Geotechnical Engineering Report

Rye Road Bridges

Manatee County, Florida

April 7, 2016

Dunkelberger Project No. HC165014

Prepared for:

Manatee Construction Services Division

Bradenton, Florida

Prepared by:

Dunkelberger Engineering & Testing, a Terracon Company

Sarasota, Florida

DUNKELBERGER

engineering & testing, inc.

A Terracon COMPANY

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

April 7, 2016

Manatee Construction Services Division
1112 Manatee Avenue, Suite 368C
Bradenton, Florida 34205

Attn: Mr. Michael Sturm, P.E.
Project Manager

Re: Geotechnical Engineering Services
Rye Road Bridges
Manatee County, Florida
Dunkelberger Project Number: HC165014

Dear Mr. Sturm:

Dunkelberger Engineering & Testing, a Terracon Company (DUNKELBERGER) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our Work Order No. 16, dated February 16, 2016 and approved on March 4, 2016. This report presents the findings of the geotechnical study in connection with planned widening of two bridges along Rye Road East.

We appreciate the opportunity to be of service during this phase of the project. If you have any questions, please contact the undersigned at 941-379-0621.

Sincerely,
Dunkelberger Engineering & Testing, a Terracon Company

JAMES M. JACKSON LICENSE No 77733 STATE OF FLORIDA PROFESSIONAL ENGINEER

James M. Jackson, P.E.
Project Engineer
FL License No.: 77733

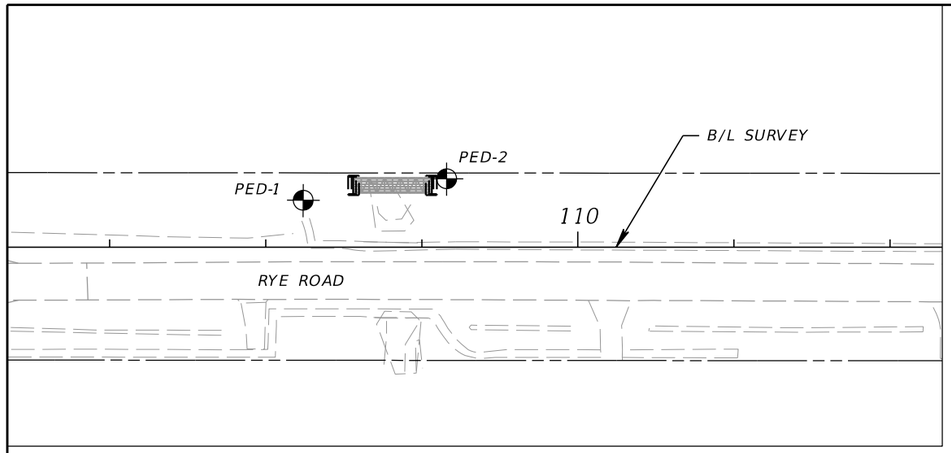
4/7/16

for

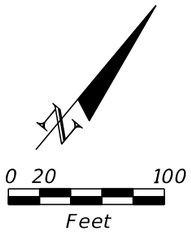
Kevin E. Aubry, P.E.
Senior Project Engineer
FL License No.: 38175

4/7/16

Enclosures
cc: 1 – Client (PDF)
1 – File



BORING LOCATION PLAN



NOTE:

THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION. THEREFORE, THE LOCATIONS OF THE BORINGS SHOULD BE CONSIDERED APPROXIMATE.

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

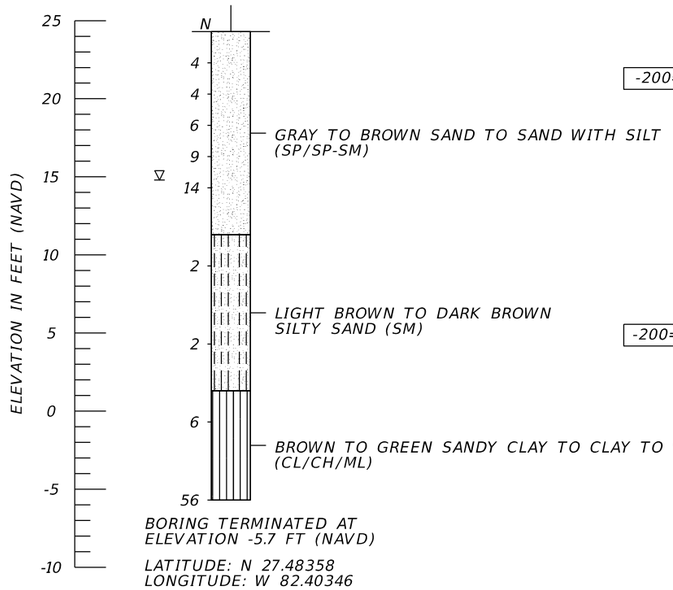
TEST RESULTS:

RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

	GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM)
	LIGHT BROWN TO DARK BROWN SILTY SAND (SM)
	BROWN TO DARK BROWN CLAYEY SAND (SC)
	BROWN TO GREEN SANDY CLAY TO CLAY TO SILT (CL/CH/ML)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
GNA	GROUNDWATER NOT APPARENT DUE TO THE INTRODUCTION OF DRILLING FLUID.
B/L SURVEY	BASELINE SURVEY OF RYE ROAD

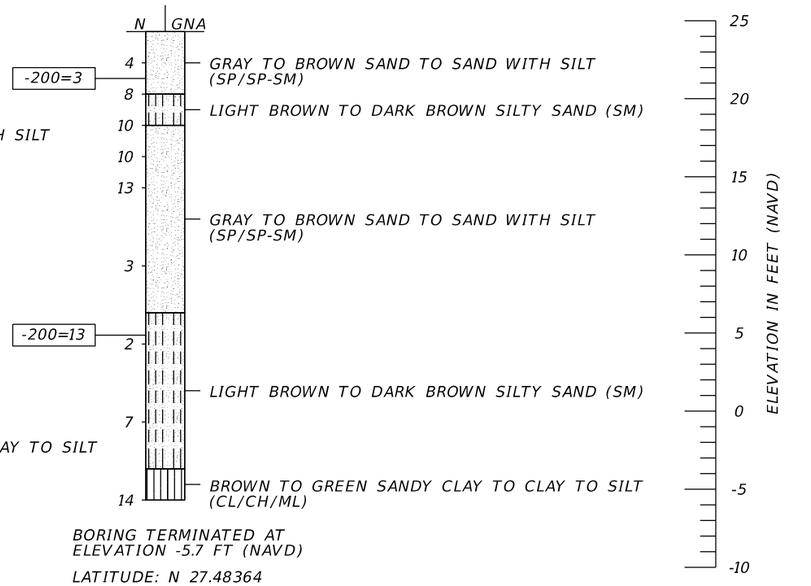
BOR # PED-1
STA. 108+24
REF. B/L SURVEY
OFF. 30' LT.
ELEV. 24.3
DATE 2/27/2017
DRILLER J. SHAW
HAMMER AUTOMATIC
RIG D-25



BORING TERMINATED AT ELEVATION -5.7 FT (NAVD)

LATITUDE: N 27.48358
LONGITUDE: W 82.40346

BOR # PED-2
STA. 109+16
REF. B/L SURVEY
OFF. 44' LT.
ELEV. 24.3
DATE 2/27/2017
DRILLER J. SHAW
HAMMER AUTOMATIC
RIG D-25



BORING TERMINATED AT ELEVATION -5.7 FT (NAVD)

LATITUDE: N 27.48364
LONGITUDE: W 82.40337

	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

PEDESTRIAN BRIDGE

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: SW
DRAWN BY: SW
CHECKED BY: DRR

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2017
PROJECT NO.: 225338

Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS (1)

SHEET NO.: P-7

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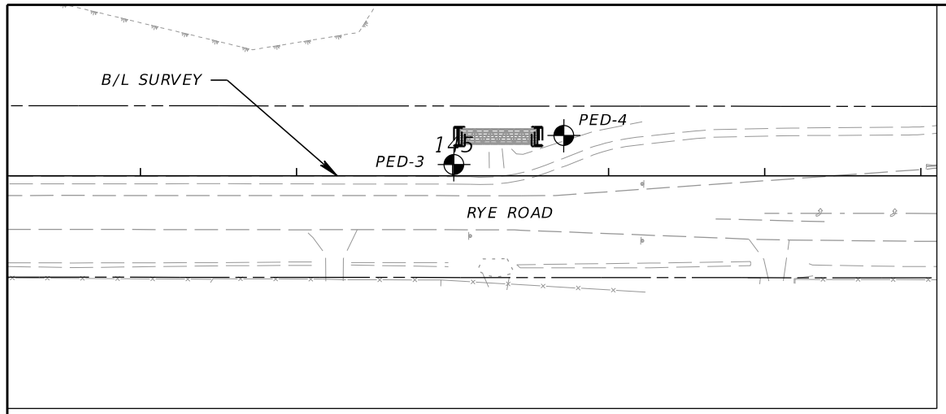
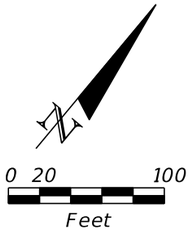


BORING LOCATION PLAN



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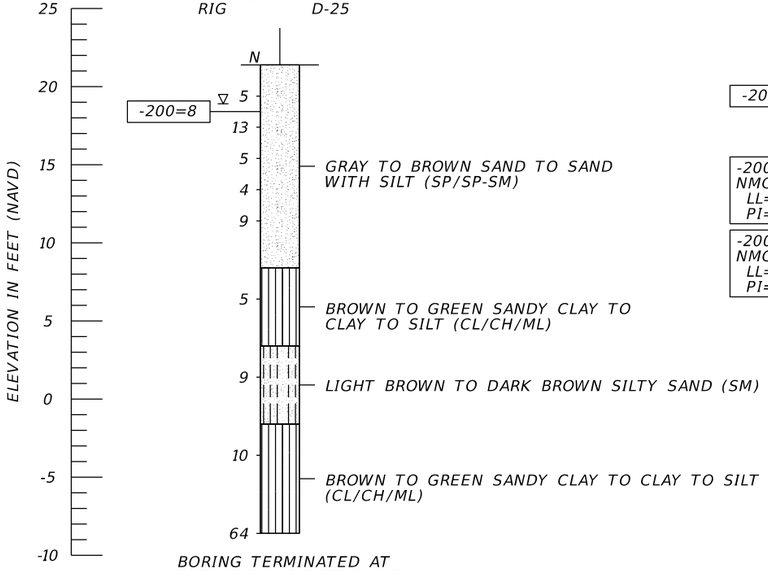
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

	GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM)
	LIGHT BROWN TO DARK BROWN SILTY SAND (SM)
	BROWN TO DARK BROWN CLAYEY SAND (SC)
	BROWN TO GREEN SANDY CLAY TO CLAY TO SILT (CL/CH/ML)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
GNA	GROUNDWATER NOT APPARENT DUE TO THE INTRODUCTION OF DRILLING FLUID.
B/L SURVEY	BASELINE SURVEY OF RYE ROAD

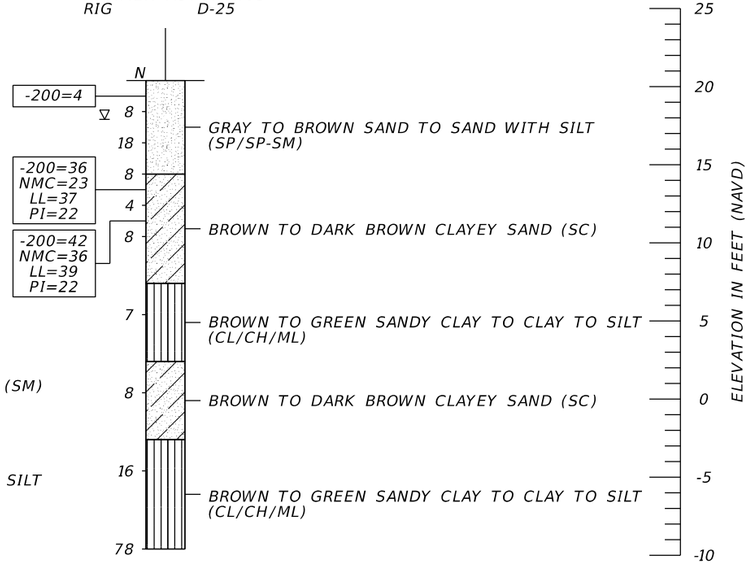
BOR # PED-3
STA. 145+01
REF. B/L SURVEY
OFF. 7' LT.
ELEV. 21.4
DATE 2/27/2017
DRILLER J. SHAW
HAMMER AUTOMATIC
RIG D-25



BORING TERMINATED AT ELEVATION -8.6 FT (NAVD)

LATITUDE: N 27.48995
LONGITUDE: W 82.39482

BOR # PED-4
STA. 145+71
REF. B/L SURVEY
OFF. 26' LT.
ELEV. 20.4
DATE 2/27/2017
DRILLER J. SHAW
HAMMER AUTOMATIC
RIG D-25



BORING TERMINATED AT ELEVATION -9.6 FT (NAVD)

LATITUDE: N 27.49006
LONGITUDE: W 82.39467

	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

PEDESTRIAN BRIDGE

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: SW
DRAWN BY: SW
CHECKED BY: DRR

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2017
PROJECT NO.: 225338

Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS (2)

SHEET NO.: P-8

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TIERRA

May 17, 2016

HDR, Inc.
2601 Cattlemen Road, Suite 400
Sarasota, Florida 34232

Attn: Mr. Jason Starr, P.E.

RE: Report of Geotechnical Engineering Services
Rye Road Functional Improvements – Lift Station and Wet Well
Manatee County, Florida
Reference: WA005467/W1400021
Tierra Project No.: 6511-15-087

Mr. Starr:

Tierra, Inc. (Tierra) has completed the geotechnical engineering study for the above referenced project. The results of the study are provided herein.

Should there be any questions regarding the report, please do not hesitate to contact our office at (813) 989-1354. Tierra would be pleased to continue providing geotechnical services throughout the implementation of the project. We look forward to working with you and your organization on this and future projects.

Respectfully Submitted,

TIERRA, INC.

Daniel R. Ruel, E.I.
Geotechnical Engineer Intern

Erick M. Frederick, P.E.
Senior Geotechnical Engineer
Florida License No. 63920

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

7351 Temple Terrace Highway • Tampa, FL 33637
Phone (813) 989-1354 • Fax (813) 989-1355
Florida Certificate No. 6486

TABLE OF CONTENTS

PROJECT DESCRIPTION

Project Information

The proposed lift station site is located along Rye Road NE approximately one mile south of the Upper Manatee River Road and Rye Road NE intersection in Manatee County, Florida. The proposed lift station is associated with the Rye Road Functional Improvements project. It is our understanding the wet well will be 10-feet in diameter and will be on the order of 12 feet below grade.

Tierra previously provided a geotechnical report addressing the force main associated with the improvements dated March 15, 2016.

Scope of Services

The objective of our study was to obtain information concerning subsurface conditions at the site to base engineering estimates and recommendations in each of the following areas:

1. Recommendations for wet well design including allowable bearing capacity, lateral earth pressures, soil properties, and modulus of subgrade reaction.

2. General location and description of potentially deleterious materials or conditions discovered in the borings

3. Identification of groundwater levels.

In order to meet the preceding objectives, we provided the following services:

1. Reviewed the “Parrish, Florida” Quadrangle Map published by the United States Geological Survey (USGS), as well as the Soil Survey of Manatee County, Florida, published by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS).

2. Executed a program of subsurface exploration consisting of one Standard Penetration Test (SPT) boring, subsurface sampling, and field testing.

3. Visually classified the samples in the laboratory using the Unified Soil Classification System (USCS). Identified soil conditions at the boring location.

4. Collected groundwater level measurements.

5. Prepared this engineering report that summarizes the course of study pursued, the field data generated, subsurface conditions encountered and our engineering recommendations in each of the pertinent topic areas.

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 this site. The scope of our services did not include determination of the potential for sinkhole activity. 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.

SITE AND SUBSURFACE CONDITIONS

General Site Information

Land use at the proposed wet well/lift station consists of open vacant land adjacent to the Del Tierra residential development.

USGS Quadrangle Maps

Based on the "Parrish, Florida" United States Geological Survey (USGS) Quadrangle Map, the natural ground elevation at the project site is on the order of +25 feet, National Geodetic Vertical Datum of 1929 (NGVD).

Potentiometric Surface

Based on a review of the "Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida" maps published by the USGS, the potentiometric surface in the vicinity of the lift station is on the order approximately +15 feet, NGVD. As previously noted, the natural ground surface elevation at the proposed lift station is on the order of approximately +25 feet, NGVD. Artesian flow conditions were not encountered within the borings performed during the field exploration.

Manatee County Soil Survey

Based on a review of the Manatee County Soil Survey published by the USDA NRCS, it appears that there is one (1) primary soil-mapping unit noted within the vicinity of the project limits. The general soil description is presented in the following paragraphs and table, as described in the Soil Survey.

EauGallie Fine Sand (Map Unit: 20) - The EauGallie, non-hydric component makes up 70 percent of the map unit. Slopes are 0 to 2 percent. This component is on flatwoods on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage

class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 12 inches during June, July, August, September, and October. Organic matter content in the surface horizon is about 5 percent.

The EauGallie, hydric component makes up 15 percent of the map unit. Slopes are 0 to 2 percent. This component is on flats on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during June, July, August, September, and October. Organic matter content in the surface horizon is about 5 percent.

SUMMARY OF USDA SOIL SURVEY
MANATEE COUNTY, FLORIDA

USDA Map Symbol and Soil Name	Soil Classification				pH	Seasonal High Water Table	
	Depth (in)	USCS	AASHTO	Permeability (in/hr)		Depth (feet)	Months
(20) EauGallie, non-hydric	0-5	SP, SP-SM	A-3	6.0 - 20.0	4.5-6.0	0.5-1.5	June-Oct
	5-28	SP, SP-SM	A-3	6.0 - 20.0	4.5-6.0		
	28-42	SM, SP-SM	A-2-4, A-3	0.6 - 6.0	4.5-6.5		
	42-50	SC, SC-SM, SM	A-2-4, A-2-6	0.1 - 2.0	5.6-7.8		
	50-65	SM, SP-SM	A-2-4, A-3	2.0 - 6.0	5.6-7.8		
EauGallie, hydric	0-5	SP, SP-SM	A-3	6.0 - 20.0	4.5-6.0	0.0-1.0	June-Oct
	5-28	SP, SP-SM	A-3	6.0 - 20.0	4.5-6.0		
	28-42	SM, SP-SM	A-2-4, A-3	0.6 - 6.0	4.5-6.5		
	42-50	SC, SC-SM, SM	A-2-4, A-2-6	0.1 - 2.0	5.6-7.8		
	50-65	SM, SP-SM	A-2-4, A-3	2.0 - 6.0	5.6-7.8		

It should be noted that information contained in the USDA NRCS Soil Survey may not be reflective of current subsurface conditions, particularly if recent development in the project vicinity has modified existing soils or surface/subsurface drainage.

Subsurface Conditions

Prior to commencing our subsurface explorations, a boring location plan was developed based on project information provided by the design team. The subsurface conditions within the vicinity of the proposed wet well/lift station were explored using one (1) Standard Penetration Test (SPT) boring drilled to a depth of 35 feet below the ground surface.

The boring was located in the field using a Garmin eTrex® hand-held Global Positioning System (GPS) unit with a reported accuracy of ±10 feet. The approximate boring location is presented on the **Report of Core Boring** sheet in the **Appendix**.

The SPT boring was performed with the use of a drill rig using Bentonite Mud drilling procedures. The soil sampling was performed in general accordance with American Society for Testing and Materials (ASTM) Test Designation D-1586 titled "Penetration Test and Split-Barrel Sampling of Soils." The initial 4 feet were manually augered to verify utility clearance. SPT resistance N-values were then recorded continuously to a depth of 10 feet and on intervals of 5 feet thereafter to the boring termination depth. The soil samples were classified in the field and transported to our laboratory for review.

The soil strata encountered in the borings performed at the project site are summarized in the following table:

Stratum Number	Soil Description	USCS Symbol
1	Gray to Brown Sand to Sand with Silt	SP/SP-SM
2	Light Brown to Dark Brown Silty Sand	SM

The subsurface soil stratification is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The soil profile included in the **Appendix** should be reviewed for specific information. This profile includes soil descriptions, stratifications, and penetration resistances. The stratifications shown on the boring profile represents the conditions only at the actual boring location. Variations in soil stratigraphy should be expected. The stratifications represent the approximate boundary between subsurface soils and the actual transition may be gradual.

Groundwater Information

The groundwater table was measured at a depth of 4 feet below the existing grade within boring Lift-1. The encountered groundwater level is depicted adjacent to the soil profile in the **Appendix**.

It should be noted that groundwater levels tend to fluctuate during periods of prolonged drought and extended rainfall and may be affected by man-made influences. In addition, a seasonal effect will also occur in which higher groundwater levels are normally recorded in rainy seasons.

EVALUATION AND RECOMMENDATIONS

General

Based on the results of the field exploration, sandy soils were encountered within the depth of the proposed lift station/wet well.

The Contractor shall be responsible for all construction requirements based on the subsurface soil and groundwater conditions encountered. If buried organic soils, debris, or unsuitable material is encountered during construction, they should be removed and replaced with clean, compacted engineered fill in accordance with project requirements.

It should be noted that if final design criteria deviates from what is stated in this report, Tierra should be given the opportunity to review the new information and amend our recommendations, if necessary.

Protection of Existing Structures

Residential homes are located on the order of 200 feet from the proposed improvements. Depending on the means and methods of construction/installation of the drainage structure, vibration concerns may become critical to the project.

Tierra recommends addressing the protection of existing structures within the plans by stating that it is the responsibility of the Contractor to take necessary precautions to protect existing structures and that it is the Contractor's responsibility to repair any damage to adjacent structures caused at his expense.

On-Site Soil Suitability

The suitability of the soil for reuse along the project should be evaluated against the project engineering fill requirements. Variations in the subsurface stratifications should be expected between borings. Fill should be placed in accordance with current County requirements.

In general, the soils of Strata 1 and 2 (SP/SP-SM/SM) may be moved and used for grading purposes, site leveling, general engineering fill, and trench backfill, provided the fill is free of organic materials, clay, debris or any other material deemed unsuitable for construction and evaluated against engineering fill requirements.

Site Preparation

Prior to construction, the location of any existing underground utilities within the construction area should be established. Material suitable for re-use may be stockpiled; however, any material stockpiled for re-use shall be tested for conformance to material

specifications as indicated in the following sections of this report. Provisions should then be made to relocate any interfering utility lines within the construction area to appropriate locations and backfilling the resulting excavations with compacted structural fill. In this regard, it should be noted that if abandoned underground pipes are not properly removed or plugged, they might serve as conduits for subsurface erosion, which subsequently may result in excessive settlement.

Lift Station/Wet Well

Based on project information, a 10-foot diameter and approximately 12-foot deep wet well is being proposed along with an associated lift. Excavations for the proposed wet well/lift station structure should be carried out in accordance with OSHA requirements/guidelines. To facilitate preparation of the subgrade soils for the construction of the proposed lift station, it may be necessary to place geotextile fabric and/or gravel aggregate to achieve stable/unyielding conditions.

A net allowable bearing pressure of 2,000psf and a modulus of subgrade reaction of 65,000pcf can be used for the design of the wet well foundation. Tierra recommends that for design purposes the water table be modelled at the ground surface. In addition, it is recommended that the designer take into account the buoyancy of the wet well and incorporate this into the design.

The in-situ soils will exert lateral (horizontal) earth pressure on the walls of the wet well structure. Walls constructed below grade which have adjacent in-situ soils will be subjected to active, passive, or at-rest lateral earth pressures. Active pressures are usually employed for unrestrained retaining wall design. Walls which are restrained at the top and bottom will be subjected to at-rest soil pressures. A table of **Recommended Soil Parameters** is provided on the **Report of Core Boring** sheet in the **Appendix**.

Drainage and Groundwater Concerns

The groundwater level presented in this report is the level that was measured at the time of our field activities. Fluctuation should be anticipated. We recommend that the Contractor determine the actual groundwater levels at the time of the construction to determine groundwater impact on his construction procedure. Care should be given to open excavations and site grading to minimize ponding of surface water.

Backfill

All materials to be used for fill or backfill should be evaluated and, if necessary, tested by Tierra prior to placement to determine if they are suitable for the intended use. Suitable fill materials should be placed and compacted in accordance with County requirements for the respective backfill zones and be free of rubble, organics, debris and other unsuitable material.

Excavations

Excavations and temporary side slopes should comply with the Occupational Safety and Health Administration's (OSHA) trench safety standards, 29 C.F.R., s. 1926.650, Subpart P, all subsequent revisions or updates of OSHA's referenced standard adopted by the Department of Labor and Employment Security and Florida's Trench Safety Act, Section 553.62, Florida Statutes.
We are providing this information solely as a service to our client. Tierra does not assume responsibility for construction site safety or the Contractor's or other party's compliance with local, state, and federal safety or other regulations.

REPORT LIMITATIONS

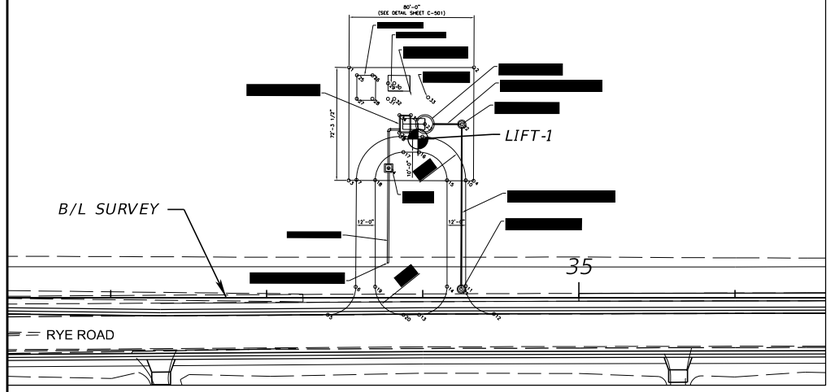
The analyses, conclusions and recommendations contained in this report are professional opinions based on the site conditions and project layout described herein and further assume that the conditions observed in the exploratory boring is representative of the subsurface conditions throughout the site, i.e., the subsurface conditions elsewhere on the site are the same as those disclosed by the boring. If, during construction, subsurface conditions different from those encountered in the exploratory boring are observed or appear to be present beneath excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary.

If there is a substantial lapse in time between the submittal of this report and the start of work at the site, or if conditions or project layout are changed due to natural causes or construction operations at or adjacent to the site, we recommend that this report be reviewed to determine the applicability of conclusions and recommendations considering the changed conditions and time lapse.

This report was prepared for the exclusive use of HDR, Inc. and their clients for evaluating the design of the project as it relates to the geotechnical aspects discussed herein. It should be made available to prospective contractors for information on factual data only and not as a warranty of subsurface conditions included in this report. Unanticipated soil conditions may require that additional expense be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

Appendix

Report of Core Boring (1 Sheet)



BORING LOCATION PLAN

0 20 100
Feet

ENVIRONMENTAL CLASSIFICATION:
SUBSTRUCTURE CONCRETE: MODERATELY AGGRESSIVE (SOIL PH=6.0)
SUBSTRUCTURE STEEL: MODERATELY AGGRESSIVE (SOIL PH=6.0)

SOIL TEST RESULTS:

RESISTIVITY	13,000 OHM-CM
CHLORIDES	30 PPM
SULFATES	<4.8 PPM
pH	6.0

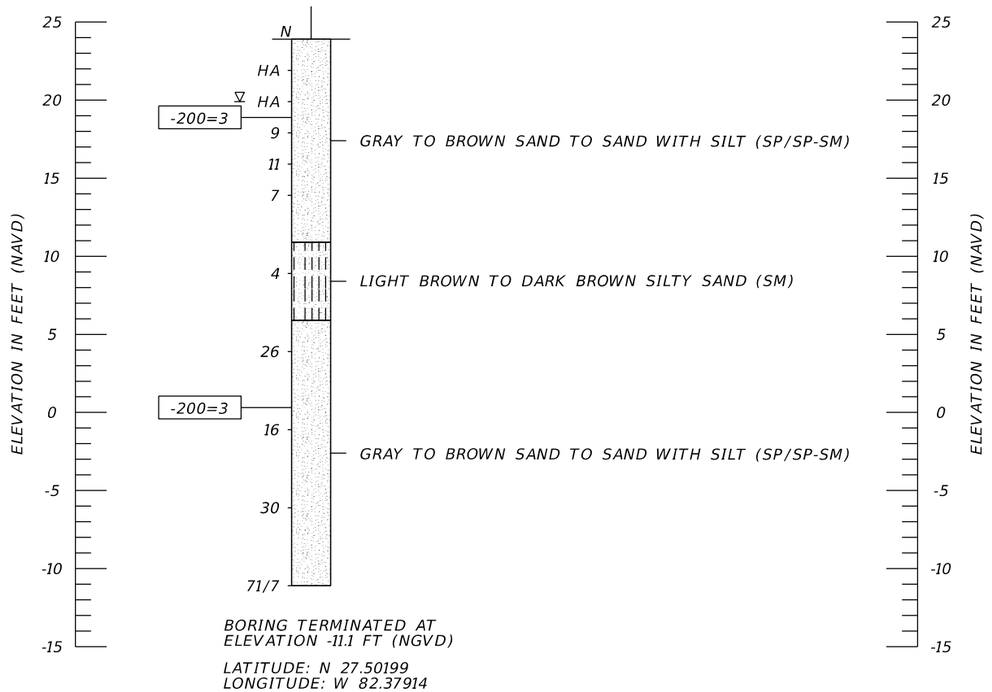
NOTES:

1. THE LOCATION OF THE BORING WAS RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN APPROXIMATE STATION, OFFSET, AND ELEVATION.
2. BASED ON A REVIEW OF THE "POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER, WEST-CENTRAL FLORIDA"MAPS PUBLISHED BY THE USGS, THE POTENTIOMETRIC SURFACE IN THE VICINITY OF THE LIFT STATION IS ON THE ORDER APPROXIMATELY +15 FEET, NGVD. AS PREVIOUSLY NOTED, THE NATURAL GROUND SURFACE ELEVATION AT THE PROPOSED LIFT STATION IS ON THE ORDER OF APPROXIMATELY +25 FEET, NGVD. ARTESIAN FLOW CONDITIONS WERE NOT ENCOUNTERED WITHIN THE BORINGS PERFORMED DURING THE FIELD EXPLORATION.

LEGEND

	GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM)
	LIGHT BROWN TO DARK BROWN SILTY SAND (SM)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
-200	PERCENT PASSING #200 SIEVE
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

BOR # LIFT-1
STA. 33+97
REF. BL SURVEY
OFF. 102' LT.
ELEV. 23.9
DATE 4/27/2016
DRILLER A. JACKSON
HAMMER AUTOMATIC
RIG D-25



BORING TERMINATED AT ELEVATION -11.1 FT (NGVD)

LATITUDE: N 27.50199
LONGITUDE: W 82.37914

RECOMMENDED SOIL PARAMETERS

BORING NUMBER	DEPTH (FT)	N	SOIL CLASSIFICATION	SOIL UNIT WEIGHT (PCF) ɣ SAT	SOIL UNIT WEIGHT (PCF) ɣ SUB	SOIL ANGLE OF FRICTION (DEGREES)	COHESION (PSF)	EARTH PRESSURE COEFFICIENT* ACTIVE (Ka)	EARTH PRESSURE COEFFICIENT* AT REST (Ko)	EARTH PRESSURE COEFFICIENT* PASSING (Kp)
LIFT-1	0 TO 18	4 TO 11	SP/SP-SM/SM	105	42.6	29	0	0.347	0.515	2.88
	18 TO 33	16 TO 30	SP/SP-SM	115	52.6	32	0	0.307	0.470	3.25
	33 TO 35	71/7	SP/SP-SM	125	62.6	34	0	0.283	0.441	3.54

*EARTH PRESSURE COEFFICIENTS ARE BASED ON FLAT/NON-SLOPING GROUND

GRANULAR MATERIALS- RELATIVE DENSITY	SAFETY HAMMER SPT N-VALUE (BLOWS/FT.)	AUTOMATIC HAMMER SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	**SPT N-VALUE (BLOWS/FT.)**	**SPT N-VALUE (BLOWS/FT.)**
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

No.	REVISIONS	DATE	BY

SCALE AS NOTED
DESIGNED BY DRR
DRAWN BY BJS
CHECKED BY EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE 3/2016
PROJECT NO. 225338

Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER ERICK M. FREDERICK
FL. LICENSE NO. 63920

REPORT OF CORE BORING

SHEET NO.

