated hand-auger (HA) borings through the subbase to approximately 5-ft. below existing ground surface (bgs) or until auger refusal was met or borehole collapse occurred, whichever was shallower. The purpose of the HA borings was to document subsurface conditions, including base and subbase materials and thickness, if apparent.
5. Dynamic Cone Penetrometer (DCP) testing at each test-hole were performed continuously at the request of the **County** to evaluate the soil consistency and/or determine an in-situ LBR value of the base course and subgrade materials. It should be noted that no laboratory testing was performed to determine the LBR value of the soils encountered in our borings. Pavement cores were performed along the roadway alignment at the locations provided by **County** personnel.
6. Recorded the depth to groundwater at the test-hole locations, if encountered.
7. Visually examined all recovered pavement cores and soil samples in the laboratory and performed laboratory tests on selected representative soil samples to develop the soil legend for the project using the American Association of State Highway and Transportation Office (AASHTO) Classification System, as appropriate. The laboratory testing included grain size analyses (-200 sieve), organic and natural moisture content determinations.

As requested, this Geotechnical Engineering Services Report contains the following:

1. A test-holes location diagram (provided by the **County** and drafted by **MC²**).
2. General assessment of area soils based on our past experience, USDA published literature and boring information.
3. A summary table with northing and easting GPS coordinates for each pavement core/test-hole location.

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4. Pavement core/test-hole logs and DCP data sheets prepared for each test location that include a description of the soils encountered and the results of the DCP and laboratory tests. The logs will also contain thicknesses of bases and subbases, if discernible, and photos of pavement cores. A **Pavement Core Summary** for each test location is included in the **Appendix**.
5. Depth to groundwater in the test-holes and estimate of seasonal high groundwater level(s) (SHWT).
6. A discussion of potential construction issues related to the pavements based on the soil and groundwater conditions encountered in the test-holes.

The scope of our services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, groundwater, or air, on or below or around the roadway alignment. Any statements in this report or on the boring logs regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of our client.

2 SITE CONDITIONS

2.1 Site Features

The project site is along N. Armenia Ave. from W. Kennedy Blvd. to W. Saint Louis St. in Tampa, Hillsborough County, Florida. The area around the roadway is developed with predominantly residential properties. The site is generally clear with overhead power along the sides of the road and occasionally crossing perpendicularly. The project alignment traverses underneath I-275 within the eastern half of the project alignment and also spans over the Hillsborough River near it's halfway point.

Figure 2: Columbus Drive looking East from N. Essex Ct. (Google Maps, photographed May of 2017)



2.2 Hillsborough County Soil Survey

The USDA Soil Conservation Service *Soil Survey of Hillsborough County, Florida* was reviewed for general information on the shallow soils in the site vicinity. The survey area data is Version 16 dated October 4, 2017, with aerial images taken from December 19, 2013 to January 17, 2014. The USDA Soil Conservation Service Soil Survey outlines approximate areas dominated by a particular shallow soil type. Small areas of other soils may occur within the mapping unit. The project is within eight (8) mapping units: Arents, nearly level (4), Immokalee-Urban land complex (22), Malabar fine sand, 0 to 2 percent slopes (27) Myakka-Urban land complex (32), Pomello-Urban land complex, 0 to 5 percent slopes (42), Tavares-Urban land complex, 0 to 5 percent slopes (55), Urban land (56), and Winder fine sand, 0 to 2 percent slopes (59), and.

Arents, nearly level (4) has a parent material of altered marine deposits and a typical profile of fine sand from zero to 60-in. bgs. The material is somewhat poorly drained and has a high to very high capacity to transmit water. The depth to the groundwater table is about 18 to 36 inches.

Immokalee-Urban land complex (22) has a parent material of sandy marine deposits and a typical profile of fine sand from zero to 80-in. bgs. The material is poorly drained and has a moderately high to high capacity to transmit water. The depth to the groundwater table is about 6 to 18 inches.

Malabar fine sand, 0 to 2 percent slopes (27) has a parent material of sandy and loamy marine deposits and a typical profile of fine sand from zero to 42-in., fine sandy loam from 42 to 59-in. and loamy fine sand from 59 to 80-in. bgs. The material is poorly drained and has a high capacity to transmit water. The depth to the groundwater table is about zero to 12 inches.

Myakka-Urban land complex (32) has a parent material of sandy marine deposits and a typical profile of fine sand from zero to 80-in. bgs. The material is poorly drained and has a moderately high to high capacity to transmit water. The depth to the groundwater table is about 6 to 18 inches.

Pomello-Urban land complex, 0 to 5 percent slopes (42) has a parent material of sandy marine deposits and a typical profile of fine sand from zero to 80-in. bgs. The material is moderately well drained and has a high capacity to transmit water. The depth to the groundwater table is about 24 to 42 inches.

Tavares-Urban land complex, 0 to 5 percent slopes (55) has a parent material of Eolian or sandy marine deposits and a typical profile of fine sand from zero to 80-in. bgs. The material is moderately well drained and has a very high capacity to transmit water. The depth to the groundwater table is about 42 to 72 inches.

Urban land (56) is a designation used by USDA to signify areas where general characteristics are too difficult to accurately assign. This is typically due to the amount of land development, including imported fill and stormwater improvements, which the area has experienced over time increasing the soils variability over a short distance.

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Winder fine sand, 0 to 2 percent slopes (59) has a parent material of sandy and loamy marine deposits and a typical profile of fine sand from zero to 10-in., sandy loam from 10 to 14-in., sandy clay loam from 14 to 58-in., and sandy loam from 58 to 80-in. bgs. The material is poorly drained and has a moderately low to moderately high capacity to transmit water. The depth to the groundwater table is about zero to 12 inches.

The USDA Soil Survey is not necessarily an exact representation of the soils on the site. The mapping is based on interpretation of aerial maps with scattered shallow borings for confirmation. Accordingly, borders between mapping units are approximate and the change may be transitional. Differences may also occur from the typical stratigraphy, and small areas of other similar and dissimilar soils may occur within the soil-mapping unit. As such, there may be differences in the mapped description and the boring descriptions obtained for this report. The survey is, however, a good basis for evaluating the shallow soil conditions of the area. The **USDA Soil Survey Map** is included in the **Appendix** and a summary of the USDA mapping unit at each boring location is contained in the following **Table 1**.

Table 1: Summary of USDA Soil Survey Information at Boring Locations

Boring IDs	USDA Mapping Unit	USDA Typical Profile (in)	USDA SHWT (in)
C-05 & C-06	Arents, nearly level (4)	fine sand: 0 to 60	18 to 36
C-11	Immokalee-Urban land complex (22)	fine sand: 0 to 80	6 to 18
C-03, C-04, C-07 & C-08	Myakka-Urban land complex (32)	fine sand: 0 to 80	6 to 18
C-12	Pomello-Urban land complex, 0 to 5 percent slopes (42)	fine sand: 0 to 80	24 to 42
C-09, C-13, C-14 & C-16 through C-19	Tavares-Urban land complex, 0 to 5 percent slopes (55)	fine sand: 0 to 80	42 to 72
C-01, C-02 & C-15	Urban land (56)	-	-
C-10	Winder fine sand, 0 to 2 percent slopes (59)	fine sand: 0 to 10 sandy loam: 10 to 14 sandy clay loam: 14 to 58 sandy loam: 58 to 80	0 to 12

2.3 USGS Topographic Survey

The U.S. Geological Survey (USGS) maintains a database of historical topographic maps. Based upon our review of these USGS Topographic Maps, 7.5 Minute Series "Tampa Quadrangle, Florida-

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Hillsborough Co.” and “Gandy Bridge Quadrangle, Florida” where datum is NGVD 1929, approximate elevation of the project alignment ranges within the 5 to 45-ft contour lines with the lower lying areas near the Hillsborough River. No major changes in elevation within the project limits are evident in the USGS topographic maps over time. A **Topographic Map** is included in the **Appendix** for reference and information.

3 FIELD EXPLORATION PROGRAM

3.1 General

The field exploration program consisted of performing nineteen (19) pavement cores, subsequently deepened by HA borings, as well as DCP tests to determine the in-place LBR values of the subbase soils. The field services were performed from July 20 to July 26, 2018, once utility tickets were cleared and permits approved, by MC² personnel and overseen by one of its Florida State licensed professional geotechnical engineers.

3.2 Pavement Cores

The pavement cores were performed using a 4-in. diameter core barrel that was advanced through the asphalt layer. This was followed by HA borings through the base and subbase material to a depth of 5-ft. bgs or until the borehole collapsed or auger refusal, whichever came first. In tandem with the HA borings, DCP tests were performed in order to collect data that could be used to determine the in-place LBR values of the soils. The pavement cores and soil samples were collected and transported to our Tampa, FL office.

3.3 Dynamic Cone Penetrometer Tests

The DCP tests were completed at the site in general accordance with ASTM D-6951 (Standard Test Method for Use of the Dynamic Cone Penetrometer in Shallow Pavement Applications) using a 10.1-lb. steel mass falling 22.6-in. to strike an anvil and cone into the subbase material. The DCP is used to gauge the in-place LBR value. This LBR value is not related to a laboratory soaked LBR test, but is more of an indicator of current conditions on site. At the request of the **County**, the DCP testing was performed continuously from the base course (if encountered) to approximately 4-ft. bgs, or until the water table was encountered, utilizing a Kessler K-100 Model DCP. Continuous testing was only interrupted when 40+ material was encountered. The DCP tests were performed by MC² personnel.

4 LABORATORY TESTING

4.1 Soil Classification Testing

A representative set of soil samples were tested in the laboratory to assist in the classification and

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determination of engineering characteristics of the soils based on their mechanical and physical behavior. Laboratory testing was accomplished in general accordance with applicable AASHTO standards. Laboratory tests completed on representative soil samples retrieved for this project include:

- Twelve (12) moisture content determinations (AASHTO T-265),
- Twelve (12) percent passing the No. 200 US standard sieve tests (AASHTO T-11)
- Two (2) organic content determinations (AASHTO T-267) and
- Visual classification in general accordance with applicable procedures.

Results for each of these laboratory tests are summarized in **Table 2** below and are presented on the individual **Soil Profile Logs** provided in the **Appendix**.

Table 2: Summary of Laboratory Testing

Boring ID (Depth) (ft)	Moisture Content (%)	Percent Passing No. 200 Sieve (%)	Organic Content (%)	Plastic Limit	Liquid Limit	Plastic Index	AASHTO Classification
C-01 (1-2)	14.5	14.9	-	-	-	-	A-2-4
C-01 (4-4.5)	17.6	6.1	-	-	-	-	A-3
C-02 (1-1.5)	11.2	11.3	-	-	-	-	A-2-4
C-02 (4-5)	18.3	2.1	1.2	-	-	-	A-3
C-03 (4-5)	14.3	5.0	-	-	-	-	A-3
C-05 (3-4)	11.9	5.6	-	-	-	-	A-3
C-06 (3-5)	16.3	21.5	-	-	-	-	A-2-4
C-07 (2-2.5)	15.0	18.2	-	-	-	-	A-2-4
C-08 (3.5-4.5)	31.1	68.8	-	-	-	-	A-7
C-09 (4.5-5)	21.4	4.2	0.5	-	-	-	A-3
C-11 (1-2.5)	12.3	12.6	-	-	-	-	A-2-4
C-19 (4-5)	17.1	24.2	-	-	-	-	A-2-6

5 SUBSURFACE CONDITIONS

5.1 Subsurface Conditions

The subsurface conditions described herein are of a generalized nature to highlight the major stratification features and material characteristics encountered during the field exploration. The soil profiles included in the **Appendix** should be reviewed for specific information at individual boring locations. These profiles include soil description, stratification and groundwater table depths where encountered. The stratification shown on the boring profiles represents the conditions only at the actual boring locations. Variations are quite possible and should be expected between boring

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locations. **Table 3** below summarizes the approximate Northing and Easting coordinates of the pavement core locations.