2:57:52 PM 5/17/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\rdgeoLift01.dgn

TIERRA

September 21, 2017

HDR, Inc.
2601 Cattlemen Road, Suite 400
Sarasota, Florida 34232

Attn: Mr. Chad Smith, P.E.

RE: Report of Geotechnical Engineering Services
Rye Road Functional Improvements – Pedestrian Bridges
Manatee County, Florida
Reference: WA005467/W1400021
Tierra Project No.: 6511-15-087

Mr. Smith:

Tierra, Inc. (Tierra) has completed the geotechnical engineering study for the above referenced project. The results of the study are provided herein.

Tierra appreciates the opportunity to be of services to HDR on this project. Should there be any questions regarding the report, please do not hesitate to contact our office at (813) 989-1354.

Respectfully Submitted,

TIERRA, INC.

Ryan Gray, E.I.
Geotechnical Engineer Intern

Marc E. Novak, P.E., Ph. D.
Senior Geotechnical Engineer
Florida License No. 67431

Daniel R. Ruel, P.E.
Geotechnical Engineer
Florida License No. 82404

7351 Temple Terrace Highway • Tampa, Florida 33637
Phone (813) 989-1354 • Fax (813) 989-1355
Florida Certificate No. 6486

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APPENDIX

PROJECT DESCRIPTION

Project Information

The project site is located along Rye Road E in Manatee County, Florida. The project consists of the design and construction of two (2) pedestrian bridges. Based on information provided by HDR, the approximate locations of the proposed pedestrian bridges are provided below.

Bridge No.	Reference	Begin Bridge		End Bridge	
		Station (feet)	Offset (feet)	Station (feet)	Offset (feet)
1	B/L Survey Rye Road	108+56.00	39.57 LT	109+06.42	39.57 LT
2		145+04.00	39.57 LT	145+54.42	39.57 LT

The proposed pedestrian bridges are associated with the Rye Road Functional Improvements project. The new bridges will be prefabricated aluminum truss single-span structures approximately 50 feet long with a clear width of approximately 8 feet. Both bridges will span existing shallow drainage ditches/canals on the northwestern side of Rye Road. It is our understanding that the proposed bridge structures will be supported on shallow foundations (spread footings).

If any of the project information is incorrect or has changed, Tierra should be notified as soon as possible so we can determine if the changes impact our recommendations mentioned in this report. The subsurface information obtained and engineering recommendations for the proposed bridge foundation systems are provided herein.

Scope of Services

The objective of our study was to obtain information concerning subsurface conditions at the pedestrian bridge sites in order to establish geotechnical parameters and recommendations for the design of the proposed structure foundations. In order to meet this objective, Tierra performed the following services:

1. Reviewed published soil information obtained from the “Soil Survey of Manatee County, Florida” published by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Reviewed topographic and potentiometric information obtained from the “Lorraine, Florida” Quadrangle Map and the “Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida” Maps published by the United States Geological Survey (USGS).

2. Conducted a site reconnaissance of the project site and coordinated utility clearances via Sunshine State One Call.

3. Executed a program of subsurface exploration consisting of borings and subsurface sampling. Tierra performed four (4) Standard Penetration Test (SPT) borings to a depth of approximately 30 feet below the existing ground surface.

4. Visually classified the soil samples in the laboratory using the Unified Soil Classification System (USCS). Conducted laboratory tests on selected soil samples to further characterize the subsurface conditions. Identified soil conditions at each boring location.

5. Collected groundwater level measurements at each boring location.

6. Evaluated foundation criteria and performed engineering analyses to develop design recommendations for the chosen foundation systems.

7. Prepared this engineering report that summarizes the course of study pursued, the field and laboratory data generated, the subsurface conditions encountered and our engineering recommendations for the design of the proposed bridge structures.

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 proposed bridge sites. The scope of our services did not include determination of the potential for sinkhole activity. 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.

REVIEW OF PUBLISHED DATA

USDA Soil Survey

Based on a review of the "Soil Survey of Manatee County, Florida" published by the USDA NRCS, it appears that there are two (2) primary soil-mapping units noted at the bridge sites. The general soil descriptions are presented in the following paragraphs and table, as described in the Soil Survey.

EauGallie fine sand (Map Unit 20)

The EauGallie, non-hydric component makes up 70 percent of the map unit. Slopes are 0 to 2 percent. This component is on flatwoods on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 12 inches during June, July, August, September, and October. Organic matter content in the surface horizon is about 5 percent. This soil does not meet hydric criteria. The soil has a slightly sodic horizon within 30 inches of the soil surface.

The EauGallie, hydric component makes up 15 percent of the map unit. Slopes are 0 to 2 percent. This component is on flats on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during June, July, August, September, and October. Organic matter content in the surface

horizon is about 5 percent. This soil meets hydric criteria. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Wabasso fine sand (Map Unit 48)

The Wabasso, non-hydric component makes up 70 percent of the map unit. Slopes are 0 to 2 percent. This component is on flatwoods on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 12 inches during June, July, August, September, and October. Organic matter content in the surface horizon is about 2 percent. This soil does not meet hydric criteria. The soil has a slightly sodic horizon within 30 inches of the soil surface.

The Wabasso, hydric component makes up 25 percent of the map unit. Slopes are 0 to 2 percent. This component is on flats on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during June, July, August, September, and October. Organic matter content in the surface horizon is about 2 percent. This soil meets hydric criteria. The soil has a slightly sodic horizon within 30 inches of the soil surface.

SUMMARY OF USDA SOIL SURVEY
MANATEE COUNTY, FLORIDA

USDA Map Symbol and Soil Name	Depth (in)	Soil Classification		Permeability (in/hr)	pH	Seasonal High Water Table	
		USCS	AASHTO			Depth (feet)	Months
(20) EauGallie fine sand, non-hydric	0-28	SP, SP-SM	A-3	6.0-20.0	4.5-6.0	0.5-1.5	June-Oct
	28-42	SM, SP-SM	A-2-4, A-3	0.6-6.0	4.5-6.5		
	42-50	SC, SC-SM, SM	A-2-4, A-2-6	0.1-2.0	5.6-7.8		
	50-65	SM, SP-SM	A-2-4, A-3	2.0-6.0	5.6-7.8		
(20) EauGallie fine sand, hydric	0-28	SP, SP-SM	A-3	6.0-20.0	4.5-6.0	0.0-1.0	June-Oct
	28-42	SM, SP-SM	A-2-4, A-3	0.6-6.0	4.5-6.5		
	42-50	SC, SC-SM, SM	A-2-4, A-2-6	0.1-2.0	5.6-7.8		
	50-65	SM, SP-SM	A-2-4, A-3	2.0-6.0	5.6-7.8		
(48) Wabasso fine sand, non-hydric	0-21	SP, SP-SM	A-3	6.0-20.0	4.5-7.3	0.5-1.5	June-Oct
	21-31	SM, SP-SM	A-2-4, A-3	0.6-6.0	4.5-7.3		
	31-37	SP, SP-SM	A-3	6.0-20.0	5.6-7.8		
	37-65	SC, SC-SM	A-2-4, A-2-6	0.1-0.2	5.6-7.8		
	65-80	SM, SP-SM	A-2-4, A-3	6.0-20.0	5.6-7.8		
(48) Wabasso fine sand, hydric	0-21	SP, SP-SM	A-3	6.0-20.0	4.5-7.3	0.0-1.0	June-Oct
	21-31	SM, SP-SM	A-2-4, A-3	0.6-6.0	4.5-7.3		
	31-37	SP, SP-SM	A-3	6.0-20.0	5.6-7.8		
	37-65	SC, SC-SM	A-2-4, A-2-6	0.1-0.2	5.6-7.8		
	65-80	SM, SP-SM	A-2-4, A-3	6.0-20.0	5.6-7.8		

It should be noted that information contained in the USDA Soil Survey may not be reflective of actual soil and groundwater conditions, particularly if recent development in the project vicinity has modified soil conditions or surface/subsurface drainage.

USGS Quadrangle Map

Based on a review of the "Lorraine, Florida" USGS Quadrangle Map, it appears that the natural ground surface elevations at the bridge sites range from approximately +20 to +25 feet, National Geodetic Vertical Datum of 1929 (NGVD 29). These elevations are generally consistent with project ground elevation data.

Potentiometric Surface Elevation

Based on a review of the "Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida" Maps published by the USGS, the potentiometric surface elevation of the Upper Floridan Aquifer at the bridge sites has been estimated to range from approximately +10 to +20 feet, NGVD 29. As noted previously, the natural ground surface elevations at the bridge sites range from approximately +20 to +25 feet, NGVD 29. Artesian flow conditions were not encountered within the borings performed during the field exploration.

SUBSURFACE EXPLORATION

Prior to commencing our field activities, a boring location plan was developed based on project information provided by the design team. To evaluate the subsurface conditions at the proposed bridge sites, Tierra performed one (1) SPT boring within the vicinity of each proposed end bent for each bridge for a total of four (4) SPT borings. The SPT borings were advanced to a depth of approximately 30 feet below the existing ground surface. The results of the SPT borings are presented on the **Report of Core Borings** sheets in the **Appendix**.

The SPT borings were located in the field by a representative of Tierra using a hand-held Garmin eTrex® Global Positioning System (GPS) device with a reported accuracy of ±10 feet. The recorded GPS coordinates were utilized in conjunction with Microstation design files to obtain station, offset, and elevation. The approximate boring locations and elevations are presented on the boring location plan located on the **Report of Core Borings** sheets in the **Appendix**. If a more accurate determination of the boring locations/elevations is required, then Tierra recommends the boring locations/elevations be survey located by the project surveyor.

The SPT borings were performed with the use of a drill rig using Bentonite Mud drilling procedures. The soil sampling was performed in general accordance with American Society for Testing and Materials (ASTM) Test Designation D-1586 titled "Penetration Test and Split-Barrel Sampling of Soils." SPT resistance N-values were recorded continuously from the existing ground surface to a depth of 10 feet and on intervals of 5 feet thereafter to the boring termination depth. The soil samples were classified in the field and transported to our laboratory for review.

SUBSURFACE CONDITIONS

The soil descriptions and classifications associated with the bridge structures are provided in the following table:

Soil Description	USCS Symbol
Gray to Brown SAND to SAND with Silt	SP/SP-SM
Light Brown to Dark Brown Silty SAND	SM
Brown to Dark Brown Clayey SAND	SC
Brown to Green Sandy CLAY to CLAY to SILT	CL/CH/ML

The subsurface soil stratification is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The soil profiles included in the **Appendix** should be reviewed for specific information at individual boring locations. These profiles include soil descriptions, stratifications and penetration resistances. The stratifications shown on the boring profiles represent the conditions only at the actual boring location. Variations did occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. In some cases, small variations in properties that were not considered pertinent to our engineering evaluation may have been abbreviated or omitted for clarity.

Groundwater Information

The groundwater table, when encountered, was measured at depths ranging from approximately 2.5 to 9.5 feet below existing grades within the borings performed. The encountered groundwater level at each boring location is presented adjacent to the soil profiles on the **Report of Core Borings** sheets in the **Appendix**.

At one boring location (SPT Boring PED-2), the groundwater table was not apparent prior to the introduction of drilling fluids (a depth of 10 feet). Therefore, GNA (Groundwater Not Apparent) is indicated on the soil profile of this boring in the **Appendix**.

It should be noted that groundwater levels tend to fluctuate during periods of prolonged drought and extended rainfall and may be affected by man-made influences. In addition, a seasonal effect will also occur in which higher groundwater levels are normally recorded in rainy seasons.

Water levels within the ditches/canals which the proposed bridge span may be subject to flood levels which are not the same as groundwater table levels.

Laboratory Testing

Laboratory tests for percent passing a No. 200 sieve (ASTM D-1140), Atterberg Limits (ASTM D-4318), and natural moisture content determination (ASTM D-2216) were completed on selected soil samples obtained from the SPT borings to confirm visual classifications. The

results of the laboratory testing are presented adjacent to the soil profiles on the **Report of Core Borings** sheets in the **Appendix**.

EVALUATION AND RECOMMENDATIONS

General

Based on information provided by HDR, the foundation system chosen to support the proposed pedestrian bridges consists of shallow foundation systems. The dimensions of the shallow foundations supporting the pedestrian bridges are provided below.

Foundation Type	Length (ft)	Width (ft)	Thickness (ft)
Shallow Spread Footing	7.0	12.5	1¼

The shallow foundations will be embedded on the order of 2½ to 3 feet. With shallow spread foundations, slope integrity must be maintained to ensure stable soil conditions within the shallow foundation influence zone. We understand slope protection measures to maintain the slopes are being implemented as part of the design consisting of rip-rap. The following sections present the results of the engineering analyses for the proposed shallow foundation systems.

Foundation Recommendations

Based on the results of our borings and our understanding of the proposed pedestrian bridges as discussed herein, subsurface conditions are considered suitable for supporting the structures on shallow spread foundations after proper subgrade preparation. A maximum Nominal Bearing Resistance (NBR) of 4,500 pounds per square foot (psf) can be used for the design of the foundations. This value was developed based on the proposed loads and foundation dimensions and depth provided by HDR, which are shown on the **Pedestrian Bridge Plans** in the **Appendix**.

The Nominal Bearing Resistance (NBR) for shallow foundations must satisfy the following requirement:

$$NBR \geq (\text{Factored Design Load})/\phi$$

Where: ϕ = Resistance Factor.

Where ϕ = 0.45; using the Resistance Factors for Geotechnical Resistance of Shallow Foundations at the Strength Limit State (Table 10.5.5.2.2-1, AASHTO 2015), assuming theoretical method in sand, SPT.

Site Preparation

Prior to construction, the location of any existing underground utilities within the construction area should be established. Material suitable for re-use may be stockpiled; however, any material stockpiled for re-use shall be tested for conformance to project specifications. Provisions should then be made to relocate any interfering utility lines within the construction area to appropriate locations and backfilling the resulting excavations with compacted approved

fill. In this regard, it should be noted that if abandoned underground pipes are not properly removed or plugged, they might serve as conduits for subsurface erosion, which subsequently may result in excessive settlement.

As a minimum, it is recommended that the clearing operations extend to the depth needed to remove material considered deleterious at least 5 feet beyond the proposed construction limits, where practical. Deleterious materials to be removed include roots, organics, tree stumps or other buried or surface debris. Fill placement and subgrade preparation recommendations are presented in the Construction Considerations section of this report.

Settlement

The settlement of shallow foundations supported on compacted sand fill and/or natural sandy soils should occur rapidly after loading. Thus, the expected settlement should occur during construction as dead loads are imposed. Provided the recommended site preparation operations are properly performed and the recommendations noted herein are utilized, the total settlement should not exceed approximately ½ inch. The differential settlement is not expected to exceed one half of the total settlement. Differential settlement of this magnitude is usually considered tolerable for the anticipated construction; however, the tolerance of the proposed structures to the predicted total and differential settlements should be confirmed by the structural engineer.

CONSTRUCTION CONSIDERATIONS

General

The overall site preparation and construction should be in accordance with the AASHTO and FDOT requirements, as described in the General Notes on the bridge plans.

Scour/Slope Protection

We understand rip rap is being utilized as slope protection. Periodic regular maintenance and review of the drainage ditches/canals slopes at the bridge foundations should be performed. If erosion or sloughing is observed near the foundations the Engineer should be contacted and repair of the slope should be implemented immediately.

Drainage and Groundwater Concerns

The groundwater levels presented in this report are the levels that were measured at the time of our field activities. Fluctuation should be anticipated. We recommend that the Contractor determine the actual groundwater levels at the time of construction to determine potential groundwater impacts that may occur during the proposed construction.

Structural Fill

All materials used for structural fill or backfill should be evaluated and, if necessary, tested by Tierra prior to placement to determine if they are suitable for the intended use. Suitable fill

materials should consist of sand with less than 12% passing the No. 200 sieve, free of rubble, organics, clay, debris and other unsuitable material.

In general, the majority of the Stratum 1 sands (SP/SP-SM) can be moved and used for grading purposes, site leveling, general engineering fill, structural fill and backfill in other areas, provided the fill is free of organic material, clay, debris or any other material deemed unsuitable for construction and verified with project specifications. All fill should be placed in accordance with the project specifications.

REPORT LIMITATIONS

The analyses, conclusions and recommendations contained in this report are professional opinions based on the site conditions and project layout described herein and further assume that the conditions observed in the exploratory borings are representative of the subsurface conditions throughout the site, i.e., the subsurface conditions elsewhere on the site are the same as those disclosed by the borings. If, during construction, subsurface conditions different from those encountered in the exploratory borings are observed or appear to be present beneath excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary.

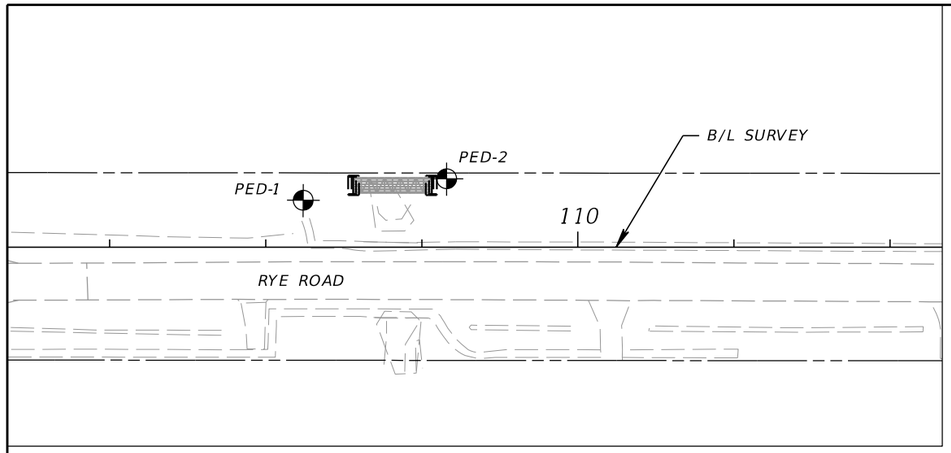
If there is a substantial lapse in time between the submittal of this report and the start of work at the site, or if conditions or project layout are changed due to natural causes or construction operations at or adjacent to the site, we recommend that this report be reviewed to determine the applicability of conclusions and recommendations considering the changed conditions and time lapse.

This report was prepared for the exclusive use of HDR, Inc. and their clients for evaluating the design of the project as it relates to the geotechnical aspects discussed herein. It should be made available to prospective contractors for information on factual data only and not as a warranty of subsurface conditions included in this report.

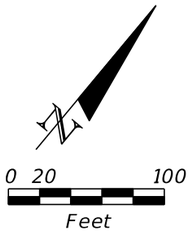
APPENDIX

Report of Core Borings (2 Sheets)

Pedestrian Bridge Plans (Provided by HDR, Inc.)



BORING LOCATION PLAN



NOTE:

THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION. THEREFORE, THE LOCATIONS OF THE BORINGS SHOULD BE CONSIDERED APPROXIMATE.

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

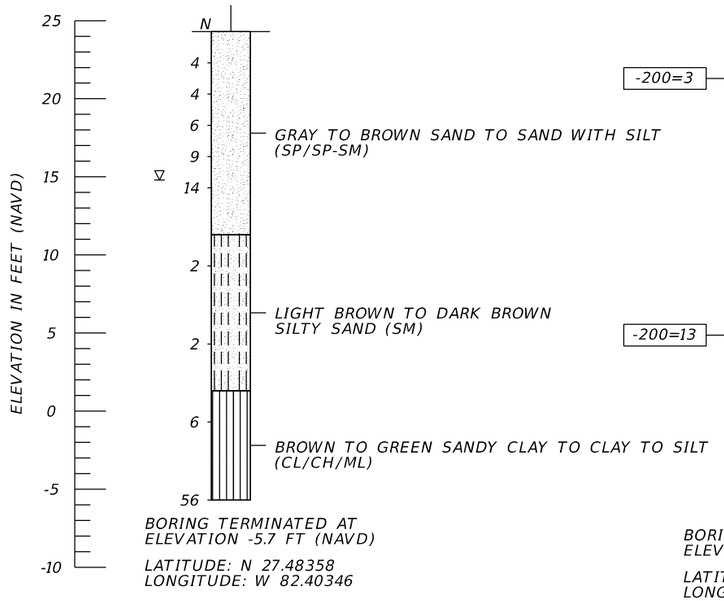
TEST RESULTS:

RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

	GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM)
	LIGHT BROWN TO DARK BROWN SILTY SAND (SM)
	BROWN TO DARK BROWN CLAYEY SAND (SC)
	BROWN TO GREEN SANDY CLAY TO CLAY TO SILT (CL/CH/ML)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
GNA	GROUNDWATER NOT APPARENT DUE TO THE INTRODUCTION OF DRILLING FLUID.
B/L SURVEY	BASELINE SURVEY OF RYE ROAD

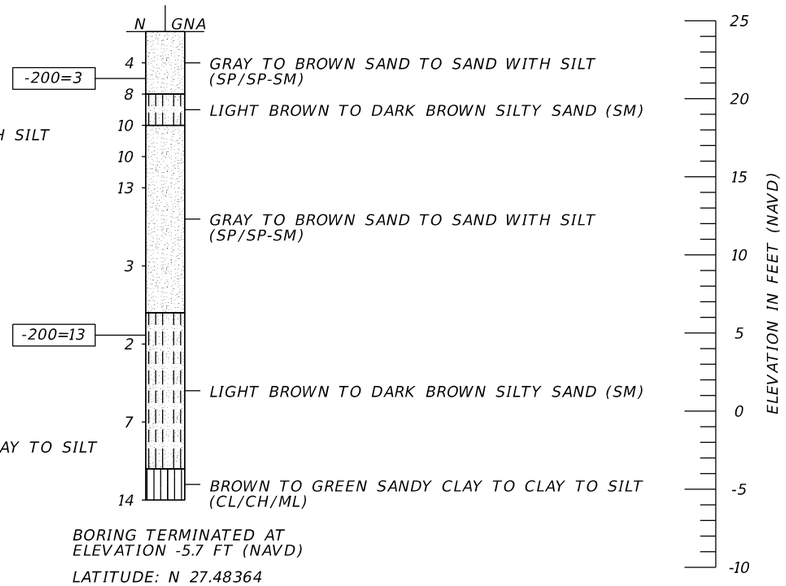
BOR # PED-1
STA. 108+24
REF. B/L SURVEY
OFF. 30' LT.
ELEV. 24.3
DATE 2/27/2017
DRILLER J. SHAW
HAMMER AUTOMATIC
RIG D-25



BORING TERMINATED AT ELEVATION -5.7 FT (NAVD)

LATITUDE: N 27.48358
LONGITUDE: W 82.40346

BOR # PED-2
STA. 109+16
REF. B/L SURVEY
OFF. 44' LT.
ELEV. 24.3
DATE 2/27/2017
DRILLER J. SHAW
HAMMER AUTOMATIC
RIG D-25



BORING TERMINATED AT ELEVATION -5.7 FT (NAVD)

LATITUDE: N 27.48364
LONGITUDE: W 82.40337

	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

PEDESTRIAN BRIDGE

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: SW
DRAWN BY: SW
CHECKED BY: DRR

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2017
PROJECT NO.: 225338

Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS (1)

SHEET NO.

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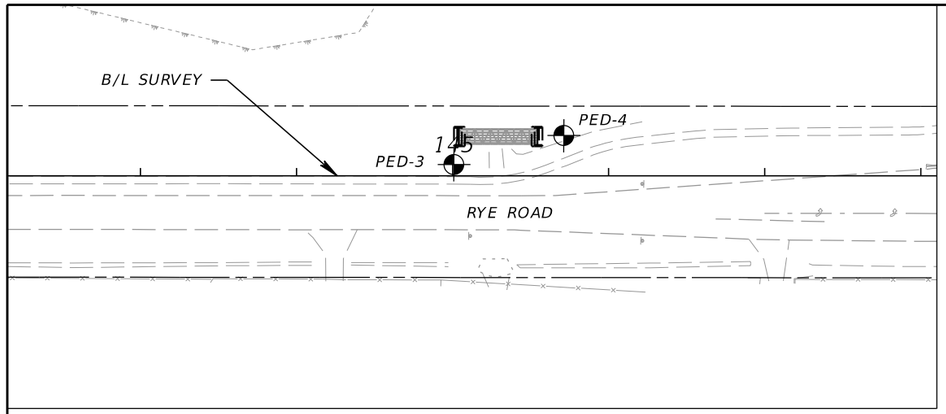
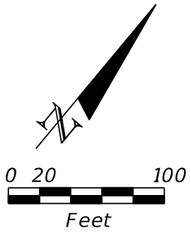


BORING LOCATION PLAN



NOTE:

THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION. THEREFORE, THE LOCATIONS OF THE BORINGS SHOULD BE CONSIDERED APPROXIMATE.

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

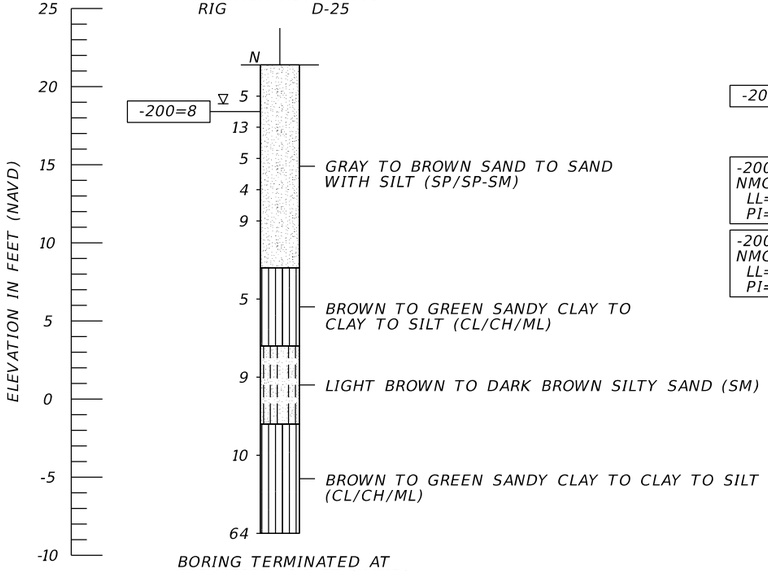
TEST RESULTS:

RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

	GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM)
	LIGHT BROWN TO DARK BROWN SILTY SAND (SM)
	BROWN TO DARK BROWN CLAYEY SAND (SC)
	BROWN TO GREEN SANDY CLAY TO CLAY TO SILT (CL/CH/ML)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
GNA	GROUNDWATER NOT APPARENT DUE TO THE INTRODUCTION OF DRILLING FLUID.
B/L SURVEY	BASELINE SURVEY OF RYE ROAD

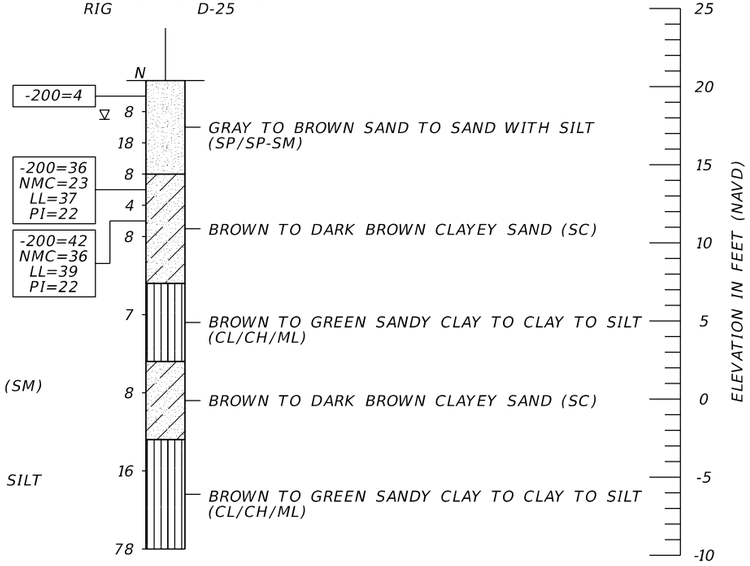
BOR # PED-3
STA. 145+01
REF. B/L SURVEY
OFF. 7' LT.
ELEV. 21.4
DATE 2/27/2017
DRILLER J. SHAW
HAMMER AUTOMATIC
RIG D-25



BORING TERMINATED AT ELEVATION -8.6 FT (NAVD)

LATITUDE: N 27.48995
LONGITUDE: W 82.39482

BOR # PED-4
STA. 145+71
REF. B/L SURVEY
OFF. 26' LT.
ELEV. 20.4
DATE 2/27/2017
DRILLER J. SHAW
HAMMER AUTOMATIC
RIG D-25



BORING TERMINATED AT ELEVATION -9.6 FT (NAVD)

LATITUDE: N 27.49006
LONGITUDE: W 82.39467

	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

PEDESTRIAN BRIDGE

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: SW
DRAWN BY: SW
CHECKED BY: DRR

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2017
PROJECT NO.: 225338

Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS (2)

SHEET NO.

5:26:21 PM 9/21/2017 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\B1boring02.dgn

MANATEE COUNTY
PUBLIC WORKS DEPARTMENT

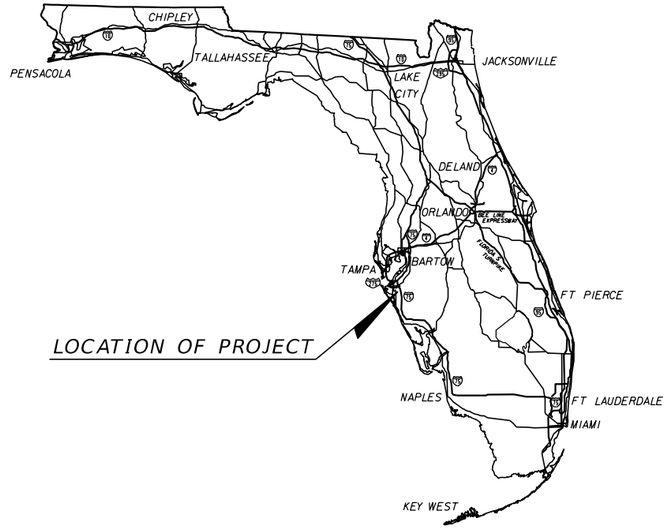
CONTRACT PLANS

MANATEE COUNTY
(6086160)

RYE ROAD
FROM SR 64 TO UPPER MANATEE RIVER ROAD

PEDESTRIAN BRIDGES

INDEX OF PEDESTRIAN BRIDGE PLANS



NOT FOR CONSTRUCTION
PRELIMINARY AND SUBJECT TO CHANGE

PEDESTRIAN BRIDGE SHOP DRAWINGS
TO BE SUBMITTED TO:
CHESTER A. SMITH III, P.E.
HDR ENGINEERING, INC.
2601 CATTLEMEN ROAD, SUITE 400
SARASOTA, FLORIDA 34232

PLANS PREPARED BY:
HDR ENGINEERING, INC.
2601 CATTLEMEN ROAD, SUITE 400
SARASOTA, FLORIDA 34232
(941) 342-2700
WWW.HDRINC.COM
FBPR CERTIFICATE OF AUTHORIZATION NO. 4213

VENDOR NO. 47-0680568
CONTRACT NO. C9480

NOTE: THE SCALE OF THESE PLANS MAY
HAVE CHANGED DUE TO REPRODUCTION.