Table 3: Summary of Northing/Easting Coordinates of Pavement Cores

Boring ID	Easting	Northing	Boring ID	Easting	Northing
C-01	493301.672	1320924.860	C-11	504218.074	1320953.130
C-02	493989.229	1320992.316	C-12	505316.633	1320980.765
C-03	495050.377	1320911.289	C-13	506338.532	1320946.944
C-04	496009.030	1320953.576	C-14	507127.066	1320960.804
C-05	497152.672	1320901.510	C-15	508011.337	1320932.193
C-06	498051.431	1320900.866	C-16	509024.217	1320941.264
C-07	499004.495	1320930.269	C-17	510050.369	1320918.092
C-08	500447.336	1320875.521	C-18	511026.104	1320940.280
C-09	501451.078	1320862.151	C-19	511984.477	1320896.398
C-10	503123.818	1320987.083			

In general, the soils consisted of poorly-graded, fine SAND to SAND with silt (A-3). Clayey, silty fine SAND (A-2-4, A-2-6) was encountered in C-01, C-02, C-06, C-08, C-11 and C-19 from 1 to 3-ft., 1 to 1.5-ft., 3 to 5-ft., 1.5 to 3.5-ft., 1 to 2.5-ft. and 4 to 5-ft. bgs, respectively. CLAY (A-7) was encountered in C-08 from 3.5 to 4.5-ft. bgs. Limerock and shell base were encountered within the pavement cores. The subgrade appeared compacted and/or stabilized within the upper 1-ft. of the majority of pavement cores performed. No laboratory testing was performed to determine the LBR value of the material encountered in the pavement cores. **Individual Subsurface Boring Profiles** are contained in the **Appendix**.

5.2 Groundwater Information

Groundwater was encountered at C-07, C-08, C-09, C-10 and C-11 at 3.5-ft., 4.5-ft., 5-ft., 5-ft. and 3.5-ft. bgs, respectively. Groundwater was not encountered (GNE) in the remaining pavement core boreholes. Based on this, we estimate the SHWT to be at an approximate depth of 2-ft. bgs at pavement cores C-07 through C-11 and at a depth of 3.5-ft. bgs at the other pavement core locations. This estimate is based upon our review of available publications and our review of the soil samples collected in the field.

In general, groundwater levels tend to fluctuate during periods of prolonged drought and extended rainfall. In addition, a seasonal effect will also occur in which higher groundwater levels are normally recorded in rainy seasons. If the groundwater level is critical to design or construction, temporary observation wells should be installed along the alignment to monitor groundwater fluctuations over an adequate period that permits more accurate determinations of wet and dry seasonal levels.

We recommend that the Contractor determine the actual groundwater levels at the time of construction to determine groundwater impact on the construction activities, if any.

5.3 Asphalt Pavement Core Information

Nineteen (19) asphalt pavement cores were performed and labeled C-01 through C-19. Information regarding these pavement cores and their subsequent hand-auger borings and DCP tests, in addition to photographs of the recovered asphalt cores, is summarized in the **Appendix**.

6 EVALUATIONS & RECOMMENDATIONS

6.1 Roadway Design Considerations

MC² understands that the subject roadway is planned to be resurfaced. Considerations to perform full depth reclamation (FDR) followed by milling and overlaying may be a preferred option to address the existing pavement conditions. Although pavement design was not included as part of our scope of services, we have included in this section some roadway design considerations that we believe could be useful, should complete reconstruction be a viable alternative.

FDOT Flexible Pavement Design Manual (January 2018 Manual) should be followed in order to determine if the current roadway design meets minimum FDOT and Hillsborough County design requirements.

At this time, the Resilient Modulus (M_R) is unknown. In addition, no information regarding the minimum Required Structural Number (SN_R) or traffic studies have been provided to MC².

The January 2018 Manual specifies a minimum base clearance above the seasonal high ground water of 3-ft. When the clearance is less than 3-ft., the pavement designer must reduce the design resilient modulus by 25% for a 2-ft. base clearance and by 50% for a 1-ft. base clearance.

Based on the DCP values recorded, the majority of the subbase encountered has an apparent LBR value of at least 40 within the upper foot of soil, which is the minimum FDOT requirement. It should be noted that no laboratory testing was performed to determine the LBR values of the subbase. Information pertaining to individual boreholes can be found in the **Appendix** of this report.

6.2 Recommendations for Addressing Existing Pavement Conditions

6.2.1 General

Certain criteria should be considered when deciding between milling and resurfacing versus complete reconstruction of the road. Milling may be appropriate for removing cracked asphalt, avoiding excessive raising of the grade, removing rut susceptible pavement, elimination of an existing mix design problem, etc. However, if subsurface conditions are in need of repair/stabilization, complete reconstruction may be necessary.

6.2.2 Milling and Resurfacing Considerations

If milling and resurfacing are selected, the January 2018 Manual recommends leaving at least $\frac{3}{4}$ -in. of asphalt over the base throughout the project to protect it from traffic and rain. However, if this is not possible because of lack of adequate asphalt thickness, the entire asphalt structure can be milled out, as long as contract provisions allow for maintenance of traffic and protection of the base, such as placement of the first lift of structural asphalt no later than the day after the surface was milled.

6.2.3 Reconstruction Considerations

Our findings indicated that the soils found at the boring locations where soil has been classified as A-3 and A-2-4 would be suitable for supporting a reconstructed roadway and for reuse as structural fill and general backfill, if needed. The A-3 soils are considered as Select Fill in accordance with FDOT Index 505. A-2-4 soils are considered Select Fill as well, however, certain types of A-2-4 material are likely to retain excess moisture and may be difficult to dry and compact. They should be used in the embankment above the groundwater level existing at the time of construction. They may be used in the subgrade portion of the roadbed when approved by the Project Engineer. A-2-4 material placed below the existing groundwater level must be non-plastic and contain less than 15% passing the No. 200 U.S. Standard Sieve.

In accordance with the January 2018 Manual, Section 5.2.2 “Design Base High water Clearance”, a clearance of 3-ft. between the design high water and the base is recommended. For clearance less than 3 feet, a thicker pavement structure may be required along with a reduction of the Design Resilient modulus of 25% for a 2-ft. base clearance and 50% for a 1-ft. base clearance. Clearances less than 1 foot will require underdrains. Superpave Type B – 12.5 base, or equivalent, is an option and a thinner lift can be used to increase the base clearance.

The base material requires a well-compacted stabilized subgrade with a minimum LBR value of 40. Therefore, it will be necessary to keep a 2-foot clearance above groundwater to achieve compaction in the top foot of subgrade. In areas where this cannot be achieved, dewatering to lower the groundwater during construction may be necessary.

These recommendations are based solely on the visual observations of the pavement sections, the distresses observed and the field and laboratory test data obtained. The final pavement design should be performed by others using the information provided in this report, traffic data, types of vehicles, design life and latest FDOT Flexible Pavement Design Manual.

6.2.4 Full Depth Reclamation Considerations

An alternative to Complete Reconstruction is Full Depth Reclamation. With this option, existing base and asphalt material will be grinded and pulverized in place while being mixed with cement and asphalt emulsion. This creates a new flexible, stabilized base material that can be incorporated as part of the new pavement. Resurfacing will then be performed to complete the improvement of the roadway(s). A benefit of FDR is the reduced risk of base course deterioration resulting from water table fluctuation. Depending on the project, this option can be cost effective

Hillsborough County Major Roads Resurfacing FY 19

Columbus Dr. from N. Dale Mabry Hwy. to N. 13th St.

Hillsborough County, Florida

MC² Project No. T051812.101

over time while still providing a similar Structural Number, as compared to the Pavement Reconstruction option, and should be considered by the pavement design engineer.

7 REPORT LIMITATIONS

The evaluations and observations detailed herein are based on the available limited soil information obtained by **MC²** and information provided by **Hillsborough County Public Works** for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, **MC²** should be notified immediately to determine if changes to our recommendations or additional testing are required for this project. In the event that **MC²** is not retained to address such revisions and/or changes, **MC²** cannot be held responsible for their potential impact on the performance of the project.

MC² warrants that the findings or professional advice contained herein has been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, **MC²** should be provided the opportunity to review the final design plans and specifications to assess that our findings have been properly incorporated into the design documents. At that time, it may be necessary to submit recommendations for supplementary information. This report has been prepared for the exclusive use of **Hillsborough County Public Works**.

APPENDIX

Pavement Core Summary (19 Pages)
Project Location Map – Sheet 1
Boring Location Map – Sheet 2
USDA Soil Survey and USGS Topographic Map – Sheet 3
Subsurface Boring Profiles – Sheets 4 through 7
Individual Boring Logs (19 Pages)
Test Procedures



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-01</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>Outside EB Lane</u>
DATE PERFORMED:	<u>7/25/18</u>	LOCATION:	<u>Approx. 310-ft. E of Dale Mabry Hwy.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	3	3	Asphalt
3	12	9	LIMEROCK Base
12	36	24	Silty, clayey SAND (A-2-4)
36	54	30	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
9 – 16	40+	15	100+	22,000+	Base Course
36 – 46	25	6	40+	12,000+	A-2-4
46 – 56	39	10	40+	12,000+	A-2-4
56 - 65	40+	11	40+	12,000+	A-2-4
70 – 80	14	4	35	11,250	A-2-4
80 – 90	22	6	40+	12,000+	A-2-4
90 - 100	30	8	40+	12,000+	A-3
100 – 110	38	10	40+	12,000+	A-3
110 - 120	40	10	40+	12,000+	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.

PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-02</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>Outside WB Lane</u>
DATE PERFORMED:	<u>7/25/18</u>	LOCATION:	<u>Approx. 300-ft. W of N. Himes Ave.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	10	10	Asphalt (bottom crumbled apart)
10	18	8	Silty, clayey SAND (A-2-4)
18	60	42	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: No Base Course Encountered. Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
35 – 45	33	8	40+	12,000+	A-2-4
45 – 53	40+	13	40+	12,000+	A-3
68 – 78	26	7	40+	12,000+	A-3
78 – 88	40	10	40+	12,000+	A-3
88 – 97	40+	11	40+	12,000+	A-3
97 – 107	32	8	40+	12,000+	A-3
107 – 117	24	6	40+	12,000+	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.

PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-03</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>Outside EB Lane</u>
DATE PERFORMED:	<u>7/25/18</u>	LOCATION:	<u>Approx. 80-ft. E of N. Glen Ave.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	3 ¾	3 ¾	Asphalt
3 ¾	12	8 ¼	LIMEROCK Base
12	60	48	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
12 – 15	40+	34	100+	22,000+	Base Course
35 – 45	27	7	40+	12,000+	A-3
45 – 55	40	10	40+	12,000+	A-3
55 – 62	40+	15	40+	12,000+	A-3
62 – 72	30	7	40+	12,000+	A-3
72 – 82	35	9	40+	12,000+	A-3
82 - 92	20	5	40+	12,000+	A-3
92 - 102	16	4	40	12,000	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-04</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>Outside WB Lane</u>
DATE PERFORMED:	<u>7/20/18</u>	LOCATION:	<u>Approx. 90-ft. W of N. St. Vincent St.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	3 ½	3 ½	Asphalt
3 ½	14	10 ½	LIMEROCK Base
14	60	46	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
13 – 15	40+	51	100+	22,000+	Base Course
36 – 45	40+	11	40+	12,000+	A-3
61 – 71	25	6	40+	12,000+	A-3
71 – 81	21	5	40+	12,000+	A-3
81 – 91	14	4	35	11,250	A-3
91 – 101	11	3	26	9,000	A-3
10 – 111	23	6	40+	12,000+	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.

PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-05</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>Outside EB Lane</u>
DATE PERFORMED:	<u>7/25/18</u>	LOCATION:	<u>Approx. 180-ft. E of N. MacDill</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	3 ¾	3 ¾	Asphalt (pavement degradation)
3 ¾	12	8 ¾	LIMEROCK Base
12	60	48	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
15 – 23	40+	13	100+	22,000+	Base Course
43 – 53	26	7	40+	12,000+	A-3
53 – 63	29	7	40+	12,000+	A-3
63 – 73	36	9	40+	12,000+	A-3
73 – 83	40	10	40+	12,000+	A-3
83 - 91	40+	13	40+	12,000+	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-06</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>Outside EB Lane</u>
DATE PERFORMED:	<u>7/25/18</u>	LOCATION:	<u>Approx. 270-ft. W of N. Habana Ave.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	3 ½	3 ½	Asphalt (cracked; pavement degradation)
3 ½	13	9 ½	LIMEROCK Base
13	36	23	SAND with silt (A-3)
36	60	24	Silty, clayey SAND (A-2-4)

Water Table Depth (ft): GNE Notes: Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
15 – 19	40+	25	100+	22,000+	Base Course
46 – 56	24	6	40+	12,000+	A-3
56 – 66	29	7	40+	12,000+	A-3
66 – 76	40	10	40+	12,000+	A-3
76 – 86	28	7	40+	12,000+	A-3
86 – 96	14	4	35	11,250	A-3
96 – 106	11	3	26	9,000	A-2-4
106 – 116	12	3	29	9,750	A-2-4

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME: HC Major Roads FY19 CORE ID: C-07
 PROJECT NO.: T051812.101 STREET: W. Columbus Drive
 CLIENT: HC Public Works LANE: Outside WB Lane
 DATE PERFORMED: 7/20/18 LOCATION: Approx. 20-ft. E of N. Tampania Ave.



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	9	9	Asphalt
9	12	3	Shell Base
12	60	48	SAND with silt (A-3)

Water Table Depth (ft): 3.5 Notes: Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
25 – 30	40+	20	100+	22,000+	Shell Base
39 – 49	24	6	40+	12,000+	A-3
49 – 58	40+	11	40+	12,000+	A-3
70 – 80	5	1	14	5,500	A-3
80 – 90	10	3	24	8,500	A-3
90 – 100	10	3	24	8,500	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-08</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>Outside EB Lane</u>
DATE PERFORMED:	<u>7/20/18</u>	LOCATION:	<u>Approx. 120-ft. E of N. Howard Ave.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	5	5	Asphalt
5	8 ½	3 ½	Paver
8 ½	18	9 ½	SAND with silt (A-3) and shell fragments
18	42	24	Silty, clayey SAND (A-2-4) with shell fragments
42	54	12	CLAY (A-7)
54	60	6	SAND with silt (A-3)

Water Table Depth (ft): 4.5 Notes: No Base Course Encountered. Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
25 – 35	27	7	40+	12,000+	A-3
35 – 45	13	3	31	10,250	A-3
45 – 55	7	2	18	7,000	A-2-4
55 – 65	8	2	20	7,500	A-2-4
65 - 75	8	2	20	7,500	A-2-4
75 – 85	10	3	24	8,500	A-2-4
85 - 95	12	3	29	9,750	A-2-4
95 – 105	12	3	29	9,750	A-2-4
105 – 115	10	3	24	8,500	A-7

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-09</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>Outside EB Lane</u>
DATE PERFORMED:	<u>7/20/18</u>	LOCATION:	<u>Approx. 210-ft. W of N. Fremont Ave.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	6 ½	6 ½	Asphalt
6 ½	12	5 ½	SAND with silt (A-3) with shell fragments
12	60	48	SAND with silt (A-3)

Water Table Depth (ft): 5 Notes: No Base Course Encountered. Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
17 – 24	40+	15	40+	12,000+	A-3
34 – 44	32	8	40+	12,000+	A-3
44 – 54	28	7	40+	12,000+	A-3
54 – 64	23	6	40+	12,000+	A-3
64 – 74	18	5	40+	12,000+	A-3
74 – 84	14	4	35	11,250	A-3
84 – 94	11	3	26	9,000	A-3
94 – 104	20	5	40+	12,000+	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-10</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>Outside WB Lane</u>
DATE PERFORMED:	<u>7/20/18</u>	LOCATION:	<u>Approx. 80-ft. E of N Riverside Dr.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	4	4	Asphalt
4	6	2	SAND with silt (A-3) with shell and brick fragments
6	60	54	SAND with silt (A-3)

Water Table Depth (ft): 5 Notes: No Base Course Encountered. Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
13 – 22	40+	11	40+	12,000+	A-3
36 – 46	14	4	35	11,250	A-3
46 – 56	18	5	40+	12,000+	A-3
56 – 66	21	5	40+	12,000+	A-3
66 – 76	17	4	40+	12,000+	A-3
76 – 86	14	4	35	11,250	A-3
86 – 96	13	3	31	10,250	A-3
96 – 106	8	2	20	7,500	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.

PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-11</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>Outside EB Lane</u>
DATE PERFORMED:	<u>7/20/18</u>	LOCATION:	<u>Approx. 20-ft. W of Royal Ct.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	4 ½	4 ½	Asphalt
4 ½	14	9 ½	LIMEROCK Base
14	30	16	Silty, clayey SAND (A-2-4)
30	60	30	SAND with silt (A-3)

Water Table Depth (ft): 3 ½ Notes: Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
20 – 30	18	5	45	12,500	Base Course
30 – 38	40+	13	100+	22,000+	Base Course
41 – 48	40+	15	40+	12,000+	A-2-4
61 – 71	26	7	40+	12,000+	A-2-4
71 – 81	31	8	40+	12,000+	A-2-4/A-3
81 - 91	23	6	40+	12,000+	A-3
91 – 101	18	5	40+	12,000+	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-12</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>WB Through Lane</u>
DATE PERFORMED:	<u>7/26/18</u>	LOCATION:	<u>Approx. 110-ft. E of North Blvd.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	3	3	Asphalt (cracked through)
3	7	4	Concrete (cracked through)
7	15 ½	8 ½	LIMEROCK Base
15 ½	60	44 ½	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
18 – 24	40+	17	100+	22,000+	Base Course
44 – 54	23	6	40+	12,000+	A-3
54 – 64	34	9	40+	12,000+	A-3
64 – 74	24	6	40+	12,000+	A-3
74 – 84	16	4	40	12,000	A-3
84 – 94	11	3	26	9,000	A-3
94 - 104	11	3	26	9,000	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-13</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>EB Lane</u>
DATE PERFORMED:	<u>7/26/18</u>	LOCATION:	<u>Approx. 170-ft. of Nevada Ave.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	4	4	Asphalt
4	7 ½	3 ½	Paver
7 ½	60	52 ½	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: No Base Course Encountered. Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
19 – 25	40+	17	40+	12,000+	A-3
46 – 55	40	10	40+	12,000+	A-3
55 – 59	40+	25	40+	12,000+	A-3
81 – 91	15	4	38	12,000	A-3
91 – 101	15	4	38	12,000	A-3
101 – 111	13	3	31	10,250	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-14</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>WB Lane</u>
DATE PERFORMED:	<u>7/24/18</u>	LOCATION:	<u>Approx. 210-ft. E of N. Highland Ave.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	5	5	Asphalt
5	8	3	Paver
8	60	52	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: No Base Course Encountered. Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
25 – 32	40+	15	40+	12,000+	A-3
50 – 60	21	5	40+	12,000+	A-3
60 – 70	23	6	40+	12,000+	A-3
70 – 80	10	3	24	8,500	A-3
80 – 90	8	2	20	7,500	A-3
90 – 100	7	2	18	7,000	A-3
100 – 110	5	1	14	5,500	A-3

*DCP performed using requested method
 **LBR value should be considered an in-situ/in-place value. No laboratory testing performed.

PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-15</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>EB Lane</u>
DATE PERFORMED:	<u>7/24/18</u>	LOCATION:	<u>Approx. 150-ft. E of N. Florida Ave.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	4 ¼	4 ¼	Asphalt
4 ¼	7 ½	3 ¼	Paver
7 ½	60	52 ½	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: No Base Course Encountered. Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
20 – 30	22	6	40+	12,000+	A-3
30 – 40	40	10	40+	12,000+	A-3
40 – 50	28	7	40+	12,000+	A-3
50 – 60	16	4	40	12,000	A-3
60 – 70	14	4	35	11,250	A-3
70 – 80	9	2	22	8,000	A-3
80 - 90	6	2	16	6,000	A-3
90 – 100	4	1	13	5,250	A-3
100 – 110	5	1	14	5,500	A-3
110 – 120	4	1	13	5,250	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-16</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>WB Lane</u>
DATE PERFORMED:	<u>7/24/18</u>	LOCATION:	<u>Approx. 180-ft. W of N. Central Ave.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	7	7	Asphalt
7	13	6	Shell Base
13	60	47	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
18 - 22	40+	25	100+	22,000+	Base Course
34 - 44	20	5	40+	12,000+	A-3
44 - 54	38	10	40+	12,000+	A-3
54 - 64	28	7	40+	12,000+	A-3
64 - 74	19	5	40+	12,000+	A-3
74 - 84	11	3	26	9,000	A-3
84 - 94	11	3	26	9,000	A-3
94 - 104	7	2	18	7,000	A-3
104 - 114	7	2	18	7,000	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME: HC Major Roads FY19 CORE ID: C-17
 PROJECT NO.: T051812.101 STREET: W. Columbus Drive
 CLIENT: HC Public Works LANE: EB Lane
 DATE PERFORMED: 7/24/18 LOCATION: Approx. 110-ft. E of N. Taliaferro Ave.