PEDESTRIAN BRIDGE PLANS
ENGINEER OF RECORD: CHESTER A. SMITH III

P.E. NO.: 70756

KEY SHEET REVISIONS	
DATE	DESCRIPTION

MANATEE COUNTY PROJECT MANAGER: MICHAEL L. STURM, PE

FISCAL YEAR	SHEET NO.
17	P-1

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

GENERAL NOTES

DESIGN SPECIFICATIONS:
AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO), LRFD BRIDGE DESIGN SPECIFICATIONS, 7th EDITION WITH 2016 INTERIMS.
AASHTO LRFD, GUIDE SPECIFICATIONS FOR DESIGN OF PEDESTRIAN BRIDGES, 2ND ADDITION WITH 2015 INTERIMS.
FDOT STRUCTURES MANUAL DATED JANUARY 2017.

FOUNDATION DESIGN LOADING:
LOAD AND RESISTANCE FACTOR DESIGN METHOD (LRFD) USING STRENGTH, SERVICE AND FATIGUE LIMIT STATES.

DESIGN LOADING:
LIVE LOAD
DESIGN TRUCK = H5 LOADING
PEDESTRIAN LOADING (PEDESTRIAN BRIDGE) = 90 PSF
DEAD LOADS:
REINFORCED CONCRETE UNIT WEIGHT = 150 PCF

FOUNDATION:
THE FOUNDATION FOR THE CONCRETE SPREAD FOOTING SHALL BE CONSTRUCTED IN ACCORDANCE WITH SECTION 455 OF THE SPECIFICATIONS.
SOIL BELOW FOOTING IS TO HAVE A MINIMUM ALLOWABLE BEARING CAPACITY OF 2.0 KIPS/SQ. FT.
FOR LEVEL GROUND, THE FOR SLOPED GROUND, MINIMUM 1'-6" SOIL COVER SHALL BE PROVIDED.

THE FOUNDATIONS HAVE BEEN DESIGNED FOR THE FOLLOWING ESTIMATED UNFACTORED LOADS FROM THE PEDESTRIAN BRIDGE WITH APPLICABLE STRENGTH AND SERVICE LIMITS APPLIED.

UNFACTORED LOADS (Υ = 1.0)
DEAD = 4,833 LBS
LIVE = 36,000 LBS
HORIZONTAL WIND = 19,471 LBS
VERTICAL WIND = 9,333 LBS

IF THE CONTRACTOR PROVIDES A PEDESTRIAN BRIDGE THAT EXCEEDS THESE LOADS, THEN THE CONTRACTOR MUST SUBMIT CALCULATIONS SIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF FLORIDA TO THE COUNTY FOR REVIEW AND APPROVAL SHOWING THAT THE SPREAD FOOTING DIMENSIONS, REINFORCING STEEL SIZE, AND SPACING ARE ADEQUATE.

VERTICAL DATUM:
ALL ELEVATIONS REFER TO THE NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1929.

DIMENSIONS:
ALL DIMENSIONS IN THE PLANS ARE MEASURED IN FEET AND INCHES.

CONCRETE:
ALL CONCRETE FOUNDATIONS SHALL BE FDOT CLASS IV AND HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH, f'c = 5500 PSI

CONCRETE COVER:
CONCRETE COVER IS 4" UNLESS NOTED OTHERWISE IN THE PLAN SET AND DO NOT INCLUDE PLACEMENT AND FABRICATION TOLERANCES. SEE SECTION 415 OF THE SPECIFICATIONS FOR ALLOWABLE TOLERANCES.

JOINTS IN CONCRETE:
CONSTRUCTION JOINTS WILL BE PERMITTED ONLY AT THE LOCATIONS INDICATED IN THE PLANS. ADDITIONAL CONSTRUCTION JOINTS OR ALTERATIONS TO THOSE SHOWN SHALL REQUIRE APPROVAL OF THE ENGINEER.

CHAMFERS:
PROVIDE ¾" CHAMFER ON ALL EXPOSED SURFACES.

REINFORCING STEEL:
MATERIAL:
REINFORCING STEEL SHALL BE ASTM A615, GRADE 60.
PLACEMENT:
ALL DIMENSIONS PERTAINING TO THE LOCATION OF REINFORCING ARE TO THE CENTERLINE OF BAR, EXCEPT WHERE THE CLEAR DIMENSION IS SHOWN TO THE FACE OF CONCRETE.

PEDESTRIAN BRIDGE:
MATERIALS:
PRIMARY STRUCTURAL MEMBERS SHALL BE 6061-T6 ALUMINUM
SECONDARY STRUCTURAL MEMBERS SHALL BE 6000 SERIES ALUMINUM
BRIDGE DECKING SHALL BE ALUMINUM ALLOY 6061-T6 EXTRUDED

DEFLECTIONS REQUIREMENTS:
VERTICAL = SPAN / 400
HORIZONTAL = SPAN / 500

THE FUNDAMENTAL FREQUENCY OF THE UNLOADED PEDESTRIAN BRIDGE SHALL BE NO LESS THAN 3.0 HERTZ.

BRIDGE SHALL BE CAMBERED TO OFFSET THE DEAD LOAD.

DEPTH OF BRIDGE STRUCTURE FROM TOP OF DECK TO BOTTOM OF LOWEST CHORD IS ASSUMED TO BE 1'-5½" MAXIMUM. BRIDGE SUPPLIER TO PROVIDE 1'-5½" MAX DEPTH FROM TOP OF DECK TO BOTTOM OF LOWEST CHORD.

ANCHOR BOLTS:
THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ANCHOR BOLTS THAT MEET PREFABRICATED BRIDGE SUPPLIER REQUIREMENTS.

COVER PLATES:
PROVIDE A ADA COMPLIANT COVER PLATE SYSTEM AT BEGIN AND END BRIDGE LOCATIONS WHERE PEDESTRIANS TRANSITION BETWEEN SURFACES. THE COVER PLATE SHALL BE RUBBER ENCAPSULATED STEEL COVER SYSTEM TO AVOID CORROSION BETWEEN DISSIMILAR MATERIALS.

UTILITIES:
LOCATION AND TYPE OF UTILITIES SHOWN IN THE BRIDGE PLANS ARE APPROXIMATE. FOR UTILITY DISPOSITIONS AND ADDITIONAL INFORMATION, REFER TO THE UTILITY ADJUSTMENTS PLANS.

BID ITEM NOTES:
PAYMENT FOR INCIDENTAL ITEMS NOT SPECIFICALLY COVERED IN THE INDIVIDUAL PAY ITEMS SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE FOR THE PAY ITEMS.

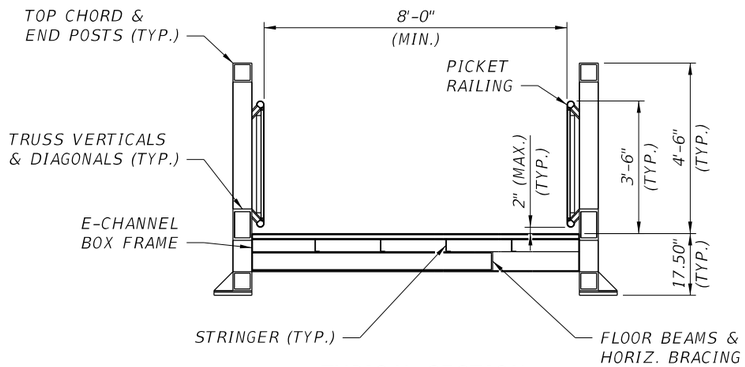
NO SEPARATE PAYMENT WILL BE MADE FOR EXCAVATIONS FOR CONSTRUCTION OF FOOTINGS. ALL COSTS FOR EXCAVATION SHALL BE INCIDENTIAL TO THE ELEMENT REQUIRING SUCH WORK.

THE COST OF THE COVER PLATES SHALL BE INCLUDED WITH THE COST OF THE CLASS IV (SUBSTRUCTURE) CONCRETE, PAY ITEM 400-4-5.

ABBREVIATIONS:
E = EXPANSION BEARING
FFBW = FRONT FACE OF BACKWALL
E.F. = EACH FACE

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY		
		LOC. 1	LOC. 2	TOTAL
CLASS IV (SUBSTRUCTURE)	C.Y.	16	16	32
REINFORCING STEEL	LBS.	1428	1428	2856
COVER PLATES	EA.	2	2	4



TYPICAL SECTION

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: JA
DRAWN BY: DAR
CHECKED BY: AT

HDR ENGINEERING, INC.
2601 CATTLEMEN ROAD, SUITE 400
SARASOTA, FLORIDA 34232
CERTIFICATE OF AUTHORIZATION 4213

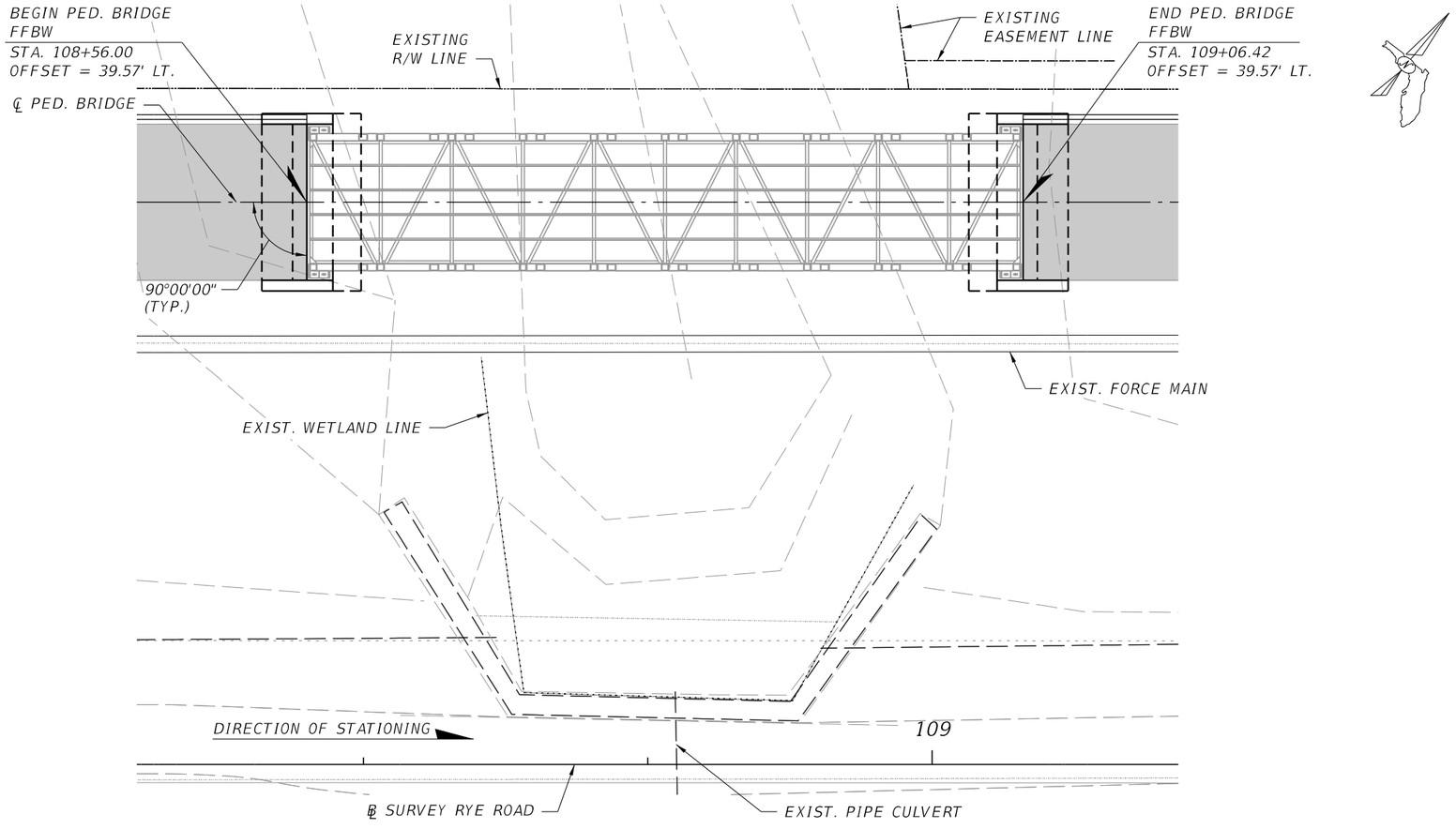
DATE: 7/2017
PROJECT NO.: 225338

MANATEE COUNTY PUBLIC WORKS

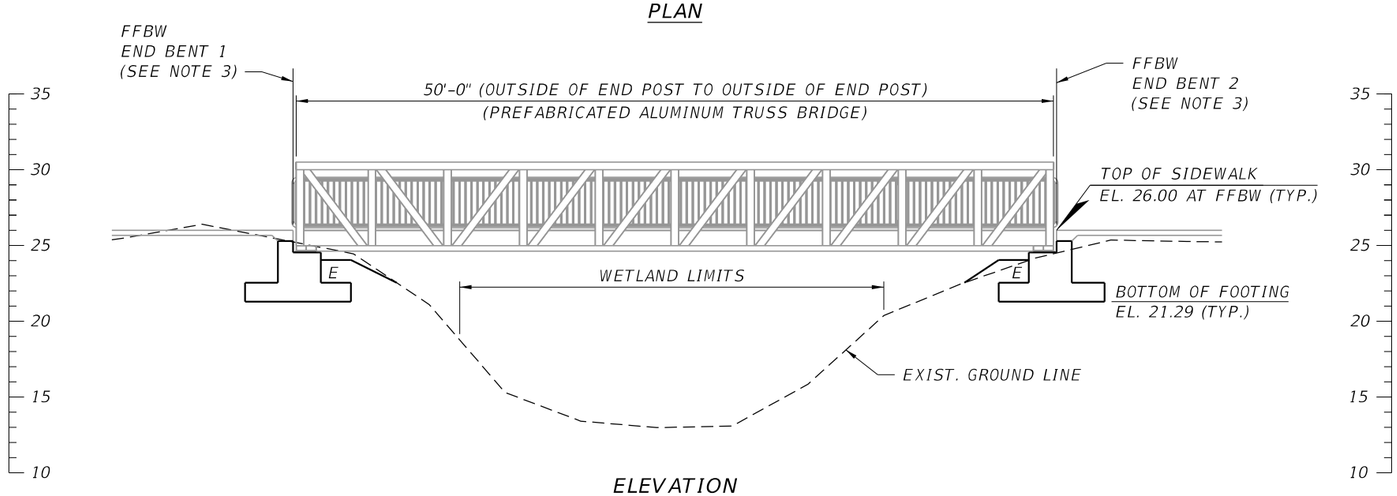
DESIGN ENGINEER: CHESTER A. SMITH III
FL. LICENSE NO.: 70756

GENERAL NOTES

SHEET NO.: P-2



PLAN



ELEVATION
(ALONG ℄ PED. BRIDGE)

NOTES:

1. PROVIDE COVER PLATE AT BEGIN / END BRIDGE FOR TRANSITION FROM BRIDGE SURFACE TO CONCRETE SIDEWALK.
2. ALUMINUM TRUSS PEDESTRIAN BRIDGE TO BE PROVIDED BY OTHERS.
3. THE FFBW IS LOCATED 2 1/2 INCHES BEYOND THE PEDESTRIAN BRIDGE END POST TO PROVIDE CLEARANCE FOR THE BASE PLATE.
4. FOR GRADING DETAILS, SEE END BENT DETAILS (2 OF 2).

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

No.	REVISIONS	DATE	BY

SCALE	AS NOTED
DESIGNED BY	JA
DRAWN BY	DAR
CHECKED BY	AT

HDR ENGINEERING, INC.
2601 CATTLEMEN ROAD, SUITE 400
SARASOTA, FLORIDA 34232
CERTIFICATE OF AUTHORIZATION 4213

DATE 7/2017

PROJECT NO. 225338

MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER
CHESTER A. SMITH III

FL. LICENSE NO. 70756

PEDESTRIAN BRIDGE LOCATION 1

SHEET NO. P-3

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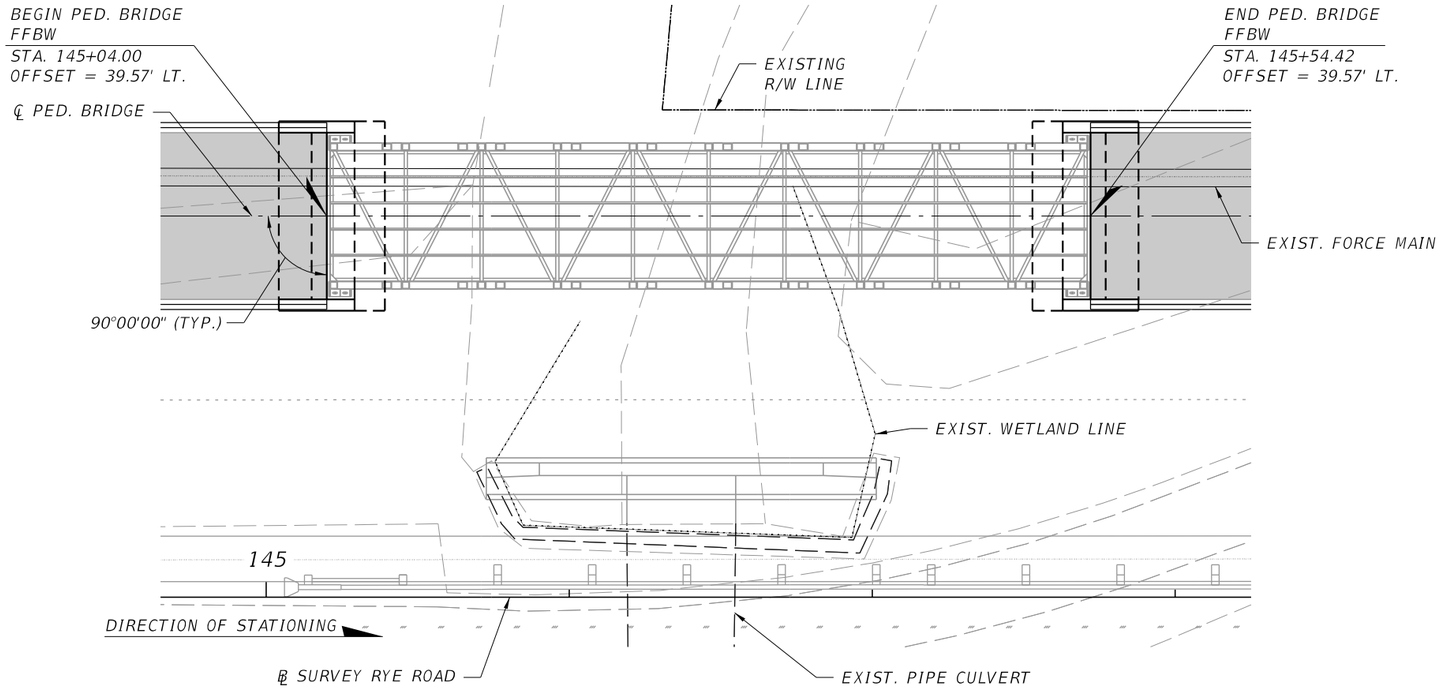
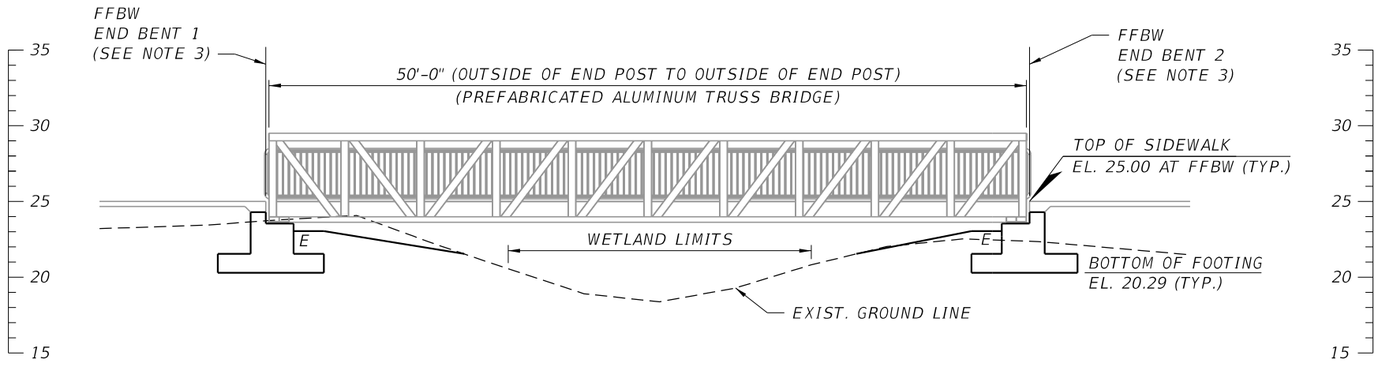


PLAN



ELEVATION
(ALONG ℄ PED. BRIDGE)

NOTES:

1. PROVIDE COVER PLATE AT BEGIN / END BRIDGE FOR TRANSITION FROM BRIDGE SURFACE TO CONCRETE SIDEWALK.
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4. FOR GRADING DETAILS, SEE END BENT DETAILS (2 OF 2).

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: JA
DRAWN BY: DAR
CHECKED BY: AT

HDR ENGINEERING, INC.
2601 CATTLEMEN ROAD, SUITE 400
SARASOTA, FLORIDA 34232
CERTIFICATE OF AUTHORIZATION 4213

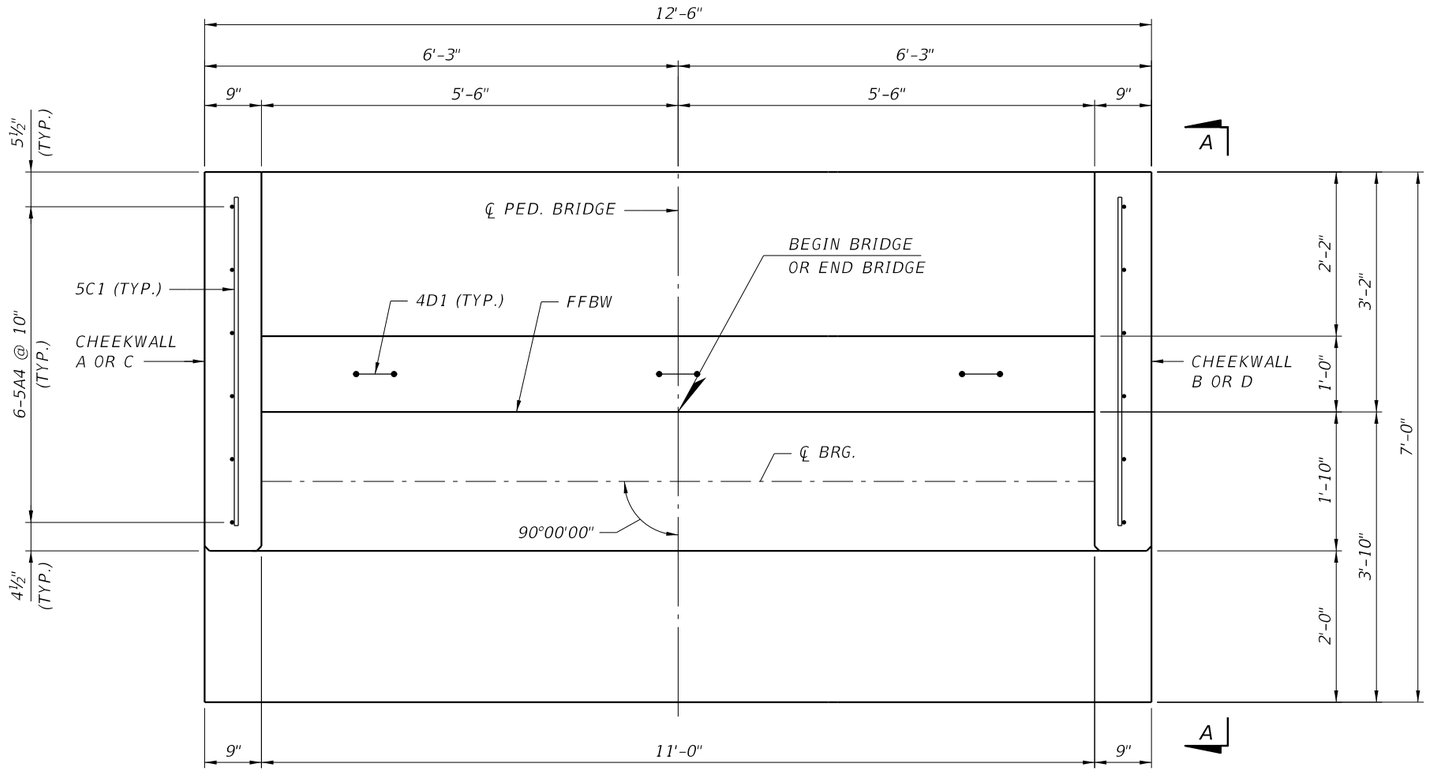
DATE: 7/2017
PROJECT NO.: 225338

MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: CHESTER A. SMITH III
FL. LICENSE NO.: 70756

PEDESTRIAN BRIDGE LOCATION 2

SHEET NO.: P-4



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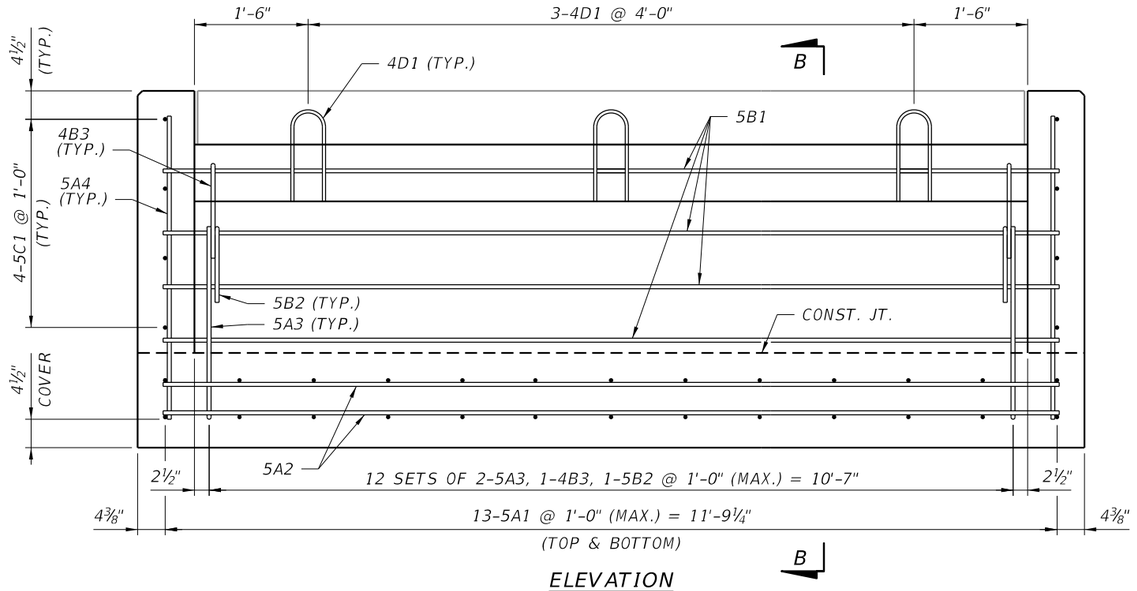
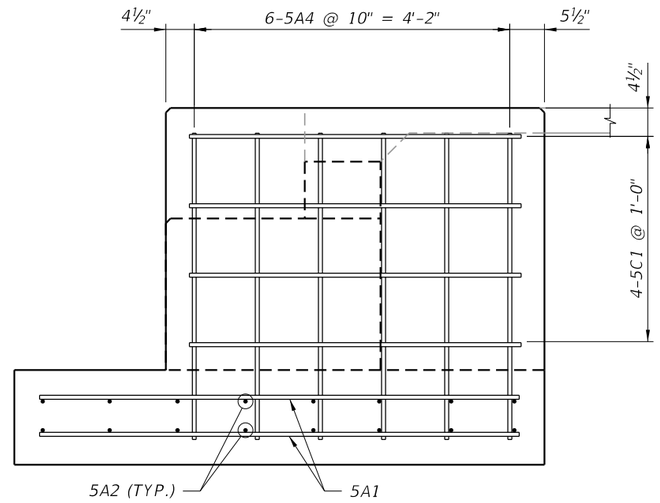


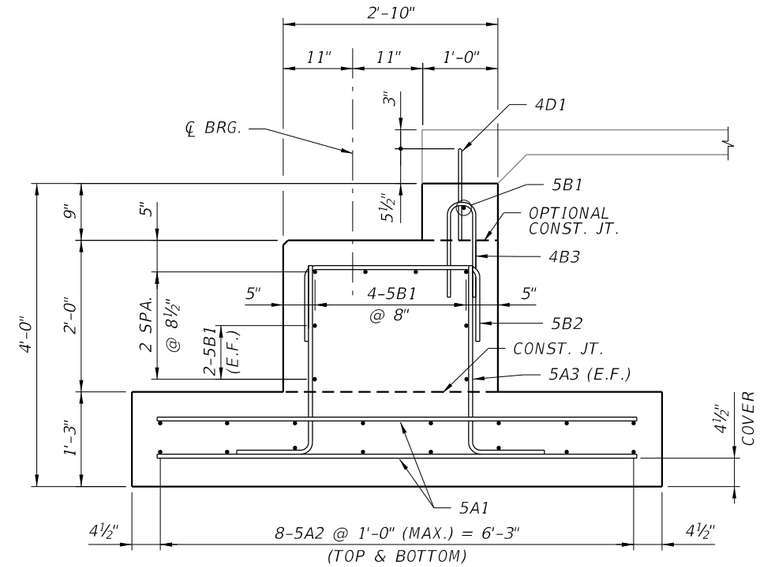
ELEVATION

DIRECTION OF STATIONING
PED. BRIDGE 1 & 2
END BENT 1

DIRECTION OF STATIONING
PED. BRIDGE 1 & 2
END BENT 2



VIEW A-A



SECTION B-B

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: JA
DRAWN BY: DAR
CHECKED BY: AT

HDR ENGINEERING, INC.
2601 CATTLEMEN ROAD, SUITE 400
SARASOTA, FLORIDA 34232
CERTIFICATE OF AUTHORIZATION 4213

DATE: 7/2017
PROJECT NO.: 225338

MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: CHESTER A. SMITH III
FL. LICENSE NO.: 70756

END BENT DETAILS (1 OF 2)

SHEET NO.: P-5

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

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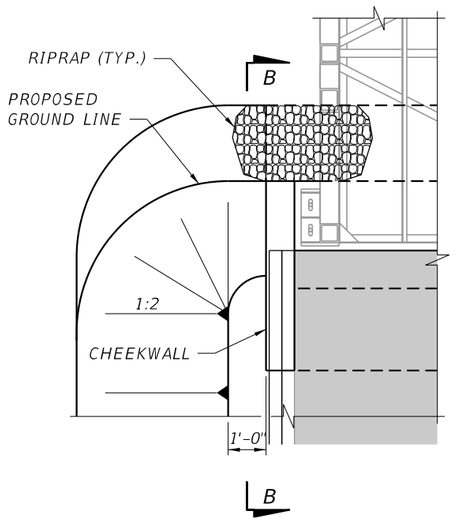
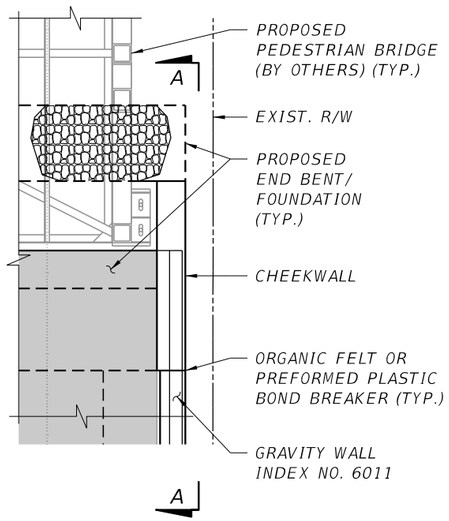


STANDARD SLOPE



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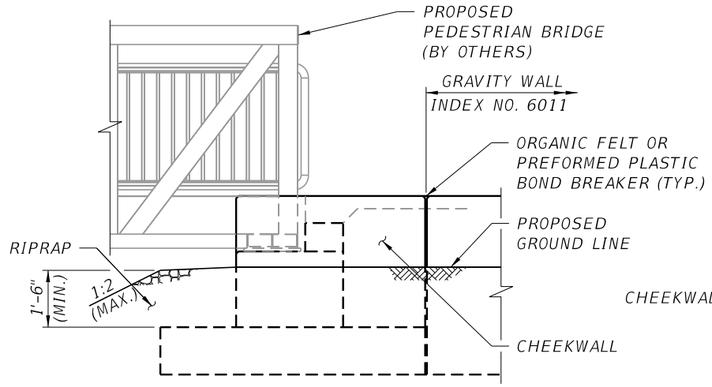
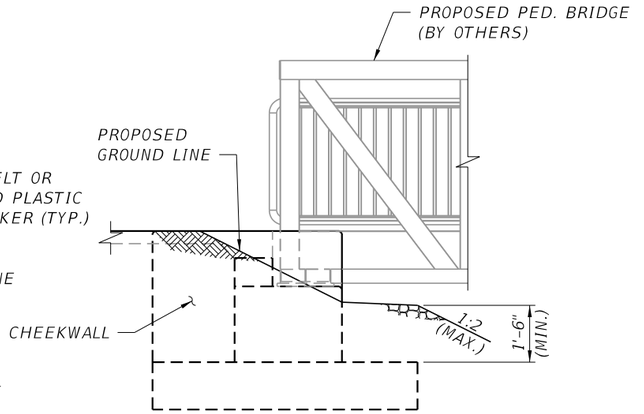
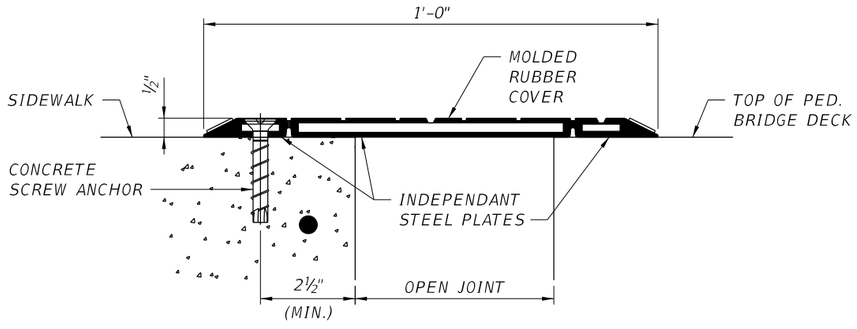


VIEW A-A



VIEW B-B

GRADING DETAILS - PLAN



COVER PLATE DETAIL

MARK		LENGTH		NO	TYP	STY		B			C			D			E			F			H			J			K			N	Ø
SIZE	DES	FT	IN	BARS	BAR	A	G	FT	IN	FR	FT	IN	FR	FT	IN	FR	FT	IN	FR	FT	IN	FR	FT	IN	FR	FT	IN	FR	FT	IN	FR	NO	ANG
END BENT 1 OR 2																																(NO. REQUIRED = 4)	
5	A1	6- 3		26	1			6- 3																									
5	A2	11- 9		16	1			11- 9																									
5	A3	3- 3		24	10			2- 5			0-10																					
5	A4	4- 0		12	1			4- 0																									
5	B1	11- 9		9	1			11- 9																									
5	B2	3-10		12	11			2- 2			0-10			0-10																			
4	B3	1- 8		12	11			0- 4			0- 8			0- 8																			
5	C1	4- 4		8	1			4- 4																									
4	D1	2- 9		3	23			1- 2			0- 1 ½			1- 2																			

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: JA
DRAWN BY: DAR
CHECKED BY: AT

HDR ENGINEERING, INC.
2601 CATTLEMEN ROAD, SUITE 400
SARASOTA, FLORIDA 34232
CERTIFICATE OF AUTHORIZATION 4213

DATE: 7/2017
PROJECT NO.: 225338

Manatee County FLORIDA
MANATEE COUNTY
PUBLIC WORKS

DESIGN ENGINEER
CHESTER A. SMITH III
FL. LICENSE NO.
70756

END BENT DETAILS (2 OF 2)

SHEET NO.
P-6

5:07:18 PM 9/26/2017 PW:\007982\C0N0086775\000000000225338\13.00_CAD\12345615201\struct\B1EndBent02.DGN

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

TIERRA

March 15, 2016

HDR, Inc.
2601 Cattlemen Road, Suite 400
Sarasota, Florida 34232

Attn: Mr. Jason Starr, P.E.

RE: Report of Geotechnical Engineering Services
Rye Road Functional Improvements
Manatee County
Reference: WA005467/W1400021
Tierra Project No.: 6511-15-087

Mr. Starr:

Tierra, Inc. (Tierra) has completed the geotechnical engineering study for the above referenced project. The results of the study are provided herein.

Should there be any questions regarding the report, please do not hesitate to contact our office at (813) 989-1354. Tierra would be pleased to continue providing geotechnical services throughout the implementation of the project. We look forward to working with you and your organization on this and future projects.

Respectfully Submitted,

TIERRA, INC.

Daniel R. Ruel, E.I.
Geotechnical Engineer Intern

Erick M. Frederick, P.E.
Senior Geotechnical Engineer
Florida License No. 63920

Kevin H. Scott, P.E.
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Phone (813) 989-1354 • Fax (813) 989-1355
Florida Certificate No. 6486

TABLE OF CONTENTS

PROJECT DESCRIPTION

Project Information

The project site is located along the Rye Road NE in Manatee County, Florida. The project improvements consist of constructing a 12-inch to 16-inch force main on the west side of Rye Road from south of SR 64 for approximately 2.5 miles. Directional drilling techniques will be utilized to traverse under wetlands as well as traversing under roadway intersections along the project. Additionally, we understand a lift station is proposed for the project and will be addressed in another plan submittal. In addition to directional drilling techniques, open trench construction is anticipated along portions of the force main alignment.

Scope of Services

The objective of our study was to obtain information concerning subsurface conditions at the site to base engineering estimates and recommendations in each of the following areas:

1. Identification of subsurface conditions at the project site.

2. General location and description of potentially deleterious materials discovered in the borings which may interfere with project progress including existing fills or organic soils.

3. Identification of groundwater levels and estimation of the Seasonal High Groundwater Table (SHGWT).

In order to meet the preceding objectives, we provided the following services:

1. Reviewed the “Lorraine, Florida”, “Parrish, Florida”, and “Rye, Florida” Quadrangle Maps published by the United States Geological Survey (USGS), as well as the Soil Survey of Manatee County, Florida, published by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS).

2. Executed a program of subsurface exploration consisting of borings, subsurface sampling, and field testing.

3. Visually classified the samples in the laboratory using the Unified Soil Classification System (USCS) and the American Association of State Highway and Transportation Officials (AASHTO) classification system. Identified soil conditions at each boring location.

4. Collected groundwater level measurements and estimated the seasonal high groundwater table at selected locations.

5. Prepared this engineering report that summarizes the course of study pursued, the field data generated, subsurface conditions encountered and our engineering recommendations in each of the pertinent topic areas.

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 this site. The scope of our services did not include determination of the potential for sinkhole activity. 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.

SITE AND SUBSURFACE CONDITIONS

General Site Information

Land use in the project area consists primarily of residential developments and undeveloped land.

USGS Quadrangle Maps

Based on the “Lorraine, Florida”, “Parrish, Florida”, and “Rye, Florida” USGS Quadrangle Maps, the natural ground elevation along the project alignment is on the order of +20 to +25 feet, National Geodetic Vertical Datum of 1929 (NGVD).

Manatee County Soil Survey

Based on a review of the Manatee County Soil Survey published by the USDA NRCS, it appears that there are seven (7) primary soil-mapping units noted within the vicinity of the project limits. The general soil descriptions are presented in the **Appendix**, as described in the Soil Survey.

It should be noted that information contained in the USDA NRCS Soil Survey may not be reflective of current subsurface conditions, particularly if recent development in the project vicinity has modified existing soils or surface/subsurface drainage.

Subsurface Conditions

Prior to commencing our subsurface explorations, a boring location plan was developed based on project information provided by the design team. The subsurface conditions within the vicinity of the proposed force main alignment were explored using thirty-four (34) Standard Penetration Test (SPT) borings drilled to a depths ranging from 10 to 30 feet below the ground surface and twenty-seven (27) hand auger borings performed to depths ranging from 3 to 7 feet below the ground surface.

The borings were located in the field using a Garmin eTrex® hand-held Global Positioning System (GPS) unit with a reported accuracy of ±10 feet. The approximate boring locations are presented on the **Report of Core Borings** sheets in the **Appendix**.

The auger borings were performed by manually twisting a bucket auger into the ground typically in 6-inch increments. As each soil type was encountered, samples were collected and visually classified in the field with representative soil samples collected and returned to Tierra for laboratory classification and testing.

The SPT borings were performed with the use of a drill rig using Bentonite Mud drilling procedures. The soil sampling was performed in general accordance with American Society for Testing and Materials (ASTM) Test Designation D-1586 titled "Penetration Test and Split-Barrel Sampling of Soils." Within the SPT borings, the initial 4 to 6 feet were manually augered to verify utility clearance. SPT resistance N-values were then recorded continuously to a depth of 10 feet and on intervals of 5 feet thereafter to the boring termination depth. The soil samples were classified in the field and transported to our laboratory for review.

The soil strata encountered in the borings performed at the project site are summarized in the following table:

Stratum Number	Soil Description	USCS Symbol	AASHTO Classification
1	Gray to Brown Sand to Sand with Silt	SP/SP-SM	A-3
2	Light Brown to Dark Brown Silty Sand	SM	A-2-4
3	Brown to Dark Brown Clayey Sand	SC	A-2-4/A-2-6
4	Brown to Green Sandy Clay to Silt	CL/ML	A-4/A-6/A-7-5/A-7-6
5	Light Gray to Green Clay to Silt	CH/MH	A-7-5/A-7-6

The subsurface soil stratification is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The soil profiles included in the **Appendix** should be reviewed for specific information at individual boring locations. These profiles include soil descriptions, stratifications, and penetration resistances when applicable. The stratifications shown on the boring profiles represent the conditions only at the actual boring location. Variations did occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface soils and the actual transition may be gradual.

Groundwater Information

The groundwater table, when encountered, was measured at depths ranging from 1¼ to 7 feet below existing grades within the borings performed. Boring AB-156 was terminated prior to encountering groundwater. As a result, GNE (Groundwater Not Encountered) is

shown adjacent to this soil profile. The **Report of Core Borings** sheets should be reviewed for specific groundwater information at each project site location.

Based on the subsurface conditions encountered in the borings performed and the Soil Survey of Manatee County, Florida published by the USDA NRCS, Tierra estimates the Seasonal High Groundwater Table (SHGWT) to be on the order of ¾ to 5½ feet below the ground surface at the locations tested. The estimated SHGWT is presented adjacent to the soil profiles in the **Appendix**.

It should be noted that groundwater levels tend to fluctuate during periods of prolonged drought and extended rainfall and may be affected by man-made influences. In addition, a seasonal effect will also occur in which higher groundwater levels are normally recorded in rainy seasons.

EVALUATION AND RECOMMENDATIONS

General

The results of the borings performed along the proposed force main alignment are presented on the **Report of Core Borings** sheets in the **Appendix**. Based on the results of the field exploration, sands, silty sands, clayey sands, clay and silt were encountered within the depths of the proposed pipe elevations.

The Contractor shall be responsible for all construction requirements based on the subsurface soil and groundwater conditions encountered. If buried organic soils, debris, or unsuitable material is encountered during construction that is not identified in this report, they should be removed and replaced with clean, compacted engineered fill in accordance with project requirements.

Very hard/dense soils, indicated by N-values of 50 and higher, were encountered within several of the borings performed along the proposed force main alignment. The Contractor should anticipate difficult directional drilling through these soils. As a result, the Contractor should anticipate the need for specialized equipment to facilitate the directional drilling.

It should be noted that if final design criteria deviates from what is stated in this report, Tierra should be given the opportunity to review the new information and amend our recommendations, if necessary.

Protection of Existing Structures

Residential homes are located within close proximity of the proposed improvements. Depending on the means and methods of construction/installation of the force main, vibration concerns may become critical to the project. Heavy vibratory equipment should not be used to compact soils along the project alignment.

Tierra recommends that the structures adjacent to the proposed project areas be monitored during construction. A pre-condition survey and a post-condition survey are recommended for structures within 150 feet of the proposed construction. Tierra recommends addressing the protection of existing structures within the plans by stating that it is the responsibility of the Contractor to take necessary precautions to protect existing structures and that it is the Contractor's responsibility to repair any damage to adjacent structures caused at his expense.

On-Site Soil Suitability

The suitability of the soil for reuse along the project should be evaluated against the project engineering fill requirements. Variations in the subsurface stratifications should be expected between borings. Fill should be placed in accordance with project requirements.

In general, the soils of Stratum 1 (SP/SP-SM) may be moved and used for grading purposes, site leveling, general engineering fill, and trench backfill, provided the fill is free of organic materials, clay, debris or any other material deemed unsuitable for construction and evaluated against engineering fill requirements.

Site Preparation

Prior to construction, the location of any existing underground utilities within the construction area should be established. Material suitable for re-use may be stockpiled; however, any material stockpiled for re-use shall be tested for conformance to material specifications as indicated in the following sections of this report. Provisions should then be made to relocate any interfering utility lines within the construction area to appropriate locations and backfilling the resulting excavations with compacted structural fill. In this regard, it should be noted that if abandoned underground pipes are not properly removed or plugged, they might serve as conduits for subsurface erosion, which subsequently may result in excessive settlement.

Drainage and Groundwater Concerns

The groundwater levels presented in this report are the levels that were measured at the time of our field activities. Fluctuation should be anticipated. We recommend that the Contractor determine the actual groundwater levels at the time of the construction to determine groundwater impact on his construction procedure. Care should be given to open excavations and site grading to minimize ponding of surface water.

Backfill

All materials to be used for fill or backfill should be evaluated and, if necessary, tested by Tierra prior to placement to determine if they are suitable for the intended use. Suitable fill materials should be placed and compacted in accordance with Manatee County requirements for the respective backfill zones and be free of rubble, organics, debris and other unsuitable material.

Excavations

Temporary side slopes and excavations should comply with the Occupational Safety and Health Administration's (OSHA) trench safety standards, 29 C.F.R., s. 1926.650, Subpart P, all subsequent revisions or updates of OSHA's referenced standard adopted by the Department of Labor and Employment Security and Florida's Trench Safety Act, Section 553.62, Florida Statutes. Excavated materials should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth.

CONSTRUCTION CONSIDERATIONS

The following are our recommendations for overall site preparation and mechanical densification work for the construction of the proposed force main installation based on the anticipated construction and our boring results. These recommendations should be used as a guideline for the project general specifications prepared by the design engineer.

1. The site should be cleared. It is recommended that any undesirable material be removed to the satisfaction of Tierra prior to beginning construction along the alignment, including trees and tree roots.

2. Careful observations should be made during compaction of the bedding zone material to help identify any areas of soft yielding soils that may require over excavation and replacement.

3. Prior to beginning compaction, soil moisture contents may need to be controlled in order to facilitate proper compaction in accordance with the contract documents. If additional moisture is necessary to achieve compaction objectives, then water should be applied in such a way that it will not cause erosion or removal of the subgrade soils.

4. A representative from our firm should be retained to provide on-site observation of earthwork and ground modification activities. Density tests should be performed at least every 500 lineal feet along the force main alignment of backfill placement per lift unless otherwise noted. It is important that Tierra be retained to observe that the subsurface conditions are as we have discussed herein, and that construction, ground modification and fill placement is in accordance with our recommendations.

5. Very hard/dense soils, indicated by N-values of 50 and higher, were encountered within several of the borings performed along the proposed force main alignment. The Contractor should anticipate difficult directional drilling through these soils. As a result, the Contractor should anticipate the need for specialized equipment to facilitate the directional drilling.

REPORT LIMITATIONS

The analyses, conclusions and recommendations contained in this report are opinions based on the site conditions and project layout described herein and further assume that the conditions observed in the exploratory borings are representative of the subsurface conditions throughout the site, i.e., the subsurface conditions elsewhere on the site are the same as those disclosed by the borings. If, during construction, subsurface conditions different from those encountered in the exploratory borings are observed or appear to be present beneath excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary.

If there is a substantial lapse in time between the submittal of this report and the start of work at the site, or if conditions or project layout are changed due to natural causes or construction operations at or adjacent to the site, we recommend that this report be reviewed to determine the applicability of conclusions and recommendations considering the changed conditions and time lapse.

This report was prepared for the exclusive use of HDR, Inc. and their clients for evaluating the design of the project as it relates to the geotechnical aspects discussed herein. It should be made available to prospective contractors for information on factual data only and not as a warranty of subsurface conditions included in this report. Unanticipated soil conditions may require that additional expense be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

Appendix

Summary of USDA Soil Survey (4 Sheets)

Report of Core Borings (14 Sheets)

Summary of USDA Soil Survey

Canova, Anclote, and Okeelanta Soils (Map Unit 7) - The Canova component makes up 40 percent of the map unit. Slopes are 0 to 2 percent. This component is on depressions on marine terraces on coastal plains. The parent material consists of loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at or above natural grades.

The Anclote component makes up 25 percent of the map unit. Slopes are 0 to 2 percent. This component is on depressions on marine terraces on coastal plains. The parent material consists of sandy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at 3 inches.

The Okeelanta component makes up 20 percent of the map unit. Slopes are 0 to 2 percent. This component is on depressions on marine terraces on coastal plains. The parent material consists of herbaceous organic material over sandy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at or above natural grades.

Cassia Fine Sand (Map Unit 11) - The Cassia component makes up 85 percent of the map unit. Slopes are 0 to 2 percent. This component is on rises on marine terraces on coastal plains. The parent material consists of sandy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 30 inches.

Delray Complex (Map Unit 16) - The Delray component makes up 75 percent of the map unit. Slopes are 0 to 2 percent. This component is on drainage ways on marine terraces on coastal plains, flats on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 3 inches.

EauGallie Fine Sand (Map Unit 20) - The EauGallie, non-hydric component makes up 70 percent of the map unit. Slopes are 0 to 2 percent. This component is on flatwoods on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 12 inches.

The EauGallie, hydric component makes up 15 percent of the map unit. Slopes are 0 to 2 percent. This component is on flats on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive

layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches.

Felda-Palmetto Complex (Map Unit 23) - The Felda component makes up 40 percent of the map unit. Slopes are 0 to 2 percent. This component is on drainage ways on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches.

The Palmetto, hydric component makes up 20 percent of the map unit. Slopes are 0 to 2 percent. This component is on drainage ways on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches.

The Palmetto, non-hydric component makes up 15 percent of the map unit. Slopes are 0 to 2 percent. This component is on flats on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 12 inches.

Floridana-Immokalee-Okeelanta Association (Map Unit 26) - The Floridana, depressional component makes up 35 percent of the map unit. Slopes are 0 to 2 percent. This component is on depressions on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at or above natural grades.

The Immokalee component makes up 30 percent of the map unit. Slopes are 0 to 2 percent. This component is on depressions on marine terraces on coastal plains. The parent material consists of sandy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at or above natural grades.

Floridana-Immokalee-Okeelanta Association (Map Unit 26) - The Okeelanta component makes up 20 percent of the map unit. Slopes are 0 to 1 percent. This component is on depressions on marine terraces on coastal plains. The parent material consists of herbaceous organic material over sandy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is very poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is frequently ponded. A seasonal zone of water saturation is at or above natural grades.

Summary of USDA Soil Survey

Wabasso Fine Sand (Map Unit 48) - The Wabasso, non-hydric component makes up 70 percent of the map unit. Slopes are 0 to 2 percent. This component is on flatwoods on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 12 inches.

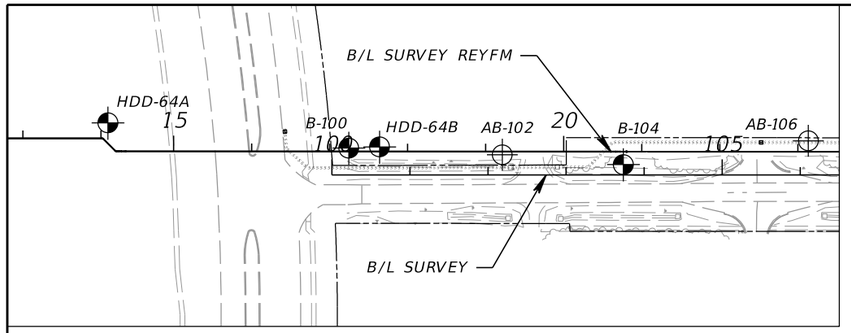
The Wabasso, hydric component makes up 25 percent of the map unit. Slopes are 0 to 2 percent. This component is on flats on marine terraces on coastal plains. The parent material consists of sandy and loamy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches.

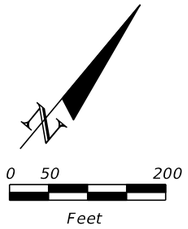
SUMMARY OF USDA SOIL SURVEY
MANATEE COUNTY, FLORIDA

USDA Map Symbol and Soil Name	Soil Classification				pH	Seasonal High Water Table	
	Depth (in)	USCS	AASHTO	Permeability (in/hr)		Depth (feet)	Months
(7) Canova	0-8	PT	A-8	6.0 - 20.0	3.5-6.0	+2.0-0.0	Jan-Dec
	8-24	SP, SP-SM	A-3	6.0 - 20.0	6.1-8.4		
	24-68	SC, SC-SM, SM	A-2-4, A-2-6	0.6 - 6.0	7.4-8.4		
Anclote	0-16	SP, SP-SM	A-2-4, A-3	6.0 - 20.0	5.6-8.4	0.0-0.5	June-Dec
	16-80	SM, SP, SP-SM	A-2-4, A-3	6.0 - 20.0	5.6-8.4		
Okelanta	0-20	PT	A-8	6.0 - 20.0	4.5-6.5	+2.0-0.0	June-Dec
	20-54	SM, SP, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-7.8		
(11) Cassia	0-3	SP, SP-SM	A-3	6.0 - 20.0	4.5-6.0	1.5-3.5	July-Dec
	3-24	SP, SP-SM	A-3	6.0 - 20.0	4.5-6.0		
	24-33	SM, SP-SM	A-2-4, A-3	0.6 - 6.0	4.5-6.0		
	33-80	SP, SP-SM	A-3	6.0 - 20.0	4.5-6.0		
(16) Delray	0-15	SC-SM, SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.6-7.3	0.0-0.5	June-Dec
	15-55	SP-SM	A-2-4, A-3	6.0 - 20.0	5.6-7.3		
	55-80	SC, SC-SM, SM	A-2-4, A-2-6	0.6 - 6.0	6.6-7.8		
(20) EauGallie, non-hydric	0-5	SP, SP-SM	A-3	6.0 - 20.0	4.5-6.0	0.5-1.5	June-Oct
	5-28	SP, SP-SM	A-3	6.0 - 20.0	4.5-6.0		
	28-42	SM, SP-SM	A-2-4, A-3	0.6 - 6.0	4.5-6.5		
	42-50	SC, SC-SM, SM	A-2-4, A-2-6	0.1 - 2.0	5.6-7.8		
	50-65	SM, SP-SM	A-2-4, A-3	2.0 - 6.0	5.6-7.8		
EauGallie, hydric	0-5	SP, SP-SM	A-3	6.0 - 20.0	4.5-6.0	0.0-1.0	June-Oct
	5-28	SP, SP-SM	A-3	6.0 - 20.0	4.5-6.0		
	28-42	SM, SP-SM	A-2-4, A-3	0.6 - 6.0	4.5-6.5		
	42-50	SC, SC-SM, SM	A-2-4, A-2-6	0.1 - 2.0	5.6-7.8		
	50-65	SM, SP-SM	A-2-4, A-3	2.0 - 6.0	5.6-7.8		

Summary of USDA Soil Survey

SUMMARY OF USDA SOIL SURVEY MANATEE COUNTY, FLORIDA							
(23) Felda	0-3	SP, SP-SM	A-3	6.0 - 20.0	5.1-6.5	0.0-1.0	July-Dec
	3-24	SP, SP-SM	A-3	6.0 - 20.0	6.1-7.8		
	24-62	SC, SC-SM, SM	A-2-4, A-2-6	0.6 - 6.0	6.6-8.4		
	62-80	SM	A-2-4	2.0 - 6.0	6.6-8.4		
Palmetto, hydric	0-8	SP, SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-5.5	0.0-1.0	Jan-Mar
	8-25	SP, SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-5.5		
	25-45	SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-5.5		
	45-64	SC, SC-SM, SM	A-2-4, A-2-6	0.2 - 0.6	4.5-5.5		
	64-68	SM, SP-SM	A-2-4, A-3	2.0 - 6.0	4.5-5.5		
Palmetto, non-hydric	0-8	SP, SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-5.5	0.5-1.5	June-Nov
	8-25	SP, SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-5.5		
	25-45	SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-5.5		
	45-64	SC, SC-SM, SM	A-2-4, A-2-6	0.2 - 0.6	4.5-5.5		
	64-68	SM, SP-SM	A-2-4, A-3	2.0 - 6.0	4.5-5.5		
(26) Floridana, depressional	0-19	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.6-7.8	+2.0-0.0	June-Dec
	19-36	SP, SP-SM	A-3	6.0 - 20.0	5.6-7.8		
	36-63	SC, SC-SM	A-2-4, A-2-6	0.1 - 0.2	5.6-7.8		
	63-80	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.6-7.8		
Immokalee	0-10	SP, SP-SM	A-3	6.0 - 20.0	4.5-5.5	+2.0-0.0	June-Dec
	10-34	SP, SP-SM	A-3	6.0 - 20.0	4.5-5.5		
	34-43	SM, SP-SM	A-2-4, A-3	0.6 - 2.0	4.5-5.5		
	43-80	SP, SP-SM	A-3	6.0 - 20.0	4.5-5.5		
Okeelanta	0-20	PT	A-8	6.0 - 20.0	5.6-8.4	+2.0-0.0	June-Oct
	20-54	SM, SP, SP-SM	A-2-4, A-3	6.0 - 20.0	5.6-8.4		
(48) Wabasso, non-hydric	0-7	SP, SP-SM	A-3	6.0 - 20.0	4.5-7.3	0.5-1.5	June-Oct
	7-21	SP, SP-SM	A-3	6.0 - 20.0	4.5-7.3		
	21-31	SM, SP-SM	A-2-4, A-3	0.6 - 6.0	4.5-7.3		
	31-37	SP, SP-SM	A-3	6.0 - 20.0	5.6-7.8		
	37-65	SC, SC-SM	A-2-4, A-2-6	0.1 - 0.2	5.6-7.8		
	65-80	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.6-7.8		
Wabasso, hydric	0-7	SP, SP-SM	A-3	6.0 - 20.0	4.5-7.3	0.0-1.0	June-Oct
	7-21	SP, SP-SM	A-3	6.0 - 20.0	4.5-7.3		
	21-31	SM, SP-SM	A-2-4, A-3	0.6 - 6.0	4.5-7.3		
	31-37	SP, SP-SM	A-3	6.0 - 20.0	5.6-7.8		
	37-65	SC, SC-SM	A-2-4, A-2-6	0.1 - 0.2	5.6-7.8		
	65-80	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.6-7.8		





BORING LOCATION PLAN

NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
2. VERY HARD/DENSE SOILS, INDICATED BY N VALUES OF 50 AND HIGHER, WERE ENCOUNTERED WITHIN SEVERAL OF THE BORINGS PERFORMED ALONG THE PROPOSED FORCE MAIN ALIGNMENT. THE CONTRACTOR SHOULD ANTICIPATE DIFFICULT DIRECTIONAL DRILLING THROUGH THESE SOILS. THE CONTRACTOR SHOULD ANTICIPATE THE NEED FOR SPECIALIZED EQUIPMENT TO FACILITATE THE DIRECTIONAL DRILLING.

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

SOIL TEST RESULTS:

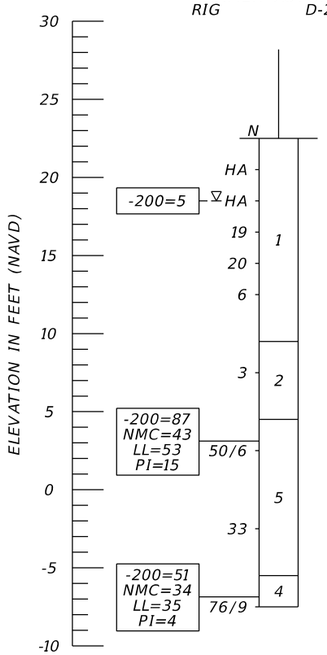
RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

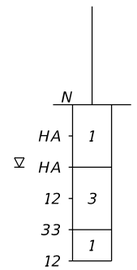
1. GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2. LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3. BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4. BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5. LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]

A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
⌖	APPROXIMATE SPT BORING LOCATION
⊕	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

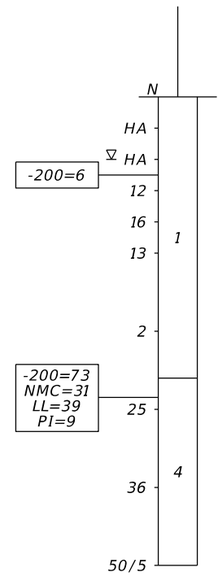
BOR # HDD-64A
STA. 14+02
REF. 21' LT.
ELEV. 22.5
DATE 12/9/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



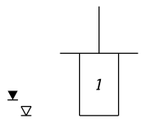
BOR # B-100
STA. 17+24
REF. B/L SURVEY REYFM
OFF. 4' LT.
ELEV. 21.9
DATE 12/5/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



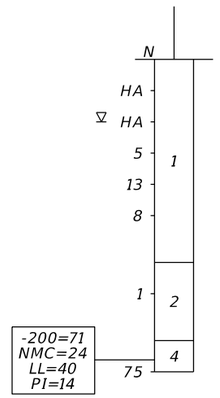
BOR # HDD-64B
STA. 17+64
REF. B/L SURVEY REYFM
OFF. 6' LT.
ELEV. 22.4
DATE 12/9/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



BOR # AB-102
STA. 19+21
REF. B/L SURVEY REYFM
OFF. 4' RT.
ELEV. 25.2
DATE 7/13/2015



BOR # B-104
STA. 20+76
REF. B/L SURVEY REYFM
OFF. 17' RT.
ELEV. 24.8
DATE 12/5/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

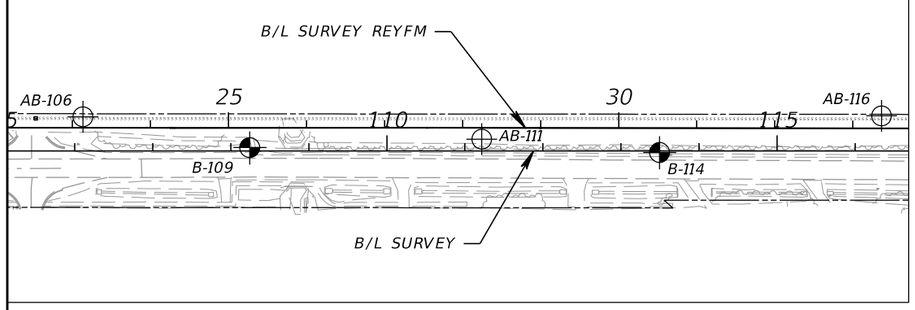
Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

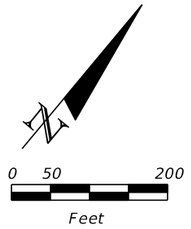
REPORT OF CORE BORINGS (1)

SHEET NO.