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	3 ¾	3 ¾	Asphalt
3 ¾	7	3 ¾	Paver
7	60	53	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: No Base Course Encountered. Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
18 – 23	40+	20	40+	12,000+	A-3
30 – 36	40+	17	40+	12,000+	A-3
71 – 81	15	4	38	12,000	A-3
81 – 91	16	4	40	12,000	A-3
91 – 101	9	2	22	8,000	A-3
101 - 111	5	1	14	5,500	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-18</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>WB Lane</u>
DATE PERFORMED:	<u>7/24/18</u>	LOCATION:	<u>Approx. 160-ft. W of N. 10th St.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	5 ½	5 ½	Asphalt
5 ½	16	10 ½	LIMEROCK Base
16	60	44	SAND with silt (A-3)

Water Table Depth (ft): GNE Notes: Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
18 – 23	40+	20	100+	22,000+	Base Course
43 – 53	29	7	40+	12,000+	A-3
53 – 63	40	10	40+	12,000+	A-3
63 – 73	26	7	40+	12,000+	A-3
73 – 83	23	6	40+	12,000+	A-3
83 – 93	25	6	40+	12,000+	A-3
93 – 103	18	5	40+	12,000+	A-3
103 – 113	14	4	35	11,250	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



PAVEMENT CORE SUMMARY

PROJECT NAME:	<u>HC Major Roads FY19</u>	CORE ID:	<u>C-19</u>
PROJECT NO.:	<u>T051812.101</u>	STREET:	<u>W. Columbus Drive</u>
CLIENT:	<u>HC Public Works</u>	LANE:	<u>EB Lane</u>
DATE PERFORMED:	<u>7/24/18</u>	LOCATION:	<u>Approx. 80-ft. E of N. 12th St.</u>



PAVEMENT AND SUBSURFACE CONDITIONS

Layer Depth (in)		Thickness (in)	Description
From	To		
0	4 ¼	4 ¼	Asphalt
4 ¼	14	9 ¾	LIMEROCK Base
14	48	34	SAND with silt (A-3)
48	60	12	Clayey SAND (A-2-6)

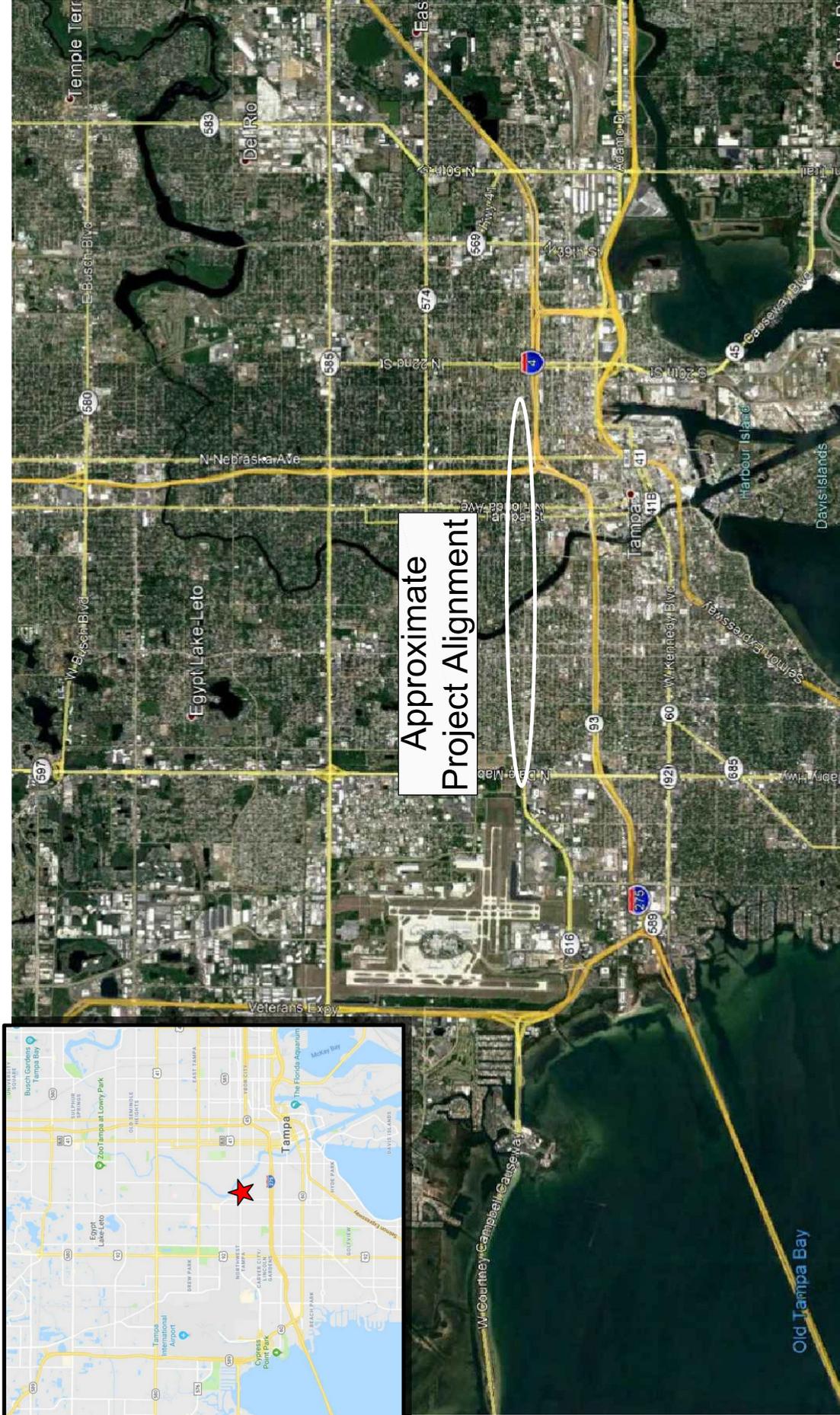
Water Table Depth (ft): GNE Notes: Borehole Terminated at 5-ft.

DCP TEST RESULTS (using a 10.1-lb hammer, K-100 Model)

Depth Interval (cm)	No. of Blows*	Blows/in	Estimated LBR Value**	Estimated M _R Value	Soil Type
15 – 25	38	10	100+	22,000+	Base Course
25 – 31	40+	17	100+	22,000+	Base Course
36 – 46	30	8	40+	12,000+	A-3
46 – 56	40+	20	40+	12,000+	A-3
66 – 76	18	5	40+	12,000+	A-3
76 – 86	22	6	40+	12,000+	A-3
86 – 96	16	4	40	12,000	A-3
96 – 106	10	3	24	8,500	A-3
106 – 116	6	2	16	6,000	A-3

*DCP performed using requested method

**LBR value should be considered an in-situ/in-place value. No laboratory testing performed.



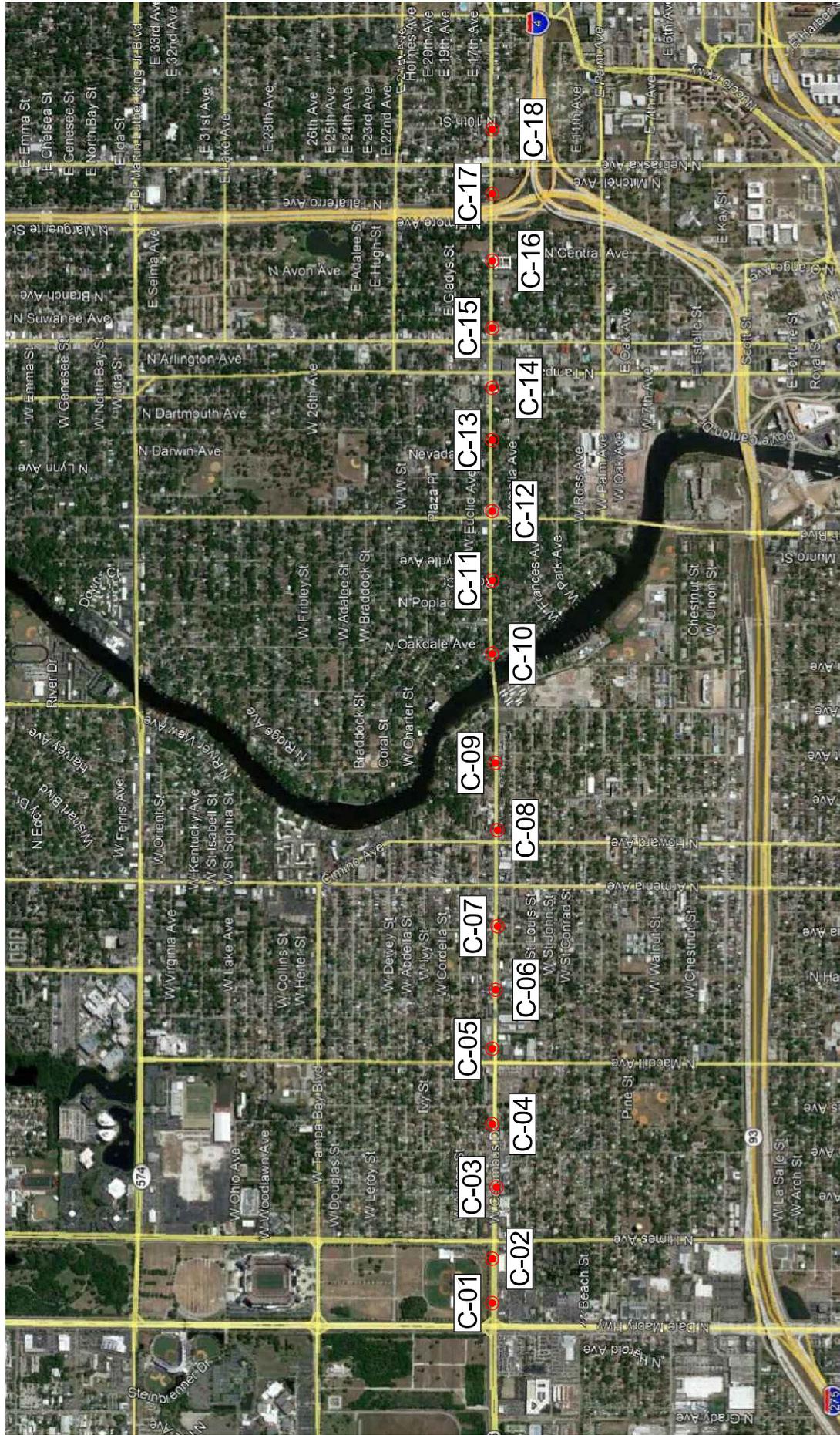
Approximate
Project Alignment

LEGEND:
★ Project Location

Source: Google Earth
 Image Date: 3/15/2018

0' 1.5 mi 3 mi
 Graphic Scale (miles)

DATE	NAME	REVISION	APPROVED BY:	 MC² <small>Geotechnical-Environmental Materials Testing</small>	MC SQUARED, INC. Geotechnical Consultants <small>2508-A E. Courtney Parkway Tampa, FL 33613 Ph: 813-823-3389 Fax: 813-823-4638</small>	<small>FLORIDA ENGINEERING CERTIFICATE OF AUTHORIZATION No. 9191 REGISTERED PROFESSIONAL ENGINEER FLORIDA LICENSE No. 67882</small>	DESIGNED BY: TC 11/01/2017 DRAWN BY: KH 7/24/2018 CHECKED BY: JH 7/24/2018 SUPERVISED BY: WS
				Project Location Map		MC ² PROJ. NO.	SHEET NO.
				Hillsborough County Major Road Resurf. FY19 (Columbus Drive) Tampa, Hillsborough County, Florida		T051812,101	1