4:59:15 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo01.dgn



BORING LOCATION PLAN



NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
2. VERY HARD/DENSE SOILS, INDICATED BY N VALUES OF 50 AND HIGHER, WERE ENCOUNTERED WITHIN SEVERAL OF THE BORINGS PERFORMED ALONG THE PROPOSED FORCE MAIN ALIGNMENT. THE CONTRACTOR SHOULD ANTICIPATE DIFFICULT DIRECTIONAL DRILLING THROUGH THESE SOILS. THE CONTRACTOR SHOULD ANTICIPATE THE NEED FOR SPECIALIZED EQUIPMENT TO FACILITATE THE DIRECTIONAL DRILLING.

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

SOIL TEST RESULTS:

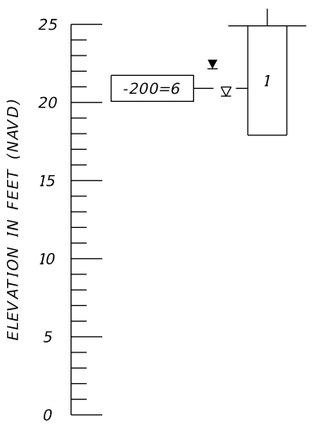
RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

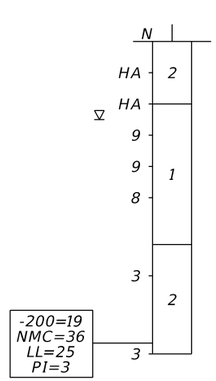
1. GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2. LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3. BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4. BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5. LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]

A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
▼	APPROXIMATE SPT BORING LOCATION
⊕	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

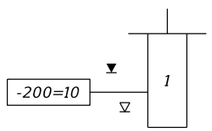
BOR # AB-106
STA. 23+13
REF. B/L SURVEY REYFM
OFF. 14' LT.
ELEV. 24.9
DATE 7/13/2015



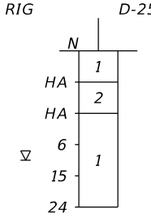
BOR # B-109
STA. 25+27
REF. B/L SURVEY REYFM
OFF. 25' RT.
ELEV. 23.9
DATE 7/15/2015
DRILLER I. POORAN
HAMMER AUTOMATIC
RIG D-25



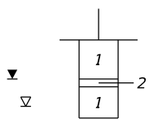
BOR # AB-111
STA. 28+25
REF. B/L SURVEY REYFM
OFF. 14' RT.
ELEV. 24.4
DATE 7/13/2015

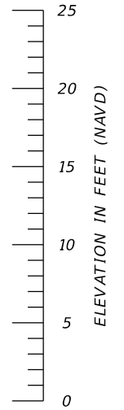


BOR # B-114
STA. 30+52
REF. B/L SURVEY REYFM
OFF. 31' RT.
ELEV. 24.9
DATE 7/15/2015
DRILLER I. POORAN
HAMMER AUTOMATIC
RIG D-25



BOR # AB-116
STA. 33+37
REF. B/L SURVEY REYFM
OFF. 16' LT.
ELEV. 24
DATE 7/13/2015





	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
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DENSE	30 to 50	24 to 40
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SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

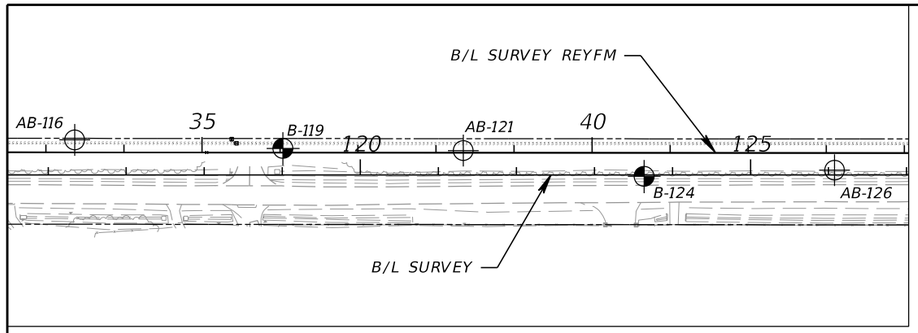
Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

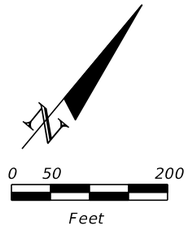
REPORT OF CORE BORINGS (2)

SHEET NO.

4:59:16 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo02.dgn



BORING LOCATION PLAN



NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
2. VERY HARD/DENSE SOILS, INDICATED BY N VALUES OF 50 AND HIGHER, WERE ENCOUNTERED WITHIN SEVERAL OF THE BORINGS PERFORMED ALONG THE PROPOSED FORCE MAIN ALIGNMENT. THE CONTRACTOR SHOULD ANTICIPATE DIFFICULT DIRECTIONAL DRILLING THROUGH THESE SOILS. THE CONTRACTOR SHOULD ANTICIPATE THE NEED FOR SPECIALIZED EQUIPMENT TO FACILITATE THE DIRECTIONAL DRILLING.

ENVIRONMENTAL CLASSIFICATION:

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SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

SOIL TEST RESULTS:

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CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

1. GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2. LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3. BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4. BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5. LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]

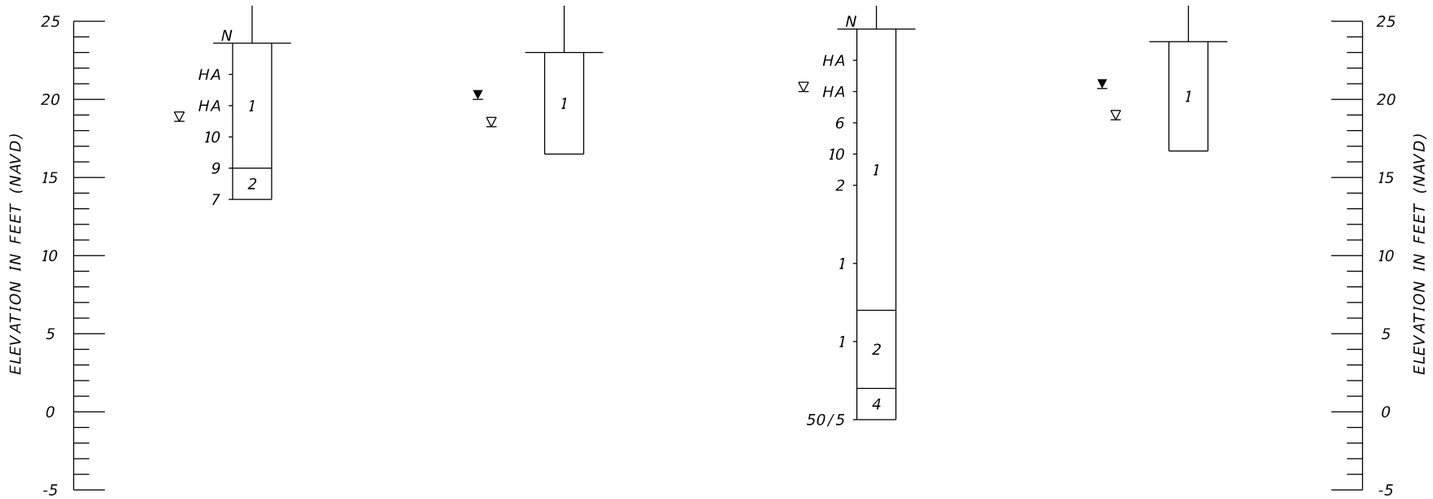
A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
⊕	APPROXIMATE SPT BORING LOCATION
⊕	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

BOR # B-119
STA. 36+04
REF. B/L SURVEY REYFM
OFF. 5' LT.
ELEV. 23.6
DATE 7/15/2015
DRILLER I. POORAN
HAMMER AUTOMATIC
RIG D-25

BOR # AB-121
STA. 38+35
REF. B/L SURVEY REYFM
OFF. 3' LT.
ELEV. 23.0
DATE 7/13/2015

BOR # B-124
STA. 40+67
REF. B/L SURVEY REYFM
OFF. 30' RT.
ELEV. 24.5
DATE 12/5/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25

BOR # AB-126
STA. 43+11
REF. B/L SURVEY REYFM
OFF. 22' RT.
ELEV. 23.7
DATE 7/13/2015



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

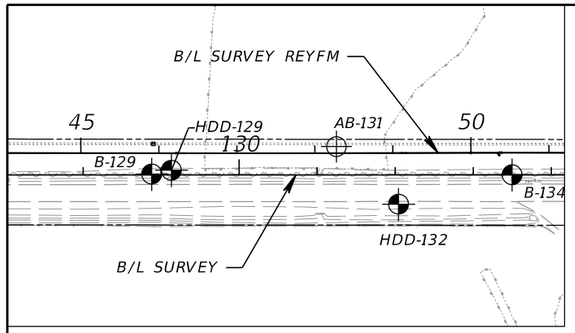
Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

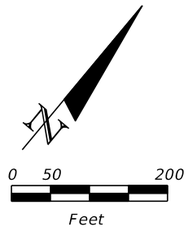
DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS (3)

SHEET NO.

4:59:16 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo03.dgn





BORING LOCATION PLAN

NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
2. VERY HARD/DENSE SOILS, INDICATED BY N VALUES OF 50 AND HIGHER, WERE ENCOUNTERED WITHIN SEVERAL OF THE BORINGS PERFORMED ALONG THE PROPOSED FORCE MAIN ALIGNMENT. THE CONTRACTOR SHOULD ANTICIPATE DIFFICULT DIRECTIONAL DRILLING THROUGH THESE SOILS. THE CONTRACTOR SHOULD ANTICIPATE THE NEED FOR SPECIALIZED EQUIPMENT TO FACILITATE THE DIRECTIONAL DRILLING.

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

SOIL TEST RESULTS:

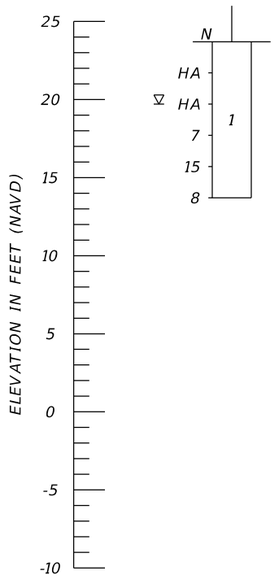
RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

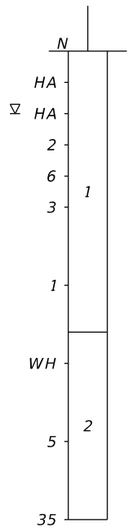
1. GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2. LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3. BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4. BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5. LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]

A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
⊕	APPROXIMATE SPT BORING LOCATION
⊕	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

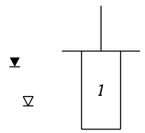
BOR # B-129
STA. 45+91
REF. B/L SURVEY REYFM
OFF. 27' RT.
ELEV. 23.7
DATE 12/5/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



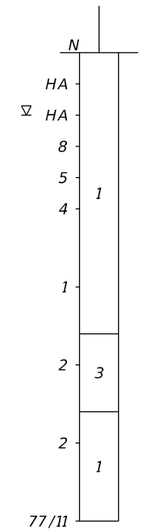
BOR # HDD-129
STA. 46+16
REF. B/L SURVEY REYFM
OFF. 22' RT.
ELEV. 23.1
DATE 12/9/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



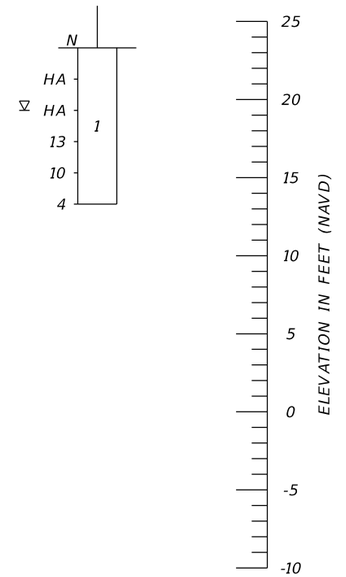
BOR # AB-131
STA. 48+28
REF. B/L SURVEY REYFM
OFF. 8' LT.
ELEV. 23.1
DATE 7/13/2015



BOR # HDD-132
STA. 49+07
REF. B/L SURVEY REYFM
OFF. 66' RT.
ELEV. 23.0
DATE 12/4/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



BOR # B-134
STA. 50+53
REF. B/L SURVEY REYFM
OFF. 28' RT.
ELEV. 23.3
DATE 12/4/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

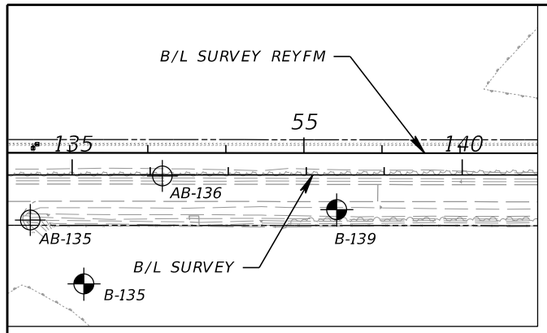
Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

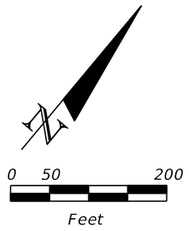
DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS (4)

SHEET NO.

4:59:17 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo04.dgn





BORING LOCATION PLAN

NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
2. VERY HARD/DENSE SOILS, INDICATED BY N VALUES OF 50 AND HIGHER, WERE ENCOUNTERED WITHIN SEVERAL OF THE BORINGS PERFORMED ALONG THE PROPOSED FORCE MAIN ALIGNMENT. THE CONTRACTOR SHOULD ANTICIPATE DIFFICULT DIRECTIONAL DRILLING THROUGH THESE SOILS. THE CONTRACTOR SHOULD ANTICIPATE THE NEED FOR SPECIALIZED EQUIPMENT TO FACILITATE THE DIRECTIONAL DRILLING.

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

SOIL TEST RESULTS:

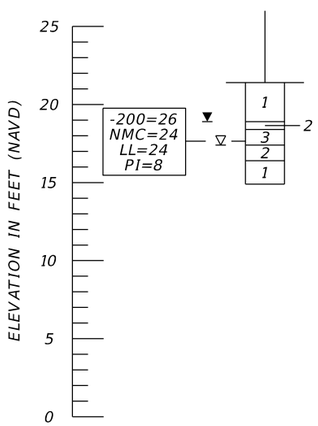
RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

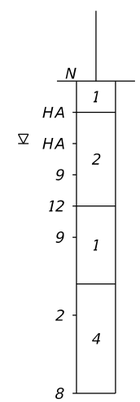
1. GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2. LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3. BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4. BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5. LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]

A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

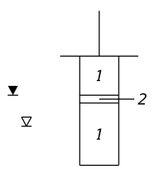
BOR # AB-135
STA. 51+49
REF. B/L SURVEY REYFM
OFF. 86' RT.
ELEV. 21.4
DATE 7/13/2015



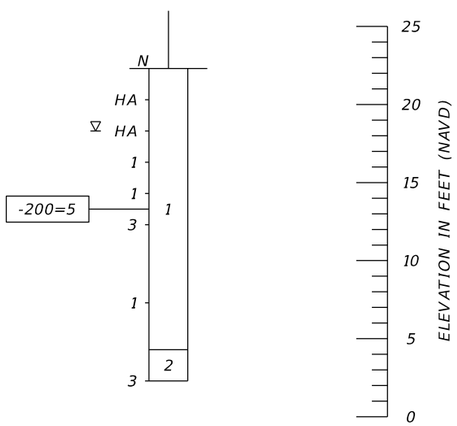
BOR # B-135
STA. 52+18
REF. B/L SURVEY REYFM
OFF. 168' RT.
ELEV. 21.5
DATE 12/5/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



BOR # AB-136
STA. 53+19
REF. B/L SURVEY REYFM
OFF. 30' RT.
ELEV. 23.1
DATE 7/13/2015



BOR # B-139
STA. 55+42
REF. B/L SURVEY REYFM
OFF. 73' RT.
ELEV. 22.3
DATE 12/4/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

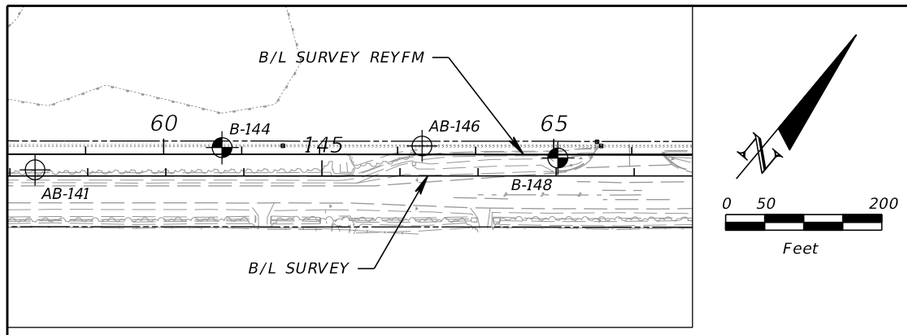
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS (5)

SHEET NO.

4:59:18 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo05.dgn



BORING LOCATION PLAN

NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
2. VERY HARD/DENSE SOILS, INDICATED BY N VALUES OF 50 AND HIGHER, WERE ENCOUNTERED WITHIN SEVERAL OF THE BORINGS PERFORMED ALONG THE PROPOSED FORCE MAIN ALIGNMENT. THE CONTRACTOR SHOULD ANTICIPATE DIFFICULT DIRECTIONAL DRILLING THROUGH THESE SOILS. THE CONTRACTOR SHOULD ANTICIPATE THE NEED FOR SPECIALIZED EQUIPMENT TO FACILITATE THE DIRECTIONAL DRILLING.

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

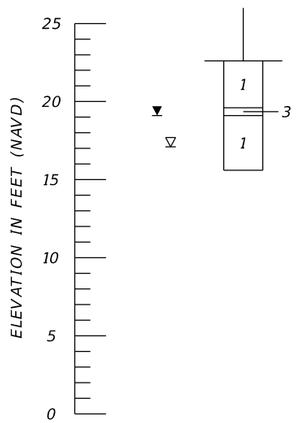
SOIL TEST RESULTS:

RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

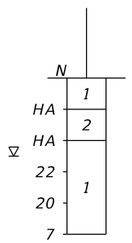
LEGEND

1.	GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2.	LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3.	BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4.	BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5.	LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]
A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
⌖	APPROXIMATE SPT BORING LOCATION
⊕	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

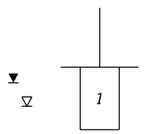
BOR # AB-141
STA. 58+35
REF. B/L SURVEY REYFM
OFF. 20' RT.
ELEV. 22.6
DATE 7/13/2015



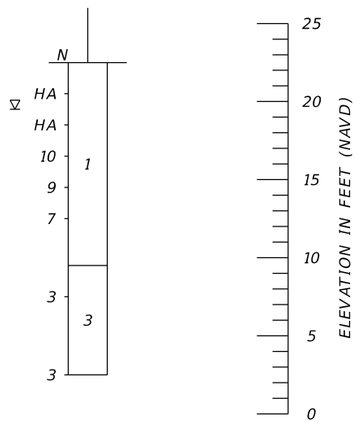
BOR # B-144
STA. 60+75
REF. B/L SURVEY REYFM
OFF. 9' LT.
ELEV. 21.5
DATE 12/4/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



BOR # AB-146
STA. 63+31
REF. B/L SURVEY REYFM
OFF. 11' LT.
ELEV. 22.2
DATE 7/13/2015



BOR # B-148
STA. 65+05
REF. B/L SURVEY REYFM
OFF. 4' RT.
ELEV. 22.5
DATE 12/4/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

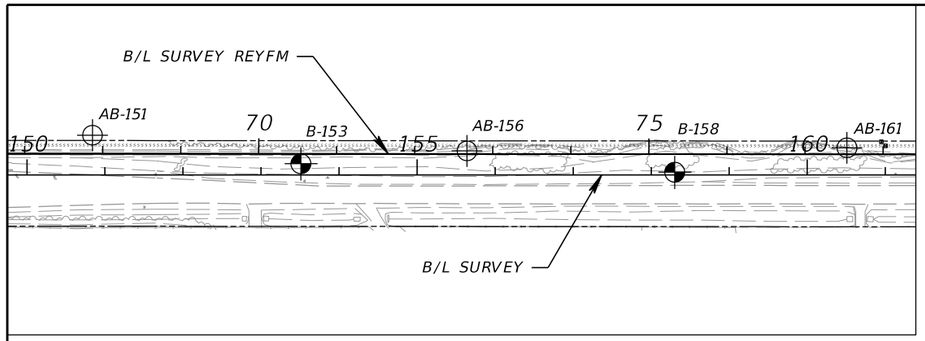
Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

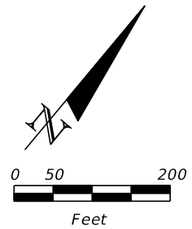
REPORT OF CORE BORINGS (6)

SHEET NO.

4:59:19 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo06.dgn



BORING LOCATION PLAN



NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
2. VERY HARD/DENSE SOILS, INDICATED BY N VALUES OF 50 AND HIGHER, WERE ENCOUNTERED WITHIN SEVERAL OF THE BORINGS PERFORMED ALONG THE PROPOSED FORCE MAIN ALIGNMENT. THE CONTRACTOR SHOULD ANTICIPATE DIFFICULT DIRECTIONAL DRILLING THROUGH THESE SOILS. THE CONTRACTOR SHOULD ANTICIPATE THE NEED FOR SPECIALIZED EQUIPMENT TO FACILITATE THE DIRECTIONAL DRILLING.

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

SOIL TEST RESULTS:

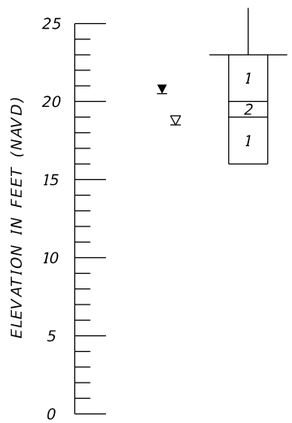
RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

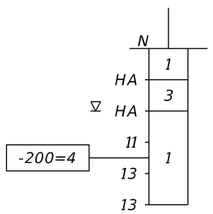
1. GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2. LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3. BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4. BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5. LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]

A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
⌖	APPROXIMATE SPT BORING LOCATION
⊕	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

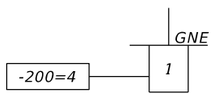
BOR # AB-151
STA. 67+87
REF. B/L SURVEY REYFM
OFF. 24' LT.
ELEV. 23.0
DATE 7/13/2015



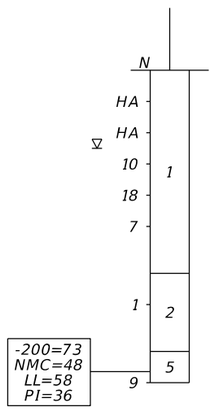
BOR # B-153
STA. 70+54
REF. B/L SURVEY REYFM
OFF. 13' RT.
ELEV. 23.4
DATE 12/4/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



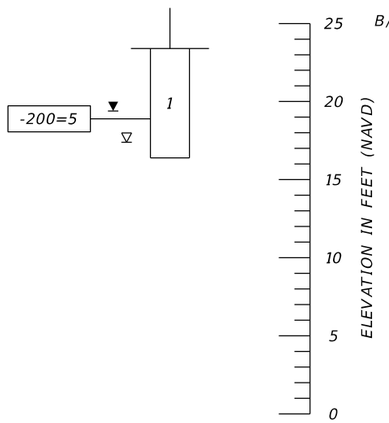
BOR # AB-156
STA. 72+67
REF. B/L SURVEY REYFM
OFF. 4' LT.
ELEV. 23.6
DATE 7/13/2015



BOR # B-158
STA. 75+33
REF. B/L SURVEY REYFM
OFF. 23' RT.
ELEV. 22.0
DATE 12/4/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



BOR # AB-161
STA. 77+54
REF. B/L SURVEY REYFM
OFF. 8' LT.
ELEV. 23.4
DATE 7/13/2015



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

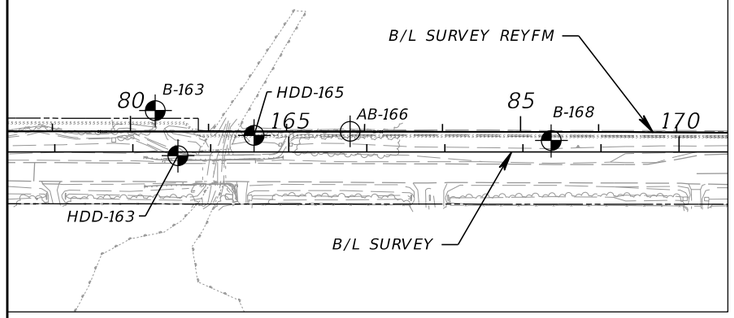
Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

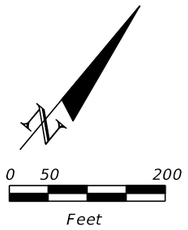
REPORT OF CORE BORINGS (7)

SHEET NO.

4:59:20 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo07.dgn



BORING LOCATION PLAN



NOTES:

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ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

SOIL TEST RESULTS:

RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

1. GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2. LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3. BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4. BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5. LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]

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50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
⌖	APPROXIMATE SPT BORING LOCATION
⊕	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

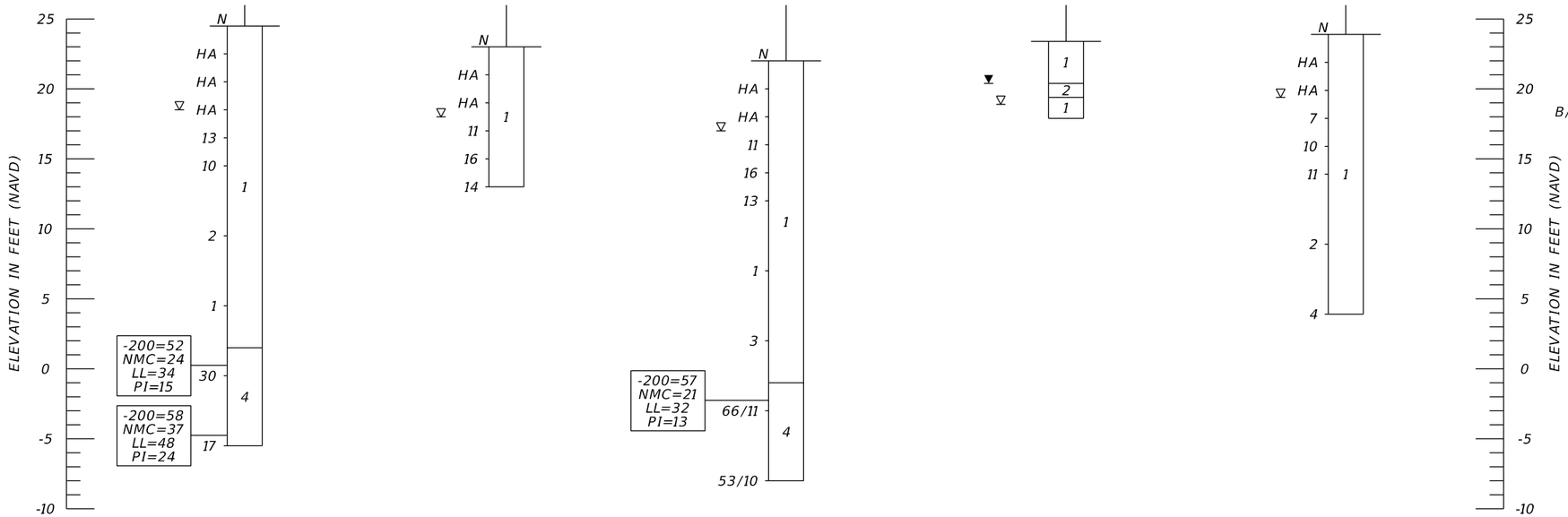
BOR # HDD-163
STA. 80+61
REF. B/L SURVEY REYFM
OFF. 31' RT.
ELEV. 24.5
DATE 12/4/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25

BOR # B-163
STA. 80+32
REF. B/L SURVEY REYFM
OFF. 27' LT.
ELEV. 23.0
DATE 12/4/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25

BOR # HDD-165
STA. 81+59
REF. B/L SURVEY REYFM
OFF. 5' RT.
ELEV. 22.0
DATE 12/3/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25

BOR # AB-166
STA. 82+82
REF. B/L SURVEY REYFM
OFF. CL
ELEV. 23.4
DATE 7/13/2015

BOR # B-168
STA. 85+39
REF. B/L SURVEY REYFM
OFF. 11' RT.
ELEV. 23.9
DATE 12/3/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
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DENSE	30 to 50	24 to 40
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SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
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FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

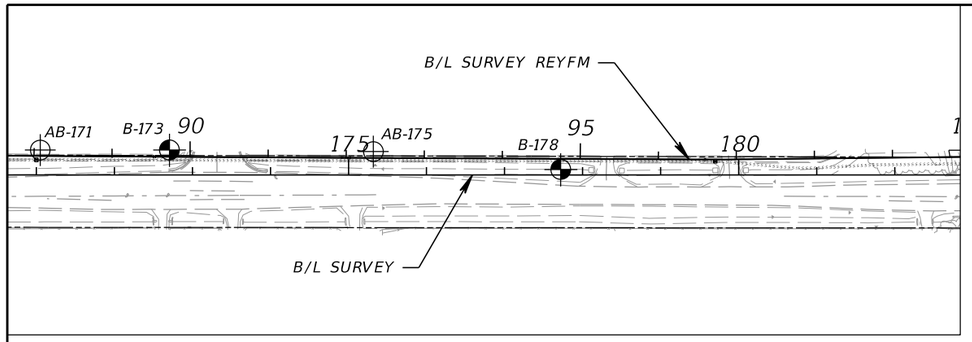
Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

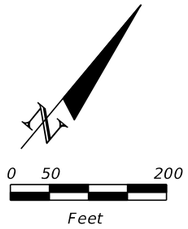
REPORT OF CORE BORINGS (8)

SHEET NO.