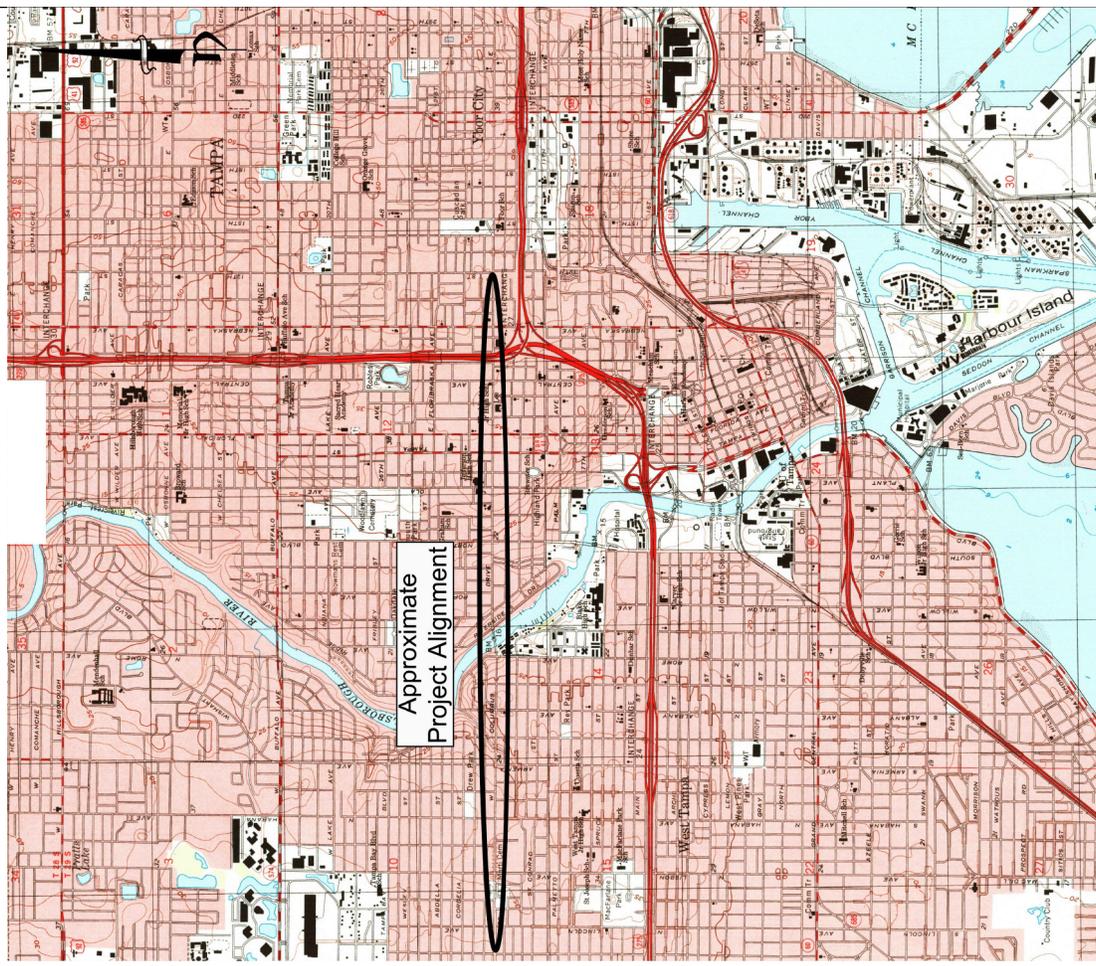
LEGEND:

● Approximate Pavement Core Location

Source: Google Earth
Image Date: 3/15/2018



DATE	NAME	REVISION	APPROVED BY:		MC SQUARED, INC. Geotechnical Consultants 2508-A Columbus Parkway Tampa, FL 33610 Ph: 813-623-3389 Fax: 813-623-4638	FLORIDA ENGINEERING CERTIFICATE OF AUTHORIZATION No. 9191 FLORIDA LICENSE No. 67882	DESIGNED BY: TC 11/01/2017	NAME DATE TC 11/01/2017 KH 7/24/2018 JH 7/24/2018 WS	Boring Location Map Hillsborough County Major Road Resurf. FY19 (Columbus Drive) Tampa, Hillsborough County, Florida	MC ² PROJ. NO. T051812.101	SHEET NO. 2
							CHECKED BY: JH 7/24/2018			SUPERVISED BY: WS	



TAMPA QUADRANGLE
 FLORIDA-HILLSBOROUGH COUNTY
 7.5 MINUTE SERIES TOPOGRAPHIC
 NGVD: 1929 - DATE: 1995
 Source: United States Geological Survey

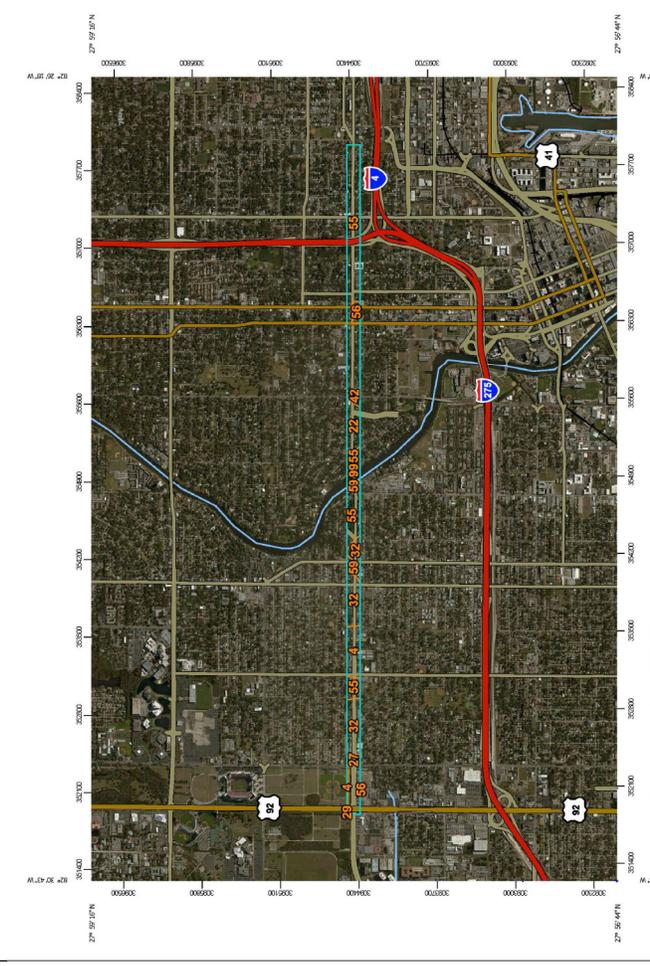
DESIGNED BY:	TC	NAME	DATE
DRAWN BY:	KH	TC	11/01/2017
CHECKED BY:	JH	KH	7/24/2018
SUPERVISED BY:	WS	JH	7/24/2018

FLORIDA ENGINEERING CERTIFICATE OF AUTHORIZATION No. 9191
 T. SQUARED, INC.
 FLORIDA LICENSE No. 67882

MC SQUARED, INC.
 Geotechnical Consultants
 2505-A Alafia Ridge Parkway
 Tampa, FL 33610
 Ph: 813-623-3389 Fax: 813-623-4638



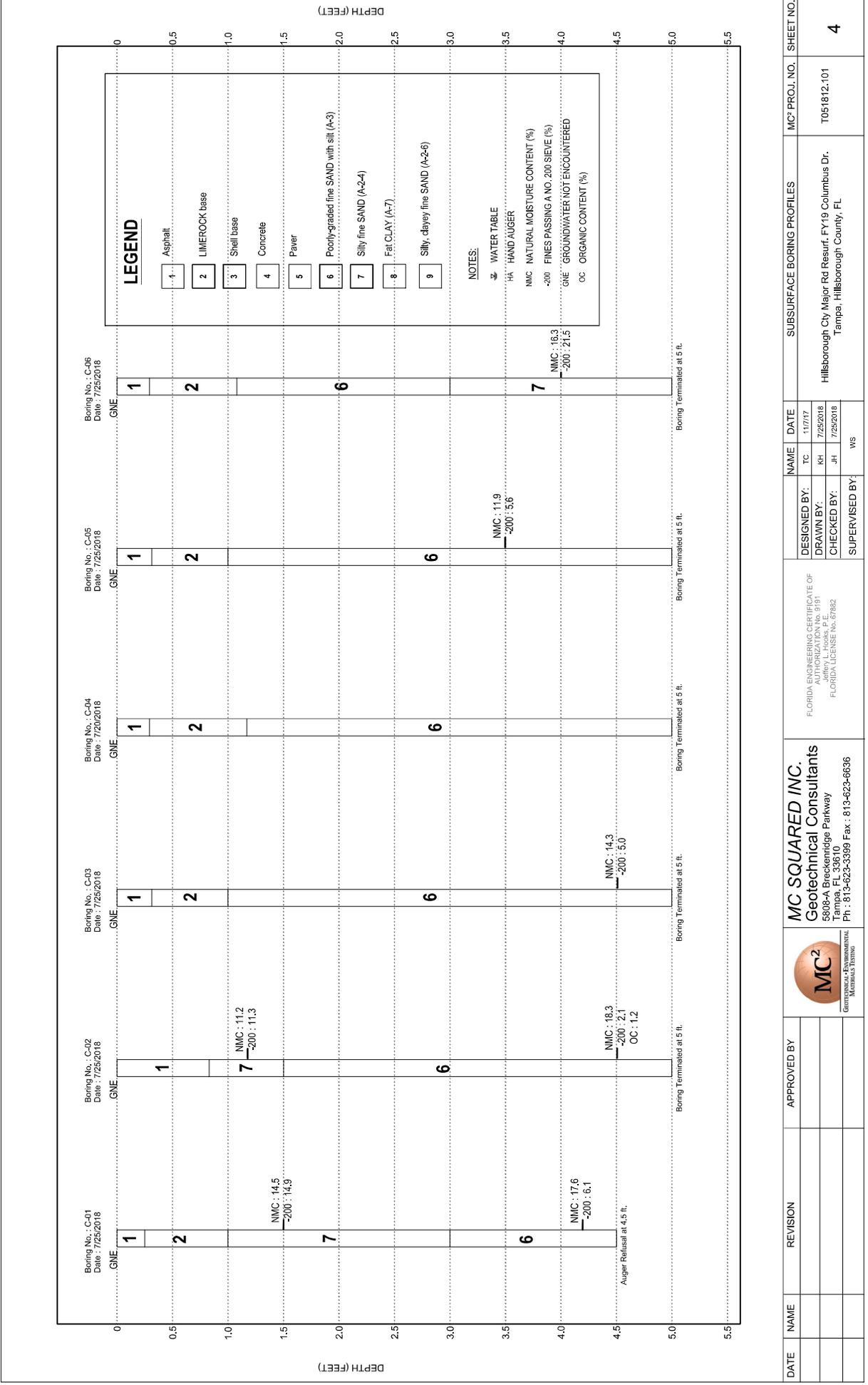
DATE	NAME	REVISION	APPROVED BY:



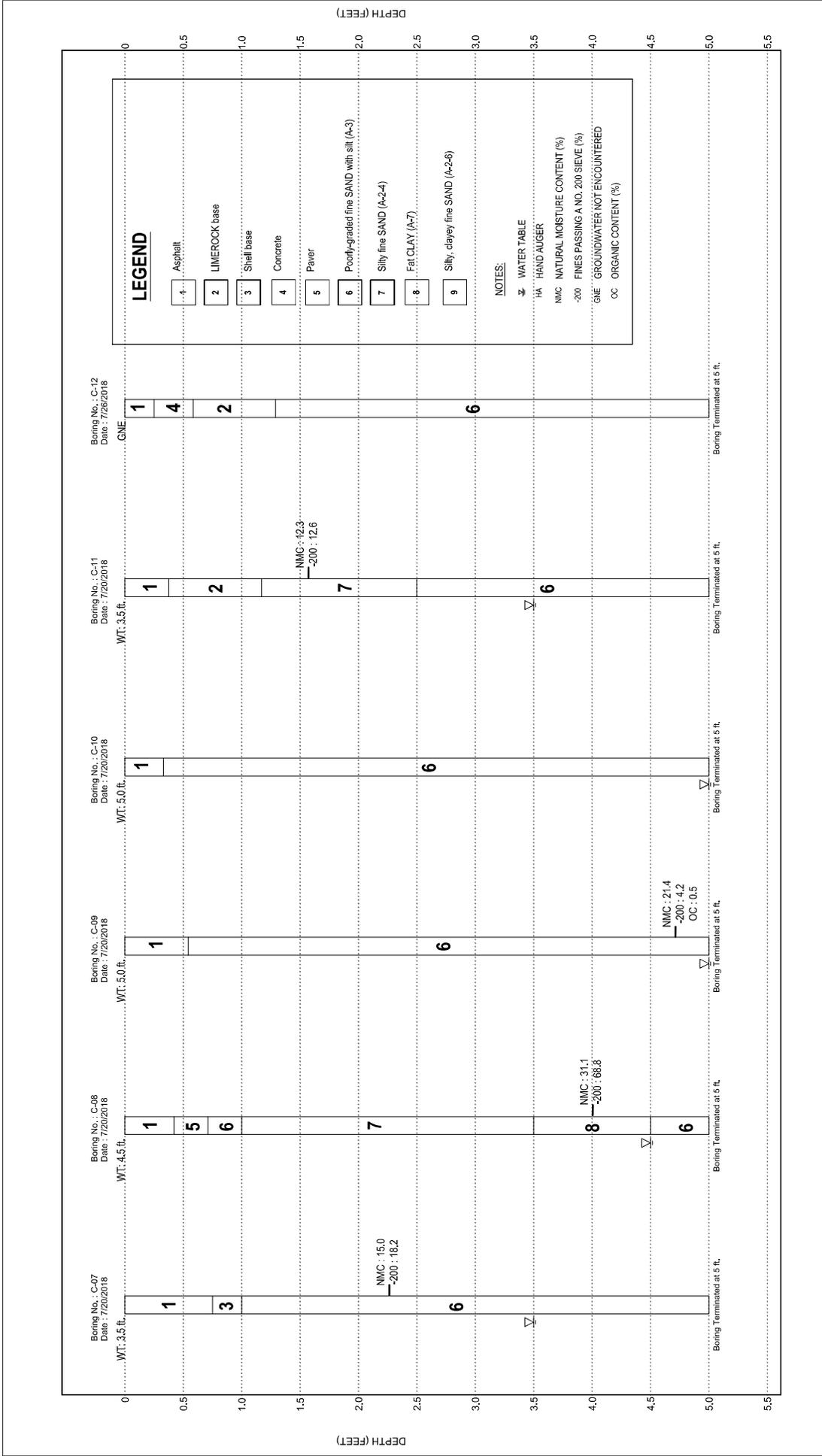
Map Scale: 1:33,200 if printed in A landscape (11" x 8.5") sheet.
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 Feet
 0 100 200 300 400 500 600 700 800 900 1000
 Feet
 Map projection: Web Mercator Corner coordinates: WGS84 Edge to: UTM Zone 17N WGS84

Hillsborough County, FL			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
4	Aren'ts, nearly level	15.0	8.4%
22	Immoderate-Urban land complex	12.6	7.0%
27	Moderate fine sand, 0 to 2 percent slopes	2.7	1.5%
29	Myakka fine sand, 0 to 2 percent slopes	0.1	0.0%
32	Myakka-Urban land complex	34.0	19.0%
42	Pomello-Urban land complex, 0 to 5 percent slopes	3.4	1.9%
55	Tavares-Urban land complex, 0 to 5 percent slopes	86.5	47.8%
56	Urban land	15.2	8.5%
59	Winder fine sand, 0 to 2 percent slopes	7.0	3.9%
99	Water	3.7	2.1%
Totals for Area of Interest		178.1	100.0%

Source: United States Department of Agriculture



DATE	NAME	REVISION	APPROVED BY	DESIGNED BY:	NAME	DATE	SUBSURFACE BORING PROFILES	MC ² PROJ. NO.	SHEET NO.
				TC	JH	11/7/17	Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr. Tampa, Hillsborough County, FL	T051812.101	4
				DRAWN BY:	JH	7/25/2018			
				CHECKED BY:	JH	7/25/2018			
				SUPERVISED BY:	WS				
				FLORIDA ENGINEERING CERTIFICATE OF AUTHORIZATION No. 9131 Jeffrey L. Hooks, P.E. FLORIDA LICENSE No. 67882					
				MC SQUARED INC. Geotechnical Consultants 5808-A Breckenridge Parkway Tampa, FL 33610 Ph : 813-623-3399 Fax : 813-623-6636					

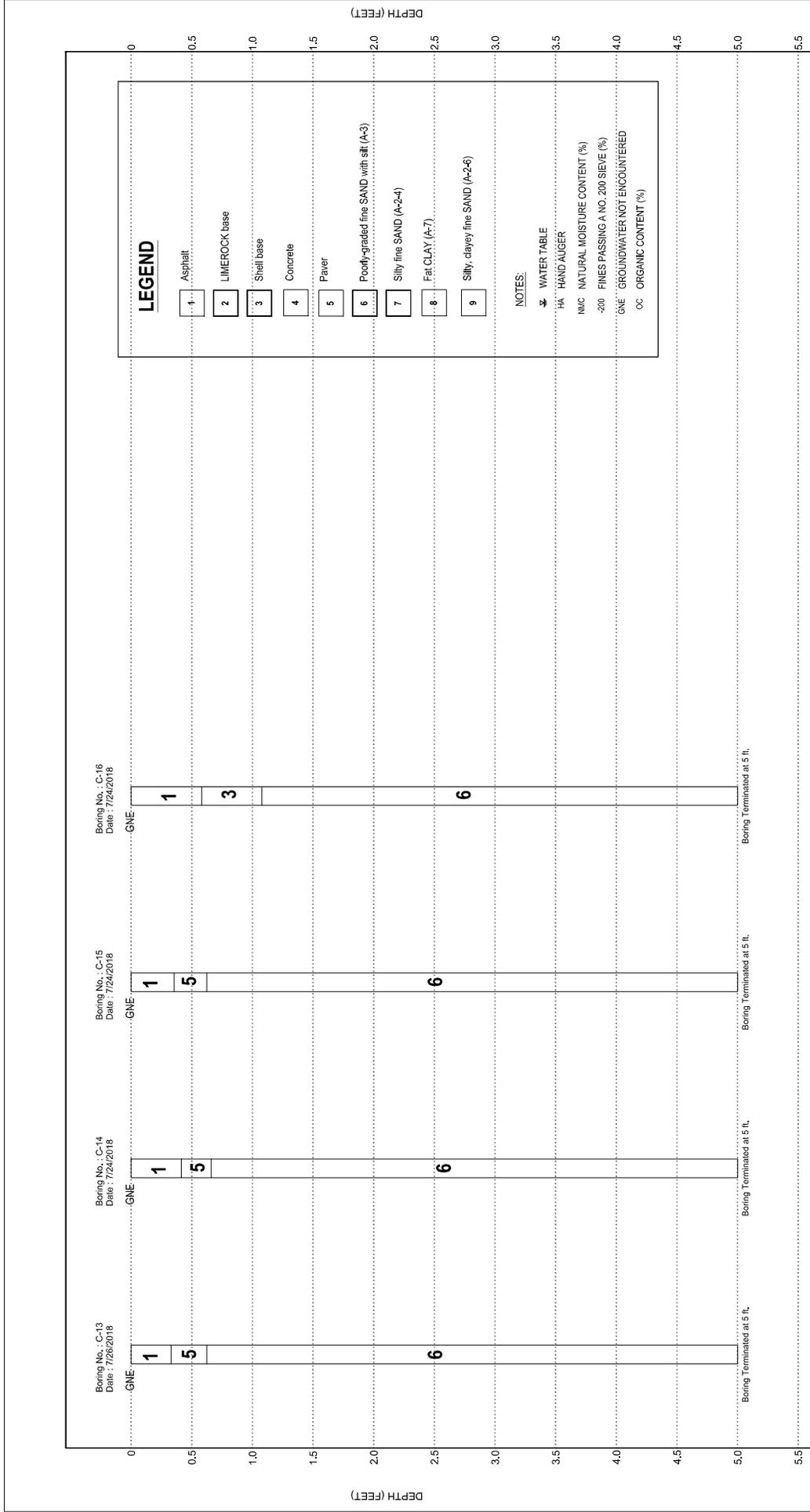


DATE	NAME	REVISION	APPROVED BY	DESIGNED BY:	NAME	DATE	SUBSURFACE BORING PROFILES	MC ² PROJ. NO.	SHEET NO.
				DRAWN BY:	TC	11/17/17	Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr. Tampa - Hillsborough County, FL	T061812, 101	5
				CHECKED BY:	KH	7/25/2018			
				SUPERVISED BY:	JH	7/25/2018			
					WS				