4:59:21 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo08.dgn



BORING LOCATION PLAN



NOTES:

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ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

SOIL TEST RESULTS:

RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

1.	GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2.	LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3.	BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4.	BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5.	LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]
A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
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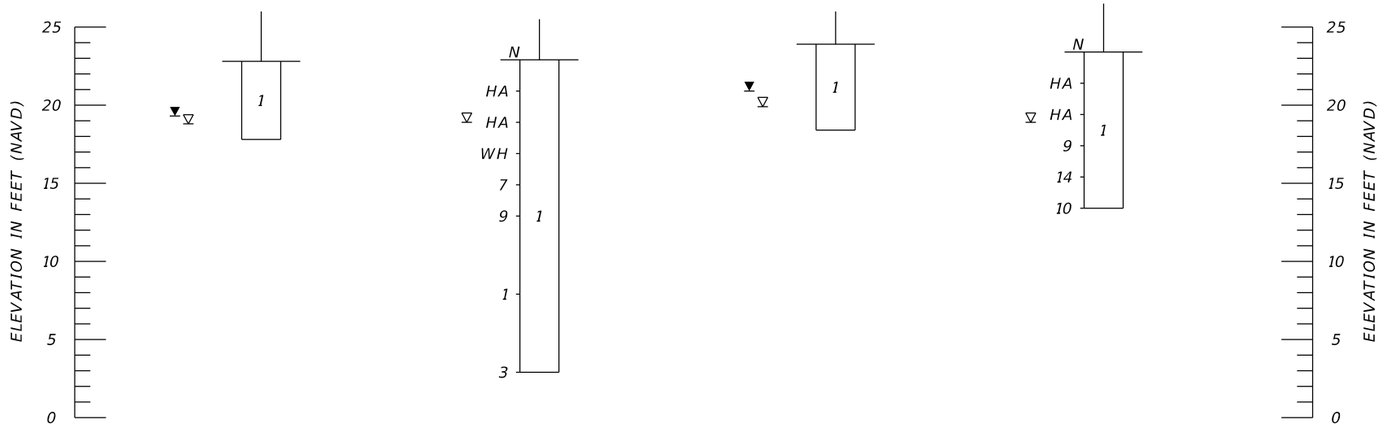
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
⊕	APPROXIMATE SPT BORING LOCATION
⊕	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

BOR # AB-171
STA. 88+08
REF. B/L SURVEY REYFM
OFF. 8' LT.
ELEV. 22.8
DATE 7/13/2015

BOR # B-173
STA. 89+73
REF. B/L SURVEY REYFM
OFF. 9' LT.
ELEV. 22.9
DATE 12/3/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25

BOR # AB-175
STA. 92+35
REF. B/L SURVEY REYFM
OFF. 8' LT.
ELEV. 23.9
DATE 7/13/2015

BOR # B-178
STA. 94+75
REF. B/L SURVEY REYFM
OFF. 14' RT.
ELEV. 23.4
DATE 12/3/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
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FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

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7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

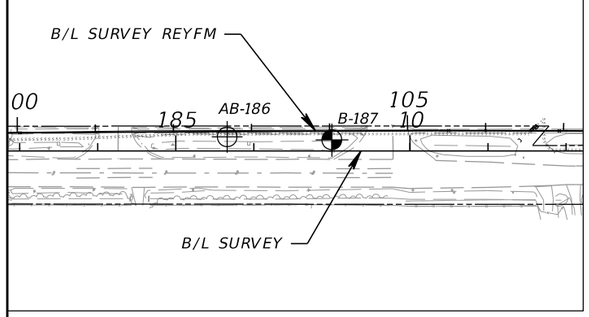
Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

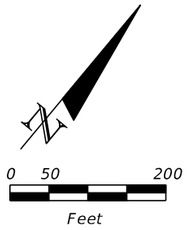
DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS (9)

SHEET NO.

4:59:22 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo09.dgn





BORING LOCATION PLAN

NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
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SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

1.	GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2.	LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3.	BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4.	BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
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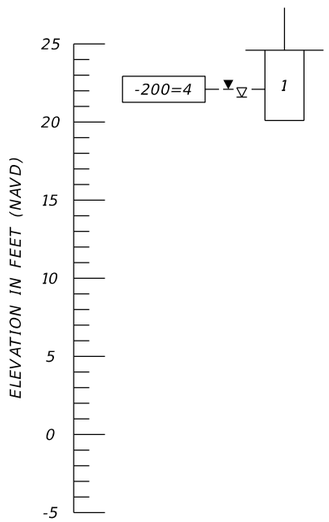
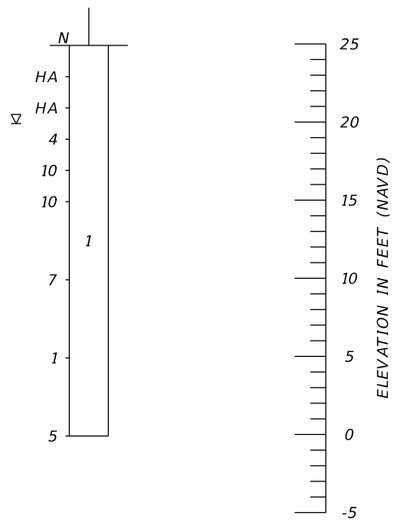
A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
⊕	APPROXIMATE SPT BORING LOCATION
⊕	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

BOR # AB-186
STA. 102+69
REF. B/L SURVEY REYFM
OFF. 7' RT.
ELEV. 24.6
DATE 7/13/2015



BOR # B-187
STA. 104+03
REF. B/L SURVEY REYFM
OFF. 12' RT.
ELEV. 24.9
DATE 12/3/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

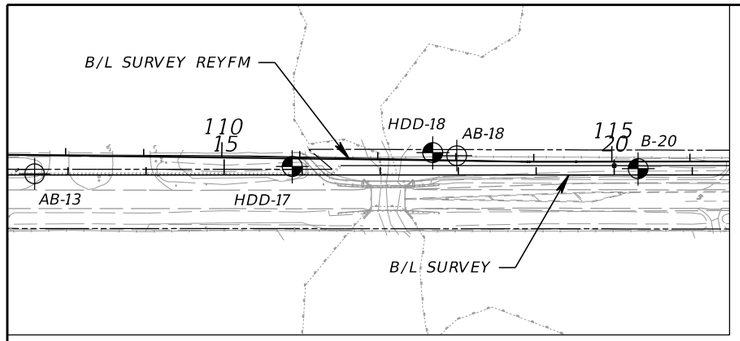
Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

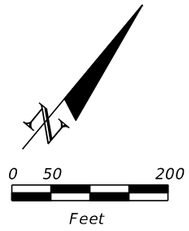
REPORT OF CORE BORINGS (10)

SHEET NO.

4:59:23 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo10.dgn



BORING LOCATION PLAN



NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
2. VERY HARD/DENSE SOILS, INDICATED BY N VALUES OF 50 AND HIGHER, WERE ENCOUNTERED WITHIN SEVERAL OF THE BORINGS PERFORMED ALONG THE PROPOSED FORCE MAIN ALIGNMENT. THE CONTRACTOR SHOULD ANTICIPATE DIFFICULT DIRECTIONAL DRILLING THROUGH THESE SOILS. THE CONTRACTOR SHOULD ANTICIPATE THE NEED FOR SPECIALIZED EQUIPMENT TO FACILITATE THE DIRECTIONAL DRILLING.

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

SOIL TEST RESULTS:

RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

1. GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2. LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3. BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4. BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5. LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]

A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	APPROXIMATE AUGER BORING LOCATION
	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

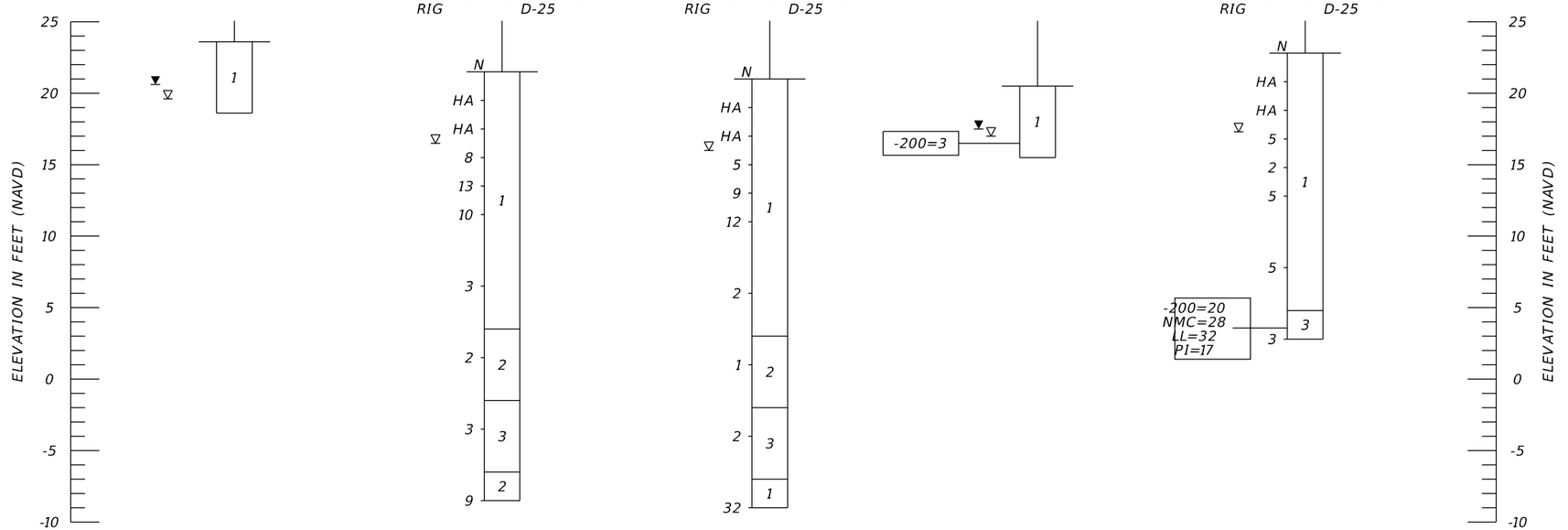
BOR # AB-13
STA. 107+61
REF. B/L SURVEY REYFM
OFF. 24' RT.
ELEV. 23.6
DATE 7/13/2015

BOR # HDD-17
STA. 110+91
REF. B/L SURVEY REYFM
OFF. 10' RT.
ELEV. 21.5
DATE 12/3/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25

BOR # HDD-18
STA. 112+70
REF. B/L SURVEY REYFM
OFF. 10' LT.
ELEV. 21.0
DATE 12/3/2015
DRILLER J. ERICKSON
HAMMER AUTOMATIC
RIG D-25

BOR # AB-18
STA. 113+01
REF. B/L SURVEY REYFM
OFF. 7' LT.
ELEV. 20.5
DATE 7/13/2015

BOR # B-20
STA. 115+34
REF. B/L SURVEY REYFM
OFF. 9' RT.
ELEV. 22.8
DATE 7/15/2015
DRILLER I. POORAN
HAMMER AUTOMATIC
RIG D-25



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE AS NOTED
DESIGNED BY DRR
DRAWN BY BJS
CHECKED BY EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE 3/2016
PROJECT NO. 225338

Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER ERICK M. FREDERICK
FL. LICENSE NO. 63920

REPORT OF CORE BORINGS (11)

SHEET NO.

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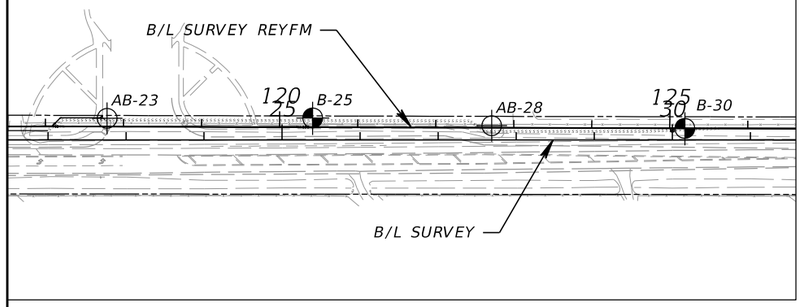
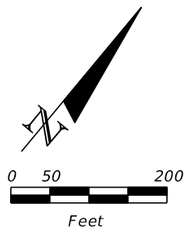




BORING LOCATION PLAN

NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
2. VERY HARD/DENSE SOILS, INDICATED BY N VALUES OF 50 AND HIGHER, WERE ENCOUNTERED WITHIN SEVERAL OF THE BORINGS PERFORMED ALONG THE PROPOSED FORCE MAIN ALIGNMENT. THE CONTRACTOR SHOULD ANTICIPATE DIFFICULT DIRECTIONAL DRILLING THROUGH THESE SOILS. THE CONTRACTOR SHOULD ANTICIPATE THE NEED FOR SPECIALIZED EQUIPMENT TO FACILITATE THE DIRECTIONAL DRILLING.

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

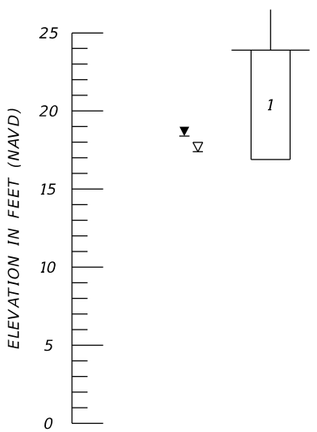
SOIL TEST RESULTS:

RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

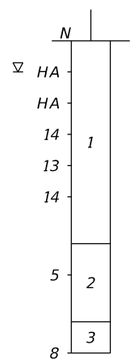
LEGEND

1.	GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2.	LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3.	BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4.	BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5.	LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]
A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
⊕	APPROXIMATE SPT BORING LOCATION
⊕	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN

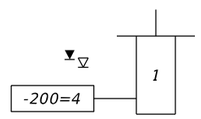
BOR # AB-23
STA. 117+79
REF. B/L SURVEY REYFM
OFF. 11' LT.
ELEV. 23.9
DATE 7/13/2015



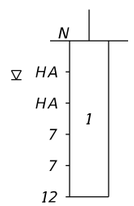
BOR # B-25
STA. 120+43
REF. B/L SURVEY REYFM
OFF. 12' LT.
ELEV. 24.5
DATE 7/14/2015
DRILLER I. POORAN
HAMMER AUTOMATIC
RIG D-25

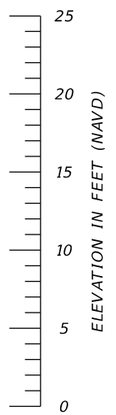


BOR # AB-28
STA. 122+72
REF. B/L SURVEY REYFM
OFF. 3' LT.
ELEV. 24.8
DATE 7/13/2015



BOR # B-30
STA. 125+19
REF. B/L SURVEY REYFM
OFF. CL
ELEV. 24.5
DATE 7/14/2015
DRILLER I. POORAN
HAMMER AUTOMATIC
RIG D-25





	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS (12)

SHEET NO.

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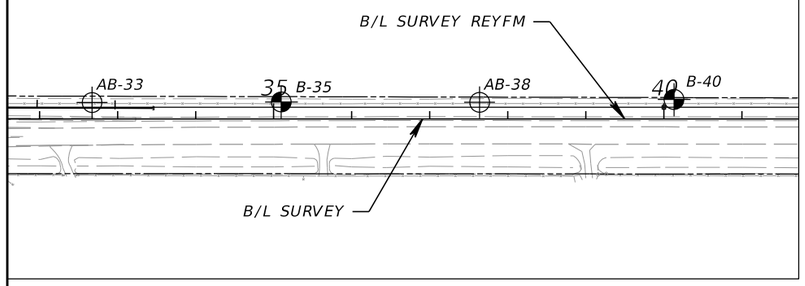

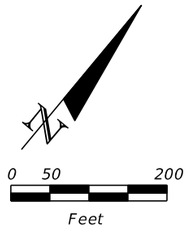

BORING LOCATION PLAN

NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
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ENVIRONMENTAL CLASSIFICATION:

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SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

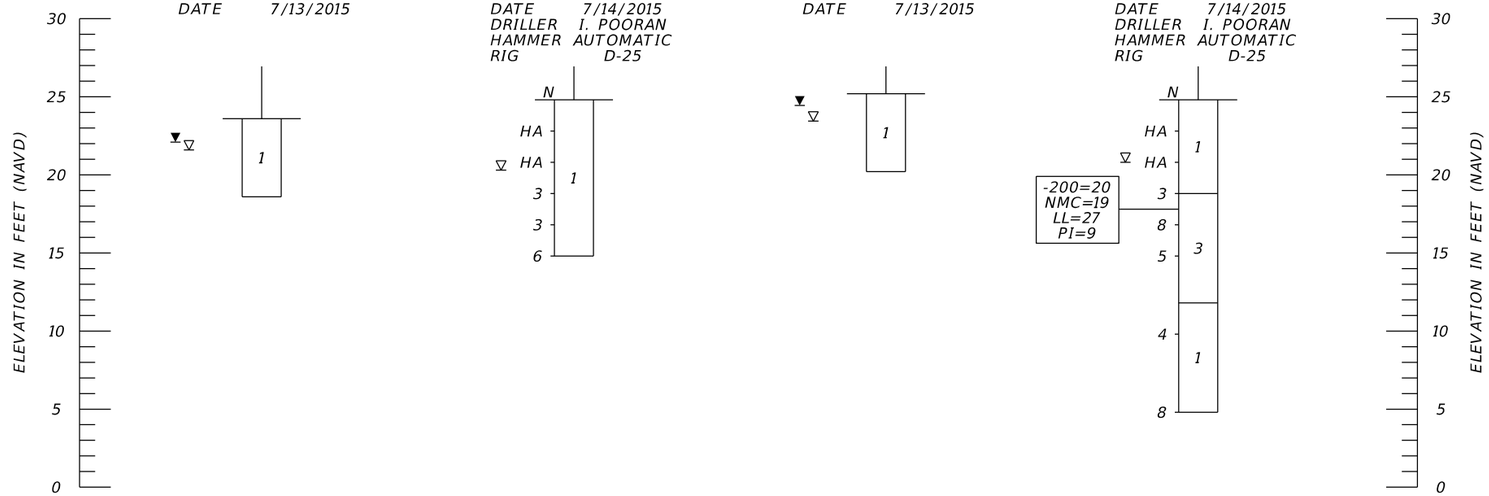
SOIL TEST RESULTS:

RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

1. GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2. LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3. BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4. BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5. LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]

A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
⊕	APPROXIMATE SPT BORING LOCATION
⊕	APPROXIMATE AUGER BORING LOCATION
▽	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
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FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

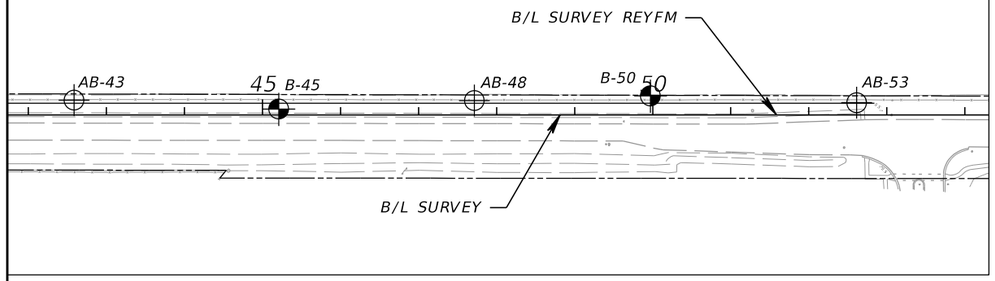
Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

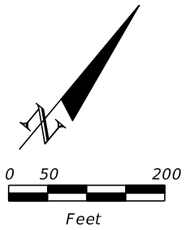
REPORT OF CORE BORINGS (13)

SHEET NO.:

4:59:25 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo13.dgn



BORING LOCATION PLAN



NOTES:

1. THE LOCATIONS OF THE BORINGS WERE RECORDED IN THE FIELD BY TIERRA, INC. USING GARMIN ETREX HAND-HELD GPS EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET. THE GPS COORDINATES RECORDED BY TIERRA WERE UTILIZED IN CONJUNCTION WITH MICROSTATION DESIGN FILES TO OBTAIN STATION, OFFSET, AND ELEVATION.
2. VERY HARD/DENSE SOILS, INDICATED BY N VALUES OF 50 AND HIGHER, WERE ENCOUNTERED WITHIN SEVERAL OF THE BORINGS PERFORMED ALONG THE PROPOSED FORCE MAIN ALIGNMENT. THE CONTRACTOR SHOULD ANTICIPATE DIFFICULT DIRECTIONAL DRILLING THROUGH THESE SOILS. THE CONTRACTOR SHOULD ANTICIPATE THE NEED FOR SPECIALIZED EQUIPMENT TO FACILITATE THE DIRECTIONAL DRILLING.

ENVIRONMENTAL CLASSIFICATION:

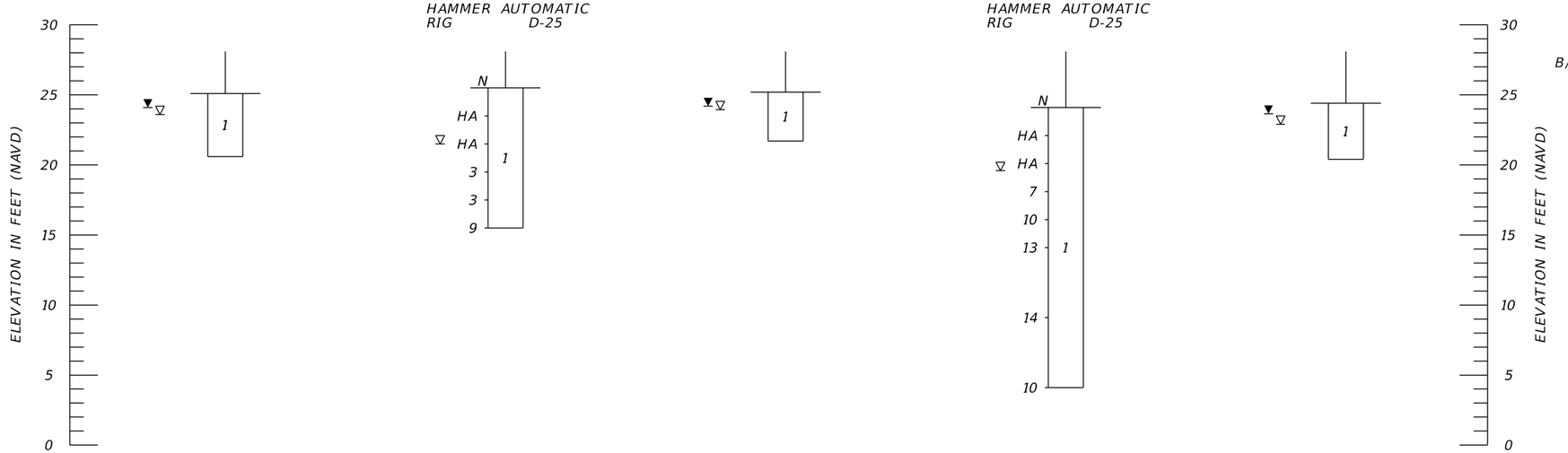
SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (pH=5.7, RESISTIVITY=1,800 OHM-CM)
SUBSTRUCTURE	STEEL: EXTREMELY AGGRESSIVE (pH=5.7)

SOIL TEST RESULTS:

RESISTIVITY	1,800 TO 14,000 OHM-CM
CHLORIDES	30 TO 105 PPM
SULFATES	<4.8 TO 204.1 PPM
pH	5.7 TO 7.8

LEGEND

1.	GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM) [A-3]
2.	LIGHT BROWN TO DARK BROWN SILTY SAND (SM) [A-2-4]
3.	BROWN TO DARK BROWN CLAYEY SAND (SC) [A-2-4/A-2-6]
4.	BROWN TO GREEN SANDY CLAY TO SILT (CL/ML) [A-4/A-6/A-7-5/A-7-6]
5.	LIGHT GRAY TO GREEN CLAY TO SILT (CH/MH) [A-7-5/A-7-6]
A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
	APPROXIMATE SPT BORING LOCATION
	APPROXIMATE AUGER BORING LOCATION
	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
GNE	GROUNDWATER NOT ENCOUNTERED
B/L SURVEY	BASELINE SURVEY OF RYE ROAD
B/L SURVEY REYFM	BASELINE SURVEY OF RYE ROAD FORCE MAIN



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

FORCE MAIN REPLACEMENT

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: DRR
DRAWN BY: BJS
CHECKED BY: EMF

TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION 6486

DATE: 3/2016
PROJECT NO.: 225338

Manatee County FLORIDA
MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS (14)

SHEET NO.

4:59:26 PM 3/16/2016 J:\6511\2015 Files\6511-15-087 Rye Road\Microstation\pdgeo14.dgn

TABLE OF CONTENTS

Page No.

EXECUTIVE SUMMARY

A geotechnical study has been completed for the proposed widening of two bridges (Nos. 134025 and 134026) along Rye Road East in Manatee County, Florida. Two (2) Standard Penetration Test (SPT) borings, were drilled to a depth of 50 feet below the existing ground surface (bgs) at opposite ends of each of the existing bridges. This report provides estimated design capacities for the proposed driven pile foundations planned for support of the bridge widenings.

Based on the information obtained from our exploratory work, it appears that the site subsurface conditions are typical for the area and therefore should allow for a conventional approach to the design and construction of foundations for the proposed bridge structures. The following geotechnical considerations were identified:

- In general, soil conditions at Bridge 134026 consist of sands with varying amounts of silt to a depth of about 23 feet bgs, followed by varying layers of sandy clay, clayey sand and clayey silt (i.e. weathered limestone) to the borehole termination depth of 50 feet bgs.

- The soil conditions at Bridge 134025 consist of sands with varying amounts of silt and clay from the surface to a depth of about 40 feet bgs, followed by varying layers of clay, weathered limestone, and silty/clayey sand to the borehole termination depth of 50 feet bgs.

- Estimated vertical capacities and recommended test pile lengths for 14-inch square pre-cast, pre-stressed driven concrete piles, driven steel HP 14x73 piles, and driven HSS 16x0.5 steel pipe piles are provided in this report.

- Close monitoring of the construction operations discussed herein will be critical in achieving the design intentions. We therefore recommend that DUNKELBERGER be retained to monitor installation of the test and production piles.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
RYE ROAD BRIDGES
SARASOTA COUNTY, FLORIDA

Dunkelberger Project No. HC165014
April 7, 2013

1.0 INTRODUCTION

A geotechnical study has been completed for the proposed widening of two bridges (Nos. 134025 and 134026) along Rye Road East in Manatee County, Florida. Two (2) Standard Penetration Test (SPT) borings, were drilled to a depth of 50 feet below the existing ground surface (bgs) at opposite ends of each of the existing bridges. This report provides estimated axial capacities for the proposed driven pile foundations planned for support of the bridge widenings. Logs of the borings along with a boring location plan are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- driven pile capacity for a bridge widening
- installation procedures for the driven piles

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description	
Site layout	See Appendix A, Exhibit A-5 and A-6: Report of Core Borings for Deep Foundation	
Structure	The existing bridges are to be widened by 4 feet to the east	
Foundation Construction	Either steel pipe piles, steel H-piles, or square concrete piles are proposed for support of the bridges	
Factored Axial Design Loads Per Pile (provided by Cardno)	**Bridge 134025**	
	Intermediate Bent: 33 Tons	End Bent: 24 Tons
	Bridge 134026	
	Intermediate Bent: 34 Tons	End Bent: 24 Tons
Factored Lateral Design Loads Per Pile (provided by Cardno)	1.6 Tons	
Maximum allowable settlement	Total: 1 inch (assumed) Differential: ½ inch (assumed)	

2.2 Site Location and Description

Item	Description
Location	Bridge 134025 is located on Rye Road East approximately 0.2 miles north of Witt Elementary School and Bridge 134026 is located on Rye Road East approximately 0.4 miles south of Witt Elementary school in Bradenton, Manatee County, Florida.
Existing improvements	Bridge 134025 is a three-span, two-lane structure consisting of a precast concrete slab supported by a pile foundation and Bridge 135026 is a two-span, two-lane structure consisting of a precast concrete slab supported by a pile foundation. Both bridges have steel pedestrian bridges offset from the main bridge.
Current ground cover	Asphalt pavement.
Existing Topography	Based on information obtained from Google Earth and the USGS Topographic Map for Lorraine, FL, dated 1987, the bridge decks appear to be at an elevation of about +24 feet-NGVD. We understand no embankment is planned for the bridge widening.

2.3 Historical Aerial Review

Selected historical aerial photographs from the Florida Department of Transportation (FDOT) Aerial Photo Lookup System (APLUS), and Google Earth were reviewed to obtain information concerning the history of development at the site. Selected photographs are summarized below.

- APLUS; 1973, 1988, 1997 (Digital Scale)
- Google Earth; 1995, 1999, 2005, 2010, 2014 (Digital Scale);

Historical Aerial Photographs

1973 - 1980: The two bridges and associated Rye Road are in place.

1991 - 2014: The bridges appear to have been widened. The site generally appears as it exists today.

3.0 SUBSURFACE CONDITIONS

3.1 Site Geologic Conditions

The *Hydrogeologic Framework of the Southwest Florida Water Management District*, issued in 1998 by the Florida Department of Environmental Protection, was reviewed to determine the geologic conditions at the site. Plate 16 in that publication, which provides a cross-sectional

view of Manatee County, indicates that the upper 10 to 20 feet of subsurface soils within the approximate site area consist of Undifferentiated Sand and Clay (UDSC) deposits of the Miocene/Pliocene Age. These soils are comprised primarily of quartz sand with varying amounts of silt, clay, organics, phosphate, and shell fragments.

Underlying the UDSC deposit is the Peace River Formation which consists of interbedded sands, clays, and carbonates. The Peace River Formation appears to extend to a depth of about 50 feet below the ground surface (bgs) which marks the beginning of the Arcadia Formation. The Arcadia Formation consists of sandy carbonate with interbeds of siliciclastic-dominant sediments to about 400 feet below the ground surface (bgs).

An approximately 150-foot thick layer of the Tampa Member appears beneath the Arcadia Formation followed by Suwanee Limestone which was reported at around 500 feet bgs and extending to a depth of about 800 feet bgs.

3.2 Soil Survey

The Soil Survey of Manatee County, Florida (i.e. Soil Survey), issued April 1983 and published by the Soil Conservation Service (U.S. Department of Agriculture), was reviewed to determine the surficial soil map units at this site. The majority of Bridge 134025 is mapped with Soil Unit 20, EauGallie fine sand with a small portion of the north east corner mapped with Soil Unit 7, *Canova, Anclote, and Okeelanta soils.* Bridge 134026 is mapped with Soil Unit 23, Felda-Palmetto complex.

In general, Soil Unit 20 consists of fine sands to a depth of 65 inches and Soil Unit 23 consists of fine sands to depth of 21 inches underlain by sandy loam to a depth of 62 inches. Soil Unit 7 typically consists of an 8 to 20 inch thick layer of muck at the surface underlain by fine sands and sandy loam to a depth up to 63 inches bgs. The SHGWT is reported to be at a depth of less than 10 inches bgs for Soil Units 20 and 23 and is reported as ponded for Soil Unit 7.

Descriptions of the soil mapping units can be found on Exhibit A-3 in *Appendix A*.

It should be noted that the Soil Survey is not intended as a substitute for site-specific geotechnical exploration; rather it is a useful tool in planning a project scope in that it provides information on soil types likely to be found.

3.3 Typical Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum	Material Description	Consistency/ Density
P	6 inches	Asphaltic concrete over limerock base course (Pavement)	N/A
1	17 ½ to 37 ½ feet	Fine SAND with trace to slight amounts of silt (SP, SP-SM)	Very Loose to Dense
2	27 ½ to 50 feet	Silty, sandy CLAY (CL)	Very Stiff to Hard
3	42 ½ to 47 ½ feet	Sandy, clayey SILT (ML), (Weathered Limestone)	Very Dense
4	32 ½ to 50 feet	Clayey SAND (SC)	Very Loose to Dense
5	27 ½ to 47 ½ feet	Silty SAND with sand size to gravel size limestone gravel fragments (SM)	Very Loose to Very Dense

Conditions disclosed at each boring location and results of laboratory testing are indicated on the *Report of Core Borings for Deep Foundation* on Exhibits A-5 and A-6. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual.