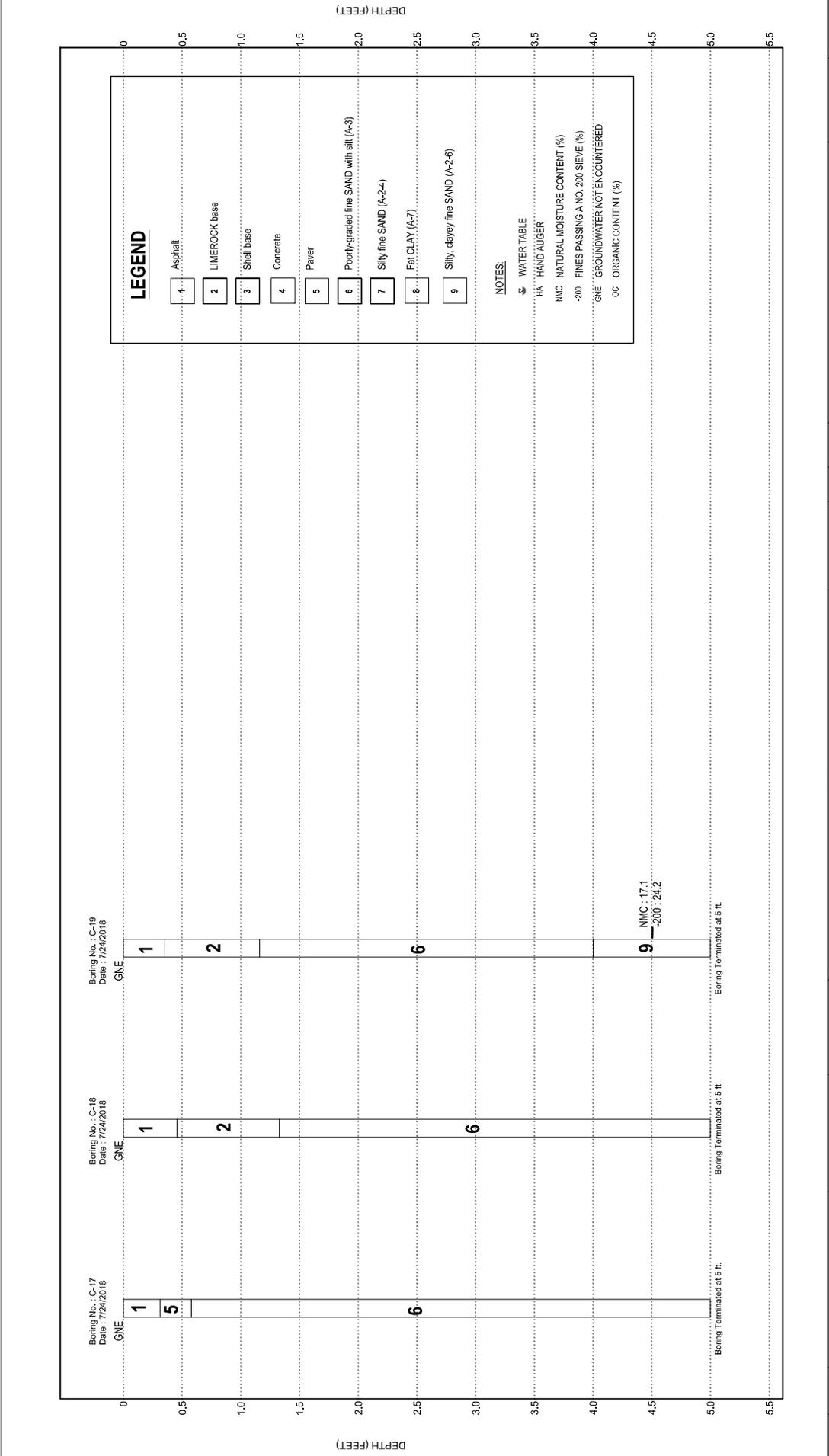
MC SQUARED INC.
Geotechnical Consultants
 5808-A Breckenridge Parkway
 Tampa, FL 33610
 PH : 813-623-3389 Fax : 813-623-6636

FLORIDA ENGINEERING CERTIFICATE OF AUTHORIZATION No. 8181
 EXPIRES 12/31/2020
 FLORIDA LICENSE No. 61982





DATE	NAME	REVISION	APPROVED BY	DESIGNED BY:	NAME	DATE	SUBSURFACE BORING PROFILES	MC ² PROJ. NO.	SHEET NO.
				DRAWN BY:	TC	11/7/17	Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr. Tampa, Hillsborough County, FL	T051812.101	6
				CHECKED BY:	RH	7/25/2018			
				SUPERVISED BY:	JH	7/25/2018			
						WS	FLORIDA ENGINEERING CERTIFICATE OF Jeffery L. Hoopes, P.E. FLORIDA LICENSE No. 67882		
							MC SQUARED INC. Geotechnical Consultants 5808-A Breckenridge Parkway Tampa, FL 33610 Ph : 813-623-3399 Fax : 813-623-6636		



DATE	NAME	REVISION	APPROVED BY	DESIGNED BY:	NAME	DATE	SUBSURFACE BORING PROFILES	MC ² PROJ. NO.	SHEET NO.
				DRAWN BY:	TC	11/7/17	Hillsborough Cty Major Rd Resurf, FY19 Columbus Dr. Tampa, Hillsborough County, FL	T051812.101	7
				CHECKED BY:	KH	7/25/2018			
				SUPERVISED BY:	JH	7/25/2018			
					WS				

FLORIDA ENGINEERING CERTIFICATE OF QUALIFICATION
 Jeffrey L. Hooks, P.E.
 FLORIDA LICENSE No. 67882

MC SQUARED INC.
 Geotechnical Consultants
 5808-A Breckenridge Parkway
 Tampa, FL 33610
 Ph : 813-623-3399 Fax : 813-623-6636



APPROVED BY

REVISION

NAME

DATE



Soil Profile

BORING ID: C-01

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/25/18 **COMPLETED** 7/25/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger **AT TIME OF DRILLING** GNE
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							☐ FINES CONTENT (%) ☐			
							20	40	60	80
0			3 inches of ASPHALT	PC 1						
			9 inches of LIMEROCK base							
1			Brown to dark grayish brown, silty fine SAND	HA 2						
2	A-2-4									
3			Gray to dark gray, poorly-graded fine SAND with silt with phosphate clumps							
4	A-3		Auger refusal at 4.5 feet.							
			Bottom of hole at 4.5 feet.							

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18



Soil Profile

BORING ID: C-02

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/25/18 **COMPLETED** 7/25/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger **AT TIME OF DRILLING** GNE
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							□ FINES CONTENT (%) □			
							20	40	60	80
0			10 inches of ASPHALT	PC 1						
1		A-2-4	Gray, silty fine SAND with shell							
2			Grayish brown, dark gray, poorly-graded fine SAND with silt							
3		A-3		HA 2						
4										
5										

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-03

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/25/18 **COMPLETED** 7/25/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger **AT TIME OF DRILLING** GNE
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●						
							⊕ ORGANIC CONTENT % ⊕						
							PL	MC	LL				
							□ FINES CONTENT (%) □						
			20 40 60 80										
0			3.75 inches of ASPHALT										
			8.25 inches of LIMEROCK base	PC 1									
1			Pale to dark brown, poorly-graded fine SAND with silt, with rocks										
2													
3		A-3		HA 2									
4													
5													

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-04

CLIENT Hillsborough County Public Works	PROJECT NAME Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101	PROJECT LOCATION Tampa, Hillsborough County, FL
DATE STARTED 7/20/18 COMPLETED 7/20/18	GROUND ELEVATION _____ HOLE SIZE 4 inches
DRILLING CONTRACTOR MC Squared, Inc.	GROUND WATER LEVELS:
DRILLING METHOD Hand Auger	AT TIME OF DRILLING GNE
LOGGED BY S. Gomez CHECKED BY J. Hooks	AT END OF DRILLING ---
NOTES _____	AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							☐ FINES CONTENT (%) ☐			
							20	40	60	80
0			3.5 inches of ASPHALT	PC 1						
			10.5 inches of LIMEROCK base							
1										
			Light brownish gray to dark brown, poorly-graded fine SAND with silt	HA 2						
2										
3	A-3									
4										
5										

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-05

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/25/18 **COMPLETED** 7/25/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger **AT TIME OF DRILLING** GNE
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							☐ FINES CONTENT (%) ☐			
							20	40	60	80
0			3.75 inches of ASPHALT	PC 1						
			8.25 inches of LIMEROCK base							
1			Dark brown, grayish to dark grayish brown, poorly-graded fine SAND with silt, with clay nodules	HA 2						
2										
3	A-3									
4										
5										

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-06

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/25/18 **COMPLETED** 7/25/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger **AT TIME OF DRILLING** GNE
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							□ FINES CONTENT (%) □			
							20	40	60	80
0			3.5 inches of ASPHALT							
			9.5 inches of LIMEROCK base	PC 1						
1			Brown to dark yellowish brown, poorly-graded fine SAND with silt							
2		A-3								
3			Pale brown, silty fine SAND	HA 2						
4		A-2-4								
5										

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-07

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/20/18 **COMPLETED** 7/20/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger ∇ **AT TIME OF DRILLING** 3.5 ft
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●						
							⊕ ORGANIC CONTENT % ⊕						
							PL	MC	LL				
							☐ FINES CONTENT (%) ☐						
							20	40	60	80			
0			9 inches of ASPHALT	PC 1									
1			3 inches of SHELL base										
2			Very pale to reddish brown, poorly-graded fine SAND with silt	HA 2									
3	A-3												
4													
5													

Bottom of hole at 5.0 feet.

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18



Soil Profile

BORING ID: C-08

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/20/18 **COMPLETED** 7/20/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger ∇ **AT TIME OF DRILLING** 4.5 ft
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							□ FINES CONTENT (%) □			
			20 40 60 80							
0			5 inches of ASPHALT							
			3.5 inches of PAVER	PC 1						
1		A-3	Grayish brown, poorly-graded fine SAND with silt, with shell fragments							
2		A-2-4	Light yellowish to grayish brown, silty fine SAND							
3				HA 2						
4		A-7	Grayish brown, fat CLAY							
			∇ Light gray, poorly-graded fine SAND with silt							
5		A-3								

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-09

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/20/18 **COMPLETED** 7/20/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger ∇ **AT TIME OF DRILLING** 5.0 ft
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							□ FINES CONTENT (%) □			
							20	40	60	80
0			6.5 inches of ASPHALT							
1			Very pale to very dark brown, poorly-graded fine SAND with silt	PC 1						
2										
3		A-3		HA 2						
4										
5										

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-10

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/20/18 **COMPLETED** 7/20/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger ∇ **AT TIME OF DRILLING** 5.0 ft
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							□ FINES CONTENT (%) □			
							20	40	60	80
0			4 inches of ASPHALT	PC 1						
1			2 inches of SAND with SHELL/BRICK/ROCK fragments and gray to grayish brown, poorly-graded fine SAND with silt							
2										
3		A-3		HA 2						
4										
5										

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-11

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/20/18 **COMPLETED** 7/20/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger ∇ **AT TIME OF DRILLING** 3.5 ft
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							□ FINES CONTENT (%) □			
							20	40	60	80
0			4.5 inches of ASPHALT	PC 1						
			9.5 inches of LIMEROCK base							
1										
			Brown, silty fine SAND	HA 2						
2	A-2-4									
			Brown to very pale brown, poorly-graded fine SAND with silt							
3										
			∇							
4		A-3								
5										

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-12

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/26/18 **COMPLETED** 7/26/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger **AT TIME OF DRILLING** GNE
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●				
							⊕ ORGANIC CONTENT % ⊕				
							PL	MC	LL		
							□ FINES CONTENT (%) □				
							20	40	60	80	
0			3 inches of ASPHALT								
			4 inches of CONCRETE								
			8.5 inches of LIMEROCK base	PC 1							
1			Very pale to pale brown, poorly-graded fine SAND with silt								
2											
3	A-3				HA 2						
4											
5											

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-13

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/26/18 **COMPLETED** 7/26/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger **AT TIME OF DRILLING** GNE
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●							
							⊕ ORGANIC CONTENT % ⊕							
							PL	MC	LL					
							□ FINES CONTENT (%) □							
			20 40 60 80											
0			4 inches of ASPHALT											
			3.5 inches of PAVER	PC 1										
1			Brown, yellow, poorly-graded fine SAND with silt											
2														
3	A-3				HA 2									
4														
5														

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-14

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/24/18 **COMPLETED** 7/24/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger **AT TIME OF DRILLING** GNE
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●							
							⊕ ORGANIC CONTENT % ⊕							
							PL	MC	LL					
							□ FINES CONTENT (%) □							
			20 40 60 80											
0			5 inches of ASPHALT											
			3 inches of PAVER	PC 1										
1			Light brownish gray, strong brown, poorly-graded fine SAND with silt											
2														
3	A-3				HA 2									
4														
5														

Bottom of hole at 5.0 feet.

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18



Soil Profile

BORING ID: C-15

CLIENT Hillsborough County Public Works	PROJECT NAME Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101	PROJECT LOCATION Tampa, Hillsborough County, FL
DATE STARTED 7/24/18 COMPLETED 7/24/18	GROUND ELEVATION _____ HOLE SIZE 4 inches
DRILLING CONTRACTOR MC Squared, Inc.	GROUND WATER LEVELS:
DRILLING METHOD Hand Auger	AT TIME OF DRILLING GNE
LOGGED BY S. Gomez CHECKED BY J. Hooks	AT END OF DRILLING ---
NOTES _____	AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							□ FINES CONTENT (%) □			
							20	40	60	80
0			4.25 inches of ASPHALT	PC 1						
			3.25 inches of PAVER							
1		A-3	Very pale brown, grayish brown to light brownish gray, poorly-graded fine SAND with silt	HA 2						
2										
3										
4										
5										

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-16

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/24/18 **COMPLETED** 7/24/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger **AT TIME OF DRILLING** GNE
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							☐ FINES CONTENT (%) ☐			
							20	40	60	80
0			7 inches of ASPHALT	PC 1						
			6 inches of LIMEROCK base							
1			Brown to very pale brown, light brownish yellow, poorly-graded fine SAND with silt	HA 2						
2										
3	A-3									
4										
5										

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-17

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/24/18 **COMPLETED** 7/24/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger **AT TIME OF DRILLING** GNE
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							☐ FINES CONTENT (%) ☐			
							20	40	60	80
0			3.75 inches of ASPHALT	PC 1						
			3.25 inches of PAVER							
1			Light brownish gray to grayish brown, poorly-graded fine SAND with silt	HA 2						
2										
3	A-3									
4										
5										

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-18

CLIENT Hillsborough County Public Works	PROJECT NAME Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101	PROJECT LOCATION Tampa, Hillsborough County, FL
DATE STARTED 7/24/18 COMPLETED 7/24/18	GROUND ELEVATION _____ HOLE SIZE 4 inches
DRILLING CONTRACTOR MC Squared, Inc.	GROUND WATER LEVELS:
DRILLING METHOD Hand Auger	AT TIME OF DRILLING GNE
LOGGED BY S. Gomez CHECKED BY J. Hooks	AT END OF DRILLING ---
NOTES _____	AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							□ FINES CONTENT (%) □			
							20	40	60	80
0			5.5 inches of ASPHALT							
			10.5 inches of LIMEROCK base	PC 1						
1										
			Brown to very pale brown, poorly-graded fine SAND with silt	HA 2						
2										
3		A-3								
4										
5										

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.



Soil Profile

BORING ID: C-19

CLIENT Hillsborough County Public Works **PROJECT NAME** Hillsborough Cty Major Rd Resurf. FY19 Columbus Dr.
PROJECT NUMBER T051812.101 **PROJECT LOCATION** Tampa, Hillsborough County, FL
DATE STARTED 7/24/18 **COMPLETED** 7/24/18 **GROUND ELEVATION** _____ **HOLE SIZE** 4 inches
DRILLING CONTRACTOR MC Squared, Inc. **GROUND WATER LEVELS:**
DRILLING METHOD Hand Auger **AT TIME OF DRILLING** GNE
LOGGED BY S. Gomez **CHECKED BY** J. Hooks **AT END OF DRILLING** ---
NOTES _____ **AFTER DRILLING** --

DEPTH (ft)	GRAPHIC LOG	AASHTO Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ●			
							⊕ ORGANIC CONTENT % ⊕			
							PL	MC	LL	
							□ FINES CONTENT (%) □			
							20	40	60	80
0			4.25 inches of ASPHALT							
			9.75 inches of LIMEROCK base	PC 1						
1										
			Brown to light brownish yellow, poorly-graded fine SAND with silt							
2										
		A-3								
3										
				HA 2						
4			Pale brown, silty, clayey fine SAND							
		A-2-6							▲ □	
5										

MC2 REPORT T-18.101 COLUMBUS.GPJ MC2.GDT 8/10/18

Bottom of hole at 5.0 feet.

TEST PROCEDURES

The general field procedures employed by MC Squared, Inc. (MC²) are summarized in the American Society for Testing and Materials (ASTM) Standard D420 which is entitled "Investigating and Sampling Soil and Rock". This recommended practice lists recognized methods for determining soil and rock distribution and groundwater conditions. These methods include geophysical and in-situ methods as well as boring.

Standard Drilling Techniques

To obtain subsurface samples, boring are drilled using one of several alternate techniques depending upon the subsurface conditions. Some of these techniques are:

In Soils:

- a) Continuous hollow stem augers.
- b) Rotary boring using roller cone bits or drag bits, and water or drilling mud to flush the hole.
- c) "Hand" augers.

In Rock:

- a) Core drilling with diamond-faced, double or triple tube core barrels.
- b) Core boring with roller cone bits.

Hollow Stem Augering: A hollow stem auger consists of a hollow steel tube with a continuous exterior spiral flange termed a flight. The auger is turned into the ground, returning the cuttings along the flights. The hollow center permits a variety of sampling and testing tools to be used without removing the auger.

Mud Rotary: In situations where unconsolidated materials are anticipated, the direct-rotary or "mud" rotary method may be used as a more effective method for obtaining soil samples. The fluid used, which is typically stored in an aluminum tub (also known as a "mudtub"), is a mix of water and bentonite, also known as a bentonite slurry or "mud". This fluid circulates into the borehole and then returns to the mudtub using a pump system. A loss of circulation, partially or otherwise, may signify a void at that sample depth. The key advantage of using this drilling method is that it stabilizes the borehole wall while drilling in unconsolidated formations, due to the buildup of a filter cake on the wall.

Core Drilling: Soil drilling methods are not normally capable of penetrating through hard cemented soil, weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound, continuous rock. Material which cannot be penetrated by auger or rotary soil-drilling methods at a reasonable rate is designated as "refusal material". Core drilling procedures are required to penetrate and sample refusal materials.

Prior to coring, casing may be set in the drilled hole through the overburden soils, to keep the hole from caving and to prevent excessive water loss. The refusal materials are then cored according to ASTM D-2113 using a diamond-studded bit fastened to the end of a hollow, double or triple tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovery is measured, and the core is placed, in sequence, in boxes for storage and transported to our laboratory.

Sampling and Testing in Boreholes

Several techniques are used to obtain samples and data in soils in the field; however the most common methods in this area are:

- a) Standard Penetrating Testing
- b) Undisturbed Sampling
- c) Dynamic Cone Penetrometer Testing
- d) Water Level Readings

The procedures utilized for this project are presented below.

Standard Penetration Testing: At regular intervals, the drilling tools are removed and soil samples obtained with a standard 2-inch diameter split tube sampler connected to an A or N-size rod. The sampler is first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows of a 140-pound safety hammer falling 30 inches. Generally, the number of hammer blows required to drive the sampler the final 12 inches is designated the "penetration resistance" or "N" value, in blows per foot (bpf). The split barrel sampler is designed to retain the soil penetrated, so that it may be returned to the surface for observation. Representative portions of the soil samples obtained from each split barrel sample are placed in jars, sealed and transported to our laboratory.

The standard penetration test, when properly evaluated, provides an indication of the soil strength and compressibility. The tests are conducted according to ASTM Standard D1586. The depths and N-values of standard penetration tests are shown on the Boring Logs. Split barrel samples are suitable for visual observation and classification tests but are not sufficiently intact for quantitative laboratory testing.

Water Level Readings: Water level readings are normally taken in the boring and are recorded on the Boring Records. In sandy soils, these readings indicate the approximate location of the hydrostatic water level at the time of our field exploration. In clayey soils, the rate of water seepage into the boring is low and it is generally not possible to establish the location of the hydrostatic water level through short-term water level readings. Also, fluctuation in the water level should be expected with variations in precipitation, surface run-off, evaporation, and other factors. For long-term monitoring of water levels, it is necessary to install piezometers.

The water levels reported on the Boring Logs are determined by field crews immediately after the drilling tools are removed, and several hours after the boring are completed, if possible. The time lag is intended to permit stabilization of the groundwater level that may have been disrupted by the drilling operation.

Occasionally the boring will cave-in, preventing water level readings from being obtained or trapping drilling water above the cave-in zone.

BORING LOGS

The subsurface conditions encountered during drilling are reported on a field boring log prepared by the Driller. The log contains information concerning the boring method, samples attempted and recovered, indications of the presence of coarse gravel, cobbles, etc., and observations of groundwater. It also contains the driller's interpretation of the soil conditions between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are kept on file in our office.

After the drilling is completed a geotechnical professional classifies the soil samples and prepares the final Boring Logs, which are the basis for our evaluations and recommendations.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our Boring Logs.

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary; grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties are presented in this report.

The following table presents criteria that are typically utilized in the classification and description of soil and rock samples for preparation of the Boring Logs.

Relative Density of Cohesionless Soils From Standard Penetration Test		Consistency of Cohesive Soils	
Very Loose	≤ 4 bpf	Very Soft	≤ 2 bpf
Loose	5 - 10 bpf	Soft	3 - 4 bpf
Medium Dense	11 - 30 bpf	Firm	5 - 8 bpf
Dense	31 - 50 bpf	Stiff	9 - 15 bpf
Very Dense	> 50 bpf	Very Stiff	16 - 30 bpf
		Hard	30 - 50 bpf
		Very Hard	> 50 bpf
(bpf = blows per foot, ASTM D 1586)			
Relative Hardness of Rock		Particle Size Identification	
Very Soft	Very soft rock disintegrates or easily compresses to touch; can be hard to very hard soil.	Boulders	Larger than 12"
Soft	May be broken with fingers.	Cobbles	3" - 12"
Moderately Soft	May be scratched with a nail, corners and edges may be broken with fingers.	Gravel	
		Coarse	3/4" - 3"
		Fine	4.76mm - 3/4"
Moderately Hard	Light blow of hammer required to break samples.	Sand	
		Coarse	2.0 - 4.76 mm
		Medium	0.42 - 2.00 mm
		Fine	0.42 - 0.074 mm
Hard	Hard blow of hammer required to break sample.	Fines (Silt or Clay)	Smaller than 0.074 mm
Rock Continuity		Relative Quality of Rocks	
RECOVERY = $\frac{\text{Total Length of Core}}{\text{Length of Core Run}} \times 100 \%$		RQD = $\frac{\text{Total core, counting only pieces > 4" long}}{\text{Length of Core Run}} \times 100 \%$	
<u>Description</u>	<u>Core Recovery %</u>	<u>Description</u>	<u>RQD %</u>
Incompetent	Less than 40	Very Poor	0 - 25 %
Competent	40 - 70	Poor	25 - 50 %
Fairly Continuous	71 - 90	Fair	50 - 75 %
Continuous	91 - 100	Good	75 - 90 %
		Excellent	90 - 100 %