3.4 Groundwater

The depth to the groundwater measured during our field work was about 8 feet bgs. The groundwater measurements are influenced by the drilling process, water levels in the below bridge waterways, and ambient weather conditions which have been seasonably dry.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the project characteristics previously described, the data obtained from our field exploration and our experience with similar subsurface conditions and construction types. If subsurface conditions different from those disclosed by the borings are encountered during construction, we should be notified immediately so that we might review the following recommendations.

4.1 General

The site appears suitable for use of driven steel pipe piles, steel H piles, or concrete piles for the bridge widening.

4.2 Estimated Pile Capacities

Charts showing estimated Davisson axial pile capacity (i.e. Nominal Bearing Resistance) versus pile tip embedment can be seen on Exhibits D-1 through D-4. FB Deep was used to estimate the Davisson axial pile capacities. The estimated pile capacities assume the grade at the pile locations is about +16 feet-NGVD, which is about 8 feet below the grade at the boring locations. As a result, the uppermost 8 feet of soil data from the borings was ignored in the capacity calculations.

The results of the FB Deep analysis for Bridge 134025 estimate Davisson axial capacities of about 40 to 60 tons for 14-inch driven concrete piles that penetrate to 21 to 25 feet below grade, 40 to 70 tons for 16x0.5 driven steel pipe piles that penetrate to 22 to 30 feet deep, and 40 to 80 tons for 14x73 steel H piles that are driven to 26 to 35 feet deep. The estimated Davisson axial capacities for Bridge 134026 range from about 40 to 60 tons for 14-inch driven concrete piles that penetrate to 17 to 19 feet deep, 40 to 60 tons for 16x0.5 driven steel pipe piles that penetrate to 18 to 22 feet below grade, and 40 to 90 tons for 14x73 driven steel H piles that penetrate to 21 to 25 feet deep. See Appendix D for graphs showing the pile capacities with respect to depth.

4.3 Scour

A scour analysis was not part of our contractual scope of work. However, the Scour Evaluation Report, prepared by URS Corporation Southern and dated December 13, 2013, was provided for Bridge 134026. The report indicates that the existing channel bottom is at an elevation of +16.6 feet-NGVD and that the 100-year scour elevation is at +12.8 feet-NGVD. A total pile frictional resistance (scour load) of 2 to 4 tons is anticipated for this elevation interval based on the results of our FB Deep analysis. These scour loads were assumed to be applicable to Bridge 134025 as well as 134026.

4.4 Lateral Capacity Analysis

The driven piles will resist lateral loads through a combination of pile stiffness (EI) and earth pressure. To model the pile-soil-lateral interaction, we utilized the computer program LPILE (developed by Ensoft, Inc.), which incorporates the *p*-y method of lateral load analysis. Variables in the analysis included soil properties (soil unit weight, friction angle, lateral soil modulus, and shear strength), pile parameters (i.e. pile dimensions and elastic modulus) and the lateral and axial loads acting on the pile. For our lateral load analysis we assumed the following:

1. Lateral loads will act at the pile head. The lateral load direction is assumed to be in line with the “strong axis” of the piles.

2. The pile head will be at about elevation +16 feet-NGVD for both bridges at both the interior and end bents.
3. The post scour condition was modeled. The post scour grade (mudline) around the piles was taken as +12 feet-NGVD for both bridges at both the interior and end bents.
4. The piles were assumed to be fixed within a rigid pile cap.

The results of our lateral load analysis are provided in the following tables.

Bridge 134025

Pile Location	Pile Material	Pile Size (inches)	Factored Lateral Load[1] (tons)	Estimated Lateral Deflection at Pile Head (in)	Maximum Moment in Pile (inch-kips)	Estimated Minimum Pile Tip Elevation[2] (feet-NGVD)
End Bent	Concrete	14	1.6	0.17	250	-4
	HSS 16x0.5	16	1.6	0.11	255	-5
	HP 14x73	-	1.6	0.11	260	-6
Int. Bent	Concrete	14	1.6	0.17	250	-4
	HSS 16x0.5	16	1.6	0.10	255	-6
	HP 14x73	-	1.6	0.10	260	-6

1. Provided by Cardno.
2. Assumes the grade at the pile locations is +16 feet-NGVD.

Bridge 134026

Pile Location	Pile Material	Pile Size (inches)	Factored Lateral Load[1] (tons)	Lateral Deflection at Pile Head (in)	Maximum Moment in Pile (inch-kips)	Estimated Minimum Pile Tip Elevation[2] (feet-NGVD)
End Bent	Concrete	14	1.6	0.10	250	0
	HSS 16x0.5	16	1.6	0.05	255	0
	HP 14x73	-	1.6	0.05	260	0
Int. Bent	Concrete	14	1.6	0.10	250	0
	HSS 16x0.5	16	1.6	0.05	255	0
	HP 14x73	-	1.6	0.05	260	0

Pile Location	Pile Material	Pile Size (inches)	Factored Lateral Load[1] (tons)	Lateral Deflection at Pile Head (in)	Maximum Moment in Pile (inch-kips)	Estimated Minimum Pile Tip Elevation[2] (feet-NGVD)

1. Provided by Cardno.
2. Assumes the grade at the pile locations is +16 feet-NGVD.

We request that the actual design pile cutoff elevations be provided to us to allow for review of our lateral capacity estimates.

4.5 Required Nominal Bearing Resistance Values

The piles must be capable of achieving a Nominal Bearing Resistance (Davisson Capacity) that is equal to the sum of the pile factored design load and the scour resistance, together divided by a resistance factor of 0.65 (no downdrag load is anticipated). The required Nominal Bearing Resistance (NBR) values are provided in the table below for the two bridges. The table below also includes the embedment depths anticipated to be needed to satisfy the required NBR values (based on the average FB Deep results for the two borings completed at each bridge). Also shown are our estimated test pile lengths, which are equal to the anticipated pile embedment depths plus an additional 14 to 18 feet.

Bridge 134025

Pile Location	Pile Material	Pile Size (inches)	Required Nominal Bearing Resistance[1] (NBR) in tons	Estimated Pile Embedment[2] Needed to Achieve Required NBR (ft.)	Recommended Test Pile Length[3] (ft.)
End Bent	Concrete	14	43	22	40
	HSS 16x0.5	16	43	23	40
	HP 14x73	-	40	26	40
Int. Bent	Concrete	14	57	24	40
	HSS 16x0.5	16	57	28	45
	HP 14x73	-	54	35	50

1. NBR = (Factored Design Load + Net Scour + Downdrag)/φ
2. Assumes the grade at the pile locations is +16 feet-NGVD. Embedment depths needed to achieve the required NBR are the average of the required depths shown on Exhibits D-1 and D-2.
3. Recommended test pile length is equal to the estimated required pile embedment depth plus an additional 14 to 18 feet.

Bridge 134026

Pile Location	Pile Material	Pile Size (inches)	Required Nominal Bearing Resistance[1] (NBR) in tons	Estimated Pile Embedment[2] Needed to Achieve Required NBR (ft.)	Recommended Test Pile Length[3] (ft.)
End Bent	Concrete	14	43	17	35
	HSS 16x0.5	16	43	19	35
	HP 14x73	-	40	21	35
Int. Bent	Concrete	14	58	19	35
	HSS 16x0.5	16	58	21	35
	HP 14x73	-	55	25	40

1. NBR = (Factored Design Load + Net Scour + Downdrag)/φ
2. Assumes the grade at the pile locations is +16 feet-NGVD. Embedment depths needed to achieve the required NBR are the average of the required depths shown on Exhibits D-3 and D-4.
3. Recommended test pile length is equal to the estimated required pile embedment depth plus an additional 14 to 18 feet.

Additional details for the design and installation of the piles can be seen on Exhibits D-5 and D-6 in Appendix D.

4.6 Other Pile Considerations

The production piles should be driven to a blow count criteria established from a testing program that incorporates a Pile Driving Analyzer (PDA) and Case Pile Wave Analysis Program (CAPWAP) analysis. Dynamic load testing should be performed on at least 5% of the piles. Information concerning the performance of the pile load test, pile installation, equipment, procedures and determination of practical refusal are contained in Section 455 of the FDOTSS. In no case should the piles tip above the minimum tip elevations described in this report (see Section 4.4 and Appendix D) even if the blow count criterion is met at shallower depth.

Practical refusal is defined as 20 blows per inch per the Section 455-5.8 when using equipment as specified in Section 455-5.2 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (FDOTSS) dated July 2015. This office should be consulted if practical refusal is achieved above the recommended tip elevations.

It is recommended that the piles be installed with center-to-center spacing of at least three (3) pile widths. The piles should be evaluated and designed for the axial stresses by the project structural engineer. Additionally, the piles used on this project should be properly reinforced to carry lateral loads.

The installation of the piles should be monitored to record the depth driven and the number of hammer strokes for each foot of pile installed. Jetting should not be used without prior approval from this office. DUNKELBERGER should be retained, as the geotechnical engineer-of-record, to provide the pile installation monitoring services for this project.

Total and differential settlements of driven pile foundations installed in accordance with the forgoing recommendations are estimated to be less than ½ inch. Most of this settlement should occur during construction of the structure as an elastic response of the clayey sands and over-consolidated silts/clays under dead load application.

4.7 Soil Parameters

Soil parameters to be used in the design of any below grade structures are presented on the *Foundation Design Parameters* Exhibit A-7 in Appendix A.

4.8 Environmental Classification

The FDOT corrosion series tests, which test for pH, resistivity, sulfate content, and chloride content, were performed on select samples from Strata 1, 2, and 3. The results of the testing, based on the FDOT environmental classification for substructures, indicate that soils from Strata 1, 2, and 3 are classified as slightly aggressive for concrete and moderately aggressive for steel. The details of the corrosion series tests can be seen on the *Subsurface Profiles* Exhibits A-5 and A-6 in Appendix A.

5.0 GENERAL COMMENTS

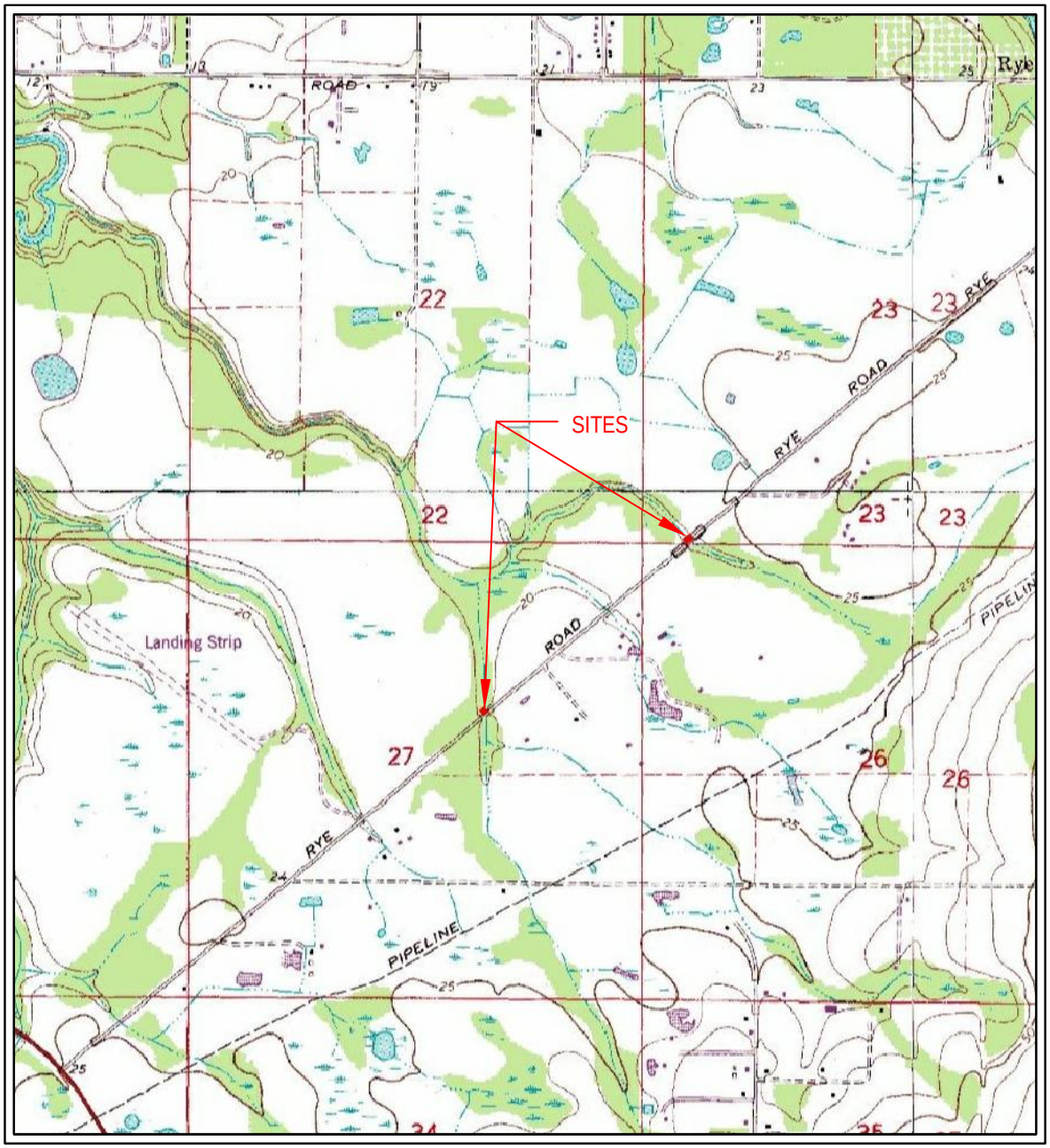
DUNKELBERGER should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. DUNKELBERGER also should be retained to provide observation and testing services during installation of the piles.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless DUNKELBERGER reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION

UNITED STATES – DEPARTMENT OF THE INTERIOR – GEOLOGICAL SURVEY



SCALE 1:24 000

1 .5 0 KILOMETERS 1 2

1000 0 METERS 1000 2000

1 .5 0 1

MILES

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL: 5 FEET

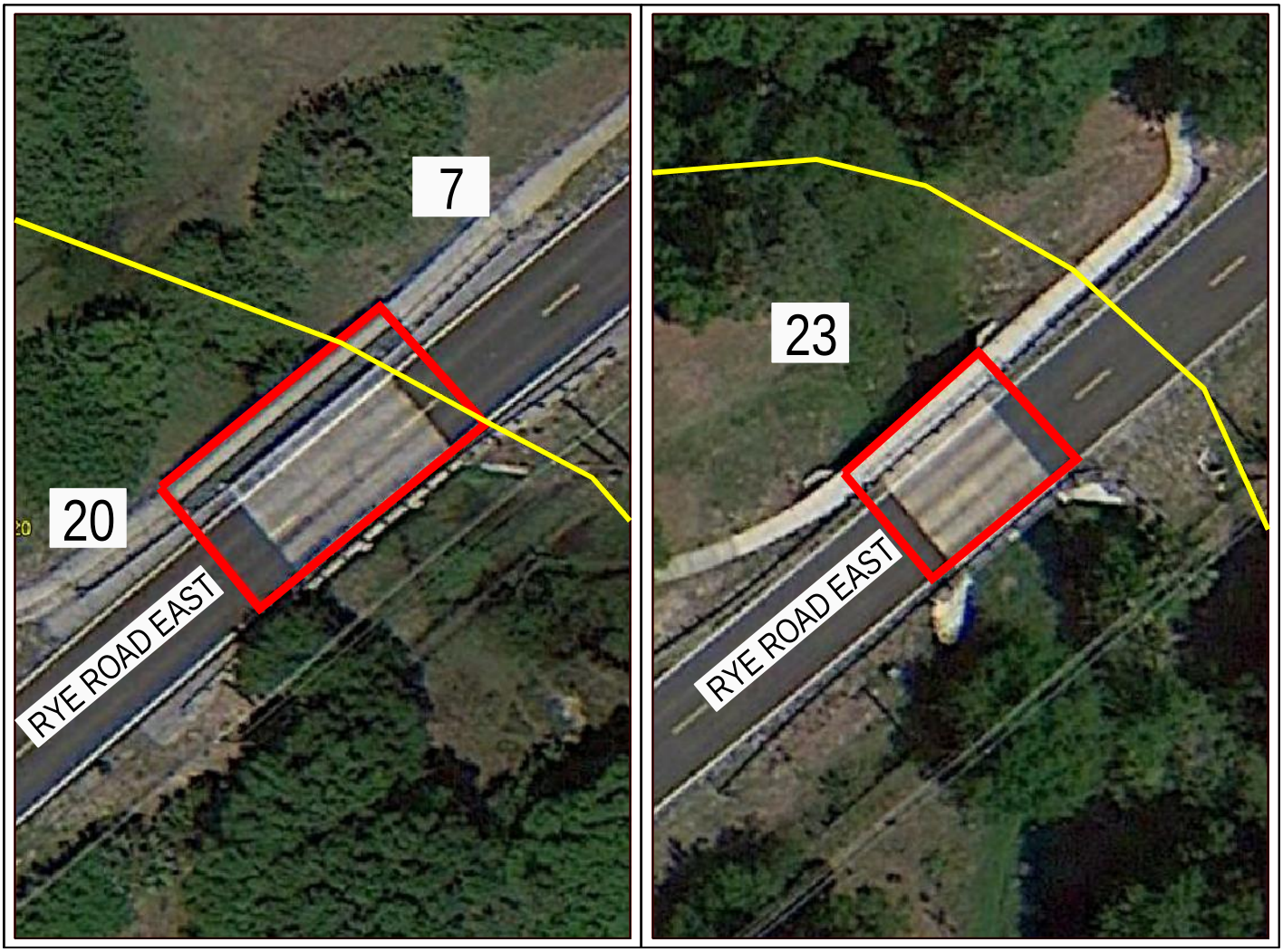
NATIONAL GEODETIC VERTICAL DATUM OF 1929

N

LORRAINE, FL
1987
7.5 MINUTE SERIES (TOPOGRAPHIC)

Project Mngr: JJ	Project No. HC165014	Terracon Consulting Engineers and Scientists	TOPOGRAPHIC VICINITY MAP
Drawn By: DV	Scale: AS-SHOWN	8260 VICO COURT, UNIT B SARASOTA, FL 34240	GEOTECHNICAL ENGINEERING REPORT
Checked By: JJ	File No. HC165014-1	PH. (941) 379-0621 FAX. (941) 379-5061	RYE ROAD BRIDGES
Approved By: KA	Date: 4-7-16		RYE ROAD EAST MANATEE COUNTY, FLORIDA

EXHIBIT A-1



BRIDGE 134025 BRIDGE 134026

SCALE 1" = 40'

20 0 20 40 60 80 100 120 140 160 180 200

U.S.D.A. SOIL SURVEY FOR MANATEE COUNTY, FLORIDA
ISSUED: APRIL 1983

N

SOIL LEGEND	
7	CANOVA, ANCLOTE, AND OKEELANTA SOILS
20	EAUGALLIE FINE SAND
23	FELDA-PALMETTO COMPLEX

Project Mngr:	JJ
Drawn By:	DV
Checked By:	JJ
Approved By:	KA

Project No.	HC165014
Scale:	AS-SHOWN
File No.	HC165014-2
Date:	4-7-16

Terracon
Consulting Engineers and Scientists
8260 VICO COURT, UNIT B SARASOTA, FL 34240
PH. (941) 379-0621 FAX. (941) 379-0621

SOILS MAP
GEOTECHNICAL ENGINEERING REPORT
RYE ROAD BRIDGES
RYE ROAD EAST
MANATEE COUNTY, FLORIDA

EXHIBIT
A-2

Soil Survey Descriptions

Unit 7, *Canova, Anclote, and Okeelanta soils*, consists of nearly level, very poorly drained mineral and organic soils in freshwater swamps and in broad, poorly defined drainage ways. It is about 40 percent Canova soils, 25 percent Anclote soils, 20 percent Okeelanta soils, and 15 percent other soils. The typical Canova soil profile consists of muck to a depth of 8 inches, followed by fine sand to a depth of 24 inches, and underlain by sandy clay loam to a depth of 63 inches. The typical Anclote soil profile consists of fine sand to a depth of 80 inches or more. The typical Okeelanta soil profile consists of muck to a depth of 20 inches underlain by fine sand to a depth of 54 inches. Under natural (pre-development) conditions, the Seasonal High Groundwater Table (SHGWT) is reported as ponded for 6 to 9 months of the year.

Unit 20, *EauGallie fine sand*, is comprised of nearly-level, poorly drained soil in broad areas of flatwoods. The typical soil profile consists of fine sand to a depth of 42 inches and underlain by loamy fine sand to a depth of 65 inches. Under natural (pre-development) conditions, the SHGWT is reported to lie at a depth of less than 10 inches (bgs) for 2 to 4 months of the year.

Unit 23, Felda-Palmetto complex, consists of soils in broad sloughs where stream channels are poorly defined and soils around some of the larger ponds in the central and eastern parts of the county. The typical soil profile consists of fine sand to a depth of 21 inches followed by sandy loam and sandy clay loam to a depth of 62 inches. Under natural (pre-development conditions, the SHGWT is reported to lie at a depth of less than 10 inches bgs for 2 to 6 months of the year.

Field Exploration Description

The boring locations were determined prior to visiting the site by a DUNKELBERGER engineer using the provided site plan. The boring locations were then staked at the project site by a DUNKELBERGER engineer using a hand-held GPS unit and existing site features as reference points.

The SPT soil borings were drilled with a rubber track mounted, rotary drilling rig equipped with a safety hammer. The boreholes were advanced with a cutting head and stabilized with the use of bentonite (drillers' mud). Soil samples were obtained by the split spoon sampling procedure in general accordance with the Standard Penetration Test (SPT) procedure. In the split spoon sampling procedure, the number of blows required to advance the sampling spoon the last 12 inches of an 18-inch penetration or the middle 12 inches of a 24-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (N). This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. The sampling depths and penetration distance, plus the standard penetration resistance values, are shown on the boring logs.

Portions of the samples from the borings were sealed in jars to reduce moisture loss, and then the jars were taken to our laboratory for further observation and classification. Upon completion, the boreholes were sealed from bottom to top with cement grout. Borings drilled in the asphalt pavement were capped with cold-mix asphalt patch.

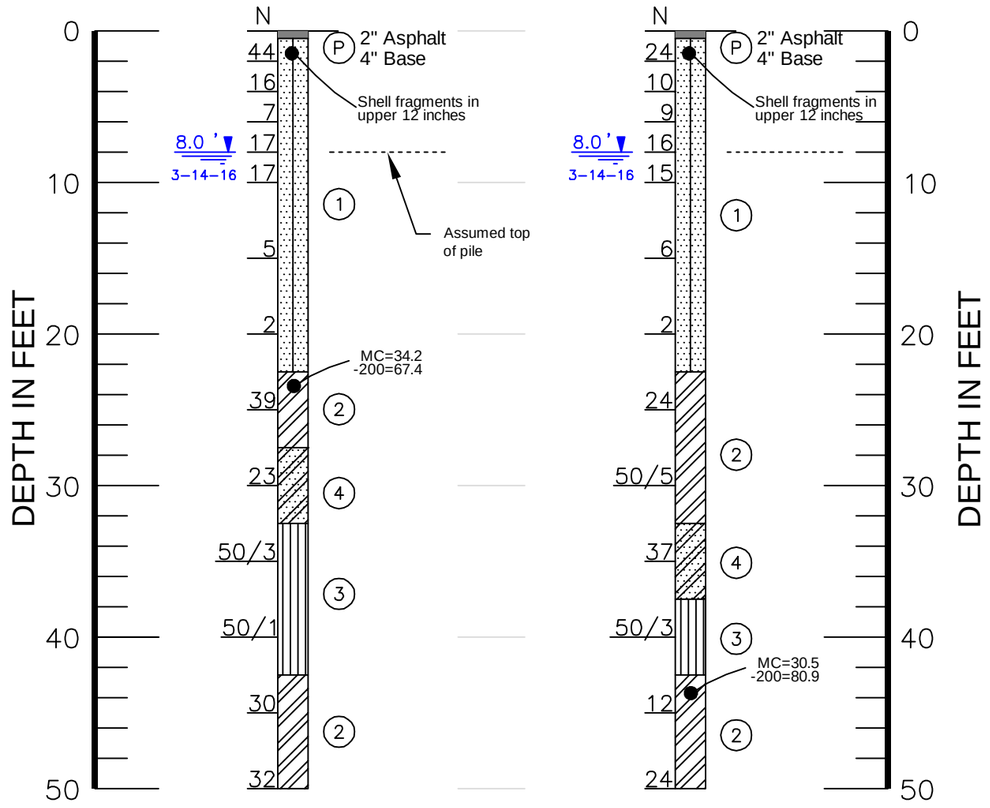
Field logs of each boring were prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The boring logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation of the samples.

SOURCE: GOOGLE EARTH PRO

0' 10' 20' 40'

B-1 APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

BORING NO. B-1 B-2



GENERAL LEGEND

- P — Asphaltic concrete over limestone gravel base
- 1 — Gray, dark gray, and brown fine SAND with trace to slight amounts of silt (SP, SP-SM)
- 2 — Light gray silty, sandy CLAY (CL)
- 3 — Light gray to gray sandy, clayey SILT (ML) (Weathered Limestone)
- 4 — Gray to brown clayey SAND (SC)
- 5 — Gray to dark gray silty SAND with sand size to gravel size limestone gravel fragments (SM)

N – Indicates the number of blows of a 140 pound hammer, freely falling a distance of 30 inches, required to drive a 2-inch diameter sampler 12 inches (ASTM D 1586)

B-1 – Standard Penetration Test (SPT) Boring and number

SP – Unified Soil Classification System Group Symbol (ASTM D 2487)

8.0 ▼ / 3-14-16 – Depth of groundwater (feet) & date measured

50/3 – Indicates fifty SPT hammer blows were required to drive the sampler 3 inches

MC – Moisture Content (%)

-200 – Amount Finer Than The U.S. Standard No. 200 Sieve (%)

CORROSION TEST RESULTS

Sample Location	RESISTIVITY ohm-cm	CHLORIDES ppm	SULFATES ppm	pH
B-1 (33.5'-35') & B-2 (23.5'-25' & 28.5'-30')	3,100	21.6	<1.6	7.1

	Steel	Concrete
Substructure Environment Classification:	Moderately Aggressive	Slightly Aggressive

ENGINEERING CLASSIFICATION (SAFTEY HAMMER)

GRANULAR MATERIALS

Relative Density	SPT BLOW-COUNTS
Very Loose	Less than 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Greater than 50

SILTS AND CLAYS

Consistency	SPT BLOW-COUNTS
Very Soft	Less than 2
Soft	2 - 4
Firm	4 - 8
Stiff	8 - 15
Very Stiff	15 - 30
Hard	Greater than 30

STANDARD PENETRATION TEST DATA

SPOON INSIDE DIA.	1.375 inch
SPOON OUTSIDE DIA.	2.00 inches
AVG. HAMMER DROP	30 inches
HAMMER WEIGHT	140 pounds

NOTES

(1) Borings were drilled on March 14, 2016 using a track-mounted BR-2500 drilling rig.

(2) Strata boundaries are approximate and represent soil strata at each test hole location only. Soil transitions may be more gradual than implied.

(3) Groundwater depths shown on the subsurface profiles represent the groundwater surfaces on the date shown. Groundwater level fluctuations should be anticipated throughout the year.

Project Mngr: JJ	Project No. HC165014	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	REPORT OF CORE BORINGS FOR DEEP FOUNDATIONS
Drawn By: DV	Scale: AS-SHOWN	8260 VICO COURT, UNIT B SARASOTA, FL 34240	GEOTECHNICAL ENGINEERING REPORT
Checked By: JJ	File No. HC165014-5	PH. (941) 379-0621 FAX. (941) 379-5061	RYE ROAD BRIDGE 134026
Approved By: KA	Date: 4-7-16		RYE ROAD EAST
			MANATEE COUNTY, FLORIDA

EXHIBIT A-5

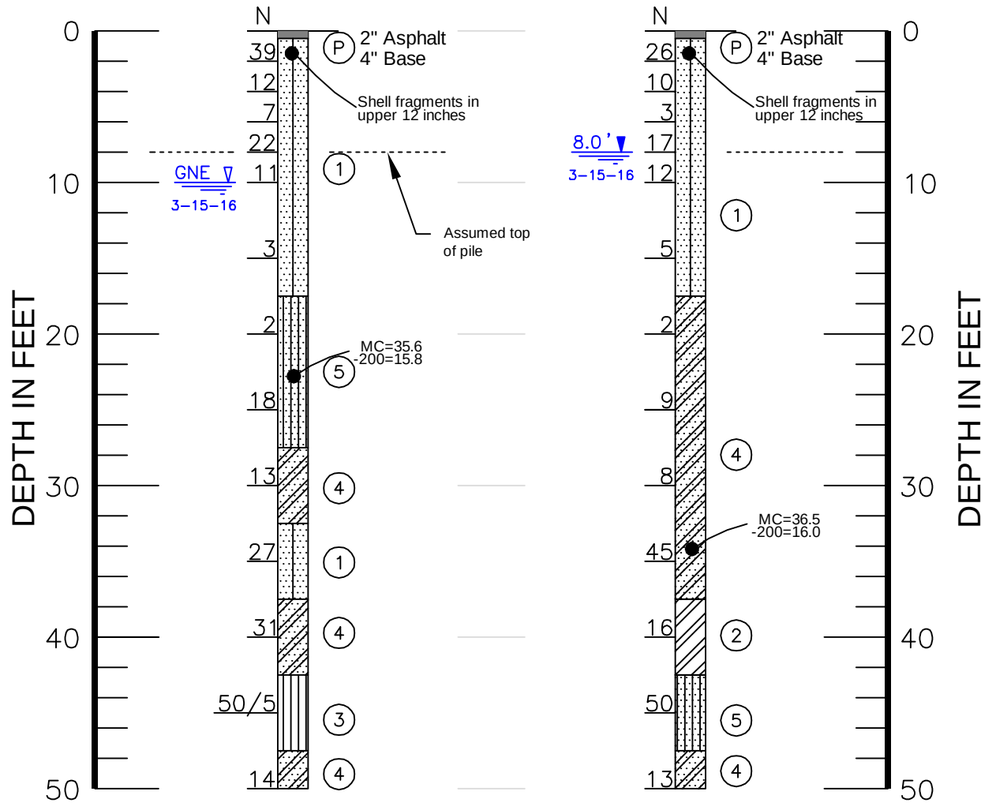
N

SOURCE: GOOGLE EARTH PRO

0' 10' 20' 40'

B-3 APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

BORING NO. B-3 B-4



GENERAL LEGEND

- (P) Asphaltic concrete over limestone gravel base
- (1) Gray, dark gray, and brown fine SAND with trace to slight amounts of silt (SP, SP-SM)
- (2) Light gray silty, sandy CLAY (CL)
- (3) Light gray to gray sandy, clayey SILT (ML) (Weathered Limestone)
- (4) Gray to brown clayey SAND (SC)
- (5) Gray to dark gray silty SAND with sand size to gravel size limestone gravel fragments (SM)

N – Indicates the number of blows of a 140 pound hammer, freely falling a distance of 30 inches, required to drive a 2-inch diameter sampler 12 inches (ASTM D 1586)

B-3 – Standard Penetration Test (SPT) Boring and number

SP – Unified Soil Classification System Group Symbol (ASTM D 2487)

8.0' / 3-15-16 – Depth of groundwater (feet) & date measured

GNE / 3-15-16 – Groundwater not encountered prior to the introduction of drilling mud

50/5 – Indicates fifty SPT hammer blows were required to drive the sampler 5 inches

MC – Moisture Content (%)

-200 – Amount Finer Than The U.S. Standard No. 200 Sieve (%)

CORROSION TEST RESULTS

Sample Location	RESISTIVITY ohm-cm	CHLORIDES ppm	SULFATES ppm	pH
B-3 (2'-4' & 4'-6') & B-4 (2'-4')	4,600	21.6	<1.6	7.2

	Steel	Concrete
Substructure Environment Classification:	Moderately Aggressive	Slightly Aggressive

ENGINEERING CLASSIFICATION (SAFTEY HAMMER)

GRANULAR MATERIALS

Relative Density	SPT BLOW-COUNTS
Very Loose	Less than 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Greater than 50

SILTS AND CLAYS

Consistency	BLOW-COUNTS
Very Soft	Less than 2
Soft	2 - 4
Firm	4 - 8
Stiff	8 - 15
Very Stiff	15 - 30
Hard	Greater than 30

STANDARD PENETRATION TEST DATA

SPOON INSIDE DIA.	1.375 inch
SPOON OUTSIDE DIA.	2.00 inches
AVG. HAMMER DROP	30 inches
HAMMER WEIGHT	140 pounds

NOTES

(1) Borings were drilled on March 15, 2016 using a track-mounted BR-2500 drilling rig.

(2) Strata boundaries are approximate and represent soil strata at each test hole location only. Soil transitions may be more gradual than implied.

(3) Groundwater depths shown on the subsurface profiles represent the groundwater surfaces on the dates shown. Groundwater level fluctuations should be anticipated throughout the year.

Project Mngr: JJ	Project No. HC165014	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	REPORT OF CORE BORINGS FOR DEEP FOUNDATIONS
Drawn By: DV	Scale: AS-SHOWN		GEOTECHNICAL ENGINEERING REPORT
Checked By: JJ	File No. HC165030-6	8260 VICO COURT, UNIT B SARASOTA, FL 34240	RYE ROAD BRIDGE 134025
Approved By: KA	Date: 4-7-16	PH. (941) 379-0621 FAX. (941) 379-5061	RYE ROAD EAST
			MANATEE COUNTY, FLORIDA

EXHIBIT A-6

SUMMARY OF FOUNDATION DESIGN PARAMETERS

BRIDGE 134026

Boring No.	U.S.C.S.	Depth (feet)	Range of SPT - N	Unit Weights (PCF) Moist	Unit Weights (PCF) Submerged	Angle of Internal Friction (degrees)	Effective Cohesion (PSF)	Earth Pressure Coefficients Ka	Earth Pressure Coefficients Kp
B-1	SP, SP-SM	0.5 - 2	44	125	62.6	34	0	0.283	3.54
	SP, SP-SM	2 - 4	16	110	47.6	30	0	0.333	3.00
	SP, SP-SM	4 - 6	7	105	42.6	29	0	0.347	2.88
	SP, SP-SM	6 - 12.5	17	110	47.6	30	0	0.333	3.00
	SP, SP-SM	12.5 - 17.5	5	105	42.6	29	0	0.333	3.00
	SP, SP-SM	17.5 - 22.5	2	100	37.6	28	0	0.361	2.77
	CL	22.5 - 27.5	39	125	62.6	0	3,900	1.00	1.00
	SC	27.5 - 32.5	23	115	52.6	32	0	0.307	3.25
	ML (Limestone)	32.5 - 42.5	50+	135	72.6	0	15,000	1.00	1.00
	CL	42.5 - 50	30 - 32	125	62.6	0	3,000	1.00	1.00

Boring No.	U.S.C.S.	Depth (feet)	Range of SPT - N	Unit Weights (PCF) Moist	Unit Weights (PCF) Submerged	Angle of Internal Friction (degrees)	Effective Cohesion (PSF)	Earth Pressure Coefficients Ka	Earth Pressure Coefficients Kp
B-2	SP, SP-SM	0.5 - 2	24	115	52.6	32	0	0.307	3.25
	SP, SP-SM	9 -10	105	42.6	29	0	0.347	2.88	
	SP, SP-SM	6 - 12.5	15 - 16	110	47.6	30	0	0.333	3.00
	SP, SP-SM	12.5 - 17.5	6	105	42.6	29	0	0.347	2.88
	SP, SP-SM	17.5 - 22.5	2	100	37.6	26	0	0.391	2.56
	CL	22.5 - 27.5	24	125	62.6	0	2,400	1.00	1.00
	CL	27.5 - 32.5	50+	125	62.6	0	5,000	1.00	1.00
	SC	32.5 - 37.5	37	120	57.6	33	0	.295	3.39
	ML (Limestone)	37.5 - 42.5	50+	135	72.6	0	15,000	1.00	1.00
	CL	42.5 - 47.5	12	120	57.6	0	1,200	1.00	1.00
	CL	47.5 - 50	24	125	62.6	0	2,400	1.00	1.00

BRIDGE 134025

Boring No.	U.S.C.S.	Depth (feet)	Range of SPT - N	Unit Weights (PCF) Moist	Unit Weights (PCF) Submerged	Angle of Internal Friction (degrees)	Effective Cohesion (PSF)	Earth Pressure Coefficients Ka	Earth Pressure Coefficients Kp
B-3	SP, SP-SM	0.5 - 2	39	120	57.6	33	0	0.295	3.39
	SP, SP-SM	2 - 4	12	110	47.6	30	0	0.333	3.00
	SP, SP-SM	4 - 6	7	105	42.6	29	0	0.347	2.88
	SP, SP-SM	6 - 8	22	115	52.6	32	0	0.307	3.25
	SP, SP-SM	8 - 12.5	11	110	47.6	30	0	0.333	3.00
	SP, SP-SM	12.5 - 17.5	3	100	37.6	28	0	0.361	2.77
	SM	17.5 - 22.5	2	100	37.6	26	0	0.391	2.56
	SM, SC	22.5 - 32.5	13 - 18	110	47.6	30	0	0.333	3.00
	SP, SP-SM	32.5 - 37.5	27	115	52.6	32	0	0.307	3.25
	SM	37.5 - 42.5	31	120	57.6	33	0	0.295	3.39
	ML (Limestone)	42.5 - 47.5	50+	135	72.6	0	15,000	1.00	1.00
	SC	47.5 - 50	14	110	47.6	30	0	0.333	3.00

Boring No.	U.S.C.S.	Depth (feet)	Range of SPT - N	Unit Weights (PCF) Moist	Unit Weights (PCF) Submerged	Angle of Internal Friction (degrees)	Effective Cohesion (PSF)	Earth Pressure Coefficients Ka	Earth Pressure Coefficients Kp
B-4	SP, SP-SM	0.5 - 2	26	115	52.6	32	0	0.307	3.25
	SP, SP-SM	2 - 4	10	105	42.6	29	0	0.347	2.88
	SP, SP-SM	4 - 6	3	100	37.6	28	0	0.361	2.77
	SP, SP-SM	6 - 12.5	12 - 17	110	47.6	30	0	0.333	3.00
	SP, SP-SM	12.5 - 17.5	5	105	42.6	29	0	0.347	2.88
	SC	17.5 - 22.5	2	100	37.6	26	0	0.391	2.56
	SC	22.5 - 32.5	8 - 9	105	42.6	29	0	0.347	2.88
	SC	32.5 - 37.5	45	125	62.6	34	0	0.283	3.54
	CL	37.5 - 42.5	16	125	62.6	0	1,600	1.00	1.00
	SM	42.5 - 47.5	50	125	62.6	34	0	0.283	3.54
	SC	47.5 - 50	13	110	47.6	30	0	0.333	3.00

Project Mngr: JJ	Project No. HC165014	DUNKELBERGER engineering & testing, inc. A Terracon COMPANY	REPORT OF CORE BORINGS FOR DEEP FOUNDATIONS
Drawn By: DV	Scale: AS-SHOWN	8260 VICO COURT, UNIT B SARASOTA, FL 34240	GEOTECHNICAL ENGINEERING REPORT
Checked By: JJ	File No. HC165014-7	PH. (941) 379-0621 FAX. (941) 379-5061	RYE ROAD BRIDGES
Approved By: KA	Date: 4-7-16		RYE ROAD EAST
			MANATEE COUNTY, FLORIDA

EXHIBIT A-7

APPENDIX B
LABORATORY TESTING

Laboratory Testing Procedures

During the field exploration, a portion of each recovered sample was sealed in a jar and transported to our laboratory for further visual observation and laboratory testing. The soil samples were classified in general accordance with the appended General Notes and the Unified Soil Classification System based on the material's texture and plasticity. The estimated group symbol for the Unified Soil Classification System is shown on the boring logs and a brief description of the Unified Soil Classification System is included in Appendix C.

Laboratory tests conducted for this project included moisture content, determination of the amount passing a U.S. No. 200 sieve, pH, resistivity, chloride content, and sulfate content. The results of the laboratory testing are summarized in the tables below and on the boring logs in Appendix A.

Boring No.	USCS Classification	Depth (ft)	Moisture Content (%)	Fines Content (%)
B-1	CL	23.5 - 25	34.2	67.4
B-2	CL	43.5 - 45	30.5	80.9
B-3	SM	23.5 - 25	35.6	15.8
B-4	SC	33.5 – 35	36.5	16.0

Boring No.	USCS Classification	Depth (ft)	Resistivity (ohm-cm)	Chlorides (ppm)	Sulfates (ppm)	pH	Environmental Classification
B-1 and B-2[1]	CL and ML	23.5 – 35	3,100	21.6	<1.6	7.1	Slightly Aggressive (for contact with Concrete) Moderately Aggressive (for contact with Steel)
B-3 and B-4[2]	SP, SP-SM	2 – 6	4,600	21.6	<1.6	7.2	Slightly Aggressive (for contact with Concrete) Moderately Aggressive (for contact with Steel)

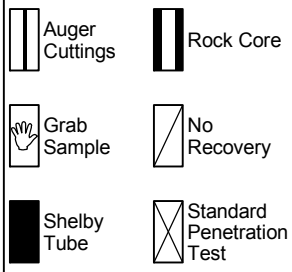
1. A composite sample was used from B-1 from 33.5 to 35 feet bgs and from B-2 from 23.5 to 25 and 28.5 to 30 feet bgs.
2. A composite sample was used from B-3 from 2 to 4 and 4 to 6 feet bgs and from B-4 from 2 to 4 feet bgs.

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(DCP)	Dynamic Cone Penetrometer
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (psf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
		Hard	> 8,000	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

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UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

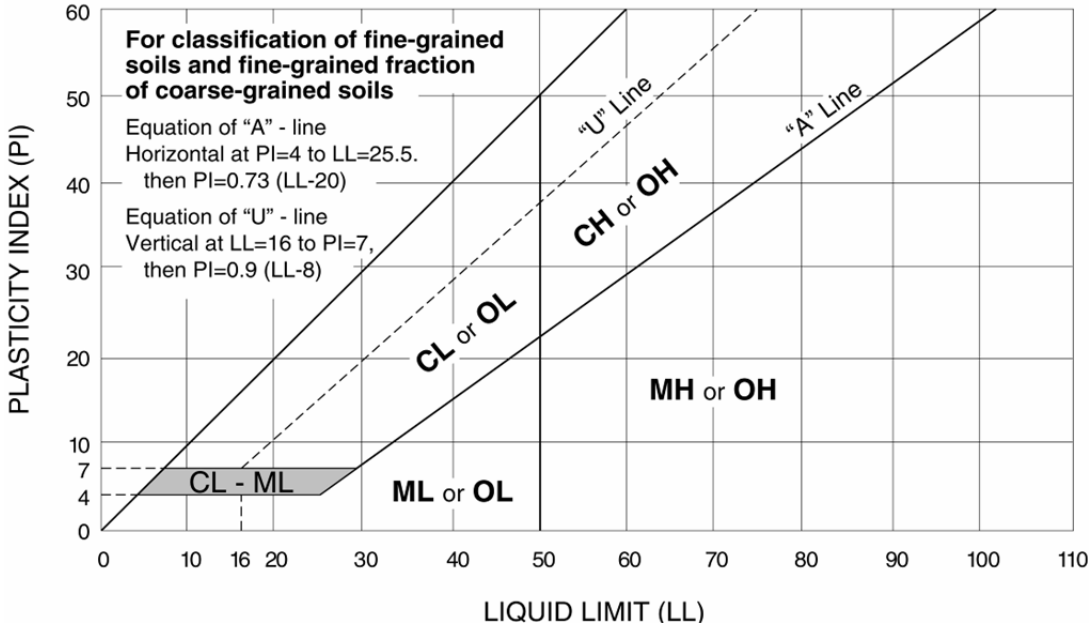
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

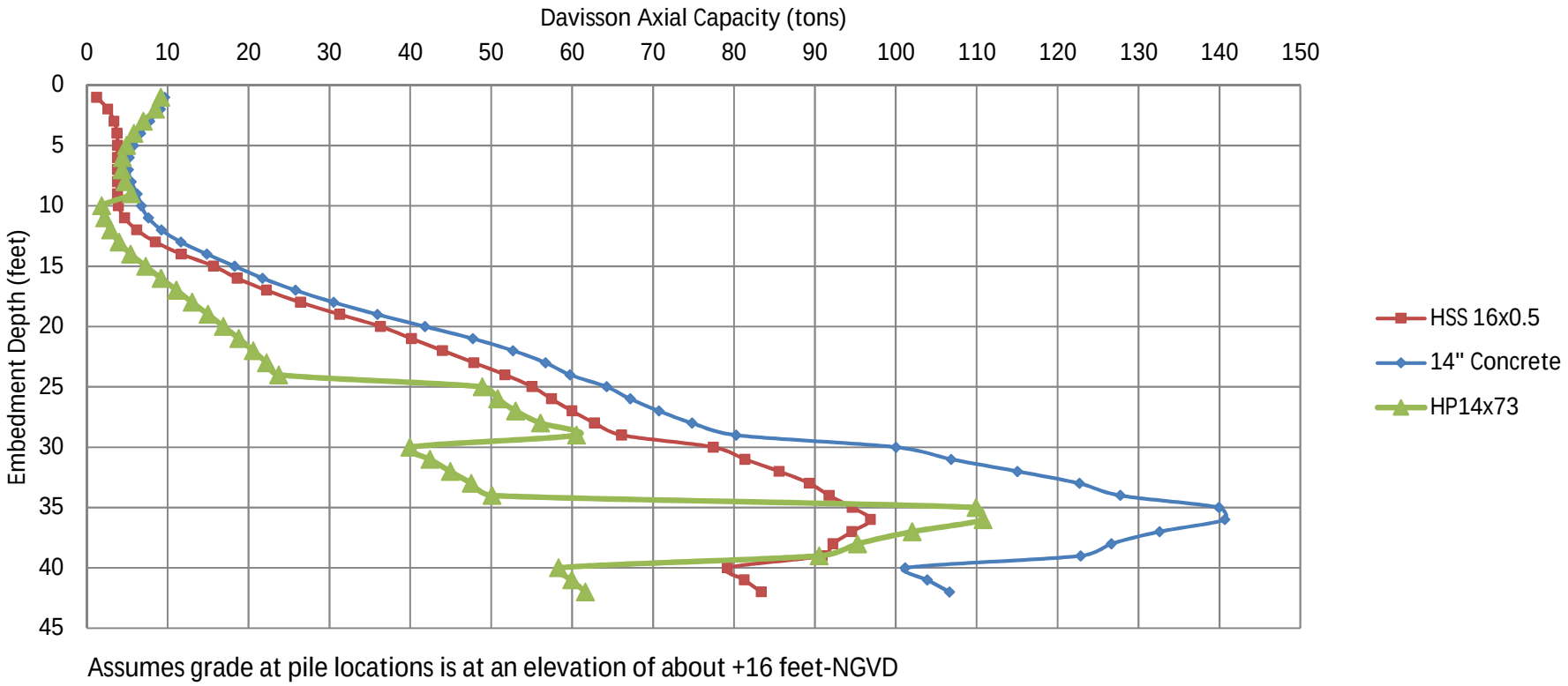


Terracon

Exhibit C-2

APPENDIX D
PILE CAPACITY CURVES

Exhibit D-1
Estimated Davisson Pile Capacity (B-3)
Bridge 134025



Assumes grade at pile locations is at an elevation of about +16 feet-NGVD

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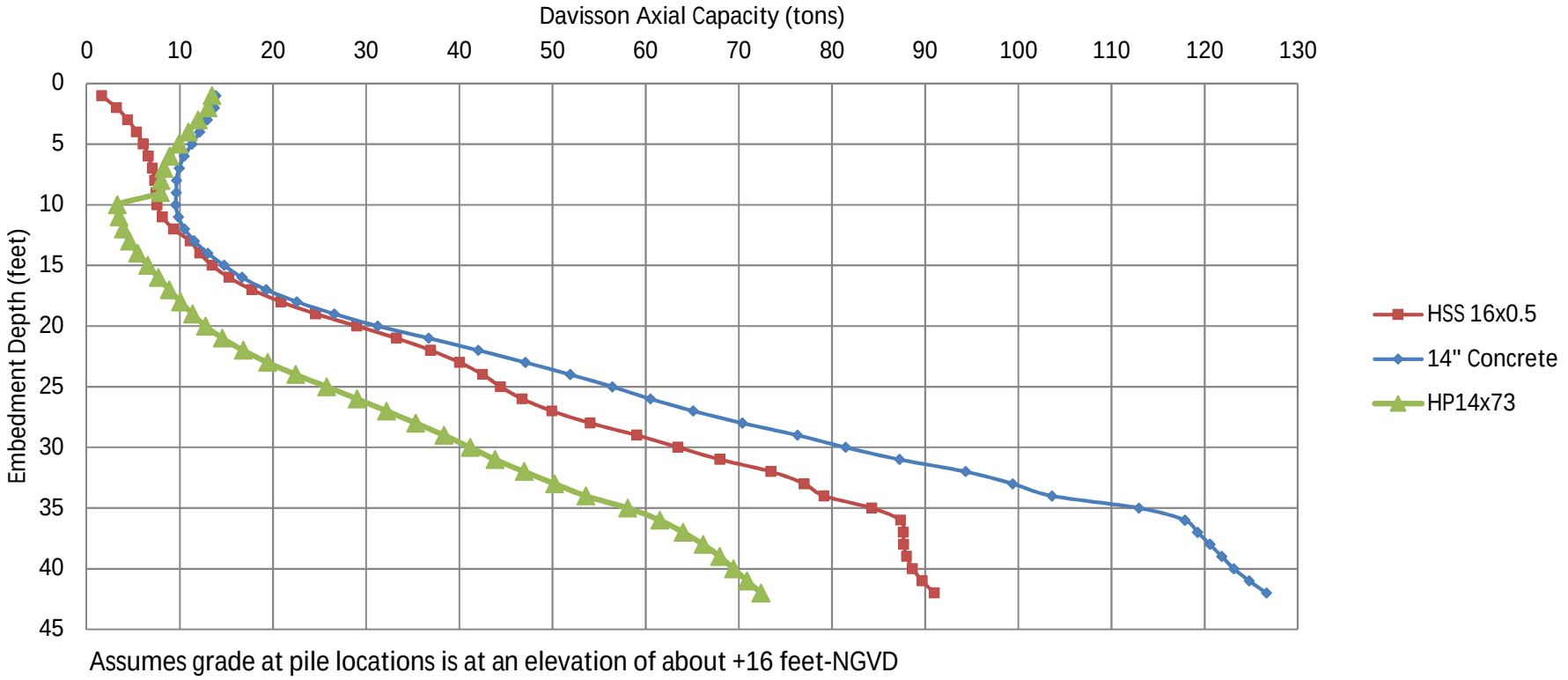
Exhibit D-2
Estimated Davisson Pile Capacity (B-4)
Bridge 134025



Assumes grade at pile locations is at an elevation of about +16 feet-NGVD

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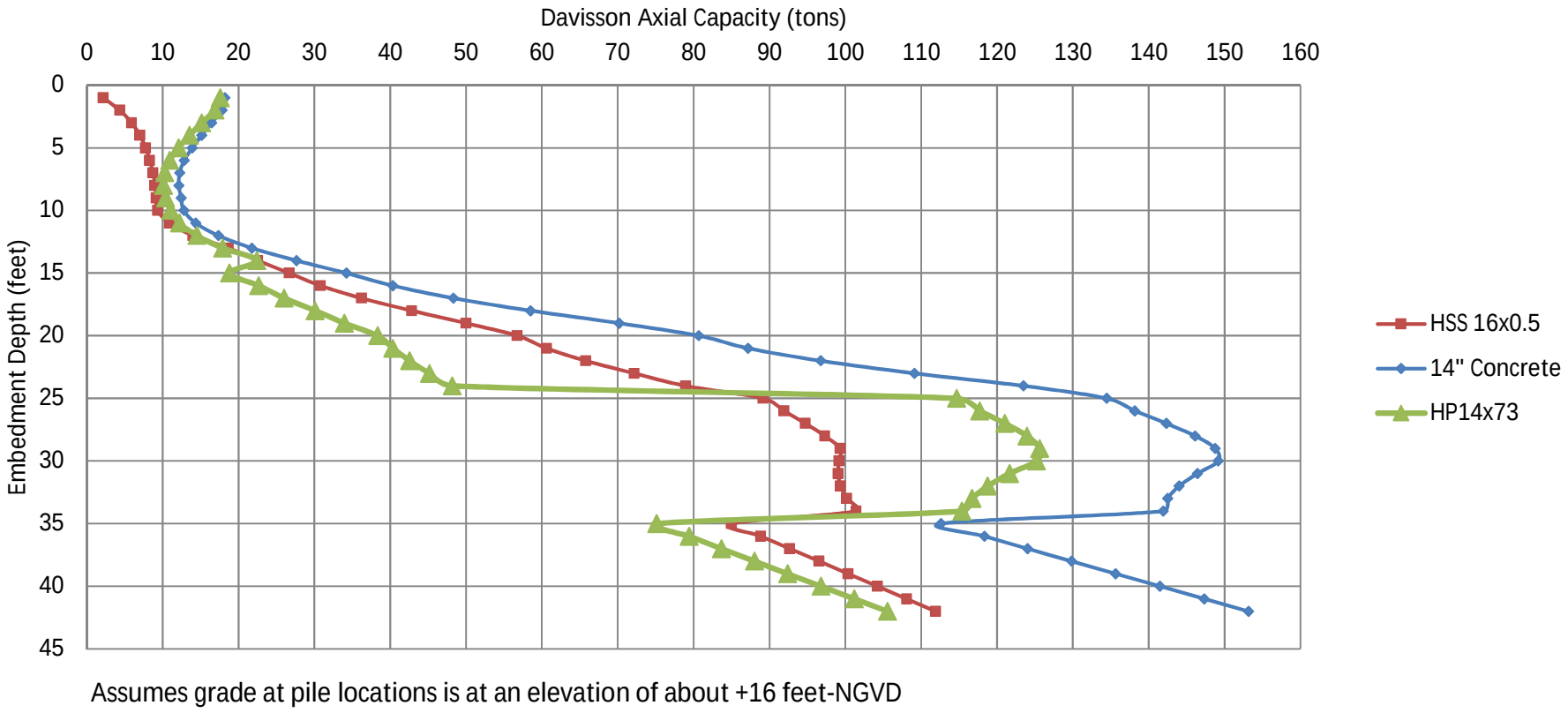
Exhibit D-3
Estimated Davisson Pile Capacity (B-1)
Bridge 134026



Assumes grade at pile locations is at an elevation of about +16 feet-NGVD

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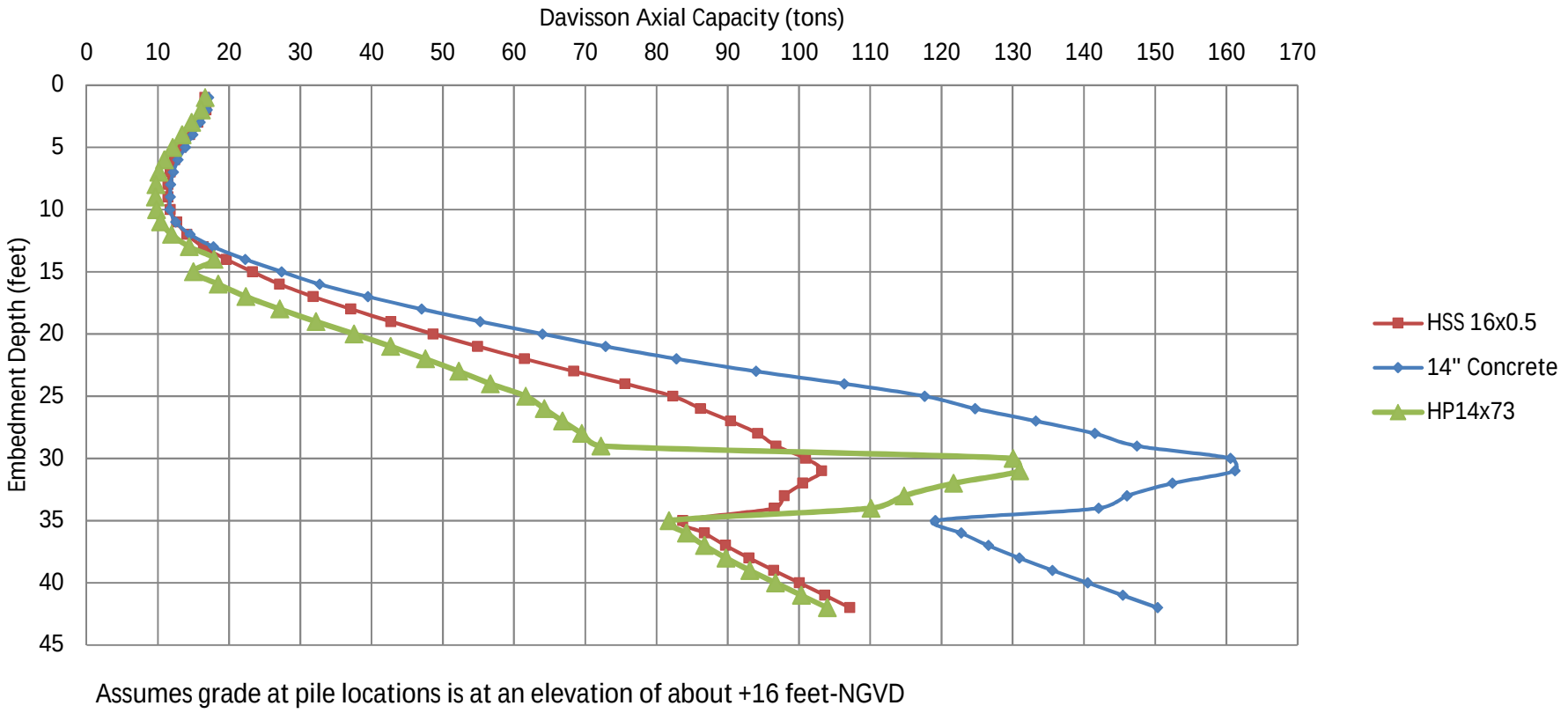
Exhibit D-4
Estimated Davisson Pile Capacity (B-2)
Bridge 134026



Assumes grade at pile locations is at an elevation of about +16 feet-NGVD

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PRELIMINARY PILE DATA TABLE INFORMATION

Terracon Project No. HC165014

Rye Road Bridge 134025

INSTALLATION CRITERIA								DESIGN CRITERIA					
PIER OR BENT NUMBER	PILE SIZE (In.)	REQUIRED NOMINAL BEARING RESISTANCE (tons)	TENSION RESISTANCE (tons)	MINIMUM TIP ELEVATION (ft-NGVD)	TEST PILE LENGTH (ft.)	REQUIRED JET ELEVATION (ft.)	REQUIRED PREFORM ELEVATION (ft.)	FACTORED DESIGN LOAD* (tons)	DOWNDRAG (tons)	TOTAL SCOUR RESISTANCE (tons)	NET SCOUR RESISTANCE (tons)	100-YEAR SCOUR ELEVATION* (ft.)	RESISTANCE FACTOR - ϕ
End Bent	14	43	N/A	-4.0	40	N/A	N/A	24	N/A	4	0	12.8	0.65
End Bent	HSS16	43	N/A	-5.0	40	N/A	N/A	24	N/A	4	0	12.8	0.65
End Bent	HP14x73	40	N/A	-6.0	40	N/A	N/A	24	N/A	2	0	12.8	0.65
Int. Bent	14	57	N/A	-4.0	40	N/A	N/A	33	N/A	4	0	12.8	0.65
Int. Bent	HSS16	57	N/A	-6.0	45	N/A	N/A	33	N/A	4	0	12.8	0.65
Int. Bent	HP14x73	54	N/A	-6.0	50	N/A	N/A	33	N/A	2	0	12.8	0.65

*Scour elevation was assumed to be the same as that provided by others for Bridge 134026

Pile Installation Notes:

1. Contractor to verify location of all utilities prior to pile driving operations.

2. Pile spacings are measured horizontally along bottom of pile caps.

3. Minimum tip elevation is required for lateral stability. Piles shall be driven to the minimum tip elevations indicated in the pile data table and extended until driving criteria has been met. Driving criteria shall be based on the following: Required Nominal Bearing Resistance (NBR) = (Factored Design Load + Net Scour + Downdrag) / φ

4. Dynamic load testing shall be performed on all test piles in accordance with FDOT standard specification section 455.

5. No jetting will be allowed below the scour elevation without the approval of the engineer.

DUNKELBERGER
engineering & testing, inc.
A Terracon COMPANY

PRELIMINARY PILE DATA TABLE INFORMATION

Terracon Project No. HC165014

Rye Road Bridge 134026

INSTALLATION CRITERIA								DESIGN CRITERIA					
PIER OR BENT NUMBER	PILE SIZE (In.)	REQUIRED NOMINAL BEARING RESISTANCE (tons)	TENSION RESISTANCE (tons)	MINIMUM TIP ELEVATION (ft-NGVD)	TEST PILE LENGTH (ft.)	REQUIRED JET ELEVATION (ft.)	REQUIRED PREFORM ELEVATION (ft.)	FACTORED DESIGN LOAD* (tons)	DOWNDRAG (tons)	TOTAL SCOUR RESISTANCE (tons)	NET SCOUR RESISTANCE (tons)	100-YEAR SCOUR ELEVATION* (ft.)	RESISTANCE FACTOR - ϕ
End Bent	14	43	N/A	0.0	35	N/A	N/A	24	N/A	4	0	12.8	0.65
End Bent	HSS16	43	N/A	0.0	35	N/A	N/A	24	N/A	4	0	12.8	0.65
End Bent	HP14x73	40	N/A	0.0	35	N/A	N/A	24	N/A	2	0	12.8	0.65
Int. Bent	14	58	N/A	0.0	35	N/A	N/A	34	N/A	4	0	12.8	0.65
Int. Bent	HSS16	58	N/A	0.0	35	N/A	N/A	34	N/A	4	0	12.8	0.65
Int. Bent	HP14x73	55	N/A	0.0	40	N/A	N/A	34	N/A	2	0	12.8	0.65

*provided by others

Pile Installation Notes:

1. Contractor to verify location of all utilities prior to pile driving operations.

2. Pile spacings are measured horizontally along bottom of pile caps.

3. Minimum tip elevation is required for lateral stability. Piles shall be driven to the minimum tip elevations indicated in the pile data table and extended until driving criteria has been met. Driving criteria shall be based on the following: Required Nominal Bearing Resistance (NBR) = (Factored Design Load + Net Scour + Downdrag) / φ

4. Dynamic load testing shall be performed on all test piles in accordance with FDOT standard specification section 455.

5. No jetting will be allowed below the scour elevation without the approval of the engineer